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Systematische Revision und chorologische Analyse der Monocotyledoneae des Karakorum (Zentralasien, West-Tibet)

Flora Karakorumensis
I. Angiospermae, Monocotyledoneae

W. B. DICKORÉ

Stapfia 39

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Flora Karakorumensis

I. Angiospermae, Monocotyledoneae

Flora of the Karakorum
including a record of species from adjacent mountains of High Asia
(East Pamir, West Kunlun, Northeast Hindukush, Northwest Himalaya, West Tibet)
I. Angiospermae. Monocotyledoneae

W. B. DICKORÉ

Stapfia 39

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Dissertation zur Erlangung des Doktorgrades der Mathematisch-Naturwissenschaftlichen Fachbereiche der Georg-August-Universität zu Göttingen

im Rahmen des Schwerpunktprogramms der Deutschen Forschungsgemeinschaft „Kulturraum Karakorum"

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Abstract

A critical revision of the Monocotyledoneae comes to the recognition of 282 species of 17 families being properly known from or likely to occur in the Karakorum mountains. Four new species are described and seven new combinations are made. Distributional and ecological data are annotated for the taxa occuring in the Karakorum, keys are included where possible. The flora of the Karakorum mountains is poor in species, but essentially transitional and dominated by taxonomically complex and widely distributed groups. Closely related or vicarious species of neighbouring mountains are informally included here for these reasons.

The Karakorum mountains, situated between the high plateaux of East Pamir and West Tibet and bounded by the Kunlun to the north and Himalaya / Hindukush to the the south, are a central continental cross-roads of the Eurasiatic Flora. The tremendous mountain chains, towering in K2 (8611 m), the second highest peak on earth, make up exceptionally sharp boundaries between the Holarctic and (sub-) tropical regions. The Karakorum also constitutes most conspicuous barriers between the Irano-Turanian, the Central Asiatic and the Sino-Himalayan regions with fundamentally different climatic features. On the other hand, the edges of the widely glaciated ridges of the Karakorum link up, as a migration path and filter, the Himalayan and Southeast Tibetan centres of diversification of many „arctic-alpine" floristic elements to other high mountain systems and to the high latitudes of the Holarctic. Centralasiatic elements generally dominate in the cold-arid Karakorum, but flora and vegetation are highly varied altitudinally, and from the periphery to the central ranges as well. A considerable decline of species number from southwest to northeast, linked to a distinct rise of altitudinal distribution limits of many species, is most conspicuous. Most of the rich Sino-Himalayan flora is excluded to the north by the Himalaya main ridge, but a fairly rich West-Himalayan flora is distributed through the Indus gorge to Nanga Parbat and the Southwest Karakorum (Gilgit). The Gilgit area is also a centre of the generally few endemic species of the Karakorum. Upper Chitral and a larger part of the South Karakorum (Yasin, Hunza, Baltistan to Southeast Zanskar) are relatively rich in Himalayan elements, which almost entirely disappear north of the Karakorum main ridge. Irano-Turanian elements are primarily excluded to the east of the ridges at the Afghan and Chitral borders. A reduced set of Irano-Turanian species is widely distributed in the inner valleys of the S Karakorum. Centralasiatic and East Pamirean elements are characteristic to the north and northwest Karakorum, a few species occur disjunct on the south slope, occasionally extending to Ladakh and South Tibet. The distribution areas of some Tibetan (High Asian) elements are separated from the East Pamir to the Tibetan Plateau ("Karakorum gap").

The regional and altitudinal floristic diversity and differentiation (vicarious species) are markedly similar in different taxonomic groups. They are, apparently, predominantly determined by steep climatic gradients. Geological, ecological and evolutionary-systematic aspects of the flora of the Karakorum and the chorology of taxa involved, are discussed. There is some evidence that characteristic actual distribution patterns are connected to palaeoecological environments and events, and they may monitor the history of pleistocene glaciation or even plate-tectonics during the Tertiary.

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Vorwort - Preface

Der vorliegende Band ist der Versuch einer kritischen Revision und systematisch-chorologischen Analyse der Flora des Karakorum, Angiospermae, Monocotyledoneae. Die Inventarisierung der Monocotyledoneae des Karakorum-Systems, darunter einige der wichtigsten Futter- und sonstigen Nutzpflanzen, basiert auf der einzigartigen "*La flora del Caracorùm*" (PAMPANINI 1930, 1934) und dem Material sowie den Ergebnissen zahlreicher früherer und nachfolgender Feldforscher und Taxonomen. Ich habe versucht, das trotz aller geländebedingter Schwierigkeiten heute weit umfangreichere Belegmaterial und die Literaturangaben, soweit verfügbar und möglich, kritisch und als Synthese angrenzender Floren zu analysieren.

Ich hatte im Jahr 1986 die Gelegenheit, die Faszination des höchsten und unzugänglichsten Gebirges der Erde, immer noch nahezu einem der letzten "blanks on the map", zu erfahren. Geschlossene Vegetation und selbst einzelne Pflanzen bilden im Großteil des hochariden Karakorum, dessen Oberfläche zu etwa der Hälfte über 5000 m Meereshöhe liegt und in weiten Teilen vergletschert ist, eine seltene Ausnahme. Umsomehr scheint der Karakorum im Herzen Zentralasiens eine "innerkontinentale Grundausstattung" des Lebens zu beherbergen, eine artenarme Flora von engem genetischen Zusammenhalt, deren Glieder außerordentliche Plastizität, Anpassungsfähigkeit und die Möglichkeit weitreichender Radiation besitzen können.

Wissenschaftliche Arbeiten im Karakorum erfordern noch immer volle Expeditionslogistik, wochenlanges Trekking in tief eingeschnittenen Tälern, abenteuerliche Flußüberquerungen und ungesichertes Klettern entlang gigantischer Felswände, nur um die abgelegeneren Gebiete zu erreichen. Die beiden einzigen Straßen über das Gebirge von annähernd der gleichen Fläche, aber fast der doppelten Reliefenergie der europäischen Alpen, der Karakorum Highway über den Khunjerab-Paß und der Kashgar - Lhasa Highway im Osten, sind teure und schwierig zu unterhaltende Bauwerke hoher politischer Sensibilität. Kriege, Nationalitäten- und Grenzkonflikte in Afghanistan, Kashmir, Ladakh und auf dem Aksai Chin-Plateau trugen überdies dazu bei, daß Teile des Karakorum seit dem späten Beginn der Erforschung, die um die Mitte des neunzehnten Jahrhunderts einsetzte, bis heute unzugänglich sind. Andererseits schreitet die Erschließung und ungeregelte Ausnutzung der erreichbaren Ressourcen, die schon bald zum Verschwinden der letzten Waldreste im SW Karakorum führen könnte, auch hier rapide fort.

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Abkürzungen, Symbole und Anordnung - Abbreviations, symbols and arrangement

Die Abkürzungen für Autoren folgen weitgehend BRUMMITT & POWELL (1992, Authors of Plant Names, Kew), für Bücher und Zeitschriften B-P-H, B-P-H/S (Botanico-Periodicum Huntianum, LAWRENCE & al. [ed.] 1968, Pittsburgh; BRIDSON & SMITH [ed.] 1991, Pittsburgh), für Herbarien Index Herbariorum (HOLMGREN & al. 1990, ed. 8, 1. The Herbaria of the World, New York). Abkürzungen allgemeinen Gebrauchs wie SI-Einheiten sind in der folgenden Liste ebenfalls nicht enthalten. Familien, Gattungen, Arten und Unterarten sind alphabetisch angeordnet, Bastarde am Ende der jeweiligen Gattung, Gattungsbastarde am Ende der Familie. Der Aufbau der systematischen Aufzählung folgt einem einheitlichen, unten erläuterten Schema, das bei kultivierten Pflanzen [•] und zusätzlich erwähnten, bislang nicht im Karakorum nachgewiesenen Sippen [*, kleingedruckt] um einige Elemente reduziert ist. In einem vertretbar erscheinenden Ausmaß wurde die Original-Information von Herbarium-Etiketten und aus der Literatur (außer von historisch interessanten Belegen und Schreibweisen sowie Typen) abgekürzt und standardisiert.

The following list does not include abbreviations of authorities, books and journals, herbaria and abbreviations of general usage, as SI-units. For the first I have followed BRUMMITT & POWELL (1992, Authors of Plant Names, Kew), largely, for the second B-P-H, B-P-H/S (Botanico-Periodicum Huntianum, LAWRENCE & al. [ed.] 1968, Pittsburgh; BRIDSON & SMITH [ed.] 1991, Pittsburgh), for the third Index Herbariorum (HOLMGREN & al. 1990, ed. 8, 1. The Herbaria of the World, New York). The last should be readily comprehensible. Families, genera, species and subspecies are arranged alphabetically, hybrids at the end of the genus, infrageneric hybrids at the end of the family. Species records from the Karakorum are given in a uniform scheme, which is explained below. The data set is reduced in cultivated plants [•], and additional species [*, printed in small type], which are not yet reported from the Karakorum. Locality references and the originial information from herbarium tickets (except for type- and historically interesting information) are standardised to a certain degree and shortened by dropping of expletives.

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I. Standardabkürzungen - General abbreviations

Afgh.	Afghanistan
alp.	alpine
Baluch.	Baluchistan
c.	circa, about
C.	central
Centr.As.	Central Asiatic element
cf.	confer, similar to
coll.	colline
Cosmopol.	Cosmopolite
Dzung.	Dzungaria
E	east
E Asiat.	East Asiatic element
E Pamir.	East Pamirean element
Endem.	Endemic, confined to a small distribution area
Euras.	Eurasiatic element
Euro-Sib.	Euro-Siberian element
excl.	excluding
fig.	figure
Gl.	glacier
Holarct.	Holarctic element
Ir.-Tur.	Irano-Turanian element
KKH	Karakorum Highway
leg.	legit, collected by
Medit.	Mediterranean element
mont.	montane
Mts.	Mountains
N	north
NWFP	North West Frontier Province (Pakistan)
P.	pass (La, Davan, An)
Palaeotrop.	Palaeotropical element
Pantrop.	Pantropical element
pl.	plate
p.p.	in part (pro parte)
Rd.	road
Rv.	river (He, Darya)
S	south
Sino-Him.	Sino-Himalayan element
s.n.	without number (sine numero)
S Tibet.	South Tibetan element
subalp.	subalpine
subniv.	subnival / high alpine
subtrop.	subtropical
Sud.-Sind.	Sudano-Sindean element
temp.	temperate
Tibet.	Tibetan element
trop.	tropical
veg.	vegetative specimen (thought to be distinctive)
Vy.	valley (Chu, river basin)
W	west
W Centr.As.	West Central Asiatic element
W Himal.	West Himalayan element
W Pamir.	West Pamirean element
yg.	Young specimen (thought to be distinctive).
!	Specimen seen by the author
?	Ambiguous data (illegible or doubted)
[ ]	Additional comments by the author
'	(in original or type information) feet: 1'= 0.3048 m
-	(with blanks) from - to, in-between
+	(before collecting number): provisional number
•	Cultivated species (potentially)
*	Additional species not reported from the Karakorum

II. Anordnung der Nachweise - Arrangement of records

Scheme of species records:

1. Current number. Name of species AUTHOR, reference to original publication
2. [synonyms] *Synonym* AUTHOR year of publication
3. **Ic.:** Illustrations (optional, if available preferably of good access and quality).
4. **[Area Subarea:]** Records of the taxon from the Karakorum) **(Unloc.:** for untracable localities).
5. **A**: Records from adjacent areas. (optional).
6. **D**: Total distribution. **Map:** Distribution map (optional).
7. **E**: Ecology (total altitudinal range in Karakorum, altitudinal belt, regional frequency. Habitat).
8. **N**: Additional Notes.

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Citation of specimens:

[locality] [altitude] [, date], [*reference*].
One or more components of this record form may be missing. Records with identical elements are connected with semicolon [;].

Locality: in descending order separated by commas, if consisting of more than one component. Symbols as defined above.

Altitude: in metres above sea level, rounded in 10 metre intervals. Values in feet were converted to metres by multiplication with 0.3048. Altitudinal ranges are cited [from-to]. If the originally given altitudinal range seems to be very inaccurate (ranging more than 400 m in a single herbarium specimen), or in any other way unconfirmed, the altitude is given in brackets [( )], dubious altitudes with question mark [?].

Date: is only given in records without collecting number or when of special interest. Citation form: Year-Month-Day, if a from - to record: [/] (example: 1856-07-15/08-05 = July 15th to August 8th, 1856).

Reference: the reference form is as follows:
[*collector*] [*collecting number*] [(HERBARIUM; LITERATURE)]. Specimens seen by the author are indicated with exclamation mark [!].

Examples of localities:

Ganto P. W :	West of Ganto La (West-facing slope)
K2-N Gl. W :	West of K2-North glacier (East-facing slope)
Muztagh Vy. E :	Eastern (flanks of) Muztagh valley (West-facing slope)
Doko - Gon :	Between Doko and Gon.

Example of a record:

(*Carex atrofusca*):

[Sassir - Murgai] (4570-5180 m), 1848-08-28, *T.Thomson* (CLARKE 1898; K! **type** *C. hypsobates* NELMES 1940).

The specimen of *Carex atrofusca* seen at Kew (K!), bearing the collecting date of *Thomas Thomson*, a rather inaccurate locality ("Nubra") and altitude "15000-17000 feet" (in brackets: amplitude > 400 m), was collected between Sassir and Murgai (in square brackets; here: according to THOMSON 1852), cited by CLARKE 1898, and taken as the (holo)type of *Carex hypsobates* by NELMES (1940).

III. Wichtigste Quellen - Main sources of records

General floras which do not, or only to a minor part of their area, cover the Karakorum, or not giving definite localities, are cited only under certain circumstances and abbreviated as follows:

Enum.Nepal	An Enumeration of the Flowering Plants of Nepal
Fl.Bhutan	Flora of Bhutan
Fl.Brit.India	Flora of British India
Fl.Eur.	Flora Europaea
Fl.Sin.	Flora Reipublicae Popularis Sinicae
Fl.USSR	Flora of the USSR

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Standard floras relating to the Karakorum or adjoining areas are cited and abbreviated as follows:

Ann.Cat.Pak.	R.R.STEWART 1972: Flora of West Pakistan. Annotated Catalogue.
Fl.Desert.Sin	Flora in Desertis Reipublicae Populorum Sinarum
Fl.Iran.	Flora Iranica
Fl.Pak.	Flora of (West) Pakistan
Fl.Tadzh.	Flora Tadzhikskoy SSR [Flora of the Tadzhik SSR]
Fl.Xizang.	Flora Xizangica
Pl.As.Centr.	Plantae Asiae Centralis

The abbreviation without volume number is cited for records from these floras, except for *Fl.Pak.* which covers most of the flora of the Karakorum. Specimens not seen by the author and cited in *Fl.Pak.* are given only by herbarium reference. *Pl.As.Centr.*, which includes the Karakorum N slope, are repeated. Records from *Fl.Iran.* and *Fl.Tadzh.*, which cover areas adjoining to, but not overlapping with the Karakorum as defined here (Chitral, Swat and Pamir), are generally not repeated, but included in the distribution maps. *Fl.Xizang.*, the only flora that is at present complete, does not include the Karakorum itself nor does it give definite localities. *Fl.Desert.Sin.* has been consulted for illustrations only.

Regional floras are:

HEMSLEY 1902	The Flora of Tibet or High Asia
FEDTSCHENKO 1903-1915	Flore du Pamir
PAMPANINI 1930	La flora del Caracorùm
PAMPANINI 1934	Aggiunte alla flora del Caracorùm
PODLECH & ANDERS 1977	Florula des Wakhan
ASWAL & MEHROTRA 1994	Flora of Lahaul-Spiti

Local floras, expedition reports and other contributions as major other sources of literature information from the Karakorum and immediately neighbouring areas are:

HENDERSON & HUME 1873	(Ladakh, E Karakorum, Kunlun, Kashgaria)
STEWART 1916	(Ladakh)
OSTENFELD 1922	(E Pamir, N Karakorum, Tibet)
DOLK 1929	(W Karakorum)
SCHMID 1932	(Ladakh, E Karakorum, Kunlun, Kashgaria)
WENDELBO 1952	(Chitral: Tirich Mir)
GILLI 1957	(CS Karakorum)
KITAMURA 1960	(Karakorum, Swat, Hazara)
KITAMURA 1964	(Afghanistan)
WEBSTER & NASIR 1965	(CS Karakorum)
HARTMANN 1966	(CS Karakorum)
GREY-WILSON 1974	(Wakhan)
BILLIÉT & LEONARD 1986	(Ladakh)
DICKORÉ 1991	(CN & N Karakorum, Kunlun, W Kashgaria)

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IV. Geographische Gliederung des Karakorum - Subareas of the Karakorum

Abgrenzung und Definition siehe Karte 1. - Delimitation and definition see map 1.

CN		Central North
1.	**Braldu**	Braldu Vy., Lower Shaksgam Vy.
2.	**K2-North**	K2 North, Muztagh Vy., Middle Shaksgam Vy.
3.	**Shaksgam**	Upper Shaksgam Vy.
CS		Central South
4.	**Shimshal**	Shimshal Vy.
5.	**Biafo**	Biafo Vy., Panmah Gl., Lower Braldo Vy.
6.	**Baltoro**	Baltoro Vy., K2 South
7.	**Saltoro**	Saltoro, Hushe Vy., Korkondus Vy.
8.	**Nubra**	Nubra Vy., Siachen Gl.
N		North
9.	**Mustagh Ata**	Mustagh Ata (Kunlun - Pamir)
10.	**Taxkorgan**	Taxkorgan Vy. (E Sarikol)
11.	**Mintake**	Mintake Vy., Khunjerab P. N
12.	**Yarkand**	Middle Yarkand Vy. (E-W course)
13.	**Upper Yarkand**	Yarkand Plateau, Karakorum P. N
14.	**Karakash**	Middle Karakash Vy. (E-W course)
W		West
15.	**Ghizar**	Ghizar Vy. (Swat - Hindukush)
16.	**Yasin**	Yasin Vy. (Karakorum - Hindukush)
17.	**Ishkoman**	Ishkoman Vy.
18.	**Gilgit**	Gilgit Basin, Lower Indus Vy., Indus Gorge
19.	**Hunza**	Hunza, Nagar, Middle Hunza Vy.
20.	**Hispar**	Hispar Vy., Gl.
21.	**Batura**	Batura Vy., Upper Hunza Vy.
22.	**Khunjerab**	Khunjerab P. S, Ghujerab Vy.
S		South
23.	**Shigar**	Shigar Vy., Chogo Lungma Gl.
24.	**Skardu**	Skardu, Middle Indus Vy.
25.	**Leh**	Leh, Upper Indus Vy. (Ladakh proper)
26.	**Lower Shyok**	Lower Shyok Vy.
27.	**Shyok**	Middle Shyok Vy., NW Ladakh Range
28.	**Pangong**	Pangong Lake (W), NE Ladakh Range
E		East
29.	**Changchenmo**	Changchenmo Vy.
30.	**Upper Shyok**	Upper Shyok (N-S course)
31.	**Depsang**	Depsang, Shyok Plateau, Karakorum P. S
32.	**Upper Karakash**	Upper Karakash Plateau
33.	**Aksai Chin**	Aksai Chin, Lingzi Tang (W Tibet)

Area numbers refer to diagrams of altitudinal distribution on distribution maps (appendix).

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V. Angrenzende Gebiete - Adjoining regions

Abgrenzung und Definition siehe Karte 1. - Delimitation and definition see map 1.

(**North**: Kashgaria, Kunlun)

W Kashg.	Plains of Western Kashgaria (<2000 m); Kashgar, Yengisar, Yarkant (Soche) Oasis, Yecheng, Pishan
S Kashg.	Plains of Southern Kashgaria (<2000 m) E of Hotan
Kongur	King Ata Tag, Kongur Shan; Kizil Vy., Gez Vy. (NW of Taxkorgan-Yarkand rivers)
W Kunlun	Western Kunlun Shan (SE of Taxkorgan-Yarkand rivers) including foothills; Lower Yarkand Vy., Tiznap Vy., Kiliang Vy., Karakax Vy.
C.Kunlun	Central Kunlun E of Karakash - Yulunkax - divide

(**West**: Pamir)

W Pamir	Western Pamir (Tadzhikistan)
E Pamir	Eastern Pamir (Tadzhikistan)
Wakhan	Wakhan (Afghanistan)

(**South**: W Himalaya)

Chitral	Chitral State / Vy.
Chilas	Chilas prefecture, Lower Indus (Inner Hazara, Nanga Parbat W)
Astor	Astor Vy. (Outer Gilgit, Nanga Parbat E)
Deosai	Deosai Plains, Shingo Vy. (Outer Baltistan)
Dras	Dras Vy. (Outer W Ladakh)
Suru	Suru Vy. (W Zanskar)
Zanskar	Central Zanskar, Zanskar Vy. (Outer C. Ladakh)
Swat	Swat State / Vy.
Hazara	Hazara State (excl. Inner Indus Vy.)
Kashmir	Kashmir Vale (incl. Azad Kashmir)
Himachal Pr.	Himachal Pradesh

(**East**: Tibet)

Rupshu	Rupshu (Outer E Ladakh)
W Tibet	(South-) West Tibet (Upper Indus basin)
Changtang	Changtang Plateau / NW Tibet (interior drainage system)

References to more distant areas are occasionally given, but not generally included:

N Kashg.	North Kashgaria
E Kashg.	East Kashgaria
Alai	Alai (Pamir - Tianshan)
Seravshan	Seravshan
Hissar-Darvas	Hissar-Darvas Mts.
S Tadzh.	S Tadzhikistan
E Tadzh.	E Tadzhikistan
Badakhshan	Afghan Badakhshan (excl. Wakhan)
Nuristan	Afghan Nuristan (Kunar Province)
Kurram	Kurram Vy. and Safed Koh Mts. (Afgh. - Pakistan border)
Uttar Pr.	Uttar Pradesh (Himalayan part)
W Nepal	W Nepal
Punjab	Punjab, lowlands of W Pakistan and NW India

Borders of areas within of Tadzhikistan are designed according to Fl.Tadzh.

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Geographical Division		**W**	**West**
		15.	Ghizar
Subareas of the Karakorum:		16.	Yasin
		17.	Ishkoman
		18.	Gilgit
CN	**Central North**	19.	Hunza
1.	Braldu	20.	Hispar
2.	K2-North	21.	Batura
3.	Shaksgam	22.	Khunjerab
CS	**Central South**	**S**	**South**
4.	Shimshal	23.	Shigar
5.	Biafo	24.	Skardu
6.	Baltoro	25.	Leh
7.	Saltoro	26.	Lower Shyok
8.	Nubra	27.	Shyok
		28.	Pangong
N	**North**		
9.	Mustagh Ata	**E**	**East**
10.	Taxkorgan	29.	Changchenmo
11.	Mintake	30.	Upper Shyok
12.	Yarkand	31.	Depsang
13.	Upper Yarkand	32.	Upper Karakash
14.	Karakash	33.	Aksai Chin

Karte 1 - Map 1: **Geographische Übersichtskarte**: Abgrenzung und geographische Gliederung des Karakorum und angrenzender Regionen

- Geographical base map: Delimitation of the Karakorum, subareas and adjacent areas.

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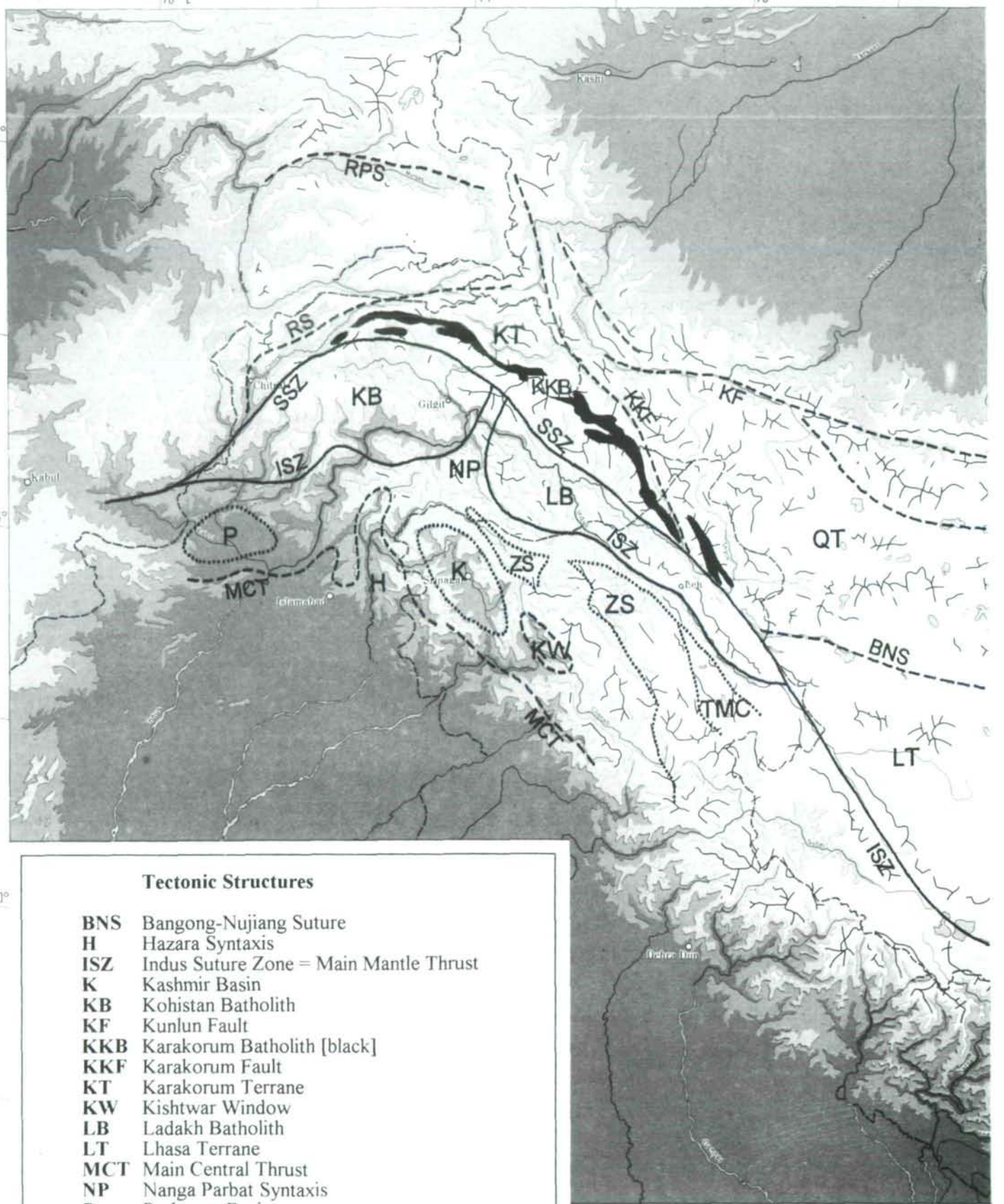

Tectonic Structures

BNS	Bangong-Nujiang Suture
H	Hazara Syntaxis
ISZ	Indus Suture Zone = Main Mantle Thrust
K	Kashmir Basin
KB	Kohistan Batholith
KF	Kunlun Fault
KKB	Karakorum Batholith [black]
KKF	Karakorum Fault
KT	Karakorum Terrane
KW	Kishtwar Window
LB	Ladakh Batholith
LT	Lhasa Terrane
MCT	Main Central Thrust
NP	Nanga Parbat Syntaxis
P	Peshawar Basin
QT	Qiangtang Terrane
RPS	Rushan-Pshart Suture
RS	Reshun Fault
SSZ	Shyok Suture Zone = Northern Suture
TMC	Tso Morari Crystalline Complex
ZS	Zanskar Soupergroup

Karte 2 - Map 2: **Geologisch-Tektonische Übersichtskarte** des Karakorum und angrenzender Gebiete - Geological-tectonic sketch map (compiled from SEARLE 1991).

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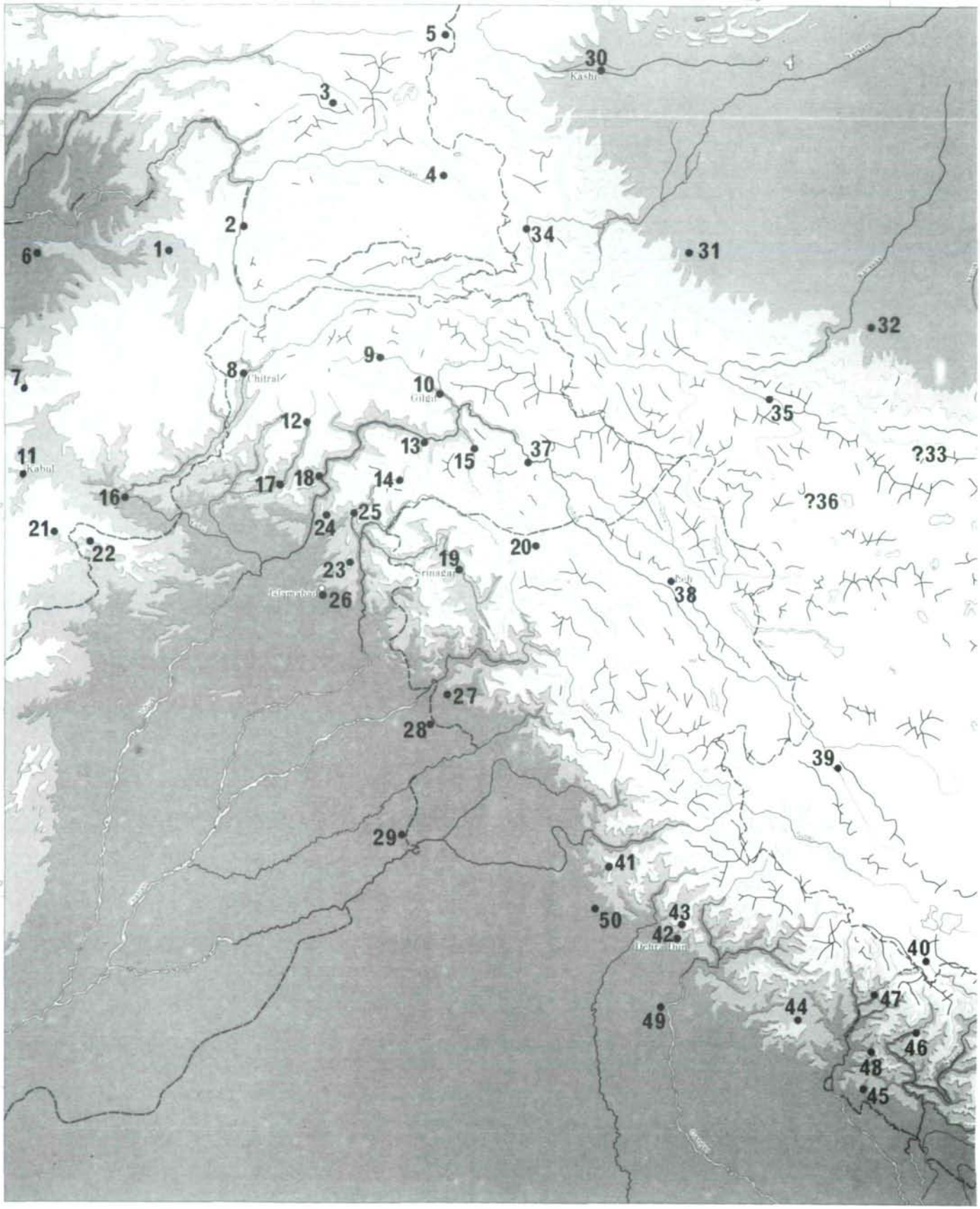

Karte 3 - Map 3: **Klimastationen / Klimadiagrammkarte** des Karakorum und angrenzender Gebiete - Climate stations and climate diagram map of the Karakorum and adjacent regions (from MIEHE unpubl.). →

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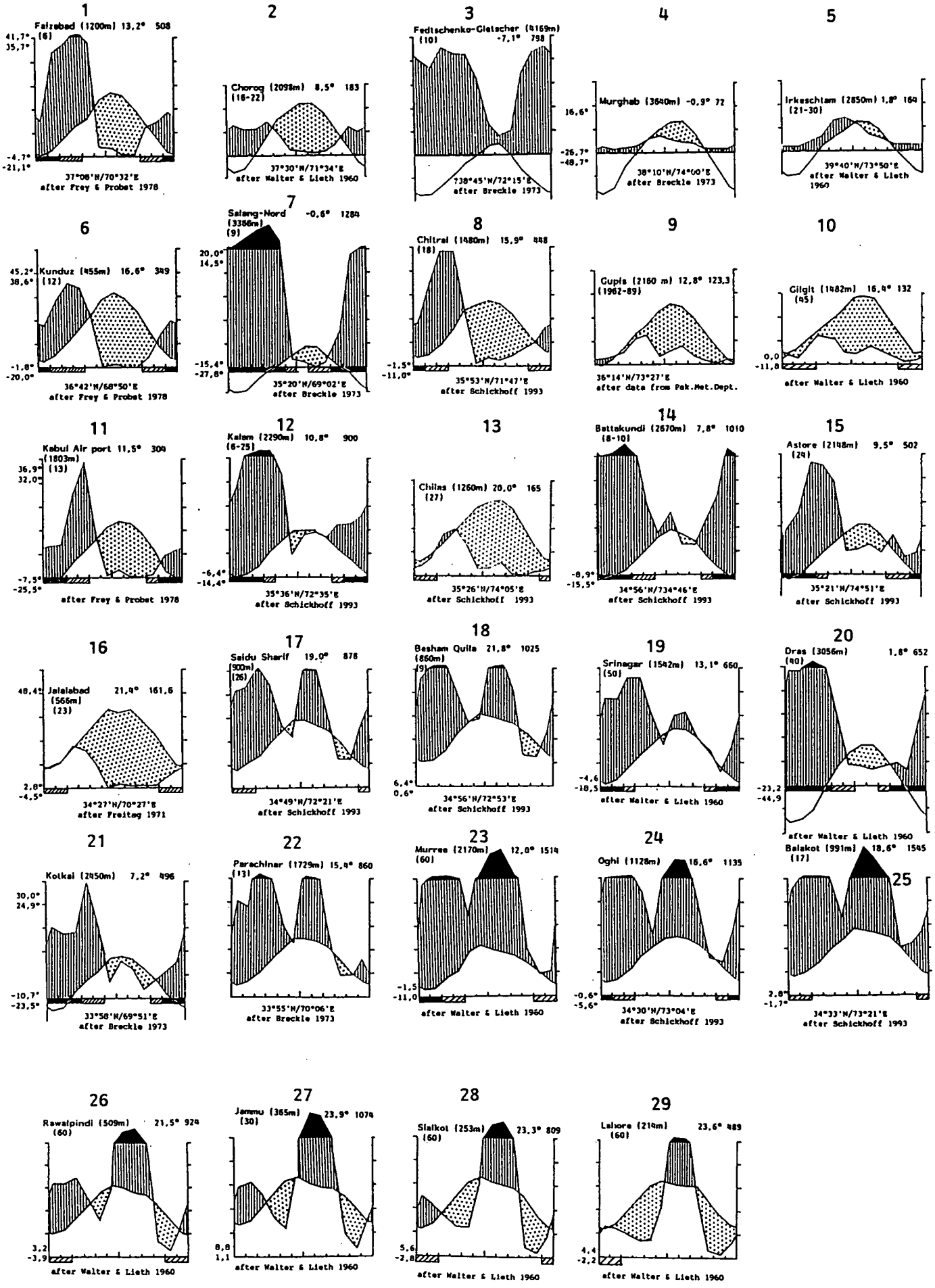

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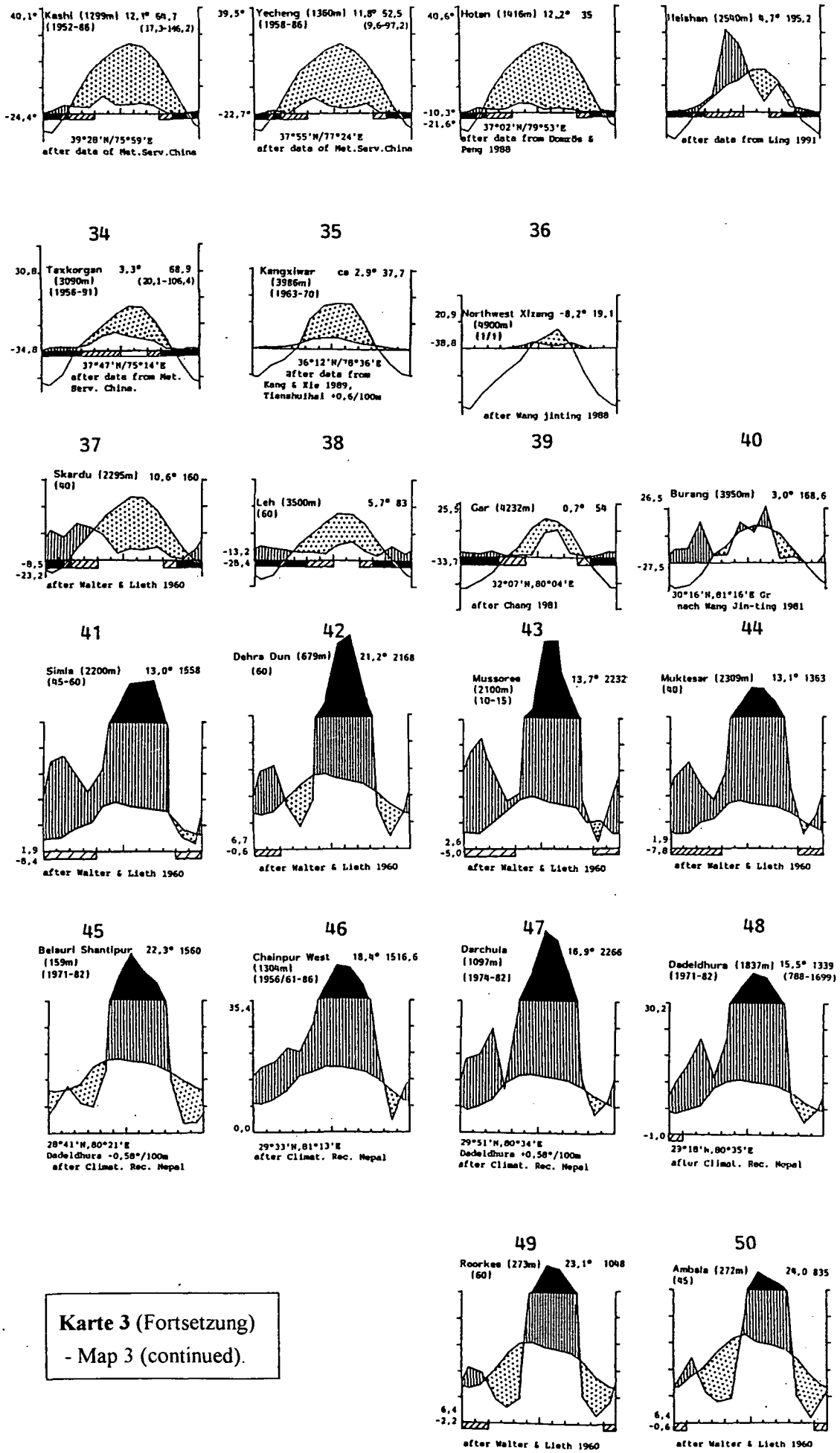

Karte 3 (Fortsetzung)
- Map 3 (continued).

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1 Einleitung - Introduction

Die letzte und einzige Flora des Karakorum, PAMPANINI (1930, 1934), ist eine sehr bemerkenswerte Arbeit, die nicht nur das floristische Wissen seiner Zeit zusammenfaßt. Sie enthält darüber hinaus die Reiserouten aller Sammler, die bis zu diesem Zeitpunkt in das abgelegene Gebirge vorgestoßen waren. Mit einer gut reproduzierbaren Nomenklatur und Sippenauffassung versucht PAMPANINI (1930) auch bereits eine geoökologische Gliederung und altitudinale Zonierung, die allerdings auf dem damals noch nicht sehr umfangreichen Datenmaterial beruht. Nach „*Flora of Tibet*" (HEMSLEY 1902) und „*Flora Pamira*" (FEDTSCHENKO 1902-1915) ist PAMPANINIs „*La flora del Caracorùm*" die letzte handliche und abgeschlossene Flora für ein geobotanisch definiertes Gebirgssystem Hochasiens. Obwohl PAMPANINI (1930, 1934) eine gute Basis bildet, verlangt das in jüngerer Zeit angesammelte Material nach einer kritischen Überarbeitung.

Moderne Floren, deren Gebiet Teile des Karakorum einschließen oder daran angrenzen sind *Flora Iranica*, *Flora of Pakistan*, *Flora Tadzhikistana*, *Plantae Asiae Centralis*, *Flora Xizangica* und *Flora Sinica*. Alle bis auf *Flora Xizangica* sind unvollendet, die meisten sind monumental und bestehen aus zahlreichen Faszikeln. Die für den Karakorum relevante botanische Information muß aus der gewaltigen Menge des publizierten Materials extrahiert werden und bleibt zu einem Großteil redundant oder inkonsistent. Der Karakorum bildet eine der markantesten natürlichen und politischen Grenzen Asiens, gleichfalls aber auch für die jeweils adaptierten unterschiedlichen taxonomischen Konzepte. Da die meisten der modernen Floren nationale Projekte sind, sind unterschiedliche Benennungen und unnötige Neubeschreibungen vermeintlich neuer Sippen jenseits politischer Grenzen häufig.

Wegen der zentralen Lage des Karakorum und der weitgehend unzusammenhängenden botanisch-systematischen Bearbeitung benachbarter Gebiete wurde der geographische Rahmen in der vorliegenden Untersuchung möglichst weit gefaßt. Eine größere Anzahl von Taxa, die bisher nicht aus dem Karakorum nachgewiesen sind, wurde mitberücksichtigt. Diese umfassen in angrenzenden Gebieten verbreitete Sippen ("to be expected"), häufige Fehlbestimmungen, die oft auch zu nah verwandten und vikariierenden Sippen zu rechnen sind (misidentifications and closely related / vicarious taxa), und ungeklärte Verwandtschaftskreise und Nomina ("poorly understood"). Obwohl somit ein großer Teil des Arteninventars benachbarter Gebirge (W Kunlun Shan, E Pamir, NE Hindukush, W Himalaya, W Tibet) hier zusätzlich berücksichtigt wird, ist die Auswahl dieser Taxa künstlich und kann nicht als repräsentativ gelten. Beabsichtigt ist allerdings die Andeutung eventueller floristischer Beziehungen zu Nachbargebieten und offener Probleme.

Generell macht die Flora des Karakorum einen außerordentlich kohärenten Eindruck. Hochgradig uniformierende Konvergenz bei gleichzeitig hoher intraspezifischer Variabilität, aber auch interspezifischer Kontakt und Genaustausch, Grenzfälle der Artbildung und des Artbegriffs, scheinen in der lebensfeindlich kalt-ariden und zentralkontinentalen Umgebung des Karakorum eher die Regel denn Ausnahme. Als schwierig bekannte Großgattungen wie *Calamagrostis*, *Elymus*, *Festuca*, *Poa*, *Puccinellia*, *Stipa*, dominieren in der Flora des Karakorum weit über die vereinzelten, taxonomisch isolierteren Endemiten. Exakte Artdefinitionen wären oft, wenn überhaupt, nur durch cytologische oder genetische Untersuchungen zu fixieren. Die schwierige Verfügbarkeit von (Lebend-) Material oder die Merkmalsarmut und mangelnde morphologische Korrelation können aber auch die Ergebnisse dieser Zukunftsaufgaben begrenzen. Ein vergleichsweise profanes, aber evidentes Problem stellte für die vorliegende morphologische Bearbeitung bereits das Herbarmaterial aus dem Karakorum dar, das auch unter günstigen Sammelbedingungen zu einem Großteil vegetativ, verkümmert oder verbissen ist.

Ungelöste taxonomische Probleme bieten weiterhin vor allem Repräsentanten Irano-Turanischer Großgattungen, die den Karakorum nur mit einzelnen Vertretern erreichen (*Eremurus*, *Gagea*). Welche Taxa im Karakorum vorkommen, kann vom Arealrand her oft nicht einwandfrei geklärt werden. Die Zahl der in der Literatur für den Karakorum angegebenen Arten übersteigt hier u.U. die Zahl der Belege.

Aus den angegebenen Gründen ist die vorliegende Flora in weiten Teilen in Diskussionsform gehalten. Zwar konnte in vielen Fällen Typusmaterial eingesehen, dessen exakter Status jedoch häufig nicht geklärt

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werden. Die Synonymie ist daher auf die für das Gebiet wichtigen und allgemein akzeptierten Nomina beschränkt; wichtige neue Synonyme sind entsprechend gekennzeichnet. Typusbelege werden generell nur zitiert, wenn sie aus dem Karakorum oder angrenzenden Gebieten stammen. Literaturangaben ohne verfügbares korrespondierendes Herbarmaterial werden, soweit möglich, übernommen bzw. interpretiert. Ich habe generell versucht, ein möglichst konservatives und relativ weites Artkonzept anzuwenden. Dieses beruht auf morphologischen Differentialdiagnosen, in einigen Fällen auch auf Beobachtungen in lebenden Populationen. Die Artabgrenzung wird, soweit möglich, durch ökologische und chorologische Konzepte gestützt.

Die Schreibweise geographischer Namen, außer von Nationalstaaten, erfolgt in der vorliegenden Arbeit grundsätzlich in einer standardisierten englischen Form, der taxonomische Teil (Systematische Aufzählung - Systematic Enumeration) ist ganz auf Englisch abgefaßt, um das Problem der zahllosen existierenden Varianten und Ansätze möglichst nicht weiter zu verschärfen. Lediglich der sprachlich korrekten Schreibweise "Karakorum" (= black gravel, nach dem im Bereich des Karakorum P. anstehenden karbonischen Schiefergestein), homonym allerdings mit der historischen Hauptstadt der Mongolei, wurde der Vorzug gegenüber dem eindeutigen, aber in der englischen Literatur auch nicht durchgängig verwendeten "Karakoram" gegeben. Russische Namen, mit Ausnahme der gebräuchlichen Autorennamen, sind in der einfachsten englischen Form transkribiert.

2 Geographie - Geography

2.1 Abgrenzung des Karakorum - Delimitation of the Karakorum

Die vorliegende Arbeit umfaßt das Karakorum-System und angrenzende Gebiete wie oben definiert (Karte 1 - map 1, pp. ix-xi). Die Abgrenzung und Untergliederung des Karakorum basiert auf der Gliederung von PAMPANINI (1930). Änderungen sind unten angegeben.

Abgesehen von verschiedenen abweichenden Systemen und Möglichkeiten (z.B. Karakoram Map, Swiss Foundation for Alpine Research 1990), ist die geographische Abgrenzung des Karakorum im N durch die Längstäler von Yarkand und Karakash und im S durch den Verlauf der Flüsse Gilgit und Indus klar definierbar. Aus praktischen Erwägungen wird hier die jeweils direkt gegenüberliegende Talseite, ausschließlich der größeren Seitentäler, mitberücksichtigt:

1. Die jeweilige Talseite, an der eine Pflanze gesammelt oder beobachtet wird, ist relativ zufällig und hängt von der Erreichbarkeit des Ortes ab. Viele der großen Täler des Karakorum sind nur an einer Seite zugänglich und müssen häufig gequert werden. Die Flußläufe sind zudem oft unstabil. Würde der Flußlauf oder die Tiefenlinie als Grenze gewählt, so müßte z.B. im Upper Indus Vy. Leh ein- und Skardu mit einer ähnlichen Flora im Lower Indus Vy. ausgeschlossen werden, weil die Orte zufällig auf verschiedenen Flußseiten liegen. Praktisch unmöglich wäre eine solche Trennung in den wenig bekannten Tälern der Karakorum N-Seite.

2. Selbst in größeren Höhen über dem Talgrund sind die Floren gegenüberliegender Talseiten einander offenbar ähnlicher als die gegenüberliegender Paßseiten. Die großen Täler haben ein eigenes Klima. Daher verlaufen auch die Vegetations-Höhengrenzen selbst E-W gerichteter Täler auf annähernd derselben Höhe. Die Asymmetrie drückt sich im ariden Gebiet überwiegend in einer höheren Artenzahl der Nordexposition aus (DICKORÉ 1991).

3. Die südexponierten Talhänge sind generell wesentlich trockener als die nordexponierten. Im extremen Fall der Täler des N Karakorum (Yarkand, Karakash), sind die südexponierten Hänge nahezu vegetationsfrei. Der Löß der Kunlun Shan N-Abdachung fehlt hier auf beiden Talhängen. Da die wenigen Arten der Kunlun Shan S-Seite ebenfalls typischer für die Flora der inneren Ketten sind, ist der Einschluß der Kunlun Shan S-Abdachung in den Karakorum auch floristisch und ökologisch gerechtfertigt.

4. Die Himalaya-Hauptkette spielt im S eine noch entscheidendere Rolle, indem sie den größten Teil der hygrophilen Sino-Himalayischen Monsun-Flora begrenzt. Die Hauptkette ist jedoch im Bereich des Indus-Durchbruchtales und im Zoji P. tief eingeschnitten. Daher kann eine verarmte Himalayische Flora in den SW Karakorum eindringen. Als Begrenzung wurde hier ein Kompromiß gewählt, der einen offenbar

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charakteristischen erweiterten W Himalayischen Artensatz einschließt, aber die Hauptmasse der artenreichen Sino-Himalayischen Flora der Himalaya S-Seite ausschließt.

Die E-Grenze des Karakorum sensu PAMPANINI (1930) ist künstlich und schließt einen ausgedehnten Teil des Tibetanischen Plateaus ein. Diese Grenze kann nicht natürlicher gefaßt werden, es sei denn, man schließt den gesamten tibetanischen NE-Teil des Karakorum aus. Um die Vergleichbarkeit zu erhalten und den Übergang zum Tibetanischen Plateau zu demonstrieren, wurde diese Grenze jedoch nur leicht verändert und schließt hier das Aksai Chin / Lingzhi Tang-Plateau, etwa entlang der Linie des "Indian claim" auf den Karten, das Changchenmo Vy. und den W Pangong Lake ein.

Im W kann eine natürlichere Abgrenzung durch den Einschluß des gesamten Gilgit-Einzugsgebietes erreicht werden. Ghizar, Yasin und Ishkoman bilden den Übergang zum Hindukush-System, sind dem Karakorum aber auch floristisch ähnlicher als dem westlich angrenzenden Gebiet, auch wenn sich ein gewisser Irano-Turanischer Einfluß bemerkbar macht. Aus ähnlichen Gründen wurde auch das bei PAMPANINI ebenfalls nicht berücksichtigte Übergangsgebiet zum Pamir-System nördlich des Khunjerab P. (Mintake, Taxkorgan) eingeschlossen. Das Mustagh Ata-Massiv steht etwas abseits und vermittelt zwischen Karakorum, Pamir und dem Kunlun Shan-System (King Ata Tagh, Kongur Shan). Eine hinreichende Ähnlichkeit zur Flora des NW Karakorum rechtfertigt auch hier den Einschluß.

Administrativ umfaßt der Karakorum Teile der Xinjiang Autonomous Region (Xinjiang Uygur Zizhiqu / Sinkiang) von China, der Gilgit and Baltistan Prefectures der Northern Areas Pakistans und des Jammu & Kashmir State Indiens. Im W grenzt das oben definierte Gebiet an den Chitral State Pakistans, den Wakhan Corridor (Badakhshan Province) Afghanistans und den Murghab District Tadzhikistans (frühere Sowjetunion); im SE an Tibet oder die Xizang Autonomous Region Chinas. Die nationalen Grenzen sind ungünstigerweise streckenweise undefiniert, umstritten oder bilden sensible Waffenstillstandslinien. Die Bezeichnung der politischen Grenzen im Text und auf den Karten sind nicht autoritativ.

2.2 **Topographie** - Topography

Der Karakorum, wie hier definiert, liegt etwa zwischen 33° - 38° N und 73° - 80° E. Er umfaßt ein Gebiet von etwa 180 000 km^2, annähernd die Ausdehnung der europäischen Alpen (200 000 km^2). Da der Karakorum seinerseits von extremen Hochgebirgen umgeben ist, ist die geoökologische Abgrenzung vergleichsweise schwierig. Das Karakorum-System verbindet die Plateaus von Tibet und Pamir. An das Westende der Karakorum-Hauptkette schließt sich der in NE - SW-Richtung verlaufende Hindukush an. Im N und S begrenzen die ± parallel verlaufenden Systeme des W Kunlun Shan bzw. des W Himalaya den Karakorum.

Das Karakorum-System besteht aus einer Serie generell NW - SE verlaufender Hochgebirgsketten von etwa 600 km Länge auf einer Breite zwischen 200 und 400 km. Im E scharen die Ketten weit und tauchen in das Tibetanische Plateau ein, einem vergleichsweise ebenen Tafelland zwischen 5000 und 6000 m Meereshöhe mit nur wenigen isolierten Bergmassiven von wesentlich größerer Höhe. Die Hauptachse des Karakorum beschreibt einen flachen nach S geöffneten Bogen, der im W auf der Höhe von Chitral nach SW schwingt und in den Hindukush übergeht. Die Ketten des N Karakorum bilden einen gegenläufigen Bogen, der im NW mit der Mustagh Ata-Gruppe an die Gebirge des King Ata Tagh und Kongur Shan (W Kunlun Shan) und die Sarykol-Kette des E Pamir anschließt.

Der größte Teil des Karakorum ist ein Gebiet maximaler Reliefenergie, das in dieser Flächenausdehnung selbst den zentralen Himalaya übertrifft. Ein Meer von 6000-8000 m hohen Gipfeln und steile Schluchttäler, eingeschnitten bis auf unter 2000-3000 m Meereshöhe, charakterisieren den Zentral-Karakorum. Vier Gipfel erreichen mehr als 8000 m, K2 (Chogori Feng, Mt. Godwin-Austen, 8611 m), der zweithöchste Berg der Erde, Gasherbrum (8068 m), Broad Peak (8047 m) und Hidden Peak (8035 m). Mehr als 15 größere Gruppen und zahllose Einzel-Peaks überragen 7000 m. Unter den prominentesten dieser Gipfel sind Rakaposhi (7754 m), Haramosh (7397 m), Disteghil Sar (7989 m), Masherbrum (7821 m), Saltoro Kangri (7742 m), Saser Kangri (7672 m) und, etwas abseits im NW, Mustagh Ata (7546 m). Einige

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der höchsten Gipfel, die den Karakorum umgeben, sind Pik Kommunizma / Pik Kaufmann (7495 m) und Pik Lenina (7134 m) im Pamir, Kongur Shan (7719 m) und Mustagh (7281 m) im Kunlun Shan, Tirich Mir (7708 m) und Noshaq (7349 m) im Hindukush, Nanga Parbat (8126 m), Nunkun (7135 m) und Shilla (7026 m) im Himalaya.

Der tiefste Punkt des Karakorum an der Einmündung des Gilgit in den Indus (1300 m, bzw. Bunji 1270 m) liegt zwischen den nur ca. 100 km von einander entfernten Gipfeln von Nanga Parbat und Rakaposhi. Talböden mit breiten alluvialen Flußterrassen reichen entlang des Indus im S von unter 1500 m bis über 4000 m und erstrecken sich entlang Yarkand und Karakash im N zwischen 3000 und über 5000 m Meereshöhe.

Der Zentral-Karakorum umfaßt grob die Hauptkette zwischen Khunjerab P. (4703 m) und Karakorum P. (5575 m). Mit Ausnahme des Shimshal P. (4735 m) unterschreitet der Kamm der Hauptkette auf einer Strecke von 250 km kaum 6000 m Meereshöhe. Der Karakorum bildet die Wasserscheide zwischen dem Indus-Einzugsgebiet und dem internen Entwässerungsgebiet Zentalasiens (Yarkand Vy., Karakash Vy.). Die NW-Grenze des Karakorum entspricht der Wasserscheide zum Einzugsgebiet des Amu Darya (mittelasiatisches internes Entwässerungsgebiet). Teile des NE Karakorum, der größte Teil NW Tibets (Changtang, Qiangtang) und ein Teil von Rupshu (S des Indus) sind abflußlose Hochgebirgsbecken. Die Pässe der kontinentalen Wasserscheide befinden sich im N Karakorum. Die rückschreitende Erosion der großen Indus-Zuflüsse, Hunza im W und Shyok im E, hat die Karakorum-Hauptkette tief durchschnitten. Die Oberläufe dieser Flüsse (Batura, Khunjerab, Shimshal; Upper Shyok, Depsang, Changchenmo) repräsentieren daher die geologische Nordseite des Karakorum (Aghil Range).

2.3 **Geographische Regionen** - Geographical divisions

Die Regionalisierung des Karakorum in größere Talschaften folgt prinzipiell PAMPANINI (1930), mit verschiedenen durch die unterschiedliche Abgrenzung und das verfügbare differenziertere Material induzierten Abweichungen. Einige der größeren Teilgebiete PAMPANINIs wurden in Einheiten vergleichbarer Größe unterteilt. So wurde sein "Valle del Hunza": Hunza, Batura, Khunjerab und Shimshal, "Valle del Indo": Skardu und Leh, "Valle del Sciàiok": Lower Shyok, Shyok und Upper Shyok, "Versante settentrionale": Yarkand, Upper Yarkand, Braldu, K2-North, Shaksgam und Upper Karakash. Die reichen, neueren Sammlungen erlauben eine feinere Unterteilung im N und W auch auf floristisch-chorologischer Grundlage, während das Material aus dem SE Karakorum bis heute unterrepräsentiert ist.

Die geographische Gliederung des Karakorum und angrenzender Gebiete ist allein als Referenzsystem gedacht. Die abgegrenzten Sektoren sind nicht notwendigerweise floristisch homogen. Hunza z.B. umfaßt einen feuchten SE- (Nagar) und einen trockenen NW-Teil. Charakteristische Verbreitungsmuster erstrecken sich oft auch etwas über Pässe. Die untersuchten Sammlungen ergaben etwa, daß die Flora eines kleinen Gebietes SW des Khunjerab P. typisch zentralasiatisch ist, oder daß der östlichste Teil des Karakash-Tales die Tibetanische Flora des Aksai Chin beherbergt. Dieses sind jedoch phytogeographische Ergebnisse, die nicht a priori als Referenzsystem genutzt werden können. Prinzipiell erwies sich jedoch die auf PAMPANINI aufbauende geographische Gliederung auch zur Darstellung chorologischer Zusammenhänge als gut geeignet. In relativ wenigen Fällen erschweren größere Paßplateaus (z.B. Shimshal [Pamir] P. und Thalle P.) oder ungenau angegebenene Fundumstände die exakte Lokalisierung und Zuordnung von Belegen oder Literaturangaben. Gegen die Anwendung eines Gitternetzes spricht die geringe und ungleichmäßige Durchforschung sowie die extrem gebirgige Natur des Karakorum, die die Zuordnung eines Nachweises zu einer Talflanke meist wesentlich sicherer und aussagekräftiger macht.

Ortsnamen sind im Karakorum und weiten Teilen Zentralasiens ein permanentes Problem, da unzählige Namen, Sprachen, Varianten und Synonyme selbst in den fast unbesiedelten Gebieten existieren. Viele Lokalitäten sind lediglich "camping grounds" oder "base camps" ohne irgendwelche Bauwerke und mit wechselnder Bedeutung und Repräsentanz auf verschiedenen Karten. Ein weiteres Problem ist die asiatische Eigenart, daß häufig die Täler an den gegenüberliegenden Seiten eines Passes den gleichen Namen tragen. In der Schreibweise der Ortsnamen habe ich eine vorsichtige, aber nicht durchgängig mögliche

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Standardisierung versucht. Herbarmaterial sollte immer mit möglichst exakten Koordinaten und Meereshöhen versehen werden.

Als weitere geographische Referenz werden für die systematische Übersicht sechs größere Unterteilungen des Karakorum eingeführt: CN, CS, N, W, S und E (Central North, Central South, North, West, South, East). Auch deren Abgrenzungen sind, wie die der angrenzenden Gebiete (Karte 1 - map 1), rein deskriptiv, aber mit dem Versuch, die Arten phytogeographischen Regionen und Verbreitungsmustern zuzuordnen, verbunden.

Auch bei den angrenzenden Gebieten bilden politische Grenzen problematische und oft unzureichende Einheiten. Hier wird Swat auf das Einzugsgebiet des Swat-Flusses (einschließlich Dir) beschränkt. Hazara schließt die direkt zum Indus entwässernden Täler und das Kaghan Vy. ein, das Gebiet indusaufwärts wird als Chilas (Diamir, Chilas Agency) abgegrenzt. Astor ist ein gut definiertes Talsystem, politisch jedoch ein Teil von Gilgit. Deosai (einschließlich Shingo Vy.), Dras, Suru (einschließlich Wakha Vy.) und Zanskar (Zaskar) umschließen ebenfalls relativ gut abgegrenzte Talschaften, werden in der Literatur aber häufig abweichend definiert. Rupshu (abflußloses Gebiet, Upper Sutlej Vy. und Hanle Vy.) ist in der hier verwendeten Umgrenzung geographisch sehr heterogen, aber durch eine einheitliche tibetanische Übergangsflora gekennzeichnet. Azad Kashmir (Muzaffarabad / Pakistan) und Kashmir (Jammu & Kashmir / Indien), getrennt durch eine militärstrategisch begründete, relativ unnatürliche Waffenstillstandslinie, werden zusammengefaßt. Die hier verwendeten Grenzen zwischen Kashmir, Himachal Pradesh und Uttar Pradesh entsprechen weitgehend denen der indischen Verwaltungseinheiten, mit der Ausnahme, daß die kleinen Teile von Himachal Pradesh N der Himalaya-Hauptkette Zanskar (Bara Lacha P. N) bzw. Rupshu (Parang P. N) zugeschlagen werden. Die geographischen Bezeichnungen werden hier in der definierten Weise benutzt und nicht in deren üblichen und oft weit differierenden Bedeutungen.

3 **Geologie und Pedologie** - Geology and Pedology

3.1 **Tektonik** - Tectonics

Die komplexe Geologie und Tektonik des Karakorum und angrenzender Gebirgssysteme ist in weiten Teilen immer noch unzureichend bekannt. Es kann jedoch auf eine hervorragende moderne Synthese (SEARLE 1991) verwiesen werden, die die Grundlage der folgenden kurzen Zusammenfassung bildet. GANSSER (1964) gibt eine Übersicht für das Himalaya-System.

Die Orogenese des Karakorum ist eine direkte Folge der äquatornahen Kollision der Indischen Kontinentalplatte im frühen Eozän (vor ca. 50 Ma) und deren mit einer Geschwindigkeit von ca. 10-20 mm/a andauernden Subduktion unter die Asiatische Plattengruppe. Die Dicke der Kontinentalkruste im Bereich von Karakorum, Himalaya und Tibet beträgt ca. 50-80 km, d.H. etwa die doppelte normale Dicke. Die Hebung des Karakorum dauert mit einem abzüglich der Erosionsrate auf 0,8-1,6 mm/a geschätzten Betrag an.

Zwei größere Nahtzonen südlich des Karakorum markieren den Schluß der Tethys-Geosynklinale, bzw. den Nordrand der Indischen (Indus Suture Zone) und den Südrand der Asiatischen Platte (Shyok Suture Zone, Main Karakoram Thrust). Der zwischen beiden Plattenrändern eingeschlossene Inselbogen (Kohistan-Ladakh Island Arc) ist durch einen im Bereich von Nanga Parbat - Haramosh unterkeilten Zahn der Indischen Platte (Nanga Parbat Syntaxis) unterbrochen (Kohistan Batholith Terrane, Ladakh Batholith Terrane). Im Nordosten begrenzt die Karakorum-Verwerfung (Karakoram Fault) den Karakorum-Batholithen gegen Tibet, das Changtang-Becken (Qiangtang Terrane) nördlich und S Tibet (Lhasa Terrane) südlich der Pangong Nahtzone (Bangong-Nujiang Suture). Die Karakorum-Verwerfung hat, trotz ihrer Ausmaße und erheblichem Lateralversatz, offenbar keinen Einfluß auf die Zone größter Massenerhebung im Zentral-Karakorum, die sie ohne erkennbare Konsequenz durchzieht (Karte 2 - map 2).

Die Durchbruchsschluchten des Indus (Nanga Parbat Syntaxis) und Tsangpo/Brahmaputra (Namcha Barwa Syntaxis) markieren die Eckpunkte der Einzahnung der Indischen Platte am W- und E- Ende des Himalaya.

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Die Auffaltung des ostwärts ausweichenden Tibetanischen Plateaus erfolgt(e) nördlich dieser analogen, durch das S Tibetanische Verwerfungssystem (Karakoram-Jiale Fault System) verbundenen Strukturen. Als südliche Begrenzung der Himalaya-Auffaltung entsprechen die Hazara Syntaxis und die Assam Syntaxis der Haupt-Unterschiebungsgrenze (Main Boundary Thrust) einander.

Details der tektonischen Abgrenzung des Karakorum gegen den afghanischen Hindukush (Reshun Fault) und den Pamirknoten im W, sowie den Kunlun Shan im N und E (Kunlun Fault, Altyn Tagh Fault) müssen als weitgehend unbekannt gelten. Eine erste Übersicht über die Stratigraphie des N Karakorum und Kunlun Shan gibt DE TERRA (1932).

3.2 **Stratigraphie** - Stratigraphy

GATTINGER (1961) und SEARLE (1991) bieten geologische Karten, die für eine nähere Untersuchung von Zusammenhängen zwischen der geologischen Unterlage und der Vegetationsbedeckung und Florenausstattung genutzt werden können. Korrelationen sind jedoch aus verschiedenen Gründen sehr schwierig. Die anstehenden Gesteine sind außerordentlich vielfältig und wechseln oft kleinräumig. Mehr oder weniger kalkhaltige, kaum metamorphe Sedimentgesteine sind aufgrund der jungen Orogenese auch in engem räumlichen Kontakt der zentralen Granitplutone erhalten. Gneise (K2 Gneiss), Granite und kaum metamorphe, vorwiegend mesozoische Sandsteine und Kalke (Aghil Formation) in enger Nachbarschaft bilden beispielsweise im CN Karakorum (DICKORÉ 1991) für das Vegetationsmuster kaum auswertbare und offensichtlich auch relativ unbedeutende Faktoren. Stark durchmischte quartäre Lockergesteine (Moränen, glaziofluviale Ablagerungen, Schuttkegel; Löß nördlich der Kunlun Shan-Hauptkette) bedecken als Folge der hohen Reliefenergie, Erosions- und Gletscheraktivität große, in den für Pflanzenwachstum verfügbaren Höhenstufen die des anstehenden Gesteins weit übertreffende Flächen. Die oberflächliche Salz- und Basenanreicherung aufgrund hoher Verdunstung im ariden Karakorum trägt weiterhin zu einer weitgehenden Nivellierung ökologisch wirksamer geologischer Standortsfaktoren bei.

Eine stratigraphisch auffallende Einheit stellen die Formationen des N Karakorum (N Karakoram Terrain) dar, die vom Chapursan Vy. (Batura) bis in die Mustagh Ata-Region und ostwärts entlang der Aghil-Kette und der Karakorum-Verwerfung großflächig anstehen. Sie umfassen mächtige, kaum gestörte karbonische bis jurassische Sedimentfolgen aus Kalk- und Sandsteinen, einschließlich der für den Karakorum namensgebenden schwarzen Schiefer, und bilden aufgrund ihrer leichten Erodierbarkeit die Hauptpässe (Khunjerab P., Aghil P., Karakorum P.).

Je nach den klimatischen Bedingungen bieten die Gesteine unterschiedliche Bedingungen für Pflanzenwuchs. Im extrem ariden N Karakorum bilden Schiefer ungünstige mobile und durchlässige Unterlagen. Die Granite der zentralen Ketten, aber auch Kalksteine, verwittern langsamer und bieten daher mehr hygrisch günstige und stabilere Felsspalten- und Hangfuß-Habitate. BHATTACHARYYA (1989) beschreibt für das etwas feuchtere Rupshu praktisch umgekehrte Verhältnisse. Ophiolithe (basische Eruptiva, Diabase), die im Bereich der Suturen anstehen, und quarzitische Gesteine bilden lokal stabile Bedingungen und Sonderstandorte, sind aber wahrscheinlich in ihrer Standortsqualität ebenso abhängig von der Exposition.

3.3 **Glaziologie und Geomorphologie** - Glaciology and geomorphology

Der Karakorum ist das größte Gletschergebiet außerhalb der Polarzonen, mehr als 15 000 km^2 des Zentral-Karakorum sind permanent von Eis und Schnee bedeckt. Glazialprozesse sind bei weitem die wichtigsten physikalischen Faktoren, die die Geomorphologie des Karakorum determinieren. Die Oberflächenformen umfassen das gesamte periglaziale Inventar von Moränen, glaziofluvialen Terrassen, Talfüllungen, Felsstürzen und Schuttströmen. Sedimente gletschergedämmter Seen wurden bereits von THOMSON (1852) nachgewiesen. Sanddünen treten am Indus von Skardu aufwärts bis in über 5000 m Meereshöhe auf den Sandern der ehemaligen tibetanischen Gletscher auf. Löß kommt am Indus nur sehr lokal und geringmächtig vor, bedeckt aber ein großes aktuelles Akkumulationsgebiet nördlich der Kunlun-Hauptkette

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(zusammenhängend mit dem Lößgürtel rings um das Tarim-Becken und dem zentralchinesischen Lößgebiet, Gansu) und dringt durch Täler in den NW Karakorum (Mustagh Ata, Taxkorgan) ein.

Die meisten Karakorum-Gletscher enden aktuell zwischen 2800 m (SW Karakorum), 4100 m (CN Karakorum, K2-N Gl.) und höher. Die Zunge des Minapin Gl. (Hunza Vy.) reichte rezent bis 2150 m herab. Das Ausmaß der pleistozänen Vergletscherung Tibets und des Karakorum ist Gegenstand heftigen Disputs (vgl. Zusammenstellung bei HÖVERMANN & LEHMKUHL 1993). Während viele frühere Autoren (z.B. HEDIN 1922, WISSMANN 1959) eine nur unwesentlich höhere eiszeitliche Gletscherbedeckung annehmen, erscheint dem Autor aufgrund geomorphologischer und biogeographischer Indizien der von KUHLE (1991) postulierte, großflächig geschlossene Eisschild über Tibet wahrscheinlicher. Für das letzte Hochglazial wäre demnach für den Karakorum zumindest ein ausgedehntes Eisstromnetz zwischen den Eiskappen über E Pamir und W Tibet und mit großen Auslaß-Gletschern in das Tarim-Becken und den Punjab, anzunehmen.

3.4 **Pedologie** - Pedology

Aufgrund der klimatisch bedingten (s.u.) Hemmung chemischer und biologischer Prozesse überschreitet die Pedogenese in weiten Teilen des Karakorum kaum das Stadium der physikalischen Verwitterung. Die einzige Untersuchung der Böden des CS Karakorum im Rahmen vegetationskundlicher Untersuchungen bietet HARTMANN (1968, 1972). Eigene Untersuchungen im CN Karakorum (DICKORÉ 1991) beschränkten sich aus Zeit- und Gewichtsgründen.

Im CN Karakorum dominieren ausgeprochene Rohböden; Yermosole (Wüstenböden der tieferen Lagen), Lithosole und Gelosole (Hochlagen). Nennenswerte Humushorizonte, von selten über 2-5 cm Mächtigkeit, kommen fast nur in der oberen alpinen Stufe unter Polstern von *Sibbaldia tetrandra* und unter Rasenflecken (z.B. *Carex borii, Stipa concinna*) vor. In Quellsümpfen gebildeter Flachmoortorf (*Carex, Kobresia*) tritt ebenfalls nur sehr lokal, kleinflächig und geringmächtig auf. Ausgedehnte Soda-Ausblühungen als Anzeichen evaporationsbedingter Oberflächenversalzung sind unterhalb 4000-4400 m in allen Expositionen häufig. Die pH-Werte des Oberbodens sind auffallend hoch, pH ($H_2$0) 7,3-8,4 (9,1), mit einer Tendenz in Richtung neutraler Reaktion in der alpinen Stufe über Granit. Die Oberfläche ist meist, außer bei ausgesprochenen Sand- und Geröllrohböden, außerordentlich hart verbacken. Solonchake treten aufgrund des hohen Reliefs und der physikalischen Instabilität ufernaher Grundwasserstandorte nur sehr kleinflächig am Rand von geschützten Quellaustritten auf.

Etwas differenzierter sind die Bedingungen im klimatisch günstigeren CS Karakorum. HARTMANN (1968) stellt die große altitudinale Variation der Böden, die mit verschiedenen Vegetationskomplexen gekoppelt ist, heraus. Die Profile der sand- oder skelettreichen Böden sind einfach. Der Humusgehalt nimmt von < 1% in grauen bis bräunlichen Steppenböden der montan-subalpinen Stauchsteppen (*Kochia - Ephedra intermedia*-Steppe) bis auf >15% in alpinen Rasen- und Gebüschgesellschaften zu. Die pH-Werte nehmen mit der Meereshöhe stark ab. Unterhalb 3900 m Meereshöhe gibt HARTMANN (1968) meist 100% Basensättigung und pH-Werte nur ausnahmsweise unter 8,4 (pH 7,8 - 9,6) an. Aus der alpinen Stufe (*Salix karelinii*-Gebüsch, alpine Rasen) werden braunerdeartige Wiesenböden mit geringerer Basensättigung (um 50%) und entsprechend höherer Ionen-Austauschkapazität bei pH-Werten im neutralen bis schwach sauren Bereich belegt.

Mesotrophe Braunerden und saure Ranker-Braunerden, eventuell auch mit Anhäufung mächtigen Auflagehumus und Podsolidierungserscheinungen, wie sie SCHICKHOFF (1993) aus dem Kaghan Vy. der Himalaya-Südabdachung angibt, sind andeutungsweise im subalpin-alpinen Grenzbereich (ca. 3000-3300 m Meereshöhe) im äußersten SW Karakorum zu erwarten. Entsprechende, im Bereich des Indus-Durchbruchtales kleinflächig vorkommende Pflanzengesellschaften (*Picea smithiana*-Wälder, vereinzelt mit *Abies webbiana*, *Rhododendron anthopogon*-Gebüsch), wurden hier offenbar noch nicht näher untersucht.

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4 Klima - Climate

Der Karakorum umfaßt Höhenvarianten der kühlgemäßigten Steppen- und Wüstenklimate am Rand der warmgemäßigten Subtropen (TROLL & PAFFEN 1964). Nach WALTER & BRECKLE (1991) sind W Himalaya und Karakorum als Orobiom des "Dreiecks-Zonoökotons" zwischen dem arid-mediterranen Mittelasien (Irano-Turanisches Vegetationsgebiet), dem arid-gemäßigtem Zentralasien (Zentralasiatisches Vegetationsgebiet) und dem humiden Monsungebiet Indiens (Sino-Himalayisches Vegetationsgebiet) aufzufassen. Die klimatischen Charakteristika der Irano-Turanischen (Winterregen), Zentralasiatischen (ganzjährig arid) und der Sino-Himalayischen Region (Sommerregen) sind fundamental unterschiedlich. Generell kann der überwiegende Teil des Karakorum dem Zentralasiatischen Klima- und Vegetationsgebiet zugerechnet werden (GRUBOV 1963), die komplexe orographische Gliederung bedingt jedoch eine außerordentliche lokale Variabilität des Klima- und Vegetationscharakters (HARTMANN 1972, SCHICKHOFF 1993; Karte 3). WEIERS (1993) bietet einen Überblick zur Klimatologie des W Karakorum.

4.1 Monsungebiet - Monsoon area

Typische ganzjährig humide Monsunklimate besitzen Stationen der äußeren Himalaya S-Abdachung in mittlerer Höhe (800-2500 m) von Nuristan, Swat, Hazara und Kashmir ostwärts (Murree, Balakot, Abottabad, Muzzafarabad, Oghi, Besham Qila, vgl. SCHICKHOFF 1993), mit Niederschlags-Jahressummen von 1000->1500 mm, die zu 30->50 % im Sommer (Juli-September) fallen. Zwischen der Vorkette (etwa N der Linie Dir, Madyan, Naran, Pir Panjal, Kishtwar, Chamba, Kulu) und der Himalaya-Hauptkette herrschen randmonsunale Bedingungen mit Niederschlägen zwischen 600-1200 m und semihumiden Sommern (10-30 % der Niederschläge im Juli-September).

4.2 Winterniederschlagsgebiet - Winter precipitation area

Die Winterniederschläge als Folge westlicher Störungen (FLOHN 1959) wirken sich im Bereich der Depression der Himalaya-Hauptkette zwischen dem Indus-Durchbruch und Zoji P. noch im SW Karakorum aus. Die Stationen Chitral, Drosh, Astor (SCHICKHOFF 1993) und Dras (HARTMANN 1983) erhalten etwa 400-600 mm Jahresniederschlag, zu 40-60 % im Winter und Frühjahr (Februar-April) und mit einer ausgeprägten ariden Periode im Sommer. Vergleichbare Bedingungen herrschen wahrscheinlich nordwestlich des Karakorum auch in mittlerer Höhe der N Abdachung des nordwestlichsten Kunlun (Kongur Shan). Die hier lokal vorkommenden *Picea schrenkiana*-Wälder dürften mit dem Übergreifen feuchterer Luftmassen durch die Alai-Senke und die kashgarische Pforte in Zusammenhang stehen, Klimadaten fehlen jedoch.

Der relative Niederschlagsreichtum im SW Karakorum erklärt sich nach WEIERS (1993) aus der Interaktion von Monsun- und Westzirkulation. Typische Niederschlagswetterlagen im Frühjahr entstehen durch zyklonale Strömungen mediterraner Provenienz, die entlang einer Kaltfront über dem Hindukush von SW in den Karakorum eindringen. Sommerniederschläge sind nach WEIERS (1993) auf westliche und südöstliche Strömungen zurückzuführen, die zwischen den Tiefs über Punjab und Pamir und dem W Tibetanischen Hoch, entlang der Indus-/ Hunza-Durchbruchstäler und östlich des Nanga Parbat-Massivs (Astor, Zoji P.), kanalisiert werden und über den W Karakorum zum Tarim-Becken abfließen.

Die altitudinale Verteilung der Niederschläge weist im randmonsunalen W Himalaya ein doppeltes Maximum auf. Das erste Maximum um 2500 m (mit ca. 1300 mm), ist an monsunale Niederschläge des tropisch-konvektiven Typs gebunden und entfällt im SW Karakorum. Das zweite Maximum um 5500 m (mit > 2000 mm auf der Südabdachung des W Himalaya) ist auf zyklonale Störungen des außertropisch-advektiven Typs zurückzuführen. Die Kurve der altitudinalen Niederschlagsverteilung zeigt im SW Karakorum oberhalb ca. 2500 m einen exponentiellen Anstieg, Wendepunkt bei ca. 4000 m, und bei ca. 5500 m ein etwas kleineres Maximum (ca. 1700 mm) (WEIERS 1993).

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Floristisch sind das Gebiet der Winterniederschläge und angrenzende randmonsunale Regionen durch das Vorkommen einer Reihe von Irano-Turanischen und Elementen der feucht-gemäßigten Breiten gekennzeichnet. Diese benötigen eine ausreichende Schneedecke und Frühjahrsfeuchtigkeit und verleihen der Vegetation der Höhenstufen im SW Karakorum, am Nanga Parbat und in Kashmir streckenweise ein nahezu mitteleuropäisches Gepräge.

4.3 Arides Gebiet - Arid area

Der größte Teil des Karakorum ist durch ein kalt-gemäßigtes hochkontinentales und ganzjährig arides bis, in den höchsten Lagen, kalt-subhumides Klima gekennzeichnet. Klimastationen fehlen weitgehend, wenige Klimadiagramme liegen aus der Talstufe vor (WALTER & LIETH 1960-1967). Gilgit (SCHICKHOFF 1993), Leh (HARTMANN 1983) und Gar in W Tibet (SONG YONGCHANG 1983) sind durch extrem niedrige Niederschläge von nur 50-200 mm/a ohne ausgeprägtes jahreszeitliches Maximum gekennzeichnet. In den subhumiden höheren Lagen des SW Karakorum und im Bereich der westlichen Hauptkette, ist eine gewisse Annäherung an das Winterregenregime zu erwarten. Der zentralasiatisch-kontinentale Typ weist ebenfalls eine exponentielle altitudinale Zunahme der Niederschläge auf, aber auf einem niedrigerem Niederschlags-Niveau bei größerer Meereshöhe (260-330 mm bei ca. 6000 m).

Das Wüsten- und Halbwüstenklima ist durch extreme diurnale und jahreszeitliche Temperaturschwankungen, in den Monatsmitteln bis über 50 K, gekennzeichnet. Die Jahresdurchschnitts-Temperaturen variieren zwischen > 15 °C in der kollinen Stufe (Gilgit 1490 m: 15,9 °C) und < 0 °C in höheren Stufen (Leh 3514 m: 5,5 °C, Gar 4278 m: 0,2 °C). Die Region der kalten Gebirgswüsten (SONG YONGCHANG 1983) mit Tibetanischem Klima (FLOHN 1959) umfaßt praktisch die gesamte Karakorum-Nordabdachung. Im E Karakorum gehen Wüsten von subalpinem Floren- und Vegetationscharakter praktisch übergangslos in die subnivalen Wüsten W Tibets über. Die montane, subalpine und alpine Stufe des W und S Karakorum umfaßt einen expositionsbedingt mehr oder weniger ausgeprägten subhumiden bis semiariden Gürtel.

Die Höhengrenzen der Vegetationsstufen und die Schneegrenze zeigen einen erheblichen peripher-zentralen Anstieg (WISSMANN 1960, 1961). Im CN Karakorum entspricht die 4400 m-Isohypse als Untergrenze der subhumid alpinen gegen die aride subalpine Stufe und schärfster Floren- und Vegetationsgrenze annähernd der 0 °C-Isotherme der Jahresdurchschnitts-Lufttemperatur (DICKORÉ 1991). Im gesamten Karakorum bestehen erhebliche Expositionsunterschiede, die sich mikroklimatisch hauptsächlich in einer artenreicheren und dichteren Vegetation der strahlungsgeschützten Nordhänge ausdrücken.

Die unterste hygrothermische Zone des SW Karakorum ist nach WEIERS (1993) warm-euarid (Vegetationsperiode > 241 d, Niederschlag 80-200 mm/a) und erstreckt sich vom Indus-Durchbruch, Gilgit Vy., Ishkoman Vy., Hunza Vy. bis zur Durchbruchsschlucht durch die Hauptkette und weniger indusaufwärts bis unterhalb Skardu, Exklave im Shigar Vy. Das Skardu-Becken und der Indus-Oberlauf sind aufgrund ungehindert abfließender tibetanischer Kaltluft und lokaler Windsysteme kühler. Die Verbreitung (trocken-) tropisch-subtropischer floristischer Elemente deckt sich gut mit dem warm-euariden Klimagebiet. Kleinere Exklaven im oberen Hunza-Einzugsgebiet (Batura, lower Shimshal Vy.) wurden von WEIERS (1993) auch aufgrund lokalklimatischer Besonderheiten (geschützte Talkessel, schwarze Gesteine) ausgewiesen. Die warm-semiaride Zone des unteren Indus Vy. (Chilas), charakterisiert durch *Quercus balloot*-Wälder und eine höhere Anzahl Sino-Himalayischer Elemente, erreicht den Karakorum nicht mehr.

Das gemäßigt-semiaride Gebiet (Vegetationsperiode 121-240 d, Niederschlag 351-500 mm/a) entspricht etwa der montanen Vegetationsstufe (potentieller Nadelwald) der größeren Täler des SW Karakorum (Yasin, Ishkoman, Hunza bis Chapursan-Khunjerab-Konfluenz, Indus bis etwa zur Shyok-Einmündung, Shigar, Biafo, ? Exklave: Hushe Vy.).

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Der übrige SW Karakorum wird als kühl-semiarid (Vegetationsperiode 1-121 d, Niederschlag 351-500 mm/a), bzw. kalt-subhumid (Vegetationsperiode 0 d, Niederschlag 351-500 mm) und kalt-humid (Niederschlag > 800 mm/a) eingestuft. Der trockenadiabatische Temperaturgradient wird von WEIERS (1993) mit -0,82 bis -0,89 K/100 m (Pasu - Khunjerab P.) angegeben.

Geschlossener Permafrost des subnivalen Fließschutt-Gürtels (free gelifluction belt) tritt bei Jahresdurchschnitts-Temperaturen < -3 bis -5 °C oberhalb ca. 4000 m im feuchten SW (Gilgit) und 4700-5000 m im CN und E Karakorum auf.

5 Flora - Flora

5.1 Geschichte der Botanischen Erforschung - History of botanical exploration

Die Erforschungsgeschichte der Karakorum-Flora und die Reiserouten früher Expeditionen wurden von PAMPANINI (1930) und STEWART (1982) ausführlich dargestellt, so daß ich mich auf einige wesentliche Eckpunkte und Ergänzungen beschränken kann.

Die Geschichte der botanischen Exploration des Karakorum beginnt mit *William Moorcroft* (1765-1825), Erstem Veterinärmediziner der East India Company, der im Jahr 1814 von Ladakh nach W Tibet vordrang. Der Grund seiner Reise, der Versuch, eine Herde der Ziegen, die die berühmte Kashmirwolle liefern, zu erwerben, blieb erfolglos, aber er brachte von dieser und einer weiteren Reise im Jahr 1820 zusammen mit *G. Trebeck* (MOORCROFT 1816, MOORCROFT & TREBECK 1841) einige Pflanzen mit, die nach London gesandt wurden. Diese sind die ersten nachweisbaren Belege sowohl aus dem Karakorum, als auch aus Ladakh, W Tibet und Kashmir. *Hugh Falconer*, ein Paläontologe und Nachfolger von *Royle* als Superintendent in Saharanpur, sammelte 1838 in Baltistan, wo er *G. T. Vigne* traf. Mit VIGNE (1842) beginnt die geographische Erforschung von Kashmir, Ladakh und Karakorum.

Wenig später wurde ein erster Höhepunkt der botanischen Entdeckungen im Karakorum und angrenzenden Gebieten mit den Reisen von *T. Thomson*, *R. Strachey* und *J. E. Winterbottom* (1847, 1848) und der *Schlagintweit*-Gebrüder (1855, 1856) erreicht. *T. Thomson*, ein Klassenkamerad von *J. D. Hooker* und Schüler von *W. J. Hooker*, dem ersten Direktor von Kew, war der erste ausgebildete Botaniker im Karakorum. *T. Thomson* brachte von seiner Reise, die von Kunawar über Spiti, Rupshu nach Leh, Skardu, zweimal nach Shyok und Nubra bis zum Karakorum P. (THOMSON 1849), nach Dras und Kashmir führte, überaus reichhaltiges Herbarmaterial mit, das eine Grundlage der "Flora of British India" (HOOKER 1875-1897) bildet. Seine Belege wurden in zahlreichen Duplikaten über die wichtigsten Herbarien seiner Zeit verteilt. Die im "Herb. Ind. Or.", *T. Thomson & J. D. Hooker* ausgegebenen Belege sind jedoch nur recht grob lokalisiert und wurden später offensichtlich nie differenzierter ausgewertet. Der Satz in Kew enthält zusätzlich Etiketten mit dem Sammeldatum, das zusammen mit dem in Tagebuchform geschriebenen, sehr inhaltsreichen und lesenswerten Reisebericht (THOMSON 1852) eine genauere Lokalisierung der Belege erlaubt. Nubra im Sinne *Thomsons* umfaßt übrigens ein weit größeres Gebiet nördlich der Ladakh-Kette als das Tal selbst. Ein Teil der von PAMPANINI (1930) für Nubra zitierten Belege stammt aus dem Shyok Vy. Die Reisen von *Winterbottom* führten nach Gilgit, Astor und Kashmir, die von *Strachey* zusammen mit *Winterbottom* von Kumaon nach W Tibet an die Quellen des Sutlej; die Routen beschreibt STRACHEY (1900).

Die Gebrüder *Schlagintweit*, *Hermann* (1826-1882), *Adolf* (1829-1857) und *Robert* (1833-1885) kamen im Jahr 1854 mit Unterstützung des preußischen Königs als Geographen nach Indien und arbeiteten als Angestellte der East India Company. Sie reisten durch viele Teile Indiens, des Himalaya und Karakorum und erreichten als erste Europäer den Kunlun Shan. *Adolf* drang bis nach Kashgar vor, wo er ermordet wurde. Die *Schlagintweit*-Brüder sammelten außerordentlich reiches Material aller Art. Das sehr gute Herbarmaterial, teilweise aus Gebieten, die später nie wieder untersucht werden konnten, ist über zahlreiche Herbarien verteilt und bislang nur in Bruchstücken ausgewertet worden. Verschiedenste geographische, geologische, klimatische und ethnologische Ergebnisse wurden in umfangreichen Werken (SCHLAGINTWEIT 1861-1866, SCHLAGINTWEIT-SAKÜNLÜNSKI 1869-1880, SCHLAGINTWEIT-

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SAKÜNLÜNSKI 1876a) dargestellt; die Anlage des Herbariums, mit einer revidierten Übersicht der Fundorte und Meereshöhen, beschreibt SCHLAGINTWEIT-SAKÜNLÜNSKI (1876b).

Im Jahr 1859 bereiste *J. L. Stewart* weite Gebiete Ladakhs und W Tibets. Sein Bericht (J. L. STEWART 1869a) enthält viel botanische Information, korrespondierendes Herbarmaterial (in CAL ?) habe ich nicht gesehen. *G. Henderson*, Teilnehmer der ersten Trade Commission Expedition nach Yarkand unter *T. D. Forsyth*, sammelte auf dem Weg von Ladakh über den Aksai Chin zum Karakash, Kunlun und nach Kashgaria, und veröffentlichte einen detaillierten Bericht (HENDERSON & HUME 1873). Die Belege (in K) sind jedoch oft nur unzureichend beschriftet. Die zweite Trade Commision nach Yarkand und Kashgar wurde von *W. Bellew* und dem Geologen *F. Stoliczka*, der kurz vor der Rückkehr nach Leh 1874 starb, begleitet. Die Belege beider Sammlungen (in K) lassen sich nicht genauer lokalisieren, die von *Bellew* tragen nur die Bezeichnung "Kashgar" oder "Kashmir", wobei offensichtlich in einigen Fällen auch Verwechslungen vorliegen.

C. B. Clarke, einer der fähigsten Botaniker und Kenner schwieriger Gruppen seiner Zeit, sammelte intensiv in Kashmir und erreichte im Jahr 1876 Skardu. Ein kurzer Abstecher führte ihn auch in den Karakorum (ca. 1876-08-01/1876-08-14). Seine Herbaretiketten sind ungenau und enthalten oft nur die Angabe "Karakorum" (in BM, K). Aus Meereshöhen und Sammeldaten läßt sich seine Route, die von Skardu nach Shigar und sehr wahrscheinlich über den Skoro P. (1876-08-07/08) nach Askole am Biafo Gl. (1876-08-10/11) und zurück durch das Braldo Vy. nach Skardu und indusaufwärts nach Dras (1876-08-18) führte, grob rekonstruieren. *Clarke* publizierte keinen speziellen Bericht oder Sammelumstände.

G. M. Giles botanisierte von 1885-1887 in Astor, Gilgit, und als einer der ersten in Chitral und Wakhan. Den "Confidental Report" der Gilgit Mission (LOCKHART, WOODTHORPE & GILES 1889; zitiert nach WENDELBO 1952) konnte ich nicht auffinden; die Rekonstruktion des Itinerars und einiger seiner Lokalitäten bereitet daher Schwierigkeiten. *J. F. Duthie*, ein Systematiker und Agronom, sammelte auf umfangreichen Reisen in Chitral, Hazara, Kashmir, Astor und Gilgit, dort auch im Naltar Vy., einem der floristisch reichhaltigsten Täler des SW Karakorum (DUTHIE 1893, DUTHIE 1894). Dank seines Fachwissens und Interesses an den ökonomisch wichtigen Futterpflanzen, enthalten seine Sammlungen mit die besten Belege der Grasartigen.

ALCOCK (1898), der den Wakhan und Pamir bereiste, bietet keine genauen Fundorte. *W. M. Conway* entdeckte 1892 den "Snow Lake" am Ursprung der Hispar und Biafo Gl. und den dritthöchsten Gipfels des Karakorum (Hidden Peak, 8035 m); *Calciati* kartierte im Saltoro-Gebiet. Beide Arbeiten, CONWAY (1894) und CALCIATI (1914) bieten auch floristische Angaben aus dem Zentral-Karakorum. MEEBOLD (1909) berichtet über eine botanische Reise von Kashmir nach Ladakh; sein Herbar wurde jedoch ebenfalls nicht zusammenhängend ausgewertet. Die Ära *R.. R. Stewart* beginnt mit der "Flora of Ladak" (STEWART 1916-1917). Das von *J. Visser-Hooft* auf mehreren Expeditionen (vgl. VISSER & VISSER-HOOFT 1935-1940) gesammelte Material wurde von HENRARD (1923) und DOLK (1929) ausgewertet. MASON (1928) untersuchte das Shaksgam Vy. im NE Karakorum und sammelte ebenfalls einige Pflanzen. BOSSHARD (1932: Gefäßpflanzen bearbeitet von SCHMID in BOSSHARD) veröffentlichte eine Liste der während der Expedition 1927-1928 in Ladakh, E Karakorum, Kunlun und Kashgaria gesammelten Pflanzen (vgl. TRINKLER 1932, DE TERRA 1932). Nach den Vorarbeiten von PAMPANINI (1915, 1916a, 1916b, 1926a, 1926b, 1929), endete schließlich mit der umfassenden Darstellung des Wissensstandes (PAMPANINI 1930, 1934) die erste Erforschungsphase der Karakorum-Flora.

Pioniere der Erforschung W und C. Tibets, die in wechselndem Umfang Pflanzen sammelten und zur floristischen Kenntnis beitrugen, waren nach *Falconer: Thorold* (BOWER 1893, 1894), GRENARD & DUTREUIL DE RHINS (1897-1898, botanische Bearbeitung: FRANCHET 1895, 1897, FRANCHET in GRENARD 1898), STRACHEY (1900) und DEASY (1901, botanische Bearbeitung: BAKER in DEASY 1901). Zusammenfassend wurde das Material von HEMSLEY (1894, 1902) bearbeitet. FRANCHET (1896) beschreibt auch eine Sammlung von *M. E. de Poncins* aus dem E Pamir. Der Nordosten Tibets wurde von *N. M. Przewalsky* bereist, auf dessen reicher Sammlungsgrundlage MAXIMOWICZ (1889a, 1889b) eindrucksvolle, leider unvollendet gebliebene botanische Werke publizierte. DANGUY (1908) bearbeitete eine Sammlung von *Lacoste*; OSTENFELD & PAULSEN in HEDIN (1922) das von *S. Hedin* gesammelte

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Material (HEDIN 1922, etc.). *H. Handel-Mazzetti*, der umfangreich in SE Tibet tätig war, bearbeitete auch eine kleine Sammlung von *E. Zugmayer* aus NW / C. Tibet (HANDEL-MAZZETTI 1930). SKRINE (1925) gibt eine erste Schilderung des Kongur Shan, der mit *Picea schrenkiana*-Wäldern an die Vegetationsverhältnisse des Tian Shan erinnert.

5.2 Neuere floristische Arbeiten - Recent floristics

Abgesehen von einer Pflanzenliste aus Kashgaria, Kunlun und Kashmir (PERSSON 1938), Untersuchungen im Hindukush und Chitral von HAECKEL & TROLL (1938) und der klassischen Vegetationskarte des Nanga-Parbat-Massivs von TROLL (1939), brachte die erste Hälfte des 20. Jahrhunderts weiterhin keine nennenswerten Fortschritte in der botanischen Erforschung des Karakorum und angrenzender Gebiete.

Eine erneute Aktivitätsphase setzte mit kleineren Artenlisten als Ergänzung zu PAMPANINI (1930, 1934) ein: GILLI (1957, 1962) über das Material österreichischer und WILLIAMS (1965) über Funde italienischer Expeditionen. WEBSTER & NASIR (1965) geben eine gute Übersicht über Flora und Vegetation des Hushe Vy. im CS Karakorum. KITAMURA (1960) faßt botanische Ergebnisse japanischer Expeditionen nach Afghanistan zusammen, die von KITAMURA (1964) auf Swat, Hazara und den S Karakorum ausgeweitet werden. HARTMANN (1966, Korrekturen HARTMANN 1984) führte die wohl sorgfältigste floristische Arbeit im Biafo-Gebiet des CS Karakorum durch, die durch eine ausführliche Darstellung der Vegetation (HARTMANN 1968, 1972) ergänzt wurde.

In der Folge wurde vorwiegend der relativ leicht zugängliche SW Karakorum Ziel zahlreicher wissenschaftlicher oder Bergsteiger-Expeditionen. Bemerkenswert ist vor allem die Sammeltätigkeit von *R.. R. Stewart*, die zu umfangreichen Checklisten für verschiedene angrenzende Gebiete, einzelne systematische Gruppen und die gesamte Flora Pakistans (STEWART 1972), sowie zur Übersicht über die Erforschungsgeschichte (STEWART 1982, hier auch Angaben über weitere Sammler), führte. Weitere wichtige, in der vorliegenden Übersicht ausgewertete Sammlungen sind die von *R.. Scott Russell* (Hispar, Shigar, Biafo; BM), *S. Bowes Lyon* (Chitral, Ghizar, Yasin, Ishkoman; BM, K) *J. D. A. Stainton* (Chitral, Ghizar; BM, W) und *O. Polunin* (Gilgit, Hunza, Hispar, Kashmir; BM). Spezielle floristische Arbeiten beschränkten sich, abgesehen von DICKORÉ (1991): CN & N Karakorum (Yarkand, Shaksgam, K2-North), W Kunlun und Kashgaria, auf Nachbargebiete.

5.3 Floren, Bearbeitungen angrenzender Gebiete - Floras, contributions to adjacent areas

„Flora of British India" (HOOKER 1875-1897) ist bis heute eine primäre Referenz für taxonomische Botanik des Indischen Subkontinents, einschließlich des Himalaya. „Flora of Pakistan" (NASIR & ALI 1970-), basierend auf der Checkliste von STEWART (1972), deckt die Karakorum-Südabdachung ab; die Bearbeitung des schwer zugänglichen zentralasiatischen Grenzgebietes in Karakorum und Kashmir ist jedoch teilweise unzureichend. „Plantae Asia Centralis" (GRUBOV 1963-) gibt zuverlässige Daten für die chinesische Karakorum-/Kunlun-Nordabdachung, das für dieses Werk verfügbare Material (in LE) dünnt aber offensichtlich gegen die Karakorum-Hauptkette und Tibet stark aus. Chinesische Floren mit Bezug zur Flora des Karakorum sind „Flora Xizangica" (WU CHENG-YIH 1980-1986) und FLORA IN DESERTIS SINICORUM, diese sind jedoch im extremen W bzw. SW ebenfalls großteils inkonsistent. Das Pamir-Plateau decken FEDTSCHENKO (1903-1915) sowie „Flora Tadzhikskoy SSR" (OVCZINNIKOV 1957-) ab. Das Gebiet der „Flora Iranica" (RECHINGER 1963-) schließt Randgebiete des südwestlichsten Karakorum ein, die Zentralasiatischen und Sino-Himalayischen Elemente sind jedoch häufig unzureichend bearbeitet.

Floristische Information vorwiegend aus angrenzenden Gebieten geben für Wakhan: PODLECH & ANDERS (1977), HUSS (1978); Chitral: WENDELBO (1952), CHAUDRI (1952, „medical plants"), CHAUDRI 1957; Astor: KAZMI & SIDDIQUI (1953, „medical plants"); Deosai: STEWART (1961); Zanskar: SEYBOLD & KULL (1985); Swat: STEWART (1967a); Kashmir RAO (1961), RAO (1967),

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DHAR & KACHROO (1983, Grasartige fehlen). SHARMA & JAMWAL (1988) beginnen eine Inventur des floristisch reichhaltigen Liddar Vy. in Kashmir; ASWAL & MEHROTRA (1993) geben einen soliden Überblick der Flora von Lahul (Lahaul) und Spiti, der kontinentalsten inneren Himalaya-Täler Indiens (Himachal Pr.). Arbeiten über Ladakh schließen Teile des SE Karakorum (Leh) ein: KACHROO, SAPRU & DHAR (1977), HARTMANN (1984) und BILLIET & LÉONARD (1986).

Afghanistan wird von AITCHISON (1888), KÖIE & RECHINGER (1954-1965), KITAMURA (1960), GREY-WILSON (1974), BRECKLE (1974) abgedeckt, speziell das floristisch interessante Kurram Vy. / Safed Koh, im Grenzbereich der Irano-Turanischen und Sino-Himalayischen Florenregion behandeln AITCHISON (1881-1882) und STEWART (1967b). Benachbarte Teile von Indien und Pakistan untersuchen STEWART (1869b: Punjab), BRANDIS (1874: "Forest flora"), STEWART (1957-1961: Rawalpindi District), BEG & KHAN 1974, BEG & SAMAD 1974 (Malakand Division), ALI (1978: Pakistan) sowie BRIJ MOHAN SHARMA & KACHROO (1981: Jammu). Interessant für floristische Fragestellungen im Karakorum sind auch Arbeiten aus weiter entfernten Gebieten, wie Mongolei (NORLINDH 1949), Tian Shan (OSTEN-SACKEN & RUPRECHT 1869, MERZBACHER 1912), Pamir, Himalaya (Everest-Region: MIEHE 1987, HUANG RONGFU 1988) und S Tibet (HUANG RONGFU & MIEHE 1988).

In weiterem Maßstab für die Identifikation und Kennzeichnung der Karakorum-Flora von Interesse sind die folgenden Standardfloren: FLORA REIPUBLICAE POPULARIS SINICAE, ICONOGRAPHIA CORMOPHYTORUM SINICORUM, „Flora USSR" (KOMAROV 1934-1964), „An Enumeration of Flowering Plants of Nepal" (HARA, WILLIAMS & al. 1979-1982), „Flora of Bhutan" (GRIERSON & LONG 1983-). „Flora Europaea" (TUTIN & al. 1964-1980), „Illustrierte Flora von Mitteleuropa" (HEGI, ed. 1: 1906-1931, ed. 2: 1936-, ed. 3: 1966-) und „Süßwasserflora von Mitteleuropa" (CASPER & KRAUSCH 1980) sind weitere Quellen für Informationen über weitverbreitete Eurasiatische Sippen. Historische Arbeiten mit Florencharakter (WALLICH 1830-1832, ROYLE 1839-1840, CAMBESSEDES & DECAISNE in JACQUEMONT 1844, KLOTZSCH & GARCKE 1862, MAXIMOWICZ 1889a, 1889b) sind als primäre Referenz in vielen Fällen unerläßlich. Populäre Pflanzenführer, mit angesichts der komplexen Himalayisch-Tibetischen Flora wichtiger Funktion als Bestimmungshilfen, sind z.B., „Beautiful flowers of Kashmir" (BLATTER 1928-1929), „Flowers of the Himalaya" (POLUNIN & STAINTON 1984, STAINTON 1988) und „Alpine plants of China" (ZHANG JINGWEI 1982).

5.4 Die Flora des Karakorum / Anlage der Flora, Korrekturen, Anmerkungen - The Flora of the Karakorum / Plan of the Flora, corrections, notes

Die vorliegende Flora enthält alle Arten und Unterarten der Monocotyledoneae, die dem Autor aus dem Karakorum als einheimisch, eingeführt oder in größerem Maßstab kultiviert bekannt wurden. Kursorisch werden nah verwandte, verwechslungsträchtige, in Nachbargebieten häufige oder für den Karakorum zu erwartende Taxa berücksichtigt.

Für die vorliegende Arbeit wurde Material folgender Herbarien eingesehen: B, BM, GAT, GOET, GZU, H, K, KYO, M, W, WHB, Z (unterstrichen: repräsentative bzw. angestrebt vollständige Auswertung der Bestände von Monocotyledoneae des Karakorum). Neben diesem Herbarmaterial und der zitierten Literatur bilden die folgenden Sammlungen eine weitere Grundlage der vorliegenden Bearbeitung (geschätzte Gesamtanzahl der Belege):

A.Bosshard, F.Klötzli & A.Schaffner 1989 (zitiert *Klötzli & al.*): Gilgit, Hunza, Batura, Khunjerab, Chilas (ca. 2000 Belege, Z, Dubletten GOET).
G.Braun 1990, 1991: Hunza (ca. 600 Belege, derzeit in GOET).
B.Dickoré 1986: Yarkand, Shaksgam, K2-North, W Kashg., W Kunlun (ca. 1000 Belege, GOET).
F.Gartner 1975: Ishkoman, Gilgit, Hunza, Hazara (ca. 1000 Belege überwiegend aus der Talstufe; GZU).

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G. & S.Miehe 1990: Yasin, Gilgit, Batura, Khunjerab, Skardu, Saltoro, Deosai, Hazara; 1991: Yasin, Ishkoman, Hunza, Skardu, Shigar, Shimshal, Batura, Khunjerab, Mintake, Taxkorgan, Mustagh Ata, W Kashgaria, Kongur, Chitral; 1992: Yarkand, Karakash, Aksai Chin, W Kashg., Kongur, W Kunlun, Changtang, W Tibet. 1993: W Tibet (Manasarowar Lakes, Burang Vy., Upper Indus). (ca. 10000 Belege einschließlich Kryptogamen, vegetationskundliche Fragestellung, Sonderstandorte unterrepräsentiert; derzeit in GOET, Teile in B, H (*Cyperaceae*), ISL, K, etc.).
R. Hansen 1992: Astor (ca. 200 Belege, GOET).
W.Holzner & M.Kriechbaum 1992, 1993: Leh, Zanskar, Rupshu, Himachal Pr. (ca. 1000 Belege, WHB, Dubletten GOET, W).
M.Nüsser 1993, 1994: Chilas, Astor (Nanga Parbat, ca. 1700 Belege, B).
J.Poelt 1991: Skardu, Shigar, Deosai (ca. 300 Belege, Phanerogamen-Sammlung mit *Miehe*; GZU).
U.Schickhoff 1990: Hazara (Kaghan Vy.; GOET, H (*Cyperaceae*), K etc.; Numerierung 1992 neu beginnend, zitiert als *Schickhoff 90/..*); 1992: Gilgit, Hunza, Skardu; 1993: Gilgit, Hunza, Skardu, Shigar, Biafo, Chilas, Astor, Deosai, Hazara. (ca. 2000 Belege vorwiegend aus der Waldstufe; derzeit in GOET).

Da die endgültige Aufbewahrung der aktuell bearbeiteten neuen Sammlungen in vielen Fällen noch nicht feststeht, werden Herbarium-Referenzen nur ausnahmsweise zitiert. Vorgesehen und z.T. bisher erfolgt ist die Verteilung von Dubletten an die Herbarien B, GOET, K, ISL, LI, PE und W. Belege der wichtigen Sammlungen von *H.Hartmann* (Skardu, Shigar, Biafo, Leh, Zanskar, Rupshu) und *D.Podlech* (Afghanistan, einschließlich Wakhan: *O.Anders*) finden sich, soweit ohne Herbariumangabe zitiert, in den jeweiligen Privatherbarien.

Eine frühere Arbeit (DICKORÉ 1991) enthält im Bereich der Monocotyledoneae, wie viele andere Bearbeitungen auch, überproportional viele Irrtümer und Unsicherheiten, die hier korrigiert werden sollen:

(DICKORÉ 1991):	hier:
Allium cf. humile	*Allium* cf. *oreoprasum*
Allium sp.	*Allium* cf. *oreoprasum*
Blysmus sinocompressus	*Blysmus compressus*
Carex atrofusca ssp. minor	*Carex atrofusca*
Carex haematostoma var. submacrogyna	*Carex alexeenkoana* X *C. borii* ?
Carex melanantha	*Carex moorcroftii*
Carex montis-everestii	*Carex borii*
Carex cf. pycnostachya	*Carex curaica*
Eleocharis quinqueflora	*Eleocharis quinqueflora* und *Trichophorum pumilum*
Kobresia deasyi	*Kobresia schoenoides*
Kobresia stenocarpa	*Kobresia royleana*
Calamagrostis holciformis	*Calamagrostis tianschanica*
Elymus cf. dentatus	*Elymus dentatus*
Elymus schrenkianus	*Elymus schrenkianus* (überwiegend) und *E. schugnanicus* (Aghil)
Festuca tibetica	*Festuca tibetica* (überwiegend) und *F. coelestis* (Kunlun)
Poa litvinoviana	*Poa lipskyi*
Poa poophagorum	*Poa attenuata*
Puccinellia kashmiriana	*Puccinellia tenuiflora*
Puccinellia tenuiflora	*Puccinellia tenuiflora* (überwiegend) und *P. himalaica* (Aghil)
Juncus ambiguus	*Juncus bufonius* s.l.
Potamogeton pectinatus	*Potamogeton amblyphyllus.*

Im Einzelfall unterschiedliche Bestimmungen anderer Autoren werden im Folgenden nach Möglichkeit diskutiert und, soweit auf systematisch abweichender Deutung beruhend, mit der Formel "auct. non ..." unter der hier akzeptierten Sippenfassung aufgeführt.

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Das umfangreiche, in jüngerer Zeit in den nationalen Herbarien von Pakistan, Indien, China und Nachbarländern angesammelte Material, aber auch Belege anderer wichtiger Herbarien, konnte für die vorliegende Untersuchung nicht genutzt werden. In *Fl.Pak.* (Herbarien ISL, KUH, RAW) und *Pl.As.Centr.* (vorwiegend Herbarium LE) zitierte Belege und weitere Literaturangaben wurden, soweit sie verläßlich erschienen oder zugeordnet werden konnten, übernommen. Zitierte Belege ohne Sichtvermerk und Quellennachweis entstammen *Fl.Pak.*, die den größten Teil des Floreninventars des Karakorum einschließt.

Obwohl Teile der Karakorum-Flora wahrscheinlich weit besser belegt sind als für diese Arbeit ausgewertet werden konnte, sind weitere Feldarbeiten und Aufsammlungen für ein besseres Verständnis der Verbreitungs- und Differenzierungsmuster sicher förderlich. Die Repräsentanz von Belegen ist in den europäischen Herbarien, aber sicher auch in den Herbarien der Anrainerstaaten, nach wie vor geographisch sehr uneinheitlich und reflektiert oft die verschiedenen Schwierigkeiten, bestimmte Gebiete zu erreichen. Allerdings korrespondiert die Erreichbarkeit zu einem gewissen Maß auch mit der floristischen Diversität. Gilgit und Hunza z.B. sind heute über den Karakorum Highway relativ einfach zugänglich und vergleichsweise gut bekannt. Aufgrund ihrer extrem abwechslungsreichen natürlichen Ausstattung bei relativ hoher Humidität, beherbergen diese Gebiete aber wahrscheinlich auch die größte Artenzahl. Nur sehr wenig und lückenhaftes Material ist aus dem Norden und Osten des Karakorum, sowohl aus dem chinesischen als auch dem indischen Teil, verfügbar. Dieses beruht zum einen auf der schweren Zugänglichkeit aus politischen Gründen. Zum anderen schränken extremes Relief, Trockenheit und die außerordentlich geringe Vegetationsdichte, korreliert mit niedriger Artenzahl, sowohl die Möglichkeiten des notwendigen Transportes mit Tragtieren als auch die Attraktivität für Botaniker ein. Einige Gebiete mit sicher extrem artenarmer Flora, z.B. Upper Yarkand, wurden anscheinend seit den SCHLAGINTWEITs nicht mehr untersucht. Die Anzahl der aus den einzelnen Gebieten des Karakorum bekannten Monocotyledoneae gibt Fig. 11 an.

In Bezug auf die Habitate ist die hochalpine Flora nach wie vor in den Sammlungen unterrepräsentiert, ebenso Arten der jedenfalls wenigen, kleinen und sehr lokalen Kultur- und Wasserzuschußflächen wie Flußoasen und Quelltälchen. Eine besondere Herausforderung dürfte die floristische Untersuchung der relativ wenigen größeren Felswände in mittleren Höhenlagen bedeuten. Diese Standorte könnten, vorzugsweise in Nordexposition, Arten beherbergen, die der Beweidung, Klimaschwankungen und anderen Umweltkatastrophen entgangen sind.

Die Vegetationszeit des Karakorum ist sehr kurz und in der alpinen Stufe im wesentlichen auf die Monate Juli und August kontrahiert. In den Tälern können zu dieser Zeit jedoch einige frühblühende Arten (Therophyten und Geophyten überwiegend Irano-Turanischer Herkunft) übersehen werden, während sich andere (hauptsächlich Vertreter der Sino-Himalayischen und Zentralasiatischen Florengebiete) erst sehr spät entwickeln. Die jedenfalls sehr limitierte Frühjahrsflora des Karakorum verdient weitere Aufmerksamkeit ortsansässiger oder überwinternder Botaniker, da die meisten Pässe bis in den frühen Sommer blockiert sind.

Eine weitere Strukturierung und Präzisierung der chorologischen (**D**:) und ökologischen (**E**:) Angaben in der folgenden Übersicht wäre sicher wünschenswert, erforderte aber umfangreiche weitere Arbeiten und Definitionen. Die ökologische Charakterisierung, einschließlich des angegebenen altitudinalen Vorkommensbereichs und der Zuordnung zu Höhenstufen, beschreibt, soweit nicht anders angegeben, ausschließlich die Situation im Karakorum. Die chorologische Einordnung hängt in hohem Maß von der taxonomischen Abgrenzung, die klimatologische (Höhenstufen-) Klassifikation der einzelnen Sippen darüber hinaus von lokalen Begebenheiten ab. Die diesbezüglich folgenden Angaben sind generell nur als ein erster Ansatz zu betrachten, der im Einzelfall anhand relativ weniger zusätzlicher Daten, eventuell grundsätzlich zu revidieren wäre.

Bestimmungsschlüssel, teilweise von provisorischem Charakter, werden für einen Teil der Gattungen angeführt, soweit das vorliegende Material eine kritische und mehr oder weniger von früheren Bearbeitungen abweichende Aufschlüsselung zuläßt. Synoptische Übersichten größerer Gattungen sind rein informeller Natur und beinhalten keinen für eine kritische Revision der jeweiligen Gattungen ausreichenden taxonomischen Ansatz.

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5.5 Systematische Aufzählung - Systematic Enumeration
I. Angiospermae, Monocotyledoneae

* Acoraceae

Lit.: as for *Araceae*.

* **Acorus calamus** L. 1753 - **Ic.:** Fl.Desert.Sin.1: fig.65(3). **A**: Chitral. Kashmir. **D**: Temp. Eurasia (introduced in Europe), N America (W). **N**: Apparently rare in the W Himalaya.

Alismataceae

Lit.:
BJÖRKQVIST, I. 1967: Studies in *Alisma* L. I. Distribution, variation and germination. - Op. Bot. (Lund) **17**: 1-128.
BJÖRKQVIST, I. 1968: Studies in *Alisma* L. II. Chromosome studies, crossing experiments and taxonomy. - Op. Bot. (Lund) **19**: 1-138.
BUCHENAU, F. 1903a: *Alismataceae*. - In: ENGLER, A., Das Pflanzenreich **16** (IV. 15): 1-66.
DANDY, J. E. 1971: *Alismataceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **78**: 1-5.
GRUBOV, V. I. & al. 1971: *Alismataceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **6**: 54-56.
OVCZINNIKOV, P. N. (ed.) 1957: *Alismataceae*. - In: Flora Tadzhikskoy SSR **1**: 106-110.
SAMUELSSON, G. 1932: Die Arten der Gattung *Alisma*. - Ark. Bot. **24A** (7): 1-46.

* **Alisma gramineum** LEJ. 1811 - **Ic.:** Fl.Iran.78: pl.4. **A**: Reported from E Afgh. and W Pakistan (Kurram). **D**: Temp. N hemisphere. **N**: 2n = 14 (Europe).

* **Alisma lanceolatum** WITH. 1796 - **Ic.:** Fl.Tadzh.1: fig.15(1). Fl.Iran.78: pl.3. **A**: Kashmir: Kashmir Vy. 1680 m, *Stainton 7846* (BM!). Manesbal, *P.M.Pinfold 236* (BM!). Tangmarg 1830 m, *O.Polunin 56/314* (BM!). Jhelum Vy., Shadipur 1580 m, *Ludlow & Sherriff 7793* (BM!). **D**: Canaries, N Africa, Eurasia E to C.Asia, Afgh., NW Himalaya; introduced in S Australia, S America. **N**: 2n = 26 (27, 28) (Europe).

1. Alisma plantago-aquatica L., Sp. Pl. 342. 1753
Alisma orientale (SAMUELSSON) JUZ. 1934

Ic.: Fl.Iran.78: pl.2. Fl.Desert.Sin.1: fig.8(1-4: *A. orientale*).

W **Yasin:** Yasin - Gupis, *Honda* s.n. (KITAMURA 1964). Yasin and surroundings, *Kazmi 5905* (M!); *5950* (M!).

S **Skardu:** Hamidgarh 2290 m, *Mir Ajab & Nisar 1203* (BM!). **Leh:** Leh - Da, *Schlagintweit* (BUCHENAU 1869).

Unloc.: Baltistan, *Duthie 12120* (BM!).

A: Swat. Hazara: 5 km SE Abottabad, Rd. to Murree 1200 m, *P.Uotila 18401a* (M!). Kashmir: "a Belaspur ad Pir Panjohe", *Hügel 889* (W!). Himachal Pr.: Kishtvar, 1856-07-27/31, *Schlagintweit 3018* (BM!). Uttar Pr.: Tihri-Garhwal.

D: Temp. regions, almost cosmopolitic. *Cosmopol.*

E: 2290 m, coll., rare in the S & W. Wet and (seasonally) flooded places.

N: 2n = 14 (Europe).

* **Sagittaria trifolia** L. 1753 (*Sagittaria sagittifolia* auct. non L.) 1753 - **Ic.:** Fl.Tadzh.1: fig.16. Fl.Desert.Sin.1: fig.8(8-11). **A**: N Kashg., E Kashg. (Pl.As.Centr.). S Tadzh. (Fl.Tadzh.). Swat. Kashmir. - **D**: Pantrop. and subtrop.

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Alliaceae

Lit.:
EGOROVA, T. V. 1977: *Allium*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **7**: 18-67.
NASIR, E. 1975: *Alliaceae*. - In: NASIR, E. & ALI, S. I. (eds.), Flora of Pakistan **83**: 1-31.
OVCZINNIKOV, P. N. (ed.) 1963: *Allium* (*Amaryllidaceae*). - In: Flora Tadzhikskoy SSR **2**: 290-370.
REGEL, E. 1875: *Alliorum* adhuc cognitorum monographia. - Acta Horti Petrop. **3** (2): 1-266.
REGEL, E. 1887: *Allii* species Asiae Centralis in Asia Media a Turcomania desertisque Aralensibus et Caspicis usque ad Mongoliam crescentes. - Acta Horti Petrop. **10** (1): 1-87, pl. 1-8.
STEARN, W. T. 1960: *Allium* and *Milula* in the Central and Eastern Himalaya. - Bull. Brit. Mus. (Nat. Hist.), Bot. **2** (6): 161-191, pl. 9-12.
WENDELBO, P. 1971: *Alliaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **76**: 1-100, pl. 1-28.
XU, J. M., HANELT, P. & LONG CHUN-LIN 1990: Key to the Alliums of China. - Herbertia **46** (2) 140-164.

Synopsis of *Allium*

Subgenus *Allium*

Sect. *Allium*: (*A. filidens* REGEL), (*A. porrum* L.), (*A. sativum* L.)
Sect. Scorodon C. KOCH: *A. caesioides* WENDELBO, (*A. griffithianum* BOISS.), *A. glomeratum* PROKHANOV, *A. jacquemontii* KUNTH, (*A. miserabile* WENDELBO), (*A. pamiricum* WENDELBO), (*A. schoenoprasoides* REGEL), (? *A. winterbottomii* WANG & TANG)

Subgenus *Rhizirideum* (C. KOCH) WENDELBO

Sect. *Rhizirideum*: (*A. senescens* L.)
Sect. *Anguinum* G. DON ex C. KOCH: (*A. victorialis* L.)
Sect. *Campanulata* KAMELIN: (*A. barszczewskii* LIPSKY), (*A. tenuicaule* REGEL)
Sect. *Reticulato-Bulbosa* KAMELIN: (*A. nuristanicum* KITAMURA), *A. oreoprasum* SCHRENK, *A. przewalskianum* REGEL, (*A. stoliczkae* REGEL)
Sect. Butomissa (SALISB.) KAMELIN: (*A. ramosum* L.), *A. tuberosum* ROTTLER ex SPRENGEL
Sect. Oreiprason HERMANN: *A. carolinianum* DC. in REDOUTÉ, *A. consanguineum* KUNTH, *A. filifolium* REGEL, *A. hymenorrhizum* LEDEB., *A. platyspathum* SCHRENK, (*A. roylei* STEARN), (*A. tianschanicum* RUPR.)
Sect. *Schoenoprasum* DUM.: (*A. schoenoprasum* L.)
Sect. *Annuloprason* EGOROVA: (*A. atrosanguineum* SCHRENK), *A. fedtschenkoanum* REGEL
Sect. *Cepa* PROKHANOV: (*A. cepa* L.), (*A. fistulosum* L.)

Subgenus *Melanocrommyum* (WEBB & BERTH.) ROUY

Sect. *Melanocrommyum*: (*A. macleanii* BAKER)
Sect. *Megaloprason* WENDELBO: (*A. chitralicum* WANG & TANG), (*A. stipitatum* REGEL)
Sect. *Porphyroprasum* EKBERG: (*A. oreophilum* C. A. MEYER)

Subgenus *Bromatorrhiza* EKBERG:

Sect. *Bromatorrhiza*: *A. gilgiticum* WANG & TANG, (*A. humile* KUNTH), (*A. wallichii* KUNTH), (*A. tripterum* E. NASIR)

* **Allium atrosanguineum** SCHRENK 1842 (*Allium chalcophengos* AIRY-SHAW 1931) - **Ic.**: Fl.Xizang.5: fig.303(1-2). **A**: W Pamir, E Pamir 3000-4250 m (Fl.Tadzh.). Chitral: Ojhor 3660 m, *Bowes Lyon 862* (BM!). Astor: 3960 m, *Tanner 171* (K!). P. to Harpo in Rongdo [Astor - Rondo, ?Alampi P.], *Winterbottom 789* (K!). Alampi P. W side 4270 m, *Duthie 12178* (BM!, K!). Kashmir: Kishtwar 2440-3050 m, *T.Thomson* s.n. (K!). **D**: Dzung. Alatau, Tian Shan, E Pamir-Alai, N Pakistan (Chitral, Astor), Kashmir. **N**: "Closely related to *A. fedtschenkoanum* but bulb coating and tepals colour different" (Fl.Pak.). A record for **Gilgit** (*Duthie 12389*) has been transferred to *A. fedtschenkoanum*.

* **Allium barszczewskii** LIPSKY 1900 - **Ic.**: Fl.Pak. 83: fig. 1 G-H. **A**: W Pamir (Fl.Tadzh.). Chitral: [?]Drosh 2130 m, *Giles 315* (K!). Tirich Mir, Barum Gol above Shokor Shal 3600 m, *Wendelbo* s.n. (Fl.Iran.). **D**: Tian Shan, Pamir-Alai, N, E & C. Afgh., NW Pakistan (Chitral).

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2. Allium caesioides WENDELBO, Bot. Not. **122**: 29. 1969

W Gilgit: Sai 3660 m, *Tanner 169* (K!).

A: ?Wakhan/Badakhshan: 2700 m, *Giles 210* (K! **type**; PODLECH & ANDERS 1977).

D: Afgh., Gilgit. *Endem.*

E: 3660 m, mont.-subalp., rare. Habitat in the Karakorum unknown.

3. Allium carolinianum DC. in REDOUTÉ, Les Liliacées **2**: tab. 101. 1804

Allium blandum WALL. 1832, *Allium polyphyllum* KAR. & KIR. 1842, *Allium obtusifolium* KLOTZSCH in KLOTZSCH & GARCKE 1862, *Allium thomsonii* BAKER 1874, *Allium aitchisonii* auct. non REGEL. 1882: BOISS. 1882, *Allium atropurpureum* auct. non WALDST. & KIT. 1800: SCHMID 1932

Ic.: WENDELBO 1958: fig.60 (*A. blandum*). Fl.Tadzh.2: fig.57(1-2) (*A. polyphyllum*). Fl.Pak.83: fig.2(A-C).

CN K2-North: Crevasse Gl. 3960 m, 1937-07-21, *M.A.Spender* s.n. (BM!). K2-N Gl. W 4360-4460 m, *Dickoré 771!*. Shaksgam: Aghil P. S 4430-4480 m, *Dickoré 591!*.

CS Biafo: Mango Brangsa 3870 m, *Conway 224* (K!; CONWAY 1894). Drinsang 3730 m; Gense 4000 m; Mango 3730-3850 m; 3760 m, *H.Hartmann 321* (Z!); Baintha 4020 m (HARTMANN 1966). Baltoro: Baltoro Gl. 3840 m, 1937-05-29, *M.A.Spender* s.n. (BM! veg.). Paiju, *M.Wakisaka* s.n.; near snout of Baltoro Gl. 3300 m, *Nakao* s.n. (KITAMURA 1964); Paiju 3450 m (HARTMANN 1966). Saltoro: Cliffside on E bank of Hushe Rv., c. 1 mile S Shahircho 3510 m, *Nasir & Webster 6048* (GH, K!, M!, RAW); Chogolisa Gl., *Nasir & Webster 6041* (GH, RAW); (WEBSTER & NASIR 1965). Nubra: Manglong Vy. 5090 m, *Visser-Hooft* (HENRARD 1923). Nubra/Upper Shyok: Sassir P. 4700 m (cf., THOMSON 1852); 4750 m, 1925-07, *Meinertzhagen* s.n. (BM!).

N Mustagh Ata: E shore of Little Karakul 3720 m, 1894-07-17, *Hedin* (OSTENFELD 1922). Hills W [Little] Karakul 4050-4100 m, *Miehe 5340!*. Ulug-Rabat P., 1909-07-23, *Divnogorskaya*; Sarykol Mts., Kashgar - Taxkorgan Rd., 10-12 km S Ulug-Rabat 4100 m, 1959-06-14, *Junatov* (Pl.As.Centr.). Mustagh Ata W, above Rd. to Taxkorgan 4270 m, *D.Mathew 31* (K!, veg.). Yarkand: Aghil P. N 4520 m, *Dickoré 520!* (veg.). Upper Yarkand: Zug-Shaksgam Vy. 4320 m, *Clifford* s.n. ("Shaksgam expedition" K!; MASON 1928).

W Ghizar: Chumarkhan P. E of Mastuj 3960 m, *Stainton 2915* (BM!). Yasin: Mush Bar 4250 m, *K.Ogino 408*; Dada - Nazbar P. 4100 m, *Honda 270* (KITAMURA 1964). Naz Bar 3620 m, *Miehe 3290!* (veg.). Ishkoman: Ishkoman P. 3960-4270 m, *Schmid 2437* (RAW). Gilgit: Gilgit, *Tanner 162* (K). Shinghai Gah - Pahot Gali 3880 m, *Miehe 1321!*. Baghrot Vy. 3050 m, *Miehe 4399!*. Hunza: Upper Batura 3900 m, *Paffen 311* (M!). Hispar: along Hispar Gl. 3500 m, *Nakao* s.n. (KITAMURA 1964: veg.). Hispar Gl., left bank, Turmun - Makerun 3350-3510 m, *R.Scott Russell 1229* (BM!). Khunjerab: Ghujerab Vy. 3800 m, *Visser-Hooft* (DOLK 1929).

S Skardu: Beyond Satpura village towards Deosai Plain 3300 m, *M.Qaiser, S.Omer & S.Z.Husain 8535* (BM!). N flanks of Deosai, towards Satpara 3880 m, *Miehe 5047!*; 3700-3900 m, *J.Poelt* s.n.*!*. Leh: [Nimu - Leh], 1848-07-11, *T.Thomson* s.n. (K!). 10 km from Kanji 4270 m, *A.R.Brown & M.A.Rothera* s.n. (K!). Shyok: Mts. N of Shayuk Rv., 1847-10-27, *T.Thomson* s.n. (K!).

E Upper Shyok: Murgo - Sassir P., *Novitzky* (PAMPANINI 1926). Sassir Bransa 4650 m, *Dainelli* (PAMPANINI 1934). Sassir, Shyok Rv. 4630 m, *F.Ludlow 445* (BM!). Depsang: Akash Gl., right lateral moraine 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930). Aksai Chin: Lingzhi Tang & Aksai Chin 5170 m, *Picot* (HEMSLEY 1895).

Unloc.: Pamir Region 4270 m, *Alcock 17765* (BM!).

A: Kongur: Jerzil 3500 m (PERSSON 1938). Kansiver Rv., 80 miles SSW Kashgar 3960 m, 1982-07-25, *Oundle School Mount. Exp. 28* (K!). W Kunlun: Upper Tiznap Vy., 25 km S Kudi 3900 m, 1959-06-01, *Junatov & al. 242* (Pl.As.Centr.). Lower Tügürmenlik Vy. [Tegürmen, N Xaidulla] 3800 m, *De Terra* (Z!; SCHMID 1932: "*A. atropurpureum*"). W Pamir, E Pamir 2400-4050 m (Fl.Tadzh.). Karasu - Chatyr-tash, 1901-08-04, *Fedtschenko* s.n. (K!). Wakhan: 3000-4400 m (PODLECH & ANDERS 1977). Noshaq area 3900 m, *Roemer 218* (W!). Vy. N of Lake Caqmaqtin 4050 m, *Grey-Wilson &*

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Hewer 1550 (W!). 10 miles E Hangar 3900 m, *Grey-Wilson & Hewer 1500B* (W!). 2 miles E Dahlez P., track to Bahrak 3800 m, *Grey-Wilson & Hewer 1452* (W!). Sarchant Vy., S Quala-i-Panja 3500 m, *J.Renz 50* (W!). Chitral: Shah Jinali P. 3350 m, *Bowes Lyon 1015* (BM!). Khot An N of Mastuj 3960 m, *Stainton 2842* (BM!). Sora Lasht 3810 m, *Bowes Lyon 1081* (BM!). Chatiboi Gl. < 4140 m, *Stamm & Wöhrl 62* (W!). Tirich Vy., above basecamp 3600 m, *Budenberg 55* (K!). Astor: Kalapani 3200 m, *Giles 182* (K!). Burzil P. N 3440 m (PERSSON 1938). Rama Vy. SW Astor 3660 m, *Lankester & Pearson* s.n. (BM!). Deosai: 3700 m, *Miehe 2082!*. Below Deosai 3810 m, *B.B.Osmaston 74* (K!); 4270 m, *M.A.Siddiqi & Y.Nasir 4097* (K!, RAW). Gulteri (STEWART 1961). Dras: Dras Vy. 3050-3350 m, *Duthie 13704* (BM!). Dras 3350 m, 1891-07-31, *Gammie* s.n. (K!). [Matayan - Zoji P.], 1848-09-27, (3050-4270 m), *T.Thomson* s.n. (K! **type** *A. thomsonii*). Zoji P. - Dras 3300 m, *Billiet & Leonard 6763* (K!). Suru: Rungdum, 2.5 km W of Zuildo 4150 m, *Southampton University 117* (K!). Zanskar: Pense P. 4150 m, *M.Grace & al. 202* (K!). Kashmir: Burzil P. S 2840 m (PERSSON 1938). [Zoji P. - Baltal], 1848-09-28, *T.Thomson* s.n. (K!). Naini Tal - Srinagar (3960-4880 m), *T.Thomson* s.n. (BM!). Kishenganga Vy., 1847-06-27, *Winterbottom 600* (K!). Thajwas N Sonamarg 3960 m, *Ludlow & Sherriff 7936* (BM!). Uishansar (N 34°52' E 75°04') 4110 m, *Stainton 5040* (BM!). Above Kishensar P. 3960 m, *O.Polunin 56/679* (BM!). Alibad 3350 m, *C.B.Clarke 29013* (BM!). Mapanon 2740 m, *C.B.Clarke 29577* (BM!). Armanath, 1975-08, *R.R.Stewart's coll.* s.n. (BM!). Kishtwar, Barnaj Nullah, Sapphire mines 3960 m, *Ludlow & Sherriff 9164* (BM!). Himachal Pr.: Ascent to Kibar, 1847-09-05, *T.Thomson 2117* (K!). [Above Kibar], 1847-09-06, *T.Thomson* s.n. (K!). Lahul, *Jaeschke 95* (K!). Lahul, Kargang 4420 m, *Bor 14896* (K!). Spiti, Kiato, *H.G.C.Gill 1998* (K!). Ki 4000 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!. Uttar Pr.: Mangsu P., Baspa Vy. (N 31°23' E 78°30') 4420 m, *G.Sherriff 7456* (BM!). Tibet, Urai Lagna (Nepal-Kumaon Frontier) 5180 m, *J.B.Tyson 86* (BM!).

D: C. Asia (Dzung. Alatau, Tian Shan, Pamir, Karakorum), NE Afgh. (Wakhan, Nuristan, Kurram), N Pakistan, W Himalaya (Afgh. - Nepal), ?Tibet. **Map**: STEARN 1960: fig.8. *W Centr. As.*

E: (3050) 3620-4520 (5170) m, (subalp.-) alp., not common, but locally abundant. Scree and gravel-fans, dry cliffs, dry alpine turf, "on dry bare hillsides" (*Ludlow 445*).

N: A stout, large plant with relatively broad leaves; the only alpine *Allium* of the inner ranges. "An attractively pink-flowered species favored as a food by the porters" (WEBSTER & NASIR 1965). Perhaps becoming rare and locally endangered, due to collecting.

• **Allium cepa** L., Sp. Pl. 301. 1753

CS Saltoro: Saling (on the right side of the Shayuk opposite Khapalu) to Hushe (on the Tsetanga Rv.), 1856-06-13/15, *Schlagintweit 5488* (BM!).

S Leh: Environs of Gia [garden of monastery: 4130 m (SCHLAGINTWEIT 1876)], 1856-07-30/31, *Schlagintweit 1679* (BM!).

N: Although not definitely indicated, the *Schlagintweit* specimens apparently represent the cultivated plant which probably is commonly cultivated in the southern valleys of the Karakorum, up to c. 3000 m (Hushe) or 4130 m (Gya). "Onion is commonly cultivated everywhere" (Fl.Pak.). **Allium ascalonicum** L. 1753: This name was based on a Palestinean species later named *A. hierochuntinum* BOISS., but has long been applied to variants of *A. cepa* (STEARN 1960); "the shallot is cultivated rarely" (Fl.Pak.). **Allium oschaninii** O. FEDTSCH. 1906, **Ic.:** Fl.Iran.76: pl.13, pl.25 fig.2, one of the putative ancestors of the cultivated onion, occurs in NE Iran, N, NW, C. & E Afgh., Pamir-Alai, W Tian Shan.

* **Allium chitralicum** WANG & TANG 1937 - **A**: Chitral: Chitral (2400-3000 m), *Harriss 16691a* (K **type**). Chitral Gol W of Chitral 3350 m, *Stainton 2673* (BM!). Dorah P. 3350 m, *Giles 266* (K!). Birmogh Lasht (N 35°55' E 71°46') 3050 m, *Bowes Lyon 737* (BM!); Rumbur (N 35°46' E 71°40') 2900 m, *Bowes Lyon 666* (BM!). **D**: NE Afgh. (Nuristan), NW Pakistan (Chitral). **N**: "The leaves are an excellent vegetable" (*Bowes Lyon 737*).

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4. Allium consanguineum KUNTH, Enum. Pl. **4**: 431. 1843

Allium stracheyi BAKER 1874

Ic.: Fl.Pak.83: fig.10 A-C.

CS **Biafo:** Drinsang 3730 m, *H.Hartmann 329!*; Laskam 3980 m (cf.; HARTMANN 1966). ? Burdomal - Baltoro Gl. 3450 m (CONWAY 1894: "*A. senescens*"). **Baltoro:** Liligo, 1958-08-24, *M.Wakisaka* s.n. (KYO!); Paiju, 1958-08-25, *M.Wakisaka* s.n. (KYO!); Paiju near snout of Baltoro Gl. 3300 m, 1955-07-07, *S.Nakao* s.n. (KYO!; KITAMURA 1964).

W **Yasin:** Yasin 3700 m, *K.Ogino 394* (KITAMURA 1964). **Ishkoman:** Ishkoman, *Shaukat Ali 368* (RAW). **Gilgit:** Shinghai Gah - Pahot Gali 2430-2550 m, *Miehe 654!* (yg.); *Miehe 1740!*; 3880 m, *Miehe 1335* (K!). Naltar Vy., on rocks, 2740-3050 m, *Duthie 12424* (K!); 3050-3350 m, *Duthie 12424* (BM!); 3050-3350 m, *Duthie 12442* (BM!). Naltar Lakes 3960 m, *R.R.Stewart 26322* (BM!, veg.). Naltar Vy., Jagot 3100-3300 m, 1974-08-03, *F.Gartner* s.n. (GZU!). Baghrot Vy. 3120-3570 m, *Miehe 4227!*; *Miehe 4614!*. **Hunza:** Pisan 2900 m, *G.Braun 544!*. **Hispar:** NW of Hispar Village 3350 m, *O.Polunin 6338* (BM!). **Batura:** Gulmit - Atabad 3500-3650 m, *Miehe 2697!* (yg.).

S **Shigar:** Kero Lungma Gl. 3660-3960 m, *R.Scott Russell 13111* (BM!). **?Skardu:** Ganto P. W 3380 m, *Miehe 4676* (veg.).

A: Astor: Burzil P. N (PERSSON 1938). Dras: Dras 2740 m, *R.N.Gohil RN/AL-15* (BM!: "2n=2x=16, *A. rubellum* det. *W.T.Stearn*"). Suru: Sanku - Panikhar 2960 m, *Uppeandra Dhar 2026* (K!). Swat: Kalam 2130-2440 m, *R.R.Stewart 24692* (W!); *24697a* (BM!). W Kalam, 25 miles above Bahrein 2740 m, *R.J.Rodin 5641* (K!). Above Ushu 2740 m, *R.R.Stewart & A.Rahman 25368a* (BM!). Sho Nala 3050 m, *A.Rahman 51* (BM!). Hazara: Kaghan Vy., above Battakundi 3150 m, *Schickhoff 876* (K!). Kashmir: Gurais 2440 m, *Giles 717* (K!); near Gurais 2440-2740 m, *Duthie 12601* (K!). Budrawar 2740 m, *C.B.Clarke 31464* (BM!, K!). Desu Vy, Bringhi Vy. 2290 m, *Ludlow & Sherriff 8205* (BM!). Pahlgam 2590 m, *O.Polunin 56/448* (BM!). Sonamarg - Baltal, 1880-09, *A.P.Young* s.n. (BM!). Wankrik 2440 m, *C.B.Clarke 31269* (K!). Banihal P., Tunnel top 2900 m, [?] *Virjee* (K!). Himachal Pr.: Jaunsar 2830 m, *J.S.Gamble 15126* (BM!). Uttar Pr.: Garhval, Badrinath 3050-3230 m, 1855-08-91/31, *Schlagintweit 10071* (BM!). Kumaon, Ralam 3660 m, *Strachey & Winterbottom 5* (BM!, K! **type** *A. stracheyi*). Ralam Vy. 3660-3960 m, *Duthie 3430* (BM!). Tihri-Garhwal, Ganges Vy. 2740 m, *Duthie 2079* (BM!).

D: NE Hindukush, SW Karakorum, W Himalaya (Swat, Gilgit, Hazara - W Nepal). **Map:** STEARN 1960: fig.9 (*A. stracheyi*). *W Himal.*

E: (2430) 2550-3880 (-3980), mont. - subalp., not common in the SW. Forest-steppes, rock and scree slopes (*Artemisia brevifolia, Juniperus excelsa*).

N: *Allium filifolium* probably is closely related and acts as a northern vicariant.

5. Allium fedtschenkoanum REGEL, Acta Horti Petrop. **3**(2): 82. 1875

Allium semenovii auct. non REGEL: HOOKER f. 1875, WENDELBO 1958, 1971, STEWART 1961

Ic.: Fl.Tadzh.2: fig.57(3-4), Fl.Pak.83: fig.3(A-C). Fl.Iran.76: pl.25 fig.1.

W **Ghizar:** Diwangal - Ghizar 3900 m, *K.Ogino 271*; 3800 m, *K.Ogino 241* (KITAMURA 1964). **Yasin:** Tui P. (3660-4270 m), *Giles 471* (K!). Darkot SW side 3510 m, *Bowes Lyon 8146* (K!). Naz Bar 4090 m, *Miehe 3305* (K!). ? Panji P. N, towards Yasin 3920-3980 m, *Miehe 6925!* (veg.). **Ishkoman:** Chhantir Gah, *Schmid 2133* (RAW). ? Panji P. S, above Holojut 4040 m, *Miehe 6992?* (veg.). **Gilgit:** Shinghai Gah - Pahot Gali 3950 m, *Miehe 1048!*. Naltar Vy. 3350-3660 m, *Duthie 12389* (BM!, K!). **Hunza:** Daintar (3200-3900 m), *Lobbichler 62* (M!); *102* (M!).

S **Skardu:** Bari P. 4270-4570 m, 1892-07-11, *Duthie* s.n. (E, K!). Burji P., *R.R.Stewart 20120* (RAW). Deosai N, towards Satpara 3880 m, *Miehe 5044!*.

Unloc.: Kashgar, *Bellew* (K!) [? perhaps from Kashmir]. Balti: Shatung P. 3960-4270 m, 1892-07-12, *Duthie* s.n. (BM!).

A: W Pamir, E Pamir 2300-4000 m (Fl.Tadzh.). Wakhan: 3300-4200 m (PODLECH & ANDERS 1977). Little Pamir 4200 m, *Roemer 355* (W!). Badakhshan. Nuristan. Chitral: Dorah P. 4510 m, *Giles 190* (K!). Lutkoo 3350 m, *Toppin 256* (K!). Madaglast 3510 m, *Toppin 491* (K!). Yarkhun (N 36°30' E 72°40' - N 36°48' E 73°05') 3660 m, *Bowes Lyon 1003* (BM!, W!). Khot An N Mastuj 3960 m, *Stainton 2840* (BM!). Chatiboi Gl. < 4140 m, *Stamm & Wöhrl 63* (W!). Astor: Gurys P. N 3660 m,

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1847-06-21, *Winterbottom 509* (K!). Kala Pani, 3200-3660 m, *Giles 183* (K!). Steanmarg, *M.B.Zaman* s.n. (PPFI-M). Deosai: S side of Satpara P. 4110 m, *G.Webster & E.Nasir 6369* (GH, K!, RAW). Deosai 3700-3900 m; 4000-4050 m, *J.Poelt* s.n.!. Shingo Vy., Burzil 3660 m (STEWART 1961). Dras: "Yarkand Exp.", Baltal - Dras, 1870-06-21, *Henderson 415* (K!). Dras Vy., Machui, *Duthie 25762* (K!). Suru: Rangdum, Suru 3960 m, *B.B.Osmaston 166* (K!). Swat: Diwan Gol - Pichar 3910 m, *K.Ogino 114; Honda 212* (Fl.Iran.). Kashmir: Burzil P. 3660 m, *C.B.Clarke 29719* (BM, K!); 3960 m, *Duthie 14046* (BM!). Zoji P., *H.H.Rich B187* (K!). Nichinai Vy., 22 km NW Sonamarg 3400 m, *C.C.Townsend 87/238* (K!). 2900-3960 m. Srinagar, Vishensar 3510 m, *C.R.Lancaster 193* (BM!). Zojpal, 1914-06-27, *M.A.Evershed* (BM!). Kishtwar (2130-3050 m), *T.Thomson* s.n. (K!). Kishtwar, Bamaj Nullah, N of Sapphire Mines 3050 m, *Ludlow & Sherriff 9140* (BM!). Himachal Pr.: Chamba, Kugti (N 32°30' E 76°42') 3810 m, *Stainton 8083* (BM!). Pangi, Bhut Nullah above Tau 3810 m, *C.D.Sayers 3725* (BM!). Garhwal, Singjari 3510 m, *Strachey & Winterbottom 4* (BM!).

D: Tian Shan, Pamir-Alai, E & NE Afgh. (Laghman, Panjshir, Nuristan, Munjan, Kataghan, Wakhan); W Himalaya: N Pakistan (Chitral, Gilgit, Baltistan), Kashmir; Garhwal. *W Pamir.*

E: (3350) 3510-4270 (4570), subalp. - alp., rare, but locally abundant in the SW. Relatively humid meadow steppes and scrub (*Acantholimon lycopodioides, Rosa webbiana, Cotoneaster, Juniperus turkestanica*), in rocky water-surplus habitats, often with *Allium carolinianum*. "Edible" (*Bowes Lyon 8146*).

N: "A plant of high altitudes, usually above 3000 m. It resembles *A. semenovii* REGEL in facies but differs in having fistular leaves" (Fl.Pak.).

* **Allium filidens** REGEL 1875 - **Ic.**: Fl.Pak.83: fig.8 H-J. **A**: Chitral: Broz 1580 m, *Harriss 16686* (BM!, K!; Fl.Iran.). **D**: Pamir-Alai, Afgh., W Pakistan. **E**: "Grows in gravelly or rocky slopes in the dry foothills" (Fl.Pak.).

6. Allium filifolium REGEL, Acta Horti Petrop. **10**: 352. 1887

CS **?Shimshal:** Zardgar Bin 3940 m, *Miehe 5979!* (cf., veg.).

N **Taxkorgan:** Above Dafda 4100 m, *Miehe 5621!*. **Yarkand:** Aghil Vy. 3940-4000 m, *Dickoré 457!*.

W **Hunza:** Minapin Gl., ridge on W side of lateral moraine, W-facing cliff face 3050 m, *Lloyd & Megan 3* (BM!). **Batura:** W Khaibar (2500-) 3000-3750 m, *Klötzli & al. 31.02!* (yg.); *801.17!*. E Morkhoon 3600-3800 m, *Klötzli & al. 804.95?* (veg.). **Khunjerab:** P. SW 4150-4350 m, *Miehe 2538* (K!).

A: W Kunlun: Akaz P. N 3200-3600 m, *Miehe 8616!* (yg.). Akaz P. 3300 m, *Dickoré 162!*; 3260-3300 m, *Miehe 7382?* (veg.); *7418!* (yg.). Tiznap Vy., Kudi 3050 m, *Dickoré 212!*. Upper Tiznap Vy. 3940 m, *Miehe 7625!* (veg.). E Tadzh. 2500-3500 m (Fl.Tadzh.). E Pamir: Chatyr-tash - Karasu, 1901-08-04, *Fedtschenko* s.n. (K!: "*A. globosum*"). Ak Baitash, 1878-08-15, *Kushakewicz* s.n. (K!). Wakhan: 2950-3200 m (PODLECH & ANDERS 1977). Quazi Deh 2950-3200 m, *Roemer 119a* (Fl.Iran.). Chitral: Tirich Mir, Shokor Shal 3700 m, *Wendelbo* s.n. (K!; Fl.Iran.).

D: Tian Shan, Pamir-Alai, Kunlun, NE Afgh. (Hindukush), NW Pakistan (Chitral). *W Centr.As.*

E: (3000) 3600-4150 (4350) m, subalp. (-alp.), not common in the NW. *Festuca olgae - Artemisia compacta* steppes, gravel terraces. Apparently more frequent on mont.-subalp. (3050-3940 m) loess slopes of the Kunlun N slope and a species of C. Asia, which penetrates S through the valleys of Wakhan, Chitral, and Hunza.

N: According to VVEDENSKY 1971, Conspectus Florae Asiae Mediae, *A. filifolium* is only a form of **Allium kokanicum** REGEL, Acta Horti Petrop. 3(2): 104. 1875.

• **Allium fistulosum** L., Sp. Pl. 301. 1753
Cultivated in W Kashg.: Hantscheng, *Törnquist* (BOSSHARD 1932).

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7. Allium gilgiticum WANG & TANG, Bull. Fan Mem. Inst. Biol. Bot. (Peking) **7**: 294. 1937

W **Gilgit:** Gilgit 10000' [3050 m], 1880-06-26, *Tanner 166* (K! **type**). Shinghai Gah - Pahot Gali 2910 m, *Miehe 721!* (veg.); 3240 m, *Miehe 1454!*. Upper Dainyor Vy. 3110 m, *Schickhoff 408!* (veg.). Sai Vy. 2850-3100 m, *Schickhoff 1998!; 2041!*. **Hunza:** Rakaposhi NW & W opposite Chalt 3200 m, *Miehe 6674!* (fr.).

D: SW Karakorum: Gilgit, Hunza. *Endem.*

E: 3050-3240 m, mont., rare in the SW. On N-facing slopes in undisturbed *Picea smithiana* forests; apparently very restricted ecologically and rarely flowering.

N: Previously "known from the type collection only" (Fl.Pak.). The species is probably closely related to the Himalayan **Allium wallichii** KUNTH 1834 (W Nepal - SE Tibet).

8. Allium glomeratum PROKHANOV, Izv. Glavn. Bot. Sada SSSR **29**: 560. 1930

N **Mustagh Ata:** N 3930 m, *Miehe 5430!*.

A: Kongur: Kansiver Rv., 3 miles SE Karakol, 80 miles SSW Kashgar 3810 m, 1982-07-25, *Oundle School Mount. Exp. 1* (K!). At point where river from Camp Barry joins Kansiver Rv. 3960 m, 1982-08-10, *Oundle School Mount. Exp. 83* (K!). ?E Pamir: Kok-Muynak, 1909-07-27, *Divnogorskaya* (**type**, Pl.As.Centr.).

D: Dzung. (Tarbagatay), Tian Shan, N Kashg., ?E Pamir, Kongur, Mustagh Ata. *E Pamir.*

E: Alpine steppes (*Oxytropis* spp., *Gramineae*), dry sandy banks.

* **Allium griffithianum** BOISS. 1859 (*Allium rubellum* M. BIEB. var. *grandiflorum* BOISS. 1859, *Allium anisopetalum* auct. non VVED. 1934: WENDELBO in RECH. f. 1971) - **Ic.**: Fl.Iran.76: pl.14 fig.5. Fl.Pak.83: fig. 7 A-C. **A**: S Tadzh. 350-1650 m (Fl.Tadzh.). Chitral: Chitral Village 1520 m, *Stainton 2192* (BM!). Chitral - Mastuj Track 1830 m, *Stainton 2432* (BM!). Swat: Mingora 910 m, *S.Ali 26047* (BM!, W!). Lower Swat 910 m, *R.R.Stewart 27439* (BM!). Kashmir: Srinagar "saffron fields", 1740 m, *F.Ludlow 3* (BM!). Avantipur "growing in saffron fields" 1580 m, *Ludlow & Sherriff 7595* (BM!). **Unloc.**: Tibet, *Hügel 1273* (W!). **D**: W Tian Shan, Pamir-Alai, Afgh., NW Pakistan. **N**: "*A. griffithianum* is the most common species of its genus in Afghanistan" (Fl.Iran.). "A very common species" (Fl.Pak.). Apparently confined to the outer ranges in the Himalayan region.

* **Allium humile** KUNTH 1843 (*Allium govanianum* WALL. ex BAKER 1874) - **Ic.**: Fl.Iran.76: pl.1 fig.3. Fl.Pak. 83: fig. 2 G-I. **A**: Chitral: Lowari P. 3510 m, *Harriss 16693* (BM!, K!; Fl.Iran.). Drosh, Dabari Gol (N 35°33' E 71°48') 3660 m, *Bowes Lyon 209* (BM!). Astor: Steanmarg, *M.B.Zaman* s.n. (PPFI-M). Swat. Hazara: Kaghan Vy., *Duthie 22615* (K!); 3050-3650 m, *Schickhoff 90/352* (K!); *90/667* (K!); *90/1433* (K!). Saiful Maluk, *Sh.Ali 100* (BM!). Kashmir: Sind Vy., Mohanmarg 3050 m, *Ludlow & Sherriff 8131* (BM!). Srinagar, Vishensar 3510 m, *C.R.Lancaster 175* (BM!). Thajiwas, *N.K.B.Robson 2054* (BM!). Pir Panjal 3050 m, *C.B.Clarke 28868* (BM!). Crest of Pir Panjal above Tilpatra Forest, near Rumpur, Jhelum Vy. 3660 m, *Ludlow & Sherriff 7763* (BM!). Above Gulmarg 3050-3350 m, *Duthie 11337* (BM!). Apharwat above Gulmarg 3960 m, *O.Polunin 9604* (BM!). Zojpal, 1914-06, *M.A.Evershed* (BM!). Liddar Vy., above Kainmul 3350-3660 m, *Duthie 13145* (BM!). Tulion above Pahlgam, *R.R.Stewart 7951* (BM!). Mamtuar Vy., near Dasu 3660 m, *F.Ludlow 103* (BM!). Barnaj Nullah, Sapphire Mines 3050 m, *Ludlow & Sherriff 9131* (BM!). Kishtwar. Kulu. Uttar Pr.: Garhwal. **D**: Himalaya (Chitral - Assam, ?Burma).

9. Allium hymenorrhizum LEDEB., Fl. Alt. **2**: 12. 1830

Allium macrorrhizum BOISS. 1854

Ic.: LEDEB., Icon.Pl.Fl.Ross.4: tab.359. 1833

W **Hunza:** Pisan 2900 m, *G.Braun 545!*.

A: W Pamir, E Pamir 2450-3800 m (Fl.Tadzh.). Wakhan 3400-4500 m (PODLECH & ANDERS 1977). Dario Kundur, *Rasoul in Breckle A-1412*; Kotal e Wazit 4500 m, *Breckle A-1258* (Fl.Iran.). ?Chitral.

D: Ural, Altai, Tarbagatai, Xinjiang, Tian Shan, Pamir-Alai, Iran, Pamir, C. & NE Afgh. (Bamian, Wakhan), SW Karakorum. *Centr.As.*

E: 2900 m, mont., rare in the SW. Habitat in the Karakorum unknown.

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10. Allium jacquemontii KUNTH, Enum. Pl. **4**: 399. 1843
(non REGEL 1875)
Allium rubellum auct. non M. BIEB. 1808: HOOKER f. 1892

Ic.: Fl.Tadzh.2: fig.58(1). Fl.Pak.83: fig. 7 H-J.

W **Gilgit:** Naltar 3050 m, *R.R.Stewart 26321* (BM!). Rakaposhi W, above Barti and Jaglot 3020-3050 m, *Miehe 6730!*. **Hunza:** Minapin Gl., Vy. W of Gl. 3050 m, *Lloyd & Megan 29* (BM!); Minapin Gl. 2900 m, 1974-07-22, *F.Gartner* s.n. (GZU!). Banidas 2600 m, *Lobbichler 276* (M!). N & NE Chaprot 2600-2950 (-3390) m, *Klötzli & al. 24/25/26.03!; 71.03!; 725.32!*. Rakaposhi N, above Nilt 2450 m, *Miehe 6390!*.

S **Shigar:** Upper Basna Vy., Doko - Gon 2680 m, *Miehe 4952!*; 2650-2750 m, *J.Poelt* s.n.!.
A: W Pamir 2300-3000 m (Fl.Tadzh.). ?Wakhan. Chilas: Buldar Vy. left slope, Muthat - Raikot Bridge 2480m, *Nüsser 1043!*. Astor: Rattu, *R.R.Stewart 18796* (RAW). Upper Rupal Vy., Tap Gl. right lateral moraine 3590 m, *Nüsser 737!* (cf.)!. Suru: Sanku - Panikhar 2960 m, *Uppeandra Dhar 2026* (K!). Swat: Sho Nala 2740 m, *A.Rahman 78* (BM!). Kalam - Utrot 2130-2440 m, *R.R.Stewart & A.Rahman 25119* (BM!). Hazara. Kashmir.
D: W Pamir, Himalaya (E Afgh. - NW India). *W Himal.*
E: (2450) 2600-3050 (3390) m, mont., rare in the SW. *Artemisia brevifolia - Juniperus excelsa* forest-steppes.
N: "A common species in the plains and the foothills" (Fl.Pak.). Closely related to *Allium griffithianum* and *A. pamiricum*, the exact delimitation of the species is apparently not fully understood.

* **Allium macleanii** BAKER 1883 (*Allium elatum* REGEL 1884, *Allium giganteum* auct. non REGEL 1883: WENDELBO 1958) - **A**: Chitral: Chitral, 1916-08-22, *Toppin* s.n. (K!). Dam Gol 1370 m, *Toppin 393* (K!). **D**: W Pamir-Alai, E Afgh., NW Pakistan (Kurram, ?Chitral).

* **Allium miserabile** WENDELBO 1967 - **Ic.**: Fl.Pak.83: fig.6 G-I. **A**: Chitral: Bundai 1200 m, *Harriss 16689*; *16690* (Fl.Iran.). Swat. **D**: E Afgh. (Khost, Urgun, Kurram), NW Pakistan (Chitral, Swat).

* **Allium nuristanicum** KITAMURA 1967 - **Ic.**: KITAMURA 1960: Fl.Afgh.: fig.46. **A**: Nuristan. **D**: C. & E Afgh. (Nuristan, Bamian, Panjao, Ghorband, Kabul, Paghman, Panjshir, Nangarhar, Ghazni). **N**: Very similar and perhaps conspecific to *A. stoliczkae*.

* **Allium oreophilum** C. A. MEYER 1831 - **A**: Chitral: Sora Lasht 3960 m, *Bowes Lyon 1079* (BM!). Owir An, SE of Tirich Mir 3660 m, *Stainton 2753* (BM!). **D**: Caucasus - W Pamir-Alai, Afgh., NW Pakistan.

11. Allium oreoprasum SCHRENK, Bull. Sci. Acad. Imp. Sci. Pétersb. **10**: 354. 1842
? *Allium odorum* auct. non L. 1767: PAULSEN in HEDIN 1922

Ic.: Pl.As.Centr. 7: fig.3(1).

CS **Biafo:** Drinsang 3600 m; Laskam 3980 m (HARTMANN 1966). **Baltoro:** Biaho Lungma 3200 m, *Nakao* s.n. (KITAMURA 1964). Upper Braldo Vy., W Paiju 3260 m, *H.Hartmann 330* (Z!; HARTMANN 1966). **Saltoro:** Hushe Vy., Hushe - Kande 2740 m, *Nasir & Webster 6267* (WEBSTER & NASIR 1965). Hushe Nullah 3810 m, *Ludlow 367* (BM!). **Nubra:** Liagtsung - Panamik, left side of the Nubra Vy., 1856-07-24/31, *Schlagintweit 2024* (M!). Umlong, Karakorum trade route 3810 m, *Ludlow 551* (BM!).

S **Leh:** [Hanupata - Wandla (3350-3990 m)], 1848-07-05, *T.Thomson* s.n. (K!). Baltistan, Gorkon 2740-3050 m, *Meebold 4887b* (K!). Hemis Nullah 3960 m, *Ludlow & Sherriff 8467* (BM!); *8469* (BM!). W below Rumbak 4000 m, *H.Hartmann 2717!*. Yangthang 3900 m, 1993-07-16, *Holzner & Kriechbaum* s.n.! (*A. oreoprasum X A. przewalskianum* ?). **Shyok:** [Calzar - Diskit], 1848-07-25, (3050-4250 m), *T.Thomson* s.n. (K!).

Unloc.: Baltistan, La Diang, *Koelz 9799* (RAW). Ladakh, Chakar Talao 4270 m, *Koelz 2454* (RAW). Pamir & Tian Shan Journey, *Appleton 123* (K!); *136* (K!, cf.), *158* (K!); *251* (K!).

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A: W Kashg: Kashgar - Ulugchat, 15 km W Kensu 2500 m, 1959-06-01, *Li & al. 9672*; 1959-06-17, *Li & al. 9676*; Xinjiang - Tibet Rd., 10 km N Kalmangou 2700 m, 1959-06-05, *Li & al. 527*; 58 km WNW Kashgar, Rd. to Kensu, 1959-06-17, *Junatov 703*; *741*; Baykurt, 83 km NW Kashgar, Rd. to Turugart, 1959-06-19, *Junatov 850*; 10 km SE Baykurt 2300 m, 1959-06-21, *Junatov 872* (Pl.As.Centr.). Upal, 1959-06-09, *Li & al. 579*; 1959-09-06, *Li & al. 587* (Pl.As.Centr.). S Kashg.: Keria, 1885, *Przewalsky* s.n. (K!); Keria Vy. 2700 m, 1885-06-30, *Przewalsky*; Keria, Nura Rv., 1885-07-23, *Przewalsky* (Pl.As.Centr.). Kongur: Bostan-Terek 2400 m; Jerzil 3000 m (PERSSON 1938). Kingtau Mts. N, 5-8 km N Kosh-Kulak, 1959-06-09, *Junatov 549*; Gez Vy. 23 km N Bulunkul, 1959-06-11, *Junatov 582*; Gez Vy., 40-42 km S Upal, 1959-06-15, *Junatov 689* (Pl.As.Centr.). S Bulunkul Lake 3340 m, *Miehe 5270!* (veg.). Gez Gorge (1840-2300 m), *Miehe 5414!*. E shore of Little Kara-Kul 3720 m, *Hedin* (PAULSEN in HEDIN 1922: "*A. odorum*"). W Kunlun: Akkez P. 2700 m, 1959-06-05, *Junatov 347*; 17 km S Pussa, 1959-06-05, *Junatov 387* (Pl.As.Centr.). Kokyar - Akaz P. 2280 m, *Dickoré 146!* (veg.). Akaz P. N (1700-2500) m, *Miehe 7371!*. Tiznap Vy., N Kudi 3030 m, *Miehe 7520!* (yg.). W Kudi 3100 m, *Miehe 8517!*. Tagra-su Vy. [N Xaidulla] 3700 m, *De Terra* (Z!; SCHMID 1932). E Pamir: Ak-ssu, Alexander Mts. N, 1880-06-31, *Fetissow* s.n. (K!). Karakul Lake, 1901-07-05, *Fedtschenko* s.n. (K!). 2700-2900 m (Fl.Tadzh.). Deosai: 3960 m, *M.A.Siddiqi, Y.Nasir & Z.Ali 4096* (K!, RAW). Suru: Middle Wakha Vy. 3650, *H.Hartmann 2718!* (*A. oreoprasum X A. przewalskianum* ?). Zanskar: [NW Zangla] 4270 m, 1848-06-30, *T.Thomson* s.n. (K!). Markha Vy., Tchatchutse 4340 m, *H.Hartmann 3048!*.

D: Dzung. Alatau, Tian Shan, Pamir-Alai (E Pamir), Kashg., Karakorum (Baltistan), W Tibet. **Map:** Pl.As.Centr. 7: map.3. *Centr. As.*

E: (2740) 3050-3980 (4270) m, mont. - subalp., not common. Dry open semi-deserts, "dominant in the clefts of rock" (*Ludlow & Sherriff 8469*), "shelter of boulders" (*Ludlow 551*). A characteristic species of mont. loess deserts and desert-steppes (*Sympegma regelii*, *Plantago minuta*, *Lepidium apetalum*) of the Kunlun N slope.

N: Usually distinct by its yellowish-brown reticulate bulb tunics and the large flowers with broad white tepals with red midnerve. *Hartmann 2718* has the bulb tunics tinged with red and red flowers with ± narrow tepals and may represent a hybrid with *A. przewalskianum*. *Hartmann 3048* has pink tepals, but otherwise is typical *A. oreoprasum*. *A. przewalskianum* appears to represent an alpine vicariant of *A. oreoprasum* in the Karakorum.

* **Allium pamiricum** WENDELBO 1969 - **A**: Wakhan: Quazi Deh 2950 m, *Roemer 119b* (PODLECH & ANDERS 1977). **D**: Pamir, Wakhan. **N**: Closely related to and perhaps conspecific with *A. jacquemontii*.

• **Allium porrum** L., Sp. Pl. 295. 1753 (*Allium ampeloprasum* L. var. *porrum* (L.) J. GAY 1847)
"Leek is cultivated as an annual in vegetable gardens in Guli Bagh, Swat and elsewhere; it has been found growing along field borders" (Fl.Pak.).

12. Allium platyspathum SCHRENK, Enum. Pl. Nov. 1: 7. 1841

? *Allium amblyophyllum* KAR. & KIR. 1842, *Allium senescens* auct. non L. 1753: NASIR 1975

W Gilgit: Gilgit 3050 m, 1880-06-27, *Tanner 168a* (K!). Sai 3960 m, 1880-06-27, *Tanner 168* (K!). Shinghai Gah - Pahot Gali 3740-4150 m, *Miehe 908!*; *1289* (K!); *1357* (K!).

Unloc.:Kashgar Mts., 1924-07, *C.P.Skrine* s.n. (K!).

A: ?Kongur: Upper Oytag Vy. 3770-3830 m, *Miehe 8714!* (veg.); *9134!* (veg.). Alai. Seravshan. E Pamir (Fl.Tadzh.). Chitral: Siru Gol, S of Shah Jinali P. 4420 m, *Stainton 3057* (BM!). Chilas: Raikot Vy., Base Camp Area 3910 m, *Nüsser 1288!*. Hazara: Kaghan Vy. 3550 m, *Schickhoff 992* (K!).

D: Altai, Tarbagatai, Dzungaria, Tian Shan, Xinjiang, Kashgaria, Pamir-Alai, Chitral, Gilgit. *W Centr. As.*

E: 3050-4150 m, subalp.-alp., rare. *Salix karelinii* scrub and meadows.

N: The Chitral, Chilas, Gilgit and Hazara localities are an extension of the known distribution range.

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13. Allium przewalskianum REGEL, Acta Horti Petrop. **3**(2): 164. 1875
Allium junceum auct. non SM. 1809: JACQUEM. ex BAKER 1874, *Allium jacquemontii* auct. non KUNTH 1843: REGEL 1875 (excl. syn. *Allium stoliczkae* REGEL 1875)

Ic.: Fl.Xizang.5: fig.302(7-8). ?Fl.Pak.83: fig.4 D-F ("*A. stoliczkii*").

CN **Braldu:** Upper Braldu tributary, above Chikor 4050-4100 m, *Miehe 6197!*. **?K2-North:** Muztagh Vy. W 3970 m, *Dickoré 904*? (veg.).

CS **Shimshal:** Upper Shimshal, Shachmirk P. W 4000-4200 m, *Miehe 6062!*. **Baltoro:** at Baltoro Camp 3540 m, *W.M.Conway B254* (K!). **Saltoro:** Hushe - Kande 2740-2900 m, *Nasir & Webster 6267* (GH, K!, RAW). **Nubra:** Panamik Village 3200 m, *A.S.Hughes 18* (K!). Nubra Vy. 3050 m, *Meinertzhagen* s.n. (BM!). Tiggur 3170 m, *F.Ludlow 537* (BM!). Upper Nubra, near Takshai 3570 m, *R.C.F.Schomburg 15* (BM!).

N **Karakash:** Karakash Vy. 4270 m, 1870-07-31, *Henderson 224* (K!; HENDERSON & HUME 1873).

S **Leh:** Giah, 1847-09-28, *T.Thomson* s.n. (K!, with *A. oreoprasum* X *przewalskianum*). Gya 5180 m, *Ludlow & Sherriff 8529* (BM!). **Lower Shyok:** Shyok 2800 m, *W.Axt* s.n. (W!). **Shyok:** [Calzar], 1848-07-22, (3660-4270 m), *T.Thomson* s.n. (K!); 1848-07-23, *T.Thomson* s.n. (K!). Kardong on the N foot of the Laotse P. 1856-08-10/17, *Schlagintweit 2174* (BM!, M!). Kardong village 3960 m, *Ludlow & Sherriff 8571* (BM!). Kardong - Diskit on the left side of the Shayok 1856-07-26/28, *Schlagintweit 2269* (BM!). Biagdang 2870 m, *F.Ludlow 382* (BM!). Shyok Vy., *Koelz 9798* (RAW). **Pangong:** Pangong Lake - Mogaleb 4360 m, *Roero* (PAMPANINI 1916). Shushal, *Koelz 2450c* (Ann.Cat.Pak.).

E **Upper Shyok:** Sassir Bransa 4650 m, *Dainelli* (PAMPANINI 1934: "*A. jacquemontii* ROYLE"). **Depsang:** Akash Gl., right lateral moraine 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930). **Upper Karakash:** Karakash watershed, 1870, *Cayley* (K!). **?Aksai Chin:** Lingzhi Tang & Aksai Chin 5170 m, *Picot* (cf.; HEMSLEY 1895).

Unloc.: Ladakh 3660 m, *P.N.Kohli 8* (K!). Karakorum, *Raja Bashir* s.n. (RAW). Tibet 4880 m, *Thorold 101* (K!); *Deasy* s.n. (K!); *Strachey 21/1* (K!).

A: ?Kongur. W Kunlun: Jerzil 2800 m (PERSSON 1938). Tügürmenlik Vy., *De Terra* (Z!; SCHMID 1932: *A. jacquemontii* REGEL). 2-3 km SW Akkez P., 1959-06-05, *Junatov & al. 353*; Upper Tiznaf Vy., 15 km from Kudi to Saryk P. 3400 m, 1959-06-01, *Junatov & al. 233* (Pl.As.Centr.). C.Kunlun: Keria Mts., Kizilsu Vy. 3150 m, 1885-07-14, *Przewalsky* (Pl.As.Centr.). E Pamir. Zanskar: Markha Vy., Tchatchutse 4560 m, *H.Hartmann 3049!*. Himachal Pr.: Piti, Ghyonmoeul, *Jacquemont 1985* (K! **type** *A. junceum* JACQUEM. ex BAKER, non SMITH). Descent to Zungehum Rv., 1847-08-29, *T.Thomson* s.n. (K!). Rupshu: Da - Hanle 4570 m, *Koelz 2279* (K!).

D: Tian Shan, Pamir-Alai, Karakorum, Himalaya (apparently widely scattered in C. Himalaya), Tibet (W, SE, NE), W China (Gansu, Sichuan). **Map:** Pl.As.Centr. 7: map 3. *Tibet.*

E: (2740-) 3200-4360 (-5180) m, subalp. - alp., not common. Steppes and semi-deserts, among rocks and gravels (granite).

N: The red-brown to almost pure red colour of the fibrous bulb-coating usually is very distinctive (see *A. oreoprasum*). "Used as a vegetable in Ladakh" (Fl.Pak.). "Strong smell of garlic, used as a spice (dried) for cooking" (*A.S.Hughes 18*).

* **Allium roylei** STEARN 1947 (*Allium liliacinum* auct. non KLOTZSCH 1862: ROYLE ex REGEL 1875, *Allium rubens* auct. non SCHRADER ex WILLD. 1809: BAKER 1874) - **Ic.**: WENDELBO 1958: fig.68. **A**: Chitral: Painogh near Drosh 3200 m, *Bowes Lyon 185* (Fl.Iran.). Astor: W Gorrakoa, Godi in Hasora, *Winterbottom 727* (K!). Hazara. Kashmir. **D**: E Afgh. (Nuristan) - W Himalaya.

• **Allium sativum** L., Sp. Pl. 296. 1753
"Garlic is extensively cultivated" (Fl.Pak.). The cultivar probably derived from **Allium longicuspis** REGEL 1875.

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* **Allium schoenoprasoides** REGEL 1878 - **A**: Kongur: Kingtau Mts. N, 3 km SE Kosh-Kulak, 1959-06-10, *Junatov & Yuan I-Feng* (Pl.As.Centr.). Upper Oytag Vy. 3080-3180 m, *Miehe 8777!*; *8796!*. Upper Gez Gorge 3500 m, *Miehe 5306!*. E Pamir. Wakhan: Khandud Vy. 3500 m, *Roemer 259* (M!); 3900-4000 m, *Renz* (Fl.Iran.; PODLECH & ANDERS 1977). **E**: (Kongur:) Mont. *Juniperus-Artemisia* forest-steppe (*J. semiglobosa*, *J. pseudosabina*, *Artemisia* cf. *brevifolia*, *Carex turkestanica*).

* **Allium schoenoprasum** L. 1753 - **Ic.**: Fl.Pak.83: fig. 1 A-C. **A**: Swat. Astor: Upper Rupal Vy., Latobo, Tap Gl., left lateral moraine 3710 m, *Nüsser 42* (cf.)*!*; Shaigiri - Latobo 3600 m, *Nüsser 1573* (cf.)*!*. Kashmir: Sonamarg 3060 m, *C.B.Clarke 27179* (BM!). Thajwas near Sonamarg 3510 m, *Ludlow & Sherriff 7909* (BM!). Haramukh 3960 m, *Ludlow & Sherriff 7842* (BM!). Zojpal, 1913-09, *M.A.Evershed* (BM!). Srinagar, Vishensar 3510 m, *C.R.Lancaster 192* (BM!). Kolahoi Vy. 3660 m, *O.Polunin 56/578* (BM!). Burzil P. S 2840 m (PERSSON 1938). **D**: Circumarctic, S to Iran, W Himalaya.

* **Allium senescens** L. 1753 - Apparently erronously reported from **Gilgit** (Fl.Pak.): to *A. platyspathum*, and **Baltoro** (CONWAY 1894): to ? *A. consanguineum*. **D**: Eurasia, S to Dzungaria, Mongolia.

* **Allium stipitatum** REGEL 1881 - **A**: Chitral: Ojor Partsan (N 36°04' E 71°48') 2960 m, *Bowes Lyon 845* (BM!; Fl.Iran.). Shiger Arirat 2900 m, *Bowes Lyon 754* (BM!). **D**: Tian Shan, Pamir-Alai, E Afgh., NW Pakistan. **N**: It differs ± only in the pilose leaves from *Allium rosenbachianum* REGEL 1884.

* **Allium stoliczkae** REGEL 1875 ("*Allium stoliczki*") - **A**: Zanskar: Lingti 3960 m, *Bor 15029* (K!). Kenlung 4720 m, *Bor 16498* (K!). Debni 4450 m, 1992-08-03, *Holzner & Kriechbaum* s.n.*!*. Gumburanjon 4450 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Himachal Pr.: Losar 3960 m, *N.G.C.Gill 1955* (K!). **D**: Zanskar, ?Lahul, Spiti (endemic ?). **E**: Alpine meadows, *Caragana* scrub. **N**: The species is collected for food (*M.Kriechbaum* in litt.). Often regarded as a synonym of *A. przewalskianum*, but it differs by the taller stature, smaller flowering heads and brown (not red) reticulate bulb-tunics. Very similar also to *Allium nuristanicum*.

* **Allium tenuicaule** REGEL 1887 - **A**: Chitral. **D**: Pamir-Alai, Afgh., Pakistan (Chitral).

* **Allium tianschanicum** RUPR. 1869 (*Allium macrorrhizum* auct. non BOISS. 1854: REGEL 1875) - **A**: Reported from E Pamir 2800-4000 m (Fl.Tadzh.). **D**: C. & N Tian Shan, E Pamir, Kashgaria. **Map:** Pl.As.Centr.7: map 1. **N**: Its relation to *A. filifolium* needs to be examined.

* **Allium tripterum** E. NASIR 1975 - **Ic.**:Fl.Pak.83: fig.10 D-H. **A**: Swat. **D**: NW Pakistan (Swat), endemic. **N**: According to NASIR 1975, probably related to the E Himalayan *Allium macranthum* BAKER 1874 (E Himalaya: Sikkim, SE Tibet - Yunnan, Shensi).

14. Allium tuberosum ROTTLER ex SPRENGEL, Syst. Veg. 2: 38. 1825

Allium roxburghii KUNTH 1843, *Allium clarkei* HOOKER f. 1892, *Allium odorum* auct. non L. 1767: HOOKER f. 1892, PAMPANINI 1930

Ic.: Fl.Pak.83: fig.5 A-C.

W **?Gilgit:** Baghrot Vy. 3170 m, *Miehe 4630?* (veg.). **Hunza:** Minapin - Chalt 2400 m, 1955-08-22, *S.Nakao* s.n. (KYO!; KITAMURA 1964); 1830-2130 m, *R.R.Stewart 26320* (BM!). Chaprot, 1847-09-01, *Winterbottom 966* (K!).

S **Skardu:** Skardu 2350 m, in the swamps, 1876-08-18, *C.B.Clarke 30505* (BM!, K! **type** *A. clarkei*). Skardu, *R.R.Stewart 20435* (RAW). Skardo - Satpor Vy. (S of Skardo), 1856-09-02, *Schlagintweit 5561* (BM!). Satpura Nullah 3050-3350 m, *Duthie 12007* (K!, BM!); Satpara Village 3050 m, common in fallow fields, *Webster & E.Nasir 6321* (GH, K!, RAW). **Lower Shyok:** Marcha 2770 m, *F.Ludlow 376* (BM!).

Unloc.: *Strachey 10* (K!).

A: ? W Pamir (Fl.Tadzh.: "*A. odorum*"). Hazara: Kaghan Vy. 3600-3860 m, *Miehe 95* (K!)*; 178* (K!)*; 109!*; *216* (K!).

D: S Karakorum, Himalaya; E Asia: Siberia, Far East, Mongolia, China, Japan. *E Asiat.*

E: 1830-3350 m, mont. (- subalp.), rare. Rather moist habitats, *Picea smithiana - Pinus wallichiana* forests, *Rhododendron anthopogon* dwarf-scrub (Kaghan Vy.), swamps, irrigated fields.

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N: Also reported from **Mustagh Ata:** E shore of Little Karakul 3720 m (PAULSEN in HEDIN 1922); probably a misidentification of *A. oreoprasum*.

* **Allium victorialis** L. 1753 - **Ic.**: Fl.Pak. 83: fig. 4 A-C. **A**: Astor: Kalapani, *M.B.Zaman 1975* (PPFI-M; Fl.Pak.). Hazara: Kaghan Vy. Kashmir 2440-3050 m. **D**: Temp. Eurasia (S to Caucasus, W Himalaya: ?Nuristan, Astor, Hazara, Kashmir - W Nepal), Japan, NW America. **Map:** STEARN 1960: fig.7. **N**: Substituted by **Allium prattii** C. H. WRIGHT 1903 in the E Himalaya (Uttar Pradesh/W Nepal - SE Tibet, SW China), which was also collected in SW Tibet S of the Manasarowar Lakes.

* **Allium winterbottomii** WANG & TANG (ined. ?) - **A**: Astor: Gurys P. N side [P. to Gurais], *Winterbottom 527* (K! **type**). Kashmir: 1830 m, 1938-05, *P.N.Kohli 43* (K!). **N**: Of unknown identity, perhaps related to *A. caesioides*.

Putative hybrid:

Allium oreoprasum X A. przewalskianum - Perhaps occuring locally in contact areas of the vicarious parent species (see under *A. oreoprasum*).

* Amaryllidaceae

Lit.:

NASIR, E. 1980: *Amaryllidaceae*. - In: Flora of Pakistan **134**: 1-7.

WENDELBO, P. 1958: *Amaryllidaceae*. - In: Symbolae Afghanicae 4. - Biol. Skr. Dan. Vid. Selsk. **10**(3): 166-185.

WENDELBO, P. 1970: *Amaryllidaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **67**: 1-8.

* **Ixiolirion karateginum** LIPSKY 1901 (*Kolpakowskia karategina* (LIPSKY) TRAUB 1942) - **A**: Badakhshan. W Pamir. Chitral: Owir An SE Tirich Mir 3600 m, *Stainton 2754*; Chitral - Mastuj, Reshun 1800 m, *Stainton 2446*; Buni 1950 m, *Stainton 2462*; Birmogh Lasht 2550 m, *Bowes Lyon 725* (Fl.Iran.). **D**: Pamir-Alai, NE Afgh. (Hindukush) NW Pakistan (Chitral). **N**: The specimen Badakhshan 3050 m, *Giles 141* (K) is certainly not from **Gilgit** as given in Fl.Pak.

* **Ixiolirion tataricum** (PALL.) HERB. 1821 (*Amaryllis tatarica* PALLAS 1776, *Amaryllis montana* LABILL. 1791, *Ixiolirion montanum* (LABILL.) HERB. 1821, *Ixiolirion pallasii* FISCHER & C. A. MEYER ex LEDEB. 1853 - **A**: Kurram. Chitral. Swat. Hazara. ?Kashmir (Ann.Cat.Pak.). **D**: NW Africa, SW & C. Asia (Anatolia - Siberia, Dzung.). **N**: The records may (partly ?) refer to *I. karateginum*.

* **Sternbergia fischeriana** (HERB.) M. ROEMER 1847 (*Oporanthus fischerianus* HERB. 1837) - **A**: Kashmir (Ann.Cat.Pak.). **D**: Anatolia, Syria, Iraq, Iran, Caucasus; Kashmir (introduced ?).

* Araceae

Lit.:

BOYCE, P. 1993: The genus *Arum*. Kew Magazine Monograph. London. 196 pp.

EGOROVA, T. V. 1967: *Araceae*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **3**: 90.

ENGLER, A. 1920: *Araceae-Aroideae* und *Araceae-Pistioideae*. - In: Das Pflanzenreich Heft **73** (IV.23).

NASIR, J. Y. 1978: *Araceae*. In: NASIR, E. & ALI, S. I. (eds.), Flora of Pakistan **120**: 1-17.

OVCZINNIKOV, P. N. (ed.) 1963: *Araceae*. - In: Flora Tadzhikskoy SSR **2**: 146-153.

RIEDL, H. 1963: *Araceae*. - In: KÖIE, M. & RECHINGER, K. H. (eds.), Symbolae Afghanicae 5. - Biol. Skr. Kongl. Danske Vid. Selskab **13** (4): 263-265.

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* **Arisaema flavum** (FORSKAL) SCHOTT 1860 (*Arum flavum* FORSKAL 1775) - **A**: Swat. Hazara. Kashmir 1520-2740 m. **D**: NE Africa, Yemen; Afgh., Pakistan, Himalaya - SE Tibet, W China.

* **Arisaema jacquemontii** BLUME 1836 (*Arisaema exile* SCHOTT 1859, *Arisaema cornutum* SCHOTT 1859) - **Ic.:** ENGLER 1920: fig.45A-C. Fl.Xizang.5: fig.266(7-9). **A**: Chitral. Swat. Hazara. Kashmir 2130-3660 m. Himachal Pr.: Lahul. **D**: Himalaya: Afgh. - SE Tibet, Assam.

* **Arisaema propinquum** SCHOTT 1857 *Arisaema wallichianum* HOOKER f. 1893 p.p. - **A**: Kashmir. **D**: Himalaya: Kashmir - Bhutan, S Tibet.

* **Arisaema tortuosum** (WALL.) SCHOTT 1832 - **A**: Kashmir. **D**: Baluch., Himalaya, W China, Burma.

* **Arisaema utile** HOOKER f. ex SCHOTT 1860 - **A**: Hazara. **D**: Himalaya: Hazara - Bhutan.

* **Arum jacquemontii** BLUME 1835 (*Arum griffithii* SCHOTT 1856) - **Ic.:** BOYCE 1993: fig.p.138, pl.10. **A**: Kurram. Chitral: Shogot 1830-2130 m, *Giles 354* (K!). Ashret, *Harriss 16732* (K!). Swat. Kashmir. **D**: N Afgh. - Tadzh., NW Pakistan - Kashmir. **Map:** BOYCE 1993: map 17. **N**: Reported in error from **Gilgit** (Ann.Cat.Pak.); *Giles'* specimen being collected in Chitral. It is, however, not quite unlikely that the species may be found in the SW Karakorum.

* **Sauromatum venosum** (AITON) KUNTH 1841 (*Arum venosum* AITON 1789) - Swat. Hazara. Kashmir. **D**: Himalaya (Hazara - SE Tibet).

Asparagaceae

Lit.: as for *Liliaceae*

* **Asparagus angulofractus** ILJIN 1935 (*Asparagus soongoricus* ILJIN 1935, *Asparagus maritimus* auct. non PALLAS 1773: ? OSTENFELD 1922, *Asparagus breslerianus* auct. non SCHULTES in ROEMER & SCHULTES 1829: BOSSHARD 1932 - **A**: Kongur (Pl.As.Centr.). W Kunlun: Zawa, 1928-05-05; Darwa - Sanju, 1928-05-07/09; Kok-yar, 1928-05-14, *Bosshard* (Z!; BOSSHARD 1932). Kokyar - Akaz P. 2540 m, *Dickoré 969!*. Akaz P. N 2630 m, *Miehe 8629!*. C.Kunlun (Pl.As.Centr.). **D**: W Mongolia, Dzungaria, Kashgaria (Kunlun foothills). **E**: (W Kunlun:) Mont. loess slopes, calcareous rocks, desert-steppe (*Stipa splendens*, *Tanacetum fruticulosum*).

* **Asparagus capitatus** BAKER 1875 - **A**: Kashmir. **D**: E Afgh., Pakistan, Kashmir, India.

* **Asparagus filicinus** BUCH.-HAM. ex D. DON 1825 - **A**: Chitral. Swat. Hazara: Kaghan Vy., below Sharan 2450 m, *Schickhoff 90/337!*. Kashmir. **D**: Himalaya: Chitral - Assam, SE Asia.

* **Asparagus griffithii** BAKER 1875 - Reported from **Ghizar:** Ghizr region, Langar E of Shandur P., *Kerstan 2029* (WENDELBO 1958). **D**: W & S Iran, C. & NE Afghanistan. *Ir.-Tur.* **N**: Doubtful record, to be confirmed; perhaps referable to *A. neglectus*.

15. Asparagus neglectus KAR. & KIR., Bull. Soc. Nat. Moscou 14: 48. 1841

W **Ishkoman:** Upper Ishkoman, Upper Baru Gah 3050-3130 m, *Miehe 6772!*.
A: Chitral. Swat.
D: NW China, S Altai, Dzungaria, Pamir-Alai, N Afgh., NW Pakistan. *Centr.As.*
E: 3050-3130 m, mont., rare in the W. *Juniperus excelsa - Artemisia brevifolia* forest-steppe.

• **Asparagus officinalis** L., Sp. Pl. 313. 1753
Cultivated throughout the temp. regions; native area unknown.
W **Gilgit:** 1500 m, *Nakao* s.n. (KITAMURA 1964).

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* **Asparagus racemosus** WILLD. 1799 - **A**: Kashmir. **D**: Africa, Himalaya: Kashmir - Sikkim, SE Asia, Australia.

* **Asparagus trichophyllus** BUNGE 1832 - **A**: Reported from N, E, W Kashg., S Kashg. (Pl.As.Centr.).

Asphodelaceae

Lit.:

FEDTSCHENKO, O. 1909: *Eremurus*. Kritische Übersicht der Gattung. - Mem. Akad. Imp. Sci. Pétersb., VIII sér., **23**(8): 1-210.

WENDELBO, P. 1982: *Liliaceae* I. - In: RECHINGER, K. H. (ed.), Flora Iranica **151**: 1-31, pl. 1-24. Graz.

Eremurus:

A tentative treatment of the strictly Irano-Turanian genus, which exhibits an extensive variation from the W Pamir-Alai westwards. Literature records from the Karakorum are in need of a critical revision according to the occasional herbarium material.

* **Eremurus aitchisonii** BAKER in AITCH. 1881 (p.p.) - **A**: Chitral (Fl.Iran.). **D**: Pamir-Alai, Afgh., NW Pakistan.

* **Eremurus comosus** O. FEDTSCH. 1904 - **D**: Pamir-Alai, N Afgh. **N**: Plants from Chitral are perhaps referable to *E. dolichomischus*.

* **Eremurus dolichomischus** VVED. & WENDELBO 1966 - **Ic:** Fl.Iran.151: pl.17(2), fig.14(2). **A**: Chitral: Drosh 1370 m, *Stainton 2359* (BM!; Fl.Iran). **D**: E Afgh., NW Pakistan (Chitral).

16. Eremurus fuscus (O. FEDTSCH.) VVED. ex NIKITIN, Fl. Kirghiz. SSR 3: 31. 1951

Eremurus altaicus (PALL.) STEVEN f. *fuscus* O. FEDTSCH. 1909

W **Yasin:** Darkot 3050 m, *Bowes Lyon 8053* (K!). Naz Bar 3400-3470 m, *Miehe 3531* (K!).
A: Chitral: Chatiboi Gl. < 3850 m, *Stamm & Wöhrl 60* (W!). Yarkhun, Ondine, *Bowes Lyon 977* (BM!; Fl.Iran.).
D: Tian Shan, Pamir-Alai, Chitral, Gilgit. *W Pamir.*
E: 3050-3470 m, mont., rare in the extreme W. Steppes.

17. Eremurus himalaicus BAKER, J. Linn. Soc. London (Bot.) 15: 283. 1877

W **Gilgit:** Naltar Vy. (Ann.Cat.Pak.).
A: Chitral: Guger - Ziarat (2440-3050 m), *Harriss 16714* (BM!). Lowari P. 3050 m, *Toppin 409* (K!). Ziarat, Lowari P. 2900 m, *Stainton 2567* (BM!). Shiger - Arirat 2740 m, *Bowes Lyon 757* (BM!). Astor: Gurys P. N [P. to Gurais] 3660 m, *Winterbottom 513* (K!). Deosai: Burzil Chowki (STEWART 1961). Dras: Dras Vy., Machhui, *Inayat 25762* (K!). Near Dras (STEWART 1917). Dras 3200 m, *Ludlow & Sherriff 8332* (BM!). Zoji P. - Dras, *Billiet & Leonard 6762* (K!). Swat. Hazara: Kaghan Vy. 2230 m, *Inayat 20210* (K!); Kamalban 3050 m, *Inayat 22618* (K!). Kashmir: 2590-3170 m. Gulmarg 2440-2740 m, *Duthie 13018* (BM!). Tragbol 3170 m, *C.B.Clarke 29315* (BM!, K!). Sonamarg 2590 m, 1891-07-28, *Gammie* s.n. (K!). Liddar Vy., near Pahlgam, *F.Ludlow 68* (BM!). Kosterokut, 8 miles NW Vishensar, *O.Polunin 56/695* (BM!). "Yarkand Exp.", 1870-06-22, *Henderson 428* (K!). Chenab [Sanch P. - Shol], 1848-06-13, *T.Thomson* s.n. (K!). Himachal Pr.: Kishtvar, Triloknath up to the Kali P. (SW of Triloknath), 1856-06-24/27, *Schlagintweit 3831* (BM!). Sach P. - Dunai Sarai 3350 m, *C.D.Sayers 3704* (BM!). Billing Nala, *Aswal 10451* (ASWAL & MEHROTRA 1994).
D: W Himalaya: NE Afgh. (Nuristan) - Lahul, Punjab. *W Himal.*

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E: (Generally:) subalp., steppes, rare in the SW. Altitude and habitat not given for the Karakorum. Grazing weed, not eaten by animals.
N: "Cut for greens when young" (STEWART 1961).

* **Eremurus inderiensis** (STEVEN) REGEL 1873 (*Asphodelus inderiensis* STEVEN 1832, *Eremurus velutinus* BOISS. & BUHSE 1860) - **Ic.**: Fl.Iran.151: pl.17(1), fig.14(1). **A**: S Tadzh. 1000-1200 m (Fl.Tadzh.). Reported from Ishkoman: Ishkoman P., *F.Schmid 2436* (Ann.Cat.Pak.). The record may belong to *E. dolichomischus*. **D**: Middle Asia, Iran, Kopet Dag, W Pamir-Alai, Afgh., W Pakistan (Baluch.).

? 18. Eremurus korshinskii O. FEDTSCH., Bull. Herb. Boiss., Sér. 2, 4: 77. 1904
Eremurus aitchisonii BAKER in AITCH. 1881 p.p.

W Yasin: Dadar-Nazbar P. 3300 m, 1957-08-10, *K.Honda 236* (KYO!, KITAMURA 1964).
A: W Pamir 1500-3000 m (Fl.Tadzh.).
D: Pamir-Alai, E Afgh., W Gilgit (Yasin). *W Pamir*.
E: 3300 m, mont., rare in the extreme W. Habitat unknown.
N: Closely related to *E. fuscus* and recorded from the same area in the extreme W Karakorum. The specimen may represent only a more robust form of *E. fuscus*.

* **Eremurus robustus** REGEL 1873 (*Eremurus aitchisonii* BAKER in AITCH. 1881 p.p.) - **A**: W Pamir 1600-3100 m (Fl.Tadzh.). Chitral: Madaglast 3050-3350 m, *Toppin 502* (K!). **A**: Tian Shan, Pamir-Alai.

* **Eremurus spectabilis** M. BIEB. 1819 - **D**: Anatolia, Palestine - Caucasus, SW & Middle Asia - Afgh., Pamir-Alai. **N**: **Eremurus spectabilis** M. BIEB. subsp. **regelii** (VVED.) WENDELBO 1982 (*Eremurus spectabilis* M. BIEB. var. *marginatus* O. FEDTSCH. 1909) from the E part of the species' distribution area is reported from Afgh., W Pamir Alai (Fl.Iran). Records from Chitral may belong to *E. fuscus*.

* **Eremurus stenophyllus** (BOISS. & BUHSE) BAKER 1877 subsp. **aurantiacus** (BAKER) WENDELBO 1964 - **A**: W Pamir 1600-3000 m (Fl.Tadzh.). Wakhan (PODLECH & ANDERS 1977). Chitral: Shoghot - Arirat 2440 m, *Bowes Lyon 751* (BM!). Chitral - Mastuj Track, Sanoghar 2130 m, *Stainton 2469* (BM!). **D**: Afgh., W Pakistan (Chitral, Baluch.).

* Butomaceae

Lit.:
BUCHENAU, F. 1903b: *Butomaceae*. - In: ENGLER, A., Das Pflanzenreich **16** (IV. 16): 1-12.
DANDY, J. E. 1971: *Butomaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **79**: 1.
GRUBOV, V. I. & al. 1971: *Butomaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **6**: 57.
OVCZINNIKOV, P. N. (ed.) 1957: *Butomaceae*. - In: Flora Tadzhikskoy SSR **1**: 110-114.

* **Butomus umbellatus** L. 1753 (*Butomus junceus* TURCZ. 1854) - **Ic.**: Fl.Tadzh.1: fig.17 (*B. junceus*). Fl.Desert.Sin.1: fig.8(12-14). **A**: S Tadzh. (Fl.Tadzh.). Kashmir: common (Ann.Cat.Pak.). **D**: Europe - E Asia, S to Iraq, Iran, Afgh., Pamir, Kashmir, Himalaya, China; introduced in N & S America. **N**: The Himalayan plant probably is var. *junceus* (TURCZ.) MICHX., a generally smaller plant, which retained specific rank in Fl.Tadzh.

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Colchicaceae

Lit.:
NASIR, E. 1979: *Colchicaceae.* - In: NASIR, E. & ALI, S. I. (eds.), Flora of Pakistan **125**: 1-5.
PERSSON, K. 1992: *Liliaceae* III. - In: RECHINGER, K. H. (ed.), Flora Iranica **170**: 1-40, pl. 1-14.
STEFANOV, B. 1926: Monographie der Gattung *Colchicum* L. - Sbornik Bulgarskata Akad. Nauk., Kniga **22**: 1-96.

* **Colchicum kesselringii** REGEL 1884 - **Ic.:** Fl.Iran.170: tab.7 fig.2,3. **A**: W Pamir (Fl.Tadzh.). Wakhan: Bawghul Plain 3810 m, *Giles 119* (K!). Chitral: Birmogh Lasht (N 35° 55' E 71°46') 3660 m, *Bowes Lyon 738* (BM!). Ziarat, Lowari P. 2740 m, *Stainton 2327* (BM!). **D**: Tian Shan, Pamir-Alai, Wakhan, Chitral.

19. Colchicum luteum BAKER, Gard. Chron., nov. ser. **2**: 34. 1874
Colchicum albertii REGEL 1884, ? *Merendera aitchisonii* auct. non HOOKER f. 1873: Ann.Cat.Pak.
Ic.: Fl.Iran. 170: tab.8 fig.1.
CS **?Saltoro:** Ghondokoro Gl. 4270 m, *Nasir & Webster 6019.* (Ann.Cat.Pak. "*Merendera aitchisonii*").
W **Ishkoman:** Shantar Galli [? Chhantir Gah] 3900 m, *F.Schmid 1759* (BM!).
Unloc.: Yarkand Exp., 1870-06-20, *Henderson 366* (K!).
A: E Pamir (Fl.Tadzh.). Chitral: Lowari P. 2590-3050 m, *Harriss 16702* (BM!). Ziarat, Lowari P. 2740 m, *Stainton 2327a* (BM!). Chilas: Raikot Vy., right slope above Fary 3300 m, *Nüsser 1025!;* Jut 3330 m, *Nüsser 933!* (cf.). Astor: Harchu Vy., left slope above Baro Nirril 3160 m, *Nüsser 857!;* above Lathang 3480 m, *Nüsser 862!.* Dras: Dras Vy., common, *Trinkler 5* (Z!; BOSSHARD 1932). Swat: Guger 2590 m, *Harriss 16705* (BM!). Hazara: Murree 2130 m, *G.Taylor 1/53* (BM!). Kashmir: Sonamarg 2190 m, *Meinertzhagen* s.n. (BM!). Tangmarg 2130 m, *Ward 232* (BM!). Wardwan Vy. 2900 m, *Stainton 7533* (BM!).
D: Tian Shan, Pamir-Alai, E Afgh., W Himalaya (Nuristan - Kashmir). *W Pamir.*
E: 3900-?4270 m, alp., rare in the SW. (Generally:) Alpine slopes, meadows, stream banks, open woodland.
N: Early flowering (March - April) and perhaps overlooked.

* **Colchicum robustum** (BUNGE) STEFANOV 1926 (*Merendera robusta* BUNGE 1854, *Merendera persica* BOISS. 1853, *Merendera aitchisonii* HOOKER f. 1873, *Colchicum aitchisonii* (HOOKER f.) E. NASIR 1979) - **Ic.:** WENDELBO 1958: fig.57 a-b. Fl.Iran.170: tab.1, tab.2 fig.1, tab.7 fig.1. **A**: Kurram. ?Chitral, ?Astor, Kashmir. **D**: Iran, Afgh., Pakistan, Kashmir; Middle Asia: Turcomania, Pamir-Alai - Balkhash). **N**: Reported, apparently in error, from **Saltoro** (Ann.Cat.Pak.).

* Commelinaceae

* **Commelina benghalensis** L. 1753 - **A**: Swat. Hazara. Kashmir. **D**: Africa, Himalaya, SE Asia.

* **Commelina paludosa** BLUME 1827 - **A**: Swat. Hazara. **D**: Himalaya, SE Asia.

Convallariaceae

Lit.: as for *Liliaceae.*

* **Liriope graminifolia** (L.) BAKER 1879 (*Ophiopogon graminifolius* L. 1762) - **A**: Hazara: Kaghan Vy., Kashmir. **D**: W Himalaya.

* **Ophiopogon intermedius** D. DON 1825 - **A**: Hazara. Kashmir. **D**: Himalaya: Hazara, Kashmir - Assam, SE Asia.

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Key to *Polygonatum*:

1. Leaves broadly lanceolate to ovate, opposite or alternate, glabrous beneath or with rather long trichomes on the nerves **2**
+ Leaves lanceolate to narrowly lanceolate, usually verticillate, alternate in young or depauperate specimens, glabrous or shortly papillose beneath **3**
2. Leaves with long trichomes on the nerves beneath, lower leaves opposite. Flowers two per peduncle ..... **P. geminiflorum**
+ Leaves glabrous, all leaves alternate. Flowers usually 3-5 per peduncle, rarely less .... **(P. multiflorum)**
3. Filaments glabrous. Peduncles longer than 1 cm. Flowers pink or white. Leaves up to 3-4 per whirl, linear-lanceolate to lanceolate, attenuated into an often uncinate tip ..... **P. leptophyllum**
+ Filaments papillose. Peduncles less than 1 cm. Flowers greenish-white. Leaves usually 4-6 per whirl, lanceolate, with a short straight tip ..... **(P. verticillatum)**

20. **Polygonatum geminiflorum** DECNE. in JACQUEM., Voy. Inde 170, pl. 170. 1844

W **Gilgit:** Baghrot Vy. 3570 m, *Miehe 4035!;* above Gutumi Nullah 3040 m, *Schickhoff 568!.* Upper Darchan Vy., above Khaltaro 3190-3230 m, *Schickhoff 642!; 689!; 721!.*

A: Chitral. Chilas: Rakhiot Vy. 3220 m, *Schickhoff 1662!.* Astor: Above Zaipur 3120-3140 m, *Schickhoff 1046!; 1098!.* Below Sachen Gl. 3080-3220 m, *Schickhoff 964!; 1023!.* Faqirkot 3220 m, *Schickhoff 1352!.* Deosai: Burzil (STEWART 1961). Swat. Hazara: Kaghan Vy. 2750-3600 m, common. Near Besri 2750 m, *Schickhoff 90/387!.* Above Battakundi 3500-3600 m, *Miehe 61!.* Kashmir: 2740-3050 m, "in birch zone" (Ann.Cat.Pak.). Himachal Pr.: Keylong, *Bor 14999* (DD; ASWAL & MEHROTRA 1994).

D: W Himalaya: Kurram, Chitral - Kashmir, Himachal Pr., ?Kumaon. *W Himal.*

E: 3040-3570 m, mont., rare in the SW. Moist coniferous forests (mainly *Picea smithiana*, sometimes *Pinus wallichiana*, potentially *Abies webbiana*), *Betula jacquemontii* forests.

N: Usually a very distinctive species, but probably intergrading with *P. leptophyllum* or species of the *P. verticillatum* complex.

21. **Polygonatum leptophyllum** (D. DON) ROYLE, Ill. Bot. Himal. 1: 380. 1839

Convallaria leptophylla D. DON 1825

Polygonatum verticillatum auct. non (L.) ALL. 1785

W **Gilgit:** Shinghai Gah - Pahot Gali 3610 m, *Miehe 840!* (veg.). Baghrot Vy. (2860) 3340-3570 m, *Miehe 4219!; 4301!.* Upper Dainyor Vy. 3110 m, *Schickhoff 402!.* Naltar Vy., above Bichgari 3120 m, *Schickhoff 20!.* Upper Darchan Vy., above Khaltaro 3210 m, *Schickhoff 678!.* Above Phuparash 2860 m, *Schickhoff 804!.* **Hunza:** Upper Rashumaling Vy. 2630 m, *Schickhoff 84!.*

S **Skardu:** Tormik Vy., Ganto P. W 3000-3200 m, 1991-07-01, *J.Poelt* s.n.!; Ganto P. W 3380 m, *Miehe 4677!.*

D: SW Karakorum, W Himalaya (Kashmir - Nepal, Bhutan). *W Himal.*

E: 2630-3610 m, mont., not common in the SW. Coniferous forests (*Picea smithiana*, *Pinus wallichiana*, *Juniperus excelsa*) and scrub (*Juniperus sibirica*), apparently of a somewhat wider ecological amplitude than *Polygonatum geminiflorum*, but often vegetative.

N: The plants from the Karakorum have narrow leaves with uncinate tip, long peduncles and glabrous filaments; the stems, lower leaf surfaces and even peduncles are rather densely puberulent, the perianth is clearly pink at the tip. Indument and leaf shape are, however, very variable, and many specimens are only vegetative. They seem to be distinct from *P. verticillatum*, but other taxa of the poorly understood complex may be involved. Some characters (long hairs) may indicate introgression from *P. geminiflorum*. **Polygonatum sewerzowii** REGEL 1868 (*Polygonatum aflatunense* B. FEDTSCH. 1915, *Polygonatum haussknechtii* BORNM. & SINT. 1903) - **Ic.:** Fl.Iran.165: pl.171. **D**: NE Iran - Turkmenia, N Afgh., W Pamir - Tian Shan, is apparently also closely related. Uncinate leaf apices are furthermore characteristic of **Polygonatum cirrhifolium** (WALL.) ROYLE 1839, a species of the C. and E Himalaya. The group deserves further studies.

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* **Polygonatum multiflorum** (L.) ALL. 1785 (*Convallaria multiflora* L. 1753) - **A**: Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1775!*; near Paprang 2400 m, *Schickhoff 90/295a!*. Kashmir 1520-2740 m, common (Ann.Cat.Pak.). Himachal Pr.: Lahul. **D**: Temp. Eurasia, S to W Himalaya.

* **Polygonatum verticillatum** (L.) ALL. 1785 (*Convallaria verticillata* L. 1753) - **Ic.**: Fl.Iran.165: pl.172. **Unloc.**: [?]Baltistan (Ann.Cat.Pak.). **A**: [?]Chitral. [?]Deosai: Gulteri below Deosai, *R.R.Stewart 22218* (Ann.Cat.Pak.). [?]Dras (HENDERSON & HUME). Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1788!*; Phagal area 1750 m, *Schickhoff 90/503!*. Kashmir 1830-3350 m. **D**: Temp. Eurasia, S to Caucasus, Himalaya. **N**: The species is apparently confined to relatively low altitudes of the humid outer ranges in the Himalaya. Records from the inner ranges may be referable to *P. leptophyllum* (see there).

Cyperaceae

Lit.:

BOECKELER, O. 1888: *Cyperaceae* novae I. Varel a.d.Jade. 53 pp.

BOOTT, F. 1858: Illustrations of the Genus *Carex*. Reprint 1968. Lehre (J. Cramer).

CLARKE, C. B. 1883: On *Hemicarex*, Benth., and its allies. - J. Linn. Soc., Bot. **20**: 374-403.

CLARKE, C. B. 1894: *Cyperaceae*. In: HOOKER f., Flora of British India **6**: 694-748.

CLARKE, C. B. 1898: On the subsubareas of British India, illustrated by the detailled distribution of the *Cyperaceae* in that Empire. - J. Linn. Soc., Bot. **34**: 1-146.

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DIETRICH, W. 1967: Die Zytotaxonomie der *Carex*-Sektion *Frigidae* in Europa. - Feddes Repert. **75** (1/2): 1-42.

EGOROVA, T. V. 1967: *Cyperaceae*. In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **3**: 8-90. Leningrad.

EGOROVA, T. V. 1981: Generis *Eleocharis* R. Br. (Cyperaceae) florae URSS systema et conspectus. - Nov. Syst. Pl. Vasc. **18**: 95-124.

EGOROVA, T. V. 1983: Generis *Kobresia* R. Br. (Cyperaceae) florae URSS systema et conspectus. - Nov. Syst. Pl. Vasc. **20**: 67-85.

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JUVAL, N. & BHATTACHARYYA, U. C. 1986: Four new species of *Carex* L. (*Cyperaceae*): new for north-western Himalaya. - Indian J. Forestry **9** (3): 279-280.

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KERN, J. H. & NOOTEBOOM, H. P. 1979: *Cyperaceae*. - In: Flora Malesiana, ser. I - Spermatophyta **9** (1): 107-187.

KOYAMA, T. 1956: Quelques *Cyperacées* nouvelles du Karakoram, recueillées par l'expedition Scientifique de l'Université de Kiote, en 1955 - Acta Phytotax. Geobot. **16** (6). 166-168.

KOYAMA, T. 1958: Taxonomic study of *Cyperaceae* 8. Some new and noteworthy *Carices* from Pakistan - Acta Phytotax. Geobot. **17** (4): 97-102.

KOYAMA, T. 1978: *Cyperaceae*. - In: HARA, H., STEARN, W. T. & WILLIAMS, L. H. J. (eds.), An enumeration of the flowering plants of Nepal 1: 96-120. London.

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KUKKONEN, I. 1984b: New infraspecific taxa and nomenclatural combinations in *Carex* (*Cyperaceae*) in the Flora iranica area. - Ann. Bot. Fennici **21**: 383-389.
KUKKONEN, I. 1986: Special features of the inflorescence structure in the family *Cyperaceae*. - Ann. Bot. Fennici **23**: 107-120.
KUKKONEN, I. 1987: The genus *Carex* (*Cyperaceae*) in the Flora Iranica area. - Pl. Syst. Evol. **155**: 27-43.
KUKKONEN, I. 1990a: On the genus *Eleocharis* (*Cyperaceae*) in the Flora Iranica area, with revised infrageneric classification and nomenclature - Ann. Bot. Fennici **27**: 109-117.
KUKKONEN, I. 1990b: The inflorescence structure of *Kobresia myosuroides* and related species of sect. *Elyna* (*Cyperaceae*). - Ann. Bot. Fennici **27**: 159-167.
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Key to *Blysmus*:

1. Perianth bristles conspicuous, long and with reflexed spines. Leaves flat to loosely inrolled, with large teeth at apex. Culm compressed ..... **B. compressus**
\+ Perianth bristles reduced, antrorsely hispid, or absent. Leaves tightly convolute to cylindric, glabrous at apex or with minute teeth. Culm terete ..... **B. rufus**

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22. Blysmus compressus (L.) PANZER ex LINK, Hort. Berol. **1**: 278. 1827

Schoenus compressus L. 1753, *Scirpus caricis* RETZ. 1779, *Scirpus compressus* (L.) PERS. 1805, *Scirpus cariciformis* VEST 1805, *Blysmus sinocompressus* TANG & WANG 1961

Ic.: Fl.Iraq 8: fig.88. Fl.Tadzh.2: fig.11(1-2). Fl.Xizang.5: fig.190(11-13): *B. sinocompressus*. Fl.Desert.Sin.1: fig.52(1-4): *B. sinocompressus*, fig.52(5): *B. compressus*.

CN **K2-North:** Muztagh Vy. 3930 m, *Dickoré 619!*. **Shaksgam:** Upper Shaksgam Vy. 4000-4060 m (*Dickoré*).

CS **Baltoro:** Near Baltoro Gl. 3300 m, *Nakao* s.n. (KITAMURA 1964). Paiju 3450 m, *H.Hartmann 306!* (HARTMANN 1966). **Nubra:** [Lower] Nubra Vy., 1848-08-01, *T.Thomson* s.n. (K!); 1848-09-04, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** Little Karakul Lake 3720 m, 1894-07-15, *S.Hedin* (OSTENFELD 1922); 3600 m, *Miehe 5477a!*. **Taxkorgan:** 3290 m, 1935-06-28, *Persson 656* (PERSSON 1938). **Yarkand:** Ilyk 3520 m, *Dickoré 402!*. Mazar Dala - Mazar 3600-3850 m, *Dickoré 265!; 341!; 359!*. **Karakash:** Khotan, Sumgal (on the S foot of the Bushia P. to Gulbagashen (large Yashem quarries), 1856-08-28/30, *Schlagintweit 12754* (BM!).

W **Gilgit:** Naltar Vy. 3350 m, *R.R.Stewart 26920* (BM!); Naltar Lakes 3660 m, *R.R.Stewart 26917* (K!); *26919* (K!); Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). **Hunza:** Minapin Gl. 3050 m, *Lloyd & Megan 13* (BM!). Pisan 2600 m, 1974-07-25, *F.Gartner* s.n. (GZU!). **Hispar:** Haru 2740 m, *R.Scott Russell 1162* (BM!). Barpu Gl., left bank 2900 m, *R.Scott Russell* s.n. (BM!). **Batura:** Khaibar 2700 m, *Klötzli & al. 801.04,46*(p.p.),*102,104!*. N Morkhoon 2740 m, *Klötzli & al. 99.01,22,38,39!*; E Morkhoon 3000 m, *Klötzli & al. 803.05!*.

S **Leh:** Leh 3500 m, 1992-07-10, *Holzner & Kriechbaum* s.n.!; 1993-07-12, *Holzner & Kriechbaum* s.n.!. N Leh 3650 m, *H.Hartmann 3003!*. Kartse 4130 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. Likir 3700 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!. **Shyok:** [Calzar - Diskit], 1848-07-25, *T.Thomson* s.n. (K!). **Pangong:** Shushal 4330 m, *Koelz 2434* (K!).

Unloc.:Ladakh 3960 m, *Stoliczka* (CLARKE 1898). W Tibet 4880 m, *Strachey & Winterbottom* (CLARKE 1898).

A: W Kashg., S Kashg. (Pl.As.Centr.). Kongur: Bostan-Terek 2400 m, 1934-08-14, *Persson 615*; Jerzil 2800 m, 1930-07-01, *Persson 21* (PERSSON 1938). W Kunlun: Kentalek 2700 m, 1931-07-14, *Persson 210* (PERSSON 1938). Tiznap Vy., N Kudi 3080 m, *Miehe 7515!; 7542!*. E Pamir. Wakhan 2800-3800 m (PODLECH & ANDERS 1977). Chilas: Martal 2970 m, *Nüsser 1145!*. Lake Funtory 3300 m, *Nüsser 345!*. Astor: Rattu - Rupal 2440-2740 m, *R.R.Stewart 22820b* (K!). Godai - Chillam, Burzil P. 2900 m, *R.R.Stewart 18975* (K!). Upper Rupal Vy., Shaigiri 3750 m, *Nüsser 1567!*. Kalapani 3010 m, *Schickhoff 1288!; 1294!*. [?]Deosai (STEWART 1961). Dras: *Schlagintweit 6467; 6670* (CLARKE 1898). [Dras - Matayan], 1848-09-26, *T.Thomson* s.n. (K!). Suru: Middle Wakha Vy. 3600 m, *H.Hartmann 2607!*. Mulbekh 3150 m, *H.Hartmann 2608!*. Zanskar: Sulle - Padum, 1856-06-22/24, *Schlagintweit 6689* (K!). Padam 3350 m, *Southampton Univ. 31* (BM!). Singhi P., 1848-07-03, *T.Thomson* s.n. (K!). Kashmir: Kunzlwan 2360 m, *C.B.Clarke 29454* (K!). Upper Chenab, Himor, 1848-06-19, *T.Thomson* s.n. (K!). Himachal Pr.: Piti Vy., 1847-09-05, *T.Thomson* s.n. (K!). Koksar, *Aswal 11095* (ASWAL & MEHROTRA 1994). Rupshu: Hanle Plain, 1847-09-14, *T.Thomson* s.n. (K!). Valley below Hanle, 1847-09-17, *T.Thomson* s.n. (K!). W Tibet: Kurnali Rv. 4720 m, *Strachey & Winterbottom* s.n. (K!). S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9660a!*. NW Gar (N 32°24' E 79°44') 4400 m, *Miehe+9661a!*. E Shiquanhe (N 32°26' E 81°00') 4500 m, *Miehe+9666a!*. S Manasarovar Lakes, Upper Burang Vy. (N 30°26' E 81°07') 4290 m, *Miehe+9637a!*.

D: Temp. Eurasia, N Africa. *Euras.*

E: (2600) 2700-4130 (4330) m, subalp., not common (but locally dominant). Moist sands of river-banks (*Kobresia royleana, Carex pseudofoetida, Equisetum ramosissimum*); wet or shallowly flooded places by springs, in fens (*Eleocharis quinqueflora, Carex orbicularis*) and in *Kobresia schoenoides*-moors.

N: *B. compressus* is quite variable in C.Asia and usually more robust than in Europe. Possibly, this is a result of introgression from *B. rufus*. The taxon of the Karakorum and Tibet (Pamir to Kansu and Sichuan) may be placed under var. *brevifolia* (*B. sinocompressus* TANG & WANG), which possibly

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includes var. *sikkimensis* (Sikkim) and var. *dissita* (Turkestan, Kumaon) sensu CLARKE (1898) as well.

? 23. Blysmus rufus (HUDSON) LINK, Hort. Berol. 1: 278. 1827

Schoenus rufus HUDSON 1762, *Scirpus rufus* SCHRADER 1806, ? *Leptolepis tibetica* BOECK. 1888, *Blysmus exilis* (PRINTZ) IVANOVA 1941

S **?Leh:** Himis Shupka [3350 m] (STEWART 1916: ?).

A: Kongur: Chumbus R., Kosh-Terek, 1909-06-07, *Divnogorskaya* (Pl.As.Centr.). W Kunlun: Tiznap Vy., N Kudi 3080 m, *Miehe 7540!* (with *B. compressus*). E Pamir. ?Dras: Dras, *Schlagintweit 6467* (BM! **type** *Leptolepis tibetica* p.p.?); Matai [Matayan] up to the Tsoji [Zoji] P. (NE slopes of the P.), 1856-10-14, *Schlagintweit 6659* (BM!); *6666* (BM!). Zanskar: More Plains 4700 m, 1992-07-28, *Holzner & Kriechbaum* s.n.*!*. Rupshu: Banks of Salt Lake [Tso Kar 4720 m], 1847-09-24, *T.Thomson* s.n. (CLARKE 1898; K!). W Tibet: Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670a!*. E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680a!*. Changtang: Lungmo Co 5150 m, *Miehe 8192!*.

D: Eurasia S to Pamir, Kunlun, W & S Tibet; N America. *Holarct.*

E: ? c. 3350 m, subalp., rare. (Generally:) Flushes, lake shores, superficially dry gravel beds, sand plains. Apparently more tolerant of (or requiring) a higher salt content than *B. compressus*. A markedly alpine species in adjacent W Tibet (4700-5100 m).

N: *B. rufus* occurs in E Pamir, Kunlun, and W & S Tibet. It may well be expected in adjacent areas of the Karakorum, but is not yet found there with certainty. The Tibetan populations of *B. rufus* are very variable; but usually the species is easily distinguished from *B. compressus*. *Leptolepis tibetica* BOECK., from (part of ?) the type material (*Schlagintweit 6467*) may be referable to *B. rufus*. The material, however, has flowers/fruits almost destroyed and probably contains different elements as well. It is found under *"Carex microglochin"* in K!, under *"Blysmus compressus"* (*C.B.Clarke* in sched. K!) in B (perhaps destroyed) and BM!. On the BM! material no perigon setae could be found and the leaves are so tightly inrolled and almost smooth at the tip, that *B. rufus* is more probable. Young or reduced plants of *Carex microglochin* and *Blysmus rufus* sometimes resemble each other.

24. Bolboschoenus maritimus (L.) PALLA in W. D. J. KOCH, Syn. Deutsch. Schweiz. Fl., ed. 3: 2532. 1905

Scirpus maritimus L. 1753

Ic.: Fl.Iraq 8, pl. 87. Fl.Desert.Sin.1: fig.49(1-6).

W **Batura:** Borit Jil 2500 m, *F.A.Perrot 18* (K!).

A: W Kashg.: Kashgar 1330 m, 1925-08-05, *Persson 69a*; 1933-06-18, *Persson 472* (PERSSON 1938), S Kashg.. Kashmir: "In paludibus frequentissime in valle Kashmir", *Jacquemont 357* (K!). Wular Lake, *Winterbottom 478* (K!).

D: Eurasia, Africa. *Euras.*

E: 2500 m, coll., rare in the SW. Shore of small saline lake. (Generally:) Wet ± saline habitats.

N: Since the taxonomy of the genus is rather difficult, the above name is meant in an aggregate sense. The single specimen seen from the Karakorum consists of small plants with congested inflorescences and light brown glumes. It may be referable to *Bolboschoenus affinis* ROTH. Pl.As.Centr. reports from Kashgaria: *Bolboschoenus maritimus, Bolboschoenus planiculmis* (Fr. SCHMIDT) EGOROVA 1967 - **Ic.:** Fl.Desert.Sin.1: fig.49(7-11), and *Bolboschoenus popovii* EGOROVA 1967 (*Scirpus affinis* auct. non ROTH: OSTENF. in HEDIN 1922, *Scirpus maritimus* auct. non L., *Scirpus strobilinus* auct. non ROXB.) - **Ic.:** Fl.Desert.Sin.1: fig.49(12-16).

* **Bulbostylis barbata** (ROTTB.) C. B. CLARKE in HOOKER f. 1893 (*Scirpus barbatus* ROTTB. 1772) - **A**: Reported from Swat, Hazara, Kashmir (Ann.Cat.Pak.). **D**: Old World trop. and subtrop.

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* **Bulbostylis densa** (WALL.) HANDEL-MAZZ. in KARSTEN & SCHENCK 1930 (*Scirpus densus* WALL. in ROXB. 1820) - **Ic.:** Fl.Xizang.5: fig.197. **A**: Reported from Kashmir (Ann.Cat.Pak.). **D**: Africa, S & E Asia.

Carex:

This is one of the largest genera of flowering plants of the Karakorum, probably before *Saussurea*. Species of *Carex*, however, occupy a significant position only in the vegetation of the humid parts of the SW Karakorum, otherwise many species are confined to local water-surplus habitats. Species of *Kobresia* are generally more representative of the alpine vegetation. The taxonomy of *Carex* in the Karakorum is rather confused, although the species delimitation, with some exceptions, presents few problems. These, however, are evident in the sections *Foetidae*, *Aulocystis* and *Atratae*, which have centres of diversification in the Karakorum and adjacent mountains. There is also some evidence of hybridisation in these groups.

Synopsis of *Carex* (Fl.Eur., Pl.As.Centr., KÜKENTHAL, Fl.Turkey):

Subgenus *Indocarex* (BAILLON) KÜK.

Sect. *Indicae* KÜKENTHAL: (*C. filicina*), (*C. sanguinea*)

Sect. *Japonicae* ?: (*C. ivanovae*)

Subgenus *Vignea* (BEAUV.) KÜKENTHAL

Sect. *Heleoglochin* DUMORT.: (*C. diandra*)

Sect. *Vulpinae* (J. CAREY) CHRIST: *C. vulpinaris*

Sect. *Phaestoglochin* DUMORT.: (*C. foliosa*)

Sect. *Divisae* CHRIST ex KÜKENTHAL: (*C. divisa*)

Sect. *Physodae* CHRIST ex KÜKENTHAL: *C. stenophylla*

Sect. *Foetidae* (L. H. BAILEY) KÜKENTHAL: *C. curaica, C. pseudofoetida, C. sagaensis*

Sect. *Multiflorae* KUNTH: (*C. nubigena*)

Sect. *Remotae* (ASCHERSON) C. B. CLARKE: (*C. remota*)

Sect. *Canescentes* (FRIES) CHRIST: (*C. canescens*)

Subgenus *Phyllophora* (DEGLAND) PETERM. (Subgenus *Primocarex* (KÜK. (KÜK.) p.p.)

Sect. *Leucoglochin* DUMORT.: *C. microglochin, C. parva*

Subgenus Carex

Sect. *Carex* (sect. *Paludosae* (FRIES) CHRIST, sect. *Pseudocypereae* (L. H. BAILEY) KÜKENTHAL, sect. *Vesicariae* (O. F. LANG) CHRIST): (*C. acutiformis*), (*C. pseudocyperus*), *C. pamirensis, C. songarica*

Sect. *Hymenochlaenae* DREJER: (*C. brunnea*), (*C. longicruris*)

Sect. *Capillares* (ASCHERSON & GRAEBNER) NELMES: *C. karoi*

Sect. *Fulvellae* (ANDERS.) FRIES ex CHRIST (sect. *Spirostachyae* (DREJER) L. H. BAILEY): *C. diluta*

Sect. *Ceratocystis* DUMORT. (sect. *Flavae* (O. F. LANG) CHRIST): *C. viridula*

Sect. *Hirtae* TUCKERM.: (*C. ligulata*)

Sect. *Digitatae* (FRIES) CHRIST: (*C. cardiolepis*), (*C. laeta*)

Sect. *Trachychlaenae* DREJER: (*C. inanis*), (*C. schlagintweitiana*), (*C. setigera*)

Sect. *Lamprochlaeneae* (DREJER) L. H. BAILEY: (*C. supina*), (*C. tangulashanensis*), (*C. turkestanica*)

Sect. *Aulocystis* DUMORT. (Sect. *Frigidae* CHRIST): (*C. alajica*), *C. alexeenkoana, C. atrofusca, C. borii*, (*C. chitralensis*), (*C. haematostoma*), (*C. kashmirensis*), (*C. montis-everestii*), *C. nivalis, C. oligocarya, C. plectobasis*, (*C. psychrophila*), *C. setosa, C. stenocarpa*

Sect. *Atratae* CHRIST: (*C. cruenta*), *C. decaulescens*, (*C. duthiei*), (*C. gracilenta*), *C. infuscata*, (*C. lehmannii*), *C. melanantha, C. moorcroftii*, (*C. obscura*)

Sect. *Phacocystis* DUMORT. (Sect. *Acutae* (FRIES) CHRIST): (*C. cernua*), *C. orbicularis*

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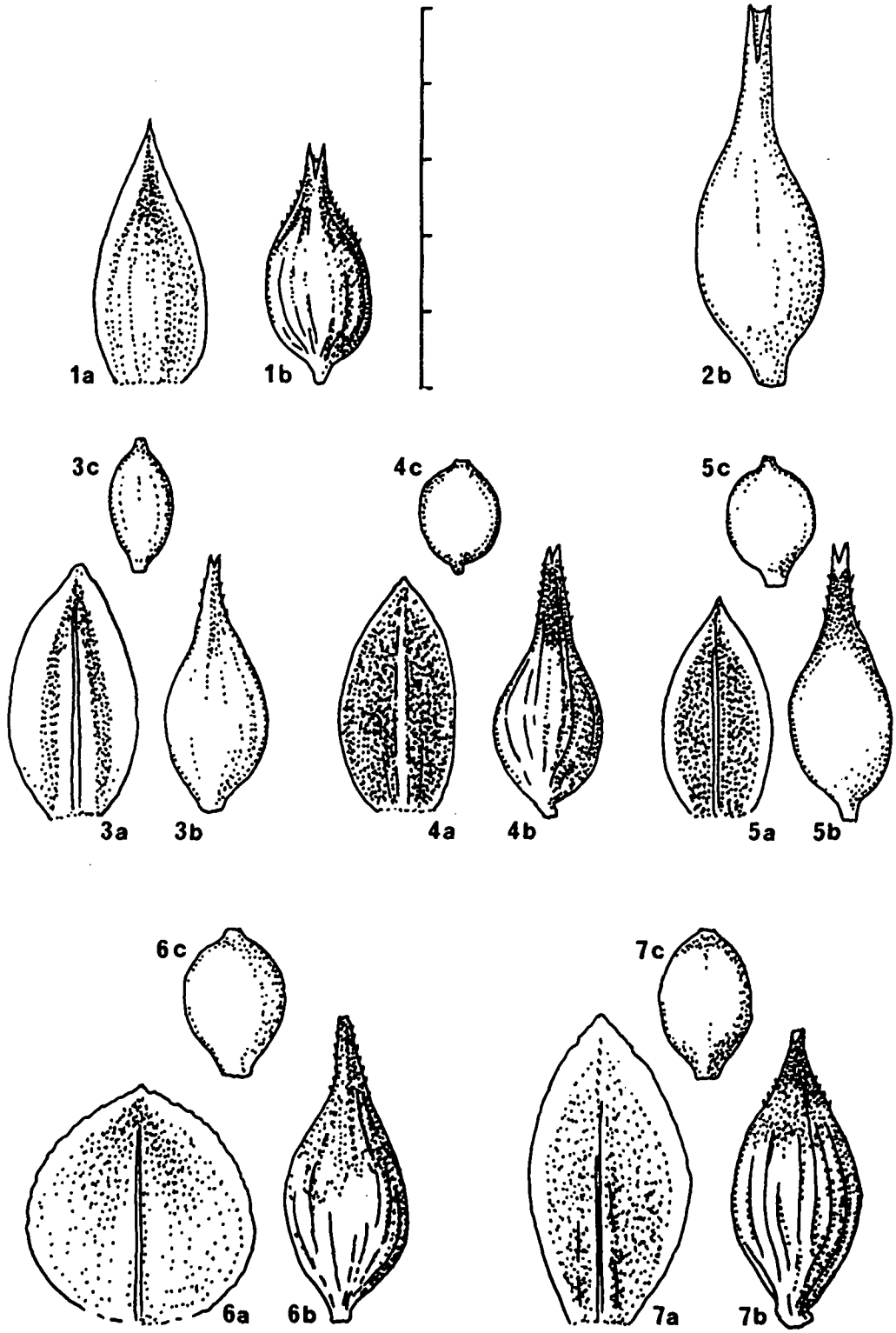

Fig. 1: *Carex* **(§ Vignea)**.
Female bract (a), utricle (b), nut (c). Scale = 5 mm.
1: C. vulpinaris (*Royle 73* **type**, K). **2: C. curacia** (Abdul Gafuer Langar 4500 m, 1927-10-04, *Bosshard* s.n., Z). **3: C. sagaensis** (*Miehe 7881*). **4: C. pseudofoetida** (Zanskar, 1993-07-29, *Holzner & Kriechbaum* s.n.). **5: C. enervis** (Altai, *Ledebour* s.n. **type**, K). **6: C. maritima** (Scotia, *Watson*, GOET). **7: C. stenophylla** (*Dickoré 863*).

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Key to *Carex* of the Karakorum (including some of the related species):

1. Inflorescence a narrow, usually few-flowered spike, leaves setaceous. Racheola present, included into or protruding from the utricle **2**
+ Inflorescence usually compound of several spikes, sometimes very congested, if (apparently) a single spike, then this ± oval. Leaves usually broader, plicate. Racheola usually absent **3**
2. Rhacheola protruding from the 3-5 mm long utricle ..... **C. microglochin**
+ Rhacheola included into the 5-7 mm long utricle ..... **C. parva**
3. Spikes all alike, hermaphrodite, stigmas 2 (*Vignea*) **4**
+ Spikes dissimilar, upper spike(s) usually male, lower female, sometimes mixed in between. Stigmas usually 3, sometimes 2 ..... **8**
4. Laxly caespitose, with short rhizomes. Utricles with strong nerves ..... **C. vulpinaris**
(Utricles with indistinct nerves: **C. diandra**)
+ Not caespitose, with long creeping rhizomes **5**
5. Utricles with prominent veins. Inflorescence oblong-ovoid, usually not lobed. Female glumes acute. Glumes and utricles usually reddish-brown. Rhizomes thin ..... **C. stenophylla**
(Inflorescence distinctly lobed, the separate spikes clearly evident at least at the base. Female glumes cuspidate or aristate. Rhizomes thick: **C. divisa**)
+ Utricles with faint veins. Glumes and utricles usually dull to greenish brown **6**
6. Tall plants, 20-40 cm high. Leaves flat ..... **C. curaica**
+ Usually smaller plants, 5-15 cm high. Leaves flat or folded **7**
7. Plants with long creeping rhizomes, usually not forming dense cushions. Leaves flat or folded, ± straight, gradually narrowed into a short trigonous or flat tip. Stems straight, usually exceeding the leaves, smooth or scabrid, usually sharply triangular. Nut broadly oval to suborbicular in outline ..... **C. pseudofoetida**
(**C. enervis** is very similar to this and to *C. stenophylla*, but has reddish-brown utricles without visible nerves)
+ Plants with short rhizomes, forming dense cushions. Leaves narrowly convolute to oblique-trigonous, with a flat, obtuse tip, usually strongly curved. Stem usually smooth, ± rounded in cross-section, often shorter than the leaves and curved downwards. Nut oval in outline ..... **C. sagaensis**
8. Stigmas 2. Utricles biconvex, broadly ovate, glabrous, without a beak ..... **C. orbicularis**
+ Stigmas 3. Utricles trigonous, biconvex or much flattened, with or without a beak, often hairy or spiny at least at apex **9**
9. Inflorescence reduced to (apparently) one (to three) compact spike(s). Utricles glabrous, small, 2.5-3 mm, attenuate at apex. Low growing high alpine plants with short ascending stolons. Nut with convex faces ..... **C. borii**
(± rhizomatous or with longer stolons. Nut with concave lateral faces: **C. montis-everestii** depauperate forms)
+ Inflorescence compound of several, usually well separated spikes. Utricles glabrous, hairy or spiny, with or without beak **10**
10. Utricles hairy on at least part of the surface of the body **11**
+ Utricles glabrous on the surface of body, though often ciliate or hispid-denticulate on margin or on beak **23**
11. Female spikes long, narrowly cylindric, ± erect **12**
+ Female spikes short, broader, erect to pendent **14**
12. Female glumes hairy on the back, dark brown to blackish ..... (**C. haematostoma**)
+ Female glumes glabrous on the back, brown or red **13**
13. Female glumes red-brown, distinctly emarginate and with the midrib forming a long aculeolate mucro. Utricles obovate, distinctly ribbed, abruptly contracted into a short entire beak ..... (**C. cardiolepis**)
+ Female glumes brown, acute to slightly, ± obliquely emarginate or with a short glabrous mucro. Utricles lanceolate-ovate, gradually contracted towards both ends, not ribbed ..... **C. setosa**
14. Lower sheaths distinctly reticulate, ± red. Utricles small **15**
+ Lower sheaths fibrous, not distinctly reticulate, brown to black. Utricles usually larger **16**
15. Surface of utricles with prominent ribs. Female glumes with indistinct midrib. Lower sheaths very delicately reticulate ..... (**C. schlagintweitiana**)

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\+ Utricles bordered with a narrow rim, otherwise without ribs. Female glumes with a prominent midrib of 3 incrassate nerves. Reticulation of lower sheath not as delicate ..... (**C. inanis**)
(Utricles with a long beak, female glumes with a long aculeolate mucro: **C. setigera**)

16. Plants forming a ligneous caudex. Female glumes reddish-brown. Utricles densely hirsute ..... (**C. koshewnikowii**)

16a Utricles large, 4-4.5 mm, female glumes c. 5 mm. Leaves broader. Plants large ..... (**C. koshewnikowii** subsp. **koshewnikowii**)

16b Utricles small, 3.5-4 mm, female glumes c. 4 mm. Leaves very narrow. Plants low ..... (**C. koshewnikowii** subsp. **chitralensis**)

\+ Plants not forming a ligneous caudex. Female glumes dull brown **17**

17. Utricles much flattened, ± contorted or with the margins involute, membranaceous or papery (sometimes ± hard when smutted) **18**

\+ Utricles trigonous or rounded, ± hard, membranaceous or coriaceous **19**

18. Utricles distinctly ribbed, ovate, gradually contracted to the base and into a ± long beak. Basal sheaths ± dissolute into fibres ..... **C. plectobasis**

\+ Utricles indistinctly ribbed, obovate, abruptly contracted into a short or indistinct beak. Basal sheaths remaining foliaceous ..... **C. alexeenkoana**

19. Leaves very broad. Beak of utricles long, with large spines on the margins. Plants densely tufted ..... **C. stenocarpa**

\+ Leaves narrower. Utricles with long or short beak, with small spines. Plants tufted to ± stoloniferous or rhizomatous **20**

20. Utricles 2.5-3 mm, smooth except for the margin of the short beak. Delicate plants with narrow leaves ..... **C. karoi**

\+ Utricles 3-5 mm long, ± covered with spines. More robust plants with broader leaves **21**

21. Plant rhizomatous. Utricles distinctly ribbed, c. 3.5 mm long, with beak 1 mm ..... (**C. kashmirensis**)

\+ Plant ± densely tufted or with elongate stolons. Utricles indistinctly ribbed on the faces of the body, 3.5-5.5 mm long, with beak 1-2 mm **22**

22. Utricles 3.5-4.5 mm, with beak 1-1.5 mm ..... **C. oligocarya**

\+ Utricles 5-5.5 mm, with beak 1,8-2 mm ..... (**C. alajica**)

23. Utricles flat, papery, gradually contracted into a short beak **24**

\+ Utricles solid, membranaceous or subcoriaceous **28**

24. Densely caespitose large plants. Utricles large, 5-8 mm long ..... **C. nivalis**

\+ Laxly caespitose, stoloniferous or rhizomatous, plants more delicate. Utricles smaller, 3.5-5.5 mm long **25**

25. Plants ± stoloniferous, with stolons densely covered with black dissolute scales. Utricles and glumes black to ± ferrugineous. Beak of utricle absent ..... (**C. montis-everestii**)

\+ Plants caespitose or rhizomatous, rhizomes not densely scaly. Glumes almost pure black, utricles black or yellowish. Beak of utricle short or long **26**

26. Plant caespitose. Utricles yellowish with a short black beak ..... **C. decaulescens**

\+ Plant rhizomatous. Utricles black except for the very base **27**

27. Beak of utricle short, up to 0.5 mm. Female glumes acute to shortly acuminate. Delicate plants ..... **C. atrofusca**

\+ Beak of utricle long, 1-1.5 mm. Female glumes with a long, setaceous tip. Robust plants ..... (**C. cruenta**)

28. At least the lowest spike long stalked, pendent **29**

\+ All spikes shortly stalked, not pendent **30**

29. Robust plants with very broad leaves. Utricles large, 4-6 mm, beak of utricles long, with large spines on the margins ..... **C. stenocarpa**

\+ Delicate plants with narrow leaves. Utricles small, 2.5-3 mm long, smooth except for the base of the short beak ..... **C. karoi**

30. Utricles ± coriaceous, shining brown, abruptly contracted into a ± long beak **31**

\+ Utricles membranaceous or papery, usually not shining, with or without beak **34**

31. Robust plant with cylindric female spikes ..... **C. songorica**

\+ Delicate plants with densely clustered, globose or ovoid female spikes **32**

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32. Acaulescent with female spikes crowded at the base of the plant, male spike long stalked. Low alpine plants, c. 5 cm high ..... (**C. tangulashanensis**)
\+ Female spikes on distinct stem. Plant (5-) 10-70 cm high **33**
33. Stem c. 5-10 cm. Female spikes ± globose, densely clustered. Beak of utricle c. 1 mm ..... (**C. supina**)
\+ Stem c. 15-30 cm. Female spikes ovoid, shortly stalked and well separated. Beak of utricle c. 2 mm ..... (**C. turkestanica**)
34. Female glumes dark brown to black, with green midrib **35**
\+ Female glumes greenish to light brown **41**
35. Utricles abruptly contracted to a black mouth or a very short entire beak **36**
\+ Utricles gradually contracted into a distinct ± bifid beak **38**
36. Utricles smooth, papery, much flattened, lenticular ..... **C. decaulescens**
\+ Utricles minutely papillose, membranaceous, oval or trigonous in cross-section **37**
37. Utricles and female glumes large. Lower leaf sheaths red ..... (**C. duthiei**)
\+ Utricles and female glumes small. Lower leaf sheaths brown ..... **C. pseudobicolor** (cf. also **C. gracilenta**, **C. lehmannii**)
38. Female glumes black, much smaller than the utricles ..... **C. infuscata**
\+ Female glumes brown to black, large and usually covering the utricles **39**
39. Utricles with strong spines towards the beak ..... (**C. obscura**)
\+ Utricles papillose, tuberculate or with very small spines towards the beak **40**
40. Utricles rounded at base, contracted into a very short beak. Female glumes dark brown to black, with narrow hyaline margin. Leaves dull green, with a trigonous, moderately long tip, not pungent ..... **C. melanantha**
\+ Utricles stipitate at base, beak long. Female glumes ferrugineous to dark brown, with a broad hyaline margin. Leaves light green, tip very long and fine, pungent ..... **C. moorcroftii**
41. Utricles inflated, very large, attenuated into a long beak ..... **C. pamirensis**
\+ Utricles not inflated, smaller, with a short beak **42**
42. Female spikes short, ovoid, ± congested ..... **C. viridula**
\+ Female spikes cylindric, widely separated ..... **C. diluta**

* **Carex acutiformis** EHRH. 1789 - **A**: Kashmir: Ganderbal 1830 m, *T.Thomson* (CLARKE 1898). **D**: Temp. Eurasia. **N**: Reported from **Gilgit**, *Tanner* (Ann.Cat.Pak.), doubtful. The few specimens from Kashmir at K and BM are mostly too young to be definite. *C. acutiformis* occurs with certainty in NE Afgh.: Takhar Prov. 1150 m, *Podlech 10687* (hb. Podlech!).

* **Carex alajica** LITV. 1910 - **Ic.**: Fl.Tadzh.2: fig.27(4). **Fig. 2** (8). **A**: Kongur: Upper Oytag Vy. 3120 m, *Miehe 8666!*. Alai: Zaalaysky Mts.; Kaindy Vy. 3000-3900 m (Fl.Tadzh.). **D**: W Tian Shan, E Pamir (Alai, Kongur Shan). **E**: (Kongur:) Relatively humid *Picea schrenkiana* forests on loess slopes. **N**: Very close to *C. oligocarya* and perhaps better regarded as a subspecies of this.

25. Carex alexeenkoana LITV., Trav. Mus. Bot. Acad. Pétersb. 7: 98. 1910

Carex kenkolensis LITV. 1910, *Carex bordabensis* LITV. 1910, *Carex pseudomacrogyna* KÜKENTHAL 1929, *Carex haematostoma* NEES var. *submacrogyna* KÜKENTHAL 1909, *Carex macrogyna* auct. non TURCZ. 1838: B. FEDTSCH. 1924, *Carex haematostoma* auct. non NEES in WIGHT 1834: CLARKE 1898, *Carex stenocarpa* auct. non TURCZ. ex KRECZ. 1935: DICKORÉ 1991

Ic.: Fl.Tadzh. 2: pl. 27, fig. 5-8. **Ic.: fig. 2** (1).

CN **Braldu:** Pamir P. S, near Shuwart 4560-4750 m, *Miehe 6081!; 6134!; 6142!*. **K2-North:** ? K2-N Gl. W 4440 m (veg.); K2-N Gl. E 4750 m, *Dickoré 676!*. **Shaksgam:** Aghil P. S 4480-4760 m, *Dickoré 602!*.

CS **Shimshal:** Pamir P. N 4600 m, *Miehe 6047!*.

N **Mustagh Ata:** Hills W [Little] Karakul 4280-4340 m, *Miehe 5382!; 5392!*. Mustagh Ata W 4520 m, *Miehe 5550!*. **Mintake:** Above Mazar 3960-4190 m, *Miehe 5700!; 5738!* (veg.); *5747!*.

W **Khunjerab:** P. SW 4150-4350 m, *Miehe 2542!*.

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S **Shigar:** Sokha Gl., right bank 4570 m, *R.Scott Russel 1638* (BM!). **?Skardu:** Satpura P. (4420-5180 m), *R.R.Stewart 20181* (Ann.Cat.Pak.).

E **Upper Shyok:** [Sassir - Murgai], 1848-08-15, *T.Thomson* s.n. (K!). [Sassir - Murgai] (4570-5180 m), 1848-08-28, *T.Thomson* (K! **type** *C. haematostoma* var. *submacrogyna*; CLARKE 1898).

A: Kongur: Upper Oytag Vy. 3770-3900 m, *Miehe 8696!; 9142!*. Upper Gez Gorge 3500 m, *Miehe 5313!; 5323!; 5330!*. Jerzil 3200 m, 1930-07-16, *Persson 118*; 3650 m, 1930-07-02, *Persson 36* (PERSSON 1938). W Kunlun: Akaz P. 3600-3710 m, *Miehe 8585!; 8611!*. Tiznap Vy., N Kudi 3800 m, *Miehe 7479!*; W Kudi 3930-4380 m, *Miehe 8421!; 8473!; 8492!*. Upper Tiznap Vy. 4200-4300 m, *Miehe 7617b!* (dwarf). E Pamir (Fl.Tadzh.). Wakhan: (N 36°53' E 73°22') (3300-3800 m), *Anders 7919* (hb. Podlech!). (N 37°14' E 74°06') 4200-4400 m, *Anders 7572* (hb. Podlech!). (N 37°02-08' E 73°47'-74°01') 3650-3850 m, *Anders 7412* (hb. Podlech!). E Sarhad (4000-4500 m), *Roemer 332* (W!). Zanskar: More 4800 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. Kashmir: Tilail 3810 m, *C.B.Clarke 30660* (BM!). [?] Baltal, Zoji P. S, *T.Thomson* (CLARKE 1898).

D: N & C. Tian Shan (2160-3600 m), Pamir-Alai, Afgh., Kunlun, Karakorum, Kashmir, Zanskar. **Map:** Pl.As.Centr.3: map 11. *E Pamir*.

E: (3960) 4150-4760 (5180) m, alp., not common (mainly in the N). Alpine steppes (*Stipa purpurea, St. subsessiliflora, Festuca olgae*) and open steppe-turf on stable dry slopes with fine substratum (loess, old glacial debris).

N: A vicariant of *C. plectobasis* on the Karakorum N slope, with its distribution area overlapping to the most continental parts of the S slope (Khunjerab, Shimshal, Nubra) and apparently very scattered towards the SE (Kashmir, Zanskar). **Carex macrogyna** TURCZ., **Ic.: fig. 2** (2), a Siberian species, differs in the female glumes with a long exserted midrib and which are densely hairy (sometimes puberulous when young in *C. alexeenkoana*).

26. **Carex atrofusca** SCHKUHR, Beschr. Abbild. Riedgr. **1**: 106. 1801

Carex ustulata WAHLENB. 1803, *Carex coriophora* FISCHER ex KUNTH 1837, *Carex atrofusca* SCHKUHR var. *angustifructus* KÜKENTHAL 1909, *Carex angustifructus* (KÜKENTHAL) NELMES, *Carex oxyleuca* V. KRECZ. 1935, *Carex hypsobates* NELMES 1940

Ic.: Fl.Tadzh.2: fig.25(1-4): *C. oxyleuca*. Fl.Xizang.5: ?fig.243: subsp. *minor*, fig.241: *C. angustifructus*, fig.244: *C. oxyleuca*. **Ic.: fig. 3** (7).

CS **Shimshal:** Pamir P. 4700 m, *Miehe 6369!*.

N **Mustagh Ata:** W 4330 m, *Miehe 5521!*; SW 4460 m, *Miehe 5907!*. **Yarkand:** Aghil P. N 4560-4800 m, *Dickoré 535!; 567!*.

W **Gilgit:** Shinghai Gah - Pahot Gali 4030 m, *Miehe 1125!* (young; *C. atrofusca* X *C. nivalis* ?); 4220 m, *Miehe 1658!*. **Hunza:** Rakaposhi N, above Nilt 4380 m, *Miehe 6612!* (*C. atrofusca* X *C. nivalis* ?). **Hispar:** Gharesa Gl. base camp, 13 miles E of Nagar 4750 m, *O.Polunin 6145* (BM!).

S **Leh:** Taglang P. 4980 m, 1993-07-21, *Holzner & Kriechbaum* s.n.!.

E **Upper Shyok:** [Sassir - Murgai] (4570-5180 m), 1848-08-28, *T.Thomson* (CLARKE 1898; K! **type** *C. hypsobates*; NELMES 1940).

A: W Kunlun: Upper Tiznap Vy. 3740 m, *Dickoré 237!*. E Pamir 3500-4500 m (Fl.Tadzh.). Wakhan: 4200-4400 m, *Anders 7600* (hb. Podlech!; PODLECH & ANDERS 1977). Badjens Vy., *Roemer 375* (W!). Kashmir: Sonamarg, *T.Thomson* (CLARKE 1898). Lake Krishensar - Gadasar 3670 m, *C.C.Townsend 89/268* (K!). Himachal Pr.: Kunawar, Transkiobrong Ghat, *Jacquemont 1823* (K!). Rupshu: [ascent to Lanak P.] (4570-5180 m), 1847-09-13, *T.Thomson* s.n. (K!). Hanle, *T.Thomson* (CLARKE 1898). W Tibet: Balch P. 5240 m, *Strachey & Winterbottom 26* (K!); Tibet 5240 m, *Strachey & Winterbottom 1742; 5030 m*, (CLARKE 1898).

D: Circumpolar: S to Karakorum, Himalaya, Tibet, Burma. *Holarct.*

E: 4030-4980 (5180) m, alp., scattered. Moist turf by springs and flushes, frost-cracks with stable fine, earthy gravel in naka moors (*Kobresia schoenoides, Kobresia royleana*).

N: The *C. atrofusca*-complex has been treated variously by different authors. A reexamination of the Himalayan and Tibetan material is desirable. The Karakorum material seems to be rather uniform and is considered here to represent the typical species. Its delimitation against *C. cruenta* NEES presents

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some problems in the Himalayas. Young specimens of *C. atrofusca* are sometimes difficult to distinguish from *C. nivalis* or *C. infuscata*, hybrids may occur with both.

27. Carex borii NELMES, Kew Bull. 4: 38. 1949

Carex montis-everestii auct. non KÜKENTHAL 1934: OVCZ. 1963, DICKORÉ 1991

Ic.: Fl.Tadzh.2: fig.34: "*C. montis-everestii*". HARTMANN 1972: fig.14. **Fig. 3** (3).

CN **K2-North:** K2-N Gl. W 4420-4460 m, *Dickoré 652!*. K2-N Gl. E 4740-5030 m, *Dickoré 681!; 783!; 793!; 810!*. **Shaksgam:** Aghil P. S 4760-4820 m (*Dickoré*).

CS **Shimshal:** Pamir P. 4800-4880 m, *Miehe 6251!; 6269!; 6317!*. **Biafo:** Skoro P. N 4600 m, *H.Hartmann 243!*; 4700 m, *E.Reiser 165* (K!); Gense 4400-4900 m; Laskam 4850 m, *H.Hartmann 237!*; Baintha 4700-4960 m; 4780 m, *H.Hartmann 242!* (HARTMANN 1966).

N **Yarkand:** Aghil P. N 4560-4800 m, *Dickoré 534!; 546!; 578!*.

W **Gilgit:** Shinghai Gah - Pahot Gali 4240-4580 m, *Miehe 955!; 956!; 1209!; 1605!*. Baghrot Vy. 4300-4350 m, *Miehe 3827!*. **Gilgit/Shigar:** Haramosh P. 4450 m, *R.C.Culbert 89* (BM!). **Hispar:** Gharesa Gl. Base Camp, 13 miles E of Nagar 4750 m, *O.Polunin 6117* (B!, BM!). **Batura:** Gulmit - Atabad 4260-4370 m, *Miehe 2874!*. **Khunjerab:** Khunjerab P. SW 4600-4750 m, *Miehe 2279!; 2391!*.

S **Shigar/Lower Shyok:** Thalle P. 4570-4880 m, *R.R.Stewart 20765* (K!: f. *lutea*). **Leh:** 2 km N Taglang P. 5250 m, *H.Hartmann 4065!*.

A: W Pamir: Vrang [Pyandzh Rv.], *Ikonnikov* (Fl.Tadzh.); to be expected in the Afghan Wakhan. E Pamir: Chechekty Rv. [N of Murgab], *Ikonnikov* (Fl.Tadzh.). Deosai: Burji P., towards Deosai, *R.R.Stewart 20160* (Ann.Cat.Pak.: f. *lutea*). Deosai E 4550-4600 m, *Miehe 5111!* (typical and f. *lutea*); *5128!*. Zanskar: Lahul, Lingti, close to water 10000' [3050 m], 1941-06-29, *N.L.Bor* s.n. (K! **type**). Surichan P. - Kargiak 4900 m, 1993-07-27, *Holzner & Kriechbaum* s.n.!. Himachal Pr.: Bara Lacha P. 4880 m, *N.L.Bor* s.n. (K!); *Aswal 11001* (ASWAL & MEHROTRA 1994).

D: Endemic: Wakhan (Pyandzh Rv., Tadzhik side), E Pamir (rare), C. Karakorum (locally frequent), Inner W Himalaya: Deosai Plains, Upper Indus Vy., SE Zanskar, NW Lahul (apparently scattered and disjunct). *Endem.*

E: (4240) 4300-5030 (5250) m, alp. - subniv., scattered, but locally frequent in the high central ranges. Dry to relatively humid turf, on slightly inclined fine gravel up to the highest turf spots of the free gelifluction belt, where on the margins of open, rapidly moving frost scree dominant and community-building, often with *Kobresia karakorumensis* or *Colpodium baltistanicum*. "Quite common at above 14000' [4270 m], beginning to form carpets" (*Culbert 89*). Rare and very local in the lower alpine belt in shady water-surplus habitats.

N: A dwarf high alpine species, which probably represents one of the most distinctive Karakorum endemics. Although *C. borii* is locally quite common, it curiously was discovered very late, probably because it nearly always occurs at very high altitudes. Apparently, it has mostly a single terminal spike, but this is often ± lobed and better developed specimens have up to three distinct spikes. *C. borii* has close affinities to sect. *Aulocystis*. Hybrids probably occur with *C. alexeenkoana*. The occasional occurrence of straw-coloured spikes (f. *lutea* R. R. STEWART) is shared with species of sect. *Atratae* (e.g. *C. nivalis*). NELMES (1949) regarded *C. borii* as a monotypic section of "*Primocarex*", which at least appears not substantial. *Carex montis-everestii* KÜKENTHAL (see there) was confused with *C. borii* (Fl.Tadzh.; DICKORÉ 1991), probably because the type specimen is a similarly reduced plant. *Carex ursina* DEWEY, a high arctic species, shows a striking superficial resemblance to *C. borii*. It has, however, gynaecandrous spikes and two stigmas.

* **Carex brunnea** THUNB. 1784 - **Ic.:** KÜKENTHAL 1909: fig.102 A-E. **A**: Reported from Kashmir (Ann.Cat.Pak.). **D**: W Himalaya, India - SE Asia, Japan; Australia.

* **Carex canescens** L. 1753 (*Carex curta* GOOD. 1794) - **A**: Astor: Kamri P. N 3660 m, *R.R.Stewart 22703* (K!). Rama 3050-3350 m, *R.R.Stewart 22895; 22896* (K!). Deosai: *R.R.Stewart 20066* (Ann.Cat.Pak.). Hazara (Ann.Cat.Pak.). Kashmir: Burzil P. 3200 m, *C.B.Clarke 29630* (K!); Pahlgam 3660 m, *C.B.Clarke 31072* (CLARKE 1898; K!). Yamhar P. 3660 m, *C.B.Clarke 12462* (K!). Himachal Pr.: Sissu, *Bor 12387* (DD; ASWAL & MEHROTRA 1994). **D**: Temp. N hemisphere. **N**: Apparently rare in the W Himalaya.

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* **Carex cardiolepis** NEES in WIGHT 1834 - **A**: Chitral. Swat: Shangla 2050 m, *Rechinger 30648* (W!). Hazara. Kashmir 2000-3300 m. Taulipir 2130 m, *A.Rashid & al. 25630* (BM!). **D**: E Afgh. (Khost, Jaji, Laghman, Kabul, Paktia, Nuristan), W Himalaya (Afgh. - Nepal), ? E Himalaya - ? SW China. **E**: Temperate forests (*Cedrus deodara, Abies webbiana, Quercus balloot*) and moist open slopes of the outer Himalaya. **N**: Although very distinct by its green-red female glumes, which are deeply emarginate with a long aculeolate mucro, it is frequently misidentified. The distribution of *C. cardiolepis* in the Himalaya therefore appears to be very uncertain. Almost certainly, it is not found N of the main Himalaya range. In the E Himalaya it is ± substituted by *Carex laeta* BOOTT 1858, and perhaps other species.

* **Carex cernua** BOOTT 1867 - **A**: Kashmir: Srinagar 1620 m, *Gammie* s.n.; *Falconer 1198* (KÜKENTHAL 1909). **D**: Himalaya, SE Asia (China, Japan).

28. Carex cruenta NEES in WIGHT, Contr. Bot. India 128. 1834

Carex atrofusca subsp. *minor* (BOOTT) KOYAMA 1975, non DICKORÉ 1991

Ic.: KÜKENTHAL 1909: fig. 91E-F. **Fig. 3** (8).

CS **Nubra/Upper Shyok:** Sassir P. 5360 m, *Meinertzhagen* s.n. (BM!).

A: Chitral: Lowari P. 2900 m, *Harris 16736* (BM!). Chilas: Kosto Vy., ridge above Jiliper High Camp 4200 m, *Nüsser 1328!;* Upper Kosto Vy., Jiliper High Camp 4210 m, *Nüsser 1433!.* Uppermost Pattaro Vy., Guttum Sagar - Kosto Gali 4830 m, *Nüsser 1407!.* Astor: Kalapani 3200 m, *Giles 121* (K!; CLARKE 1898). Das Kirim - Sardar Kothi 2740-3050 m, *R.R.Stewart 22003* (K!). Uppermost Rupal Vy. (Toshain Gah), ascent to Mazeno Gali moraine 5010 m, *Nüsser 1518!.* Deosai: Burzil P. - Deosai 3660-3960 m, *R.R.Stewart 22188* (K!). Zanskar: *T.Thomson* (CLARKE 1898). Swat. Hazara (Ann.Cat.Pak.). Kashmir: common (Ann.Cat.Pak.), 3050-3350 m. Kishenganga Vy., *Winterbottom 601* (K!). Burzil P. 1847-06-28, *Winterbottom 512* (K!); 1876-06-26, *C.B.Clarke 29616* (K!).; [?]4570 m, Gumbar [Zoji P.], *Jacquemont 988* (K!). Near Baltal, *Duthie 11622* (K!). Sonamarg 3350 m, *R.R.Stewart 9774* (K!). Khillanmarg 3050 m, *R.R.Stewart 8594A* (K!). Liddar Vy. 3350 m, *Drummond 14157* (K!). Rembiana Vy. 2440 m, *C.B.Clarke 27350* (K!). Pir Panjal, *Duthie 25771* (K!); 3350 m, *C.B.Clarke 28773* (K!). Margan P., *Meebold 2489*; Kishtwar (2440-4270 m), *T.Thomson* s.n. (KÜKENTHAL 1909). Himachal Pr.: Chotadhara-Batal, *Aswal 6901*; common (ASWAL & MEHROTRA 1994).

D: Himalaya (Chitral - SE Tibet). *Sino-Himal.*

E: 5360 m, subniv. rare in the SE. "Dry ground among rocks" (*Meinertzhagen*). (Generally:) Humid alpine meadows.

N: The Sassir P. locality does not seem to be typical according to the general ecology and chorology of *C. cruenta*. The species may have been introduced there along the Karakorum trade route, if the possibility of a wrong herbarium ticket can be excluded. *C. cruenta* furthermore is reported from Gilgit, Baltistan and Dras (Ann.Cat.Pak.), but no additional herbarium material has been found referable to the Karakorum proper. *C. cruenta* seems to be primarily a species of the (lower) Outer Himalaya, where it replaces *C. atrofusca*. Imperfect specimens are easily confused with *C. nivalis*.

29. Carex curaica KUNTH, Enum. Pl. 2: 375. 1837

Carex pycnostachya KAR. & KIR. 1842, *Carex borotalicola* REGEL 1880, *Carex curaica* KUNTH var. *pycnostachya* (KAR. & KIR.) KÜKENTHAL 1909, *Carex curaica* KUNTH subsp. *pycnostachya* (KAR. & KIR.) EGOROVA 1973, *Carex vulpinaris* auct. non NEES in WIGHT 1834

Ic.: Fl.Tadzh.2: fig.19(3,4): *C. pycnostachya*. **Fig. 1** (2).

CN **K2-North:** Muztagh Vy. 3930 m, *Dickoré 848!* (*C. curaica* X *C. pseudofoetida ?*). **Shaksgam:** Upper Shaksgam Vy. 4060 m, *Dickoré 914!.* **Shaksgam/Upper Yarkand:** Shaksgam Vy. 4820 m, 1926-07-14, *Clifford* (MASON 1928; K!).

N **Karakash:** Karakash Vy. 4270 m, *Henderson 367* (HOOKER 1894, CLARKE 1898). Abdul Gafuer Langar 4500 m, 1927-10-04, *Bosshard* (Z!; SCHMID 1932: "*C. pseudofoetida*").

Unloc.: Pamir region 3960-4270, *Alcock 17766* (K!). Yarkand Exp., 1870-07-30, *Henderson 210* (K!).

A: E Pamir 3800 m, rare (Fl.Tadzh.).

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D: Siberia (Altai - Sajan), Mountains of C. Asia (Dzung. Alatau, N & C. Tian Shan, E Pamir, N Karakorum). *Centr.As.*
E: 3930-4820 m, subalp. (- alp.), rare in the N. Fens (*Carex pseudofoetida, C. orbicularis, Kobresia royleana*).
N: A poorly understood and doubtful taxon. Usually much larger than, but perhaps intergrading with *C. pseudofoetida* and difficult to distinguish from robust forms of this. There are some large plants in the south which may be better placed under *C. pseudofoetida*, such as the record: [Deosai] Devil's Plains 3200-4420 m, *C.B.Clarke 29626; 29842* (CLARKE 1898) [**Skardu:** Burji P. 4420 m, *C.B.Clarke 29842 = C. pseudofoetida* !].

30. **Carex decaulescens** V. KRECZ., Fl. URSS 3: 255, 599. 1935

Carex atrata auct. non L. 1753: B. FEDTSCH. p.p.

Ic.: Fl.Tadzh.2: fig.23(4-7).

subsp. **alsia** (RAYMOND) KUKKONEN, Ann. Bot. Fennici **21**: 387. 1984

Carex alsia RAYMOND 1965

Ic.: **fig. 3** (2).

W **Yasin:** Darkot SW side 3510 m, *Bowes Lyon 8110* (K!).
A: W & E Pamir 1600-3900 m (Fl.Tadzh.: *C. decaulescens*). Chitral: Khot An, N of Mastuj, between Turikho and Mastuj Rivers, 13000' [3960 m], on rock ledges, 1958-07-11, *Stainton 2839* (W! **holotype**, BM **isotype**). Chumarkhan P. E of Mastuj 3960 m, *Stainton* 2921 (W!).
D: Tian Shan, W Pamir-Alai (subsp. *decaulescens*); Chitral, W Gilgit: Yasin (subsp. *alsia*). *W Pamir.*
E: 3510 m, mont., rare in the extreme W. "In moist soil near stream" (*Bowes Lyon 8110*).
N: Critical, known only from a few collections. KUKKONEN's (1984) reduction to a subspecies of *C. decaulescens* has to be proved. *Carex decaulescens* subsp. *alsia* is similar to *C. infuscata* and *C. pseudobicolor* (see there), but differs by the flat, papery, smooth utricles (± membranaceous, turgescent, verrucose in *C. infuscata* and *C. pseudobicolor*). It is also close to *C. duthiei*, which is stronger in all its parts. **Carex caucasica** STEVEN 1813 (*Carex atrata* L. var. *caucasica* (STEVEN) BOOTT 1862, *Carex atrata* L. subsp. *caucasica* (STEVEN) KÜKENTHAL 1909) apparently is also close to *C. decaulescens*. A single specimen previously determined as *C. caucasica* from **Changchenmo** probably is a form of *C. melanantha* with whitish utricles.

* **Carex diandra** SCHRANK 1781 (*Carex mitis* BOECK. 1875) - **A**: W Pamir 3550 m (Fl.Tadzh.). Kashmir 1830-2130 m. **D**: Temp. N hemisphere, S to W Himalaya (Kashmir - Bhutan). **N**: Apparently rare in the Himalaya.

31. **Carex diluta** M. BIEB., Fl. Taur.-Cauc. **2**: 388. 1808

Carex aitchisonii BOECK. 1880, *Carex fissirostris* BOISS. 1884 non J. BALL. 1884, *Carex karelinii* MEINSH. 1901, *Carex aspratilis* V. KRECZ. 1935, *Carex extensa* auct. non GOOD. 1794: C. A. MEYER 1831, *Carex punctata* auct. non GAUDIN 1811: REGEL 1881

Ic.: Fl.Tadzh.2: fig.30(4-6). Fl.Desert.Sin.1: fig.59(10-13).

CS **Saltoro:** Alluvial flats near confluence of Saltoro & Shyok Rivers, above Saling 2440 m, *Nasir & Webster 6289* (RAYMOND 1965).

W **Gilgit:** 1450 m, *O.Polunin 6021* (BM!); near aerodrome 1520 m, *R.R.Stewart 26936* (K!). Naltar Lakes [?]1520 m, *R.R.Stewart 26938* (BM! "*C. philocrena*"). **Hunza:** Chalt, *R.R.Stewart 26937* (K!); 2000 m, *Paffen 23* (M!). Budelas 2000 m, *Paffen 186* (M!). Chalt - Chaprot 2080-2120 m, *Klötzli & al. 120.06,16!; 121.10!.* N Chaprot 2380 m, *Klötzli & al. 77.08!.* Minapin Gl. W 3050 m, *Lloyd & Megan 27* (BM!). Pisan 2230-2250 m, 1974-07-23, *F.Gartner* (GZU!). **Batura:** W Khaibar (?2500-) 3000-3020 m, *Klötzli & al. 27.12,15,19,25!; 801.43!.*

S **Shigar:** 2380 m, *C.B.Clarke 30078* (K!; CLARKE 1898). **Skardu:** 2330 m, 1876-08-02, *C.B.Clarke 29966* (BM!; K!); Floodplain of Indus Rv., c. 1.5 miles E Skardu 2290 m, *G.L.Webster 6586* (K!). Skardu - Dras 2440 m, *C.B.Clarke 30511* (K!; CLARKE 1898).

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A: Kongur: Gez Rv. 100 km SE Kashgar 2420 m, 1959-06-15, *Junatov*; Bulunkul 2800 m, 1959-06-15, *Li & al.* (Pl.As.Centr.). Chitral 1830-2290 m. Kashmir.
D: NW Africa, Eurasia: SE Eur. - Siberia; Altai, Dzung., Tian Shan, Pamir-Alai, Afgh., S Karakorum, W Himalaya (Kashmir - ?Nepal). *Ir.-Tur.*
E: 1450-3050 m, coll. - mont., scattered in the SW. Moist rocks, turf, fens and scrub by springs, flushes and irrigation channels.
N: Its occurrence in the Himalaya E of Kashmir is uncertain. Perhaps, *C. diluta* is replaced there by another species (? *Carex munroi* BOOTT ex C. B. CLARKE in HOOKER f. 1894). Records of "*C. diluta*" from **Biafo** and **Baltoro** (HARTMANN 1966) belong to *C. karoi*.

* **Carex divisa** HUDSON 1762 - **A**: Hazara (Ann.Cat.Pak.). Kashmir: in humidis et oryzetis Baramulla, *Jacquemont 338; 362* (K!). **D**: NW Africa, Eurasia, E to Tian Shan, Pamir-Alai, W Himalaya. **N**: Reported from **Gilgit**, *Giles* and Dras (Ann.Cat.Pak.); doubtful. Depauperate forms of *C. stenophylla* are easily confused with *C. divisa*, but are less succulent. *C. divisa* occurs with certainty in C.Afgh.: < 2000 m, S Tadzhikistan: 700-2800 m (Fl.Tadzh.), Baluchistan and Kashmir; apparently not yet found in the Karakorum.

* **Carex duthiei** C. B. CLARKE in HOOKER f. 1893 (*Carex atrata* L. var. *pullata* BOOTT 1862, *Carex atrata* L. subsp. *pullata* (BOOTT) KÜKENTHAL 1909, *Carex nigerrima* NELMES 1939, *Carex atrata* auct. non L. 1753: CLARKE 1898) - **Ic.**: BOOTT 1862: pl. 364. Fl.Xizang.5: fig. 247. **Fig. 3** (1). **A**: Hazara. Deosai. Kashmir: Burzil P. 3440 m, *C.B.Clarke 29722* (K! **type** *C. nigerrima*). Himachal Pr.: Lahaul, *Bor 15558* (DD; ASWAL & MEHROTRA 1994: *C. nigerrima*). **D**: W Himalaya - E Tibet, W China, Taiwan, Burma, Thailand.

* **Carex enervis** C. A. MEYER in LEDEB. 1833 (*Carex stenophylla* WAHLENB. var. *enervis* KÜKENTHAL 1909, *Carex pseudofoetida* KÜKENTHAL subsp. *afghanica* KUKKONEN 1984 syn. nov. - **Ic.**: Fl.Tadzh.2: fig.21(3-4). **Fig. 1** (5). **A**: W Pamir. Wakhan: Darya-e Birgula-e Jelga Vy., NW Kol-e Chaqmaqtin, N 74°06' E 37°14', 4200-4400 m, *O.Anders 7565* (hb. Podlech ! **holotype** *Carex pseudofoetida* subsp. *afghanica*). **D**: N China, Mongolia, Siberia, Kasakhstan, Tian Shan, Pamir-Alai. **N**: The type of "*Carex pseudofoetida* subsp. *afghanica*" is different from *C. pseudofoetida* and apparently belongs to here.

* **Carex fedia** NEES in WIGHT 1834 (*Carex wallichiana* auct. non SPRENG. 1826: PRESCOTT ex WALL. 1828) - **A**: Reported from Chitral, Swat, Hazara, Kashmir (Ann.Cat.Pak.). **D**: Himalaya: E Afgh. - Assam; Burma, SE China.

* **Carex filicina** NEES in WIGHT 1834 - **Ic.**: Fl.Xizang.5: fig.227. **A**: Reported from Hazara, Kashmir (Carex filicina NEES var. meiogyna (NEES) STRACHEY 1854: Ann.Cat.Pak.). **D**: Himalaya (var. *meiogyna*), India, China, SE Asia.

* **Carex foliosa** D. DON 1824 (*Carex wallichiana* SPRENG. 1826, *Carex muricata* L. var. *indica* BOOTT 1867) - **A**: Swat. Hazara. Kashmir (Ann.Cat.Pak.). **D**: Himalaya (Swat - Sikkim), S India (Nilgiri Mts.).

* **Carex gracilenta** BOOTT ex STRACHEY 1854 (*Carex alpina* SWARTZ subsp. *infuscata* var. *gracilenta* (BOOTT) KÜKENTHAL 1909 - **A**: Reported from Chitral, doubtful, see *C. infuscata*.

* **Carex haematostoma** NEES in WIGHT 1834 - **Ic.**:**fig 2** (3). **A**: Swat. Hazara. Kashmir: Sonamarg 3660 m, *R.R.&I.D.Stewart 6850* (Z!); 3660-3960 m. Rupshu: Descent from Parang P., 1847-09-08, *T.Thomson* s.n. (K!: cf., mounted with *Blysmus compressus*). Himachal Pr.: Jalma, *Sethi & Negi 287* (DD; ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 3800 m, *Miehe+9601b!;* (N 30°09' E 81°18') 4680 m, *Miehe+9627a!.* **D**: Himalaya (Swat - SE Tibet). **N**: Excl. var. *submacrogyna* KÜKENTHAL: see *C. alexeenkoana*.

* **Carex inanis** KUNTH 1837 (excl. syn. *C. schlagintweitiana*) - **Ic.**: Fl. Xizang.5: fig.237. **A**: Reported from Hazara, Kashmir (Ann.Cat.Pak.). **D**: W Himalaya (?Hazara, Kashmir - Sikkim).

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32. Carex infuscata NEES in WIGHT, Contr. Bot. India 125. 1834

Carex alpina SWARTZ var. *infuscata* (NEES) BOOTT 1862, *Carex alpina* SWARTZ subsp. *infuscata* (NEES) KÜKENTHAL 1909, ? *Carex trispiculata* BOECK. 1888, *Carex alpina* auct. non SWARTZ in LILJEBLAD 1798

Ic.: BOOTT 1862, pl. 358. **Fig. 3** (5).

W **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12404* (BM!, K!; CLARKE 1898); Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). Naltar Lakes 3660 m, *R.R.Stewart 26922; 26926* (K! "*C. psychrophila*"); 3170 m, *Schickhoff 48!*. **Hunza:** Baltit 2300 m, *F.Lobbichler 48* (M!). Oltali Chish 2400 m, 1955-06-10, *Nakao* s.n. (KYO **type** *C. atrofurfur*; KOYAMA 1956; KITAMURA 1964).

S **Shigar:** S Gon 3000-3100 m, 1991-07-09, *J.Poelt* s.n.!.

A: W Pamir (Fl. Tadzh.: *C. trispiculata*). Wakhan: Quazi Deh Vy. 3100 m, *Roemer 155* (M!, W!; PODLECH & ANDERS 1977). Mt. Noshaq, Qasideh Village, *R.Yoshii 1175* (KYO!). Chitral: Drosh Gol 3050 m, *Bowes Lyon 166* (W!). Chilas: Fary, Buldar Vy. 2860 m, *Nüsser 1029!*. Raikot Vy., Tato - Fairy Meadows 3060 m, *Nüsser 980!*. Astor: Teing [Ting], *Strachey & Winterbottom 755* (CLARKE 1898; K!). Faqirkot 2800 m, *Schickhoff 1374!*. Swat: Utror, pr. Kalam 2200 m, *Rechinger 30817* (W!). Hazara: Kaghan Vy.. Kashmir: Burzil P. 3200 m, *C.B.Clarke 29617* (CLARKE 1898); common (Ann.Cat.Pak.). Himachal Pr.: Baralacha P., *Aswal 10293* (ASWAL & MEHROTRA 1994). ?Uttar Pr.: Garhwal 10000-10600' [3050-3230 m], *Schlagintweit 10056* (BOECKELER 1888: **type** *C. trispiculata*).

D: Pamir-Alai, E Afgh. , Hindukush, W Himalaya (Afgh. - Nepal, ?Sikkim). *W Himal.*

E: 2300-3660 m, mont. - (subalp.), scattered in the SW. Moist turf by springs and irrigation canals.

N: The *Carex norvegica* complex (*C. alpina* SWARTZ in LILJEBLAD, non SCHRANK) has been divided up variously. KALELA (1944) presents a detailed account on its variation. RAYMOND (1965a) supposes the complex to contain around 20 microspecies. The W Himalayan material, however, appears to be rather uniform. The distinction between (montane) plants with shortly beaked utricles (*C. infuscata*) and (subalpine-alpine) plants without a beak (*C. pseudobicolor*) fits well into an ecological concept, but is not necessarily specific. *C. decaulescens* appears to be well separated, but perhaps closely related to the *C. norvegica* complex. *C. pseudobicolor* seems to be a characteristic species of the inner dry W Himalaya, which is ± substituted by *C. gracilenta* BOOTT ex STRACHEY 1854 (*C. infuscata* var. *gracilenta* (BOOTT) KOYAMA 1958) in the C. and E Himalaya. The limits, however, are somewhat obscure throughout Nepal, where both species occur. There, *C. gracilenta* is possibly confined to the humid Outer Himalayas, and *C. pseudobicolor* mainly occurs in the Tibetan Himalaya. Records of *C. gracilenta* from Afghanistan (KOYAMA 1958) or its occurrence in the Karakorum appear rather unlikely. Some specimens with brown utricles may represent untypical *C. pseudobicolor* or even depauperate specimens of *C. melanantha* ?. *Carex norvegica* s.str. is said to occur northwards from Altai and Mongolia (Pl.As.Centr.).

* **Carex ivanovae** EGOROVA 1966 ("*ivanoviae*") - **Ic.:** Pl.As.Centr.3: fig.3(2). **A**: C.Kunlun: Przhevalsky Mts. 4200-4500 m, 1890-08-21, *Roborovsky*; Cherchen, 30 km SE Achan 4190-4260 m, 1959-06-04, *Li & al. 9413; 9427* (Pl.As.Centr.). **D**: NE & C.Tibet: C.Kunlun, Changtang, Tangula Shan. **Map**: Pl.As.Centr. 3: map 9. **N**: The species may be found in areas adjacent to the NE Karakorum. In habit close to a depauperate *C. stenophylla*, but with three stigmas; also similar to *C. melanantha* s.l. Originally referred to § *Lamprochlaeneae*, but with cladoprophylls and perhaps a member of § *Japonicae*.

33. Carex karoi (FREYN) FREYN, Österr. Bot. Zeitschr. 40: 303. 189O

Carex capillaris L. subsp. *karoi* FREYN 1890, ? *Carex capillaris* auct. non L. 1753, ? *Carex chlorostachys* auct. non STEVEN 1813, ? *Carex capillaris* L. subsp. *chlorostachys* auct. non LÖVE, LÖVE & RAYMOND 1957

Ic.: Fl.Tadzh.2: fig.33(5-8). Fl.Desert.Sin.1: fig.59(5-9).

CS **Biafo:** Askole 3200 m, *Nakao* s.n. (KITAMURA 1964). Ste Ste - Gense 3520 m (HARTMANN 1966: "*C. diluta*"). **Baltoro:** Paiju, near Baltoro Gl. 3300 m, *Nakao* s.n. (KITAMURA 1964); 3450 m, *H.Hartmann 245!*; *248* (Z!; HARTMANN 1966: "*C. diluta*").

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W **Yasin:** Darkot 3110 m, *Bowes Lyon 8078* (K!). Naz Bar 3350-3400 m, *Miehe 3615b!*. **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26927* (Ann.Cat.Pak.; K!).

S **Skardu:** Tormik Vy., Ganto P. W 2730 m, 1991-07-01, *J.Poelt* s.n.!.
A: Wakhan: W side Vy. to Quazi Deh Vy. 3200 m, *Roemer 170* (M!, W!). Chitral: Tirich Gol 3350 m, *Bowes Lyon 1068* (W!). Suru: *Meebold 4631* (KÜKENTHAL 1909).
D: Kasakhstan - Siberia, E Asia, Mongolia, China; Dzungaria, Tian Shan, Pamir-Alai, W Karakorum; ? N America. *E Asiat.*
E: 2730-3660 m, mont.-subalp., scattered in the SW Karakorum. Wet habitats: flushes, in moist soil.
N: Both, *C. capillaris* subsp. *chlorostachys* (regarded as a synonym of subsp. *capillaris* in Fl.Eur.5) and *C. karoi* are given for the area by LÖVE, LÖVE & RAYMOND (1957). Since the Karakorum material appears to be uniform, the records are combined here under the above name.

* **Carex kashmirensis** C. B. CLARKE in HOOKER f. 1894 - **Ic.**:**fig. 2** (6). **A**: Swat: Utror pr. Kalam 2200 m, *Rechinger 30831* (W!). Hazara: Kaghan Vy. 3200-3610 m, *Miehe 31!; 44!; 93!*. Kashmir: Godais 3050 m, *C.B.Clarke 29281* (K!). Muzzafarabad, Bangas, *Inayat 22648* (K!). Tragbol 3110 m, *C.B.Clarke 29223* (K!). Sind Vy. 3510 m, *C.B.Clarke 31039* (K!); 3660 m, *C.B.Clarke 30994* (BM!). Sonamarg area 2740 m, 1978-07-07, *E.C.Wallace* s.n. (BM!). Above Khelanmarg 3350 m, *Robson* s.n. (BM!); Khillanmarg above Gulmarg 3050 m, 1926-07-20, *R.R.Stewart* s.n. (K!). Lidder Vy., Tolian, *Inayat 25771a* (K!). Pir Panjal, *Jacquemont 559* (K!). Himachal Pr.: Chenab Vy., Pangi at the foot of the Sanch P., 1848-06-12, *T.Thomson* s.n. (K!); Punjab, Rasol - Malana, *Drummond 24153* (K!). **D**: Outer W Himalaya (Swat, Hazara, Kashmir, Himachal Pradesh). **N**: Very similar to and easily confused with *C. plectobasis* and *C. alexeenkoana*, but a smaller plant with condensed inflorescence and shorter utricles; more closely related to *C. alajica* and *C. oligocarya*.

* **Carex koshewnikowii** LITV. 1910 - **Ic.**: Fl.Tadzh.2: pl.27, fig.1-4. **A**: Chitral: Lowari P., Ziarat 2130 m, *Stainton 2321* (W!). Shah Jinali P., N Mastuj 4270 m, *Stainton 3043* (W!). Birir 2590 m, *Bowes Lyon 696* (W!); 3050 m, *Bowes Lyon 681* (W!). **D**: Turkestan, Pamir-Alai, Chitral.

* **Carex koshewnikowii** LITV., Trav. Mus. Bot. Acad. Pétersb. 7: 92. 1910
subsp. **chitralensis** (NELMES) DICKORÉ comb. nov.
Basionym: *Carex chitralensis* NELMES in WENDELBO, Nytt. Mag. Bot. 1: 22. 1952
- **A**: Chitral: [Tirich Mir,] Barum Gol, E side of main Barum Gl. 3600 m, 1950-23-07, *P.Wendelbo* s.n. (K!, W! **isotypes**). Buri 1520 m, *M.A.Siddiqui & A.Rahman 26740* (K!). Kala Drosh 2290 m, *Duthie 16750* (K!). Bumburet Vy. 2670-2700 m, *Miehe 7089!*. **D**: Chitral (endemic). **E**: (Chitral:) 1520-3600 m, ?mont.-subalp., dry slopes, temperate coniferous forests (*Abies pindrow, Pinus wallichiana, Cedrus deodara*). **N**: It differs from *C. koshewnikowii* by the generally smaller stature, smaller utricles and very narrow leaves. *C. koshewnikowii* subsp. *chitralensis* may be confused with *C. plectobasis*, from which it differs by the strong woody caudex, very narrow leaves, red-brown female glumes and smaller, very hairy utricles. Records of *C. chitralensis* from Hazara (Ann.Cat.Pak.) are probably erroneous.

* **Carex lehmannii** DREJER 1844 - **Ic.**: Fl.Xizang.5: fig.250. **A**: Kashmir: Muzzafarabad, Sarsanpar, P. to Deosai from upper Kishenganga Vy., *Inayat 23268* (K!). Himachal Pr.: Daderphoo, *Nair 16602* (BSD; ASWAL & MEHROTRA 1994). **D**: Himalaya - China, Japan. **E**: *Abies* forests. **N**: *Inayat 23268* is perhaps the only specimen known from Kashmir.

* **Carex ligulata** NEES in WIGHT 1834 (*Carex hebecarpa* var. *ligulata* (NEES) KÜKENTHAL 1909MEYER 1831) - **Ic.** Fl.Xizang.5 fig.228. **A** Kashmir. **D** Himalaya, SE Asia (China, Japan).

* **Carex longicruris** NEES in WIGHT 1834 - **A**: Kashmir. **D**: Himalaya (Kashmir-Bhutan), S India: Nilgiri Mts., Ceylon.

* **Carex longicuspis** BOECK. 1888 - **N**: Known only from the type (KÜKENTHAL 1909; Ann.Cat.Pak.): **Saltoro:** Tsogosbang, above Barolbrok, *Schlagintweit 6088* (**type**; apparently destroyed in B). Its identity is uncertain, perhaps an older name for *Carex stenocarpa* TURCZ. ex V. KRECZ. (see there).

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34. Carex melanantha C. A. MEYER in LEDEB., Fl. Alt. 4: 216. 1833

Carex regelii C. B. CLARKE in O. FEDTSCH. 1903

Ic.: KÜKENTHAL 1909: fig.61 E-G. Fl.Tadzh.2: fig.24.

CS **Shimshal:** Pamir P. 4700-4820 m, *Miehe 6256!; 6321!.* **Biafo:** Biafo Gl. 4110 m, *R.Scott Russell 1797* (BM!). Skoro P. - Nang Brok 4700 m, 1956-08-04, *G.Weiler* s.n. (W!). Skoro P. N 3700 m, *Nakao* s.n. (KITAMURA 1964); 4170 m, *H.Hartmann 252!*; *253* (Z!); 4450 m; Laskam 4520 m, *H.Hartmann 258* (Z!); 4540 m, *H.Hartmann 260!*; 4600 m; Gense 4000-4400 m; Cho Blok 4210 m, *H.Hartmann 249!*; *250* (Z!); Mango 3850-4220 m; 4150 m, *H.Hartmann 251* (Z!); Baintha 4130-4780 m (HARTMANN 1966).

N **Taxkorgan:** S Taxkorgan, W KKH 4500 m, *Miehe 5818!.* **Mintake:** Mintaka 4150 m, 1935-07-03, *Persson 689* (PERSSON 1938).

W **Yasin:** Naz Bar 4050-4440 m, *Miehe 3055!; 3075!; 3106!; 3271!; 3489!.* ?Jud Bar 3820-3900 m, *Miehe 7044!* (veg.). **Ishkoman:** Panji P. S, above Holojut, 4040-4100 m, *Miehe 6927!* (veg.); *6933!.* **Gilgit:** Jutial Nullah, *R.R.Stewart 26923* (K!). Shinghai Gah - Pahot Gali 4150-4250 m, *Miehe 1194!; 1251!; 1552!.* Baghrot Vy. 4140-4340 m, *Miehe 4101!; 4148!; 4155!.* **Hunza:** Daintar (3200-3900 m), *F.Lobbichler 145; 171* (M!). Baltar 3500-3900 m, *Paffen 78; 80; 102; 120* (M!). NE Chaprot (3600-) 4000 (-4400) m, *Klötzli & al. 12.22!; 728.53* p.p.! (with *C. nivalis*). **Hispar:** Hispar Gl., Gandar Chish - Haigutum 3950-4240 m, *Conway 195* (K!; CONWAY 1894, CLARKE 1898). Makerum 3810 m, *R.Scott Russell 1397* (BM!). Gharesa Gl. 12 miles E of Nagar 3990 m, *O.Polunin 6302* (B!). **Khunjerab:** Buksel Vy. 4000 m, *Visser-Hooft* (DOLK 1929). Khunjerab P. SW 3600 m, *Klötzli & al. 111/112.07!* (cf., "Flussaue"); 4600-4790 m, *Klötzli & al. 114.06!; 130/131.29!; 132-135.55!, Miehe 2311!; 2345!; 2363!; 2403!.*

S **Shigar:** Kero Lungma Gl. 3960-4420 m, *R.Scott Russell 1255*; *1354* (BM!). Sokha Gl., right bank 4570 m, *R.Scott Russell 1625* (BM!). Skoro P. S 4600 m (HARTMANN 1966). **Skardu:** Ruckum P. above Purpoo in Gilgit, *Winterbottom 884* (K!). [?]**Leh:** Ladakh, common (STEWART 1916).

Unloc.: Baltistan 3960-4270 m, *Duthie 12158* (CLARKE 1898).

A: Kongur: Billuli Rv. - Chumbus Rv., *Divnogorskaya* (Pl.As.Centr.). W Pamir, E Pamir 2800-4600 m (Fl.Tadzh.). Wakhan 3300-4500 m (PODLECH & ANDERS 1977). Futur Vy. 3600 m, *Roemer 97* (W!). Tergan Qurum Vy., S of lake Bishutik 4500 m, *Grey-Wilson & Hewer 1525* (W!). Deliz P. E of Sarhad 4100 m, *Grey-Wilson & Hewer 1617* (W!). Kishnikhan Vy. 4200 m, *K.Gratzl 42* (W!). Kotal-e-Wazit 4620 m, *Breckle A1377* (W!). Dario Wazit 4500 m, *Breckle 1245* (W!). Noshaq N, Qazi-Deh Gl. 4350 m, *Breckle A3813* (W!). Chitral: Baroghil 3810 m, *Stainton 2970* (W!). Chatiboi Gl. 3450 m, *Stamm & Wöhrl 105* (W!). Chilas: Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1337!;* Upper Pattaro Vy., Guttum Sagar 4490 m, *Nüsser 1365!; 1384!.* Astor: Das Kirim - Sardar Kothi, Burzil P. N 3660 m, *R.R.Stewart 22003B* (K!). Deosai: Deotsoo, *Winterbottom 884* (K!). Deosai Camp - Gulteri, Rd. to Skardu 3660 m, *R.R.Stewart 22203a* (K!). Deosai 3820 m, *Miehe 2226!.* E Deosai 4000-4300 m, *Miehe 5079!; 5135!.* Shingo - Shigar 3660 m, *B.B.Osmaston 7* (K!). Dras: Karpuchu Vy. 3660-3960 m, *Duthie 11942* (K! [*C. melanantha* X *C. moorcroftii* ?]; CLARKE 1898). Rimochagma Nullah 3960-4270 m, *Duthie 12158* (K!). Karpuchu Nullah 3350-3660 m, *Duthie 11942* (K!). Dras Vy., Machoi, *Inayat 25771b* (K!). Suru: W Sanmodangsa 4190 m, *H.Hartmann 2377!.* Pensi P. W 4340 m, *H.Hartmann 2590!*; 5030 m, *Koelz 5837* (W!). Zanskar: Shingo P. 4800 m, *Holzner & Kriechbaum* s.n.!. Debring 4570 m, *Koelz 6555* (W!: *C. melanantha* X *C. moorcroftii* ?). Lahul, Serchu 3960 m, *Koelz 5351* (W!). Kashmir: Zoji P. 3350 m, 1848-09-27, *T.Thomson* s.n. (K!; CLARKE 1898). Sonamarg 3350 m, *R.R.Stewart 9777* (K!). Burzil P. 3200 m, *C.B.Clarke 29635* (CLARKE 1898). Liddar Vy., Sonsal Nullah, *Duthie 13360* (K!). Musjid Vy. 3960 m, *Duthie 13256* (K!; CLARKE 1898). Himachal Pr.: Chotadorni, *Aswal 6711* (ASWAL & MEHROTRA 1994). W Tibet: Gnari Khorsum, Laptel & Hoti - Selchell (S of the Satlej, 1855-07-16/19, *Schlagintweit 7019* (K!; CLARKE 1898).

D: W Mongolia, Altai, Tian Shan, Pamir-Alai, Kashgaria, Hindukush, Karakorum, W Himalaya (E Afgh. - Nepal). **Map:** Pl.As.Centr. 3: map 8. *W Centr.As.*

E: (3200) 3500-4820 m, subalp.-alp., frequent in the SW Karakorum. Meadow steppes, alpine meadows and turf (often with *Kobresia schoenoides*), open scree slopes, *Salix karelinii*-scrub, riverside-meadows and *Salix* spp. scrub.

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N: A valuable account on the *C. melanantha* group is given by RAYMOND (1965). The species of the group in the extreme come very close to each other, and their variation on the Tibetan Plateau appears to be still insufficiently understood. *Carex praeclara* NELMES, a dwarf high alpine endemic of S and E Tibet, probably is the most distinctive species of the complex. *Carex sabulosa* TURCZ. from Mongolia and northern C. Asia is considered conspecific with the N American *Carex leiophylla* MACKENZIE by RAYMOND (1965). It is also close to the Tibetan endemic *C. moorcroftii*. *Carex melanantha* s.str., under our concept is still a very variable taxon. The Karakorum plants usually are rather stout and rigid and thus approaching *C. moorcroftii*. Specimens of the most humid SW Karakorum, the Outer W Himalaya and Kashmir often are rather lax, and may be referable to *C. regelii* C. B. CLARKE. It is impossible to separate them specifically, but *C. regelii* may be considered as a result of introgression from the Outer Himalayan *Carex obscura* NEES in WIGHT into *C. melanantha*. *C. melanantha* s.str. is substituted by the closely related *C. moorcroftii* E of a line from Yarkand across the Karakorum P. to Zanskar / Rupshu. The exact delimitation of both, though usually sufficiently distinct, is not quite clear; hybrids may occur in areas of contact (Yarkand, Upper Indus Vy. ?). On the Pensi P., *C. melanantha* was collected W, and *C. moorcroftii* E of the pass; a similar situation probably with *Calamagrostis stoliczkae* - *Calamagrostis pulchella*.

35. Carex microglochin WAHLENB., Kungl. Svenska Vet.-Akad. Handl., nov.ser. **24**: 140. 1803
Kobresia microglochin (WAHLENB.) WANG & TANG ex Y. C. YANG 1987

Ic.: Fl.Tadzh.2: fig.26(1-5).

CN **K2-North:** Muztagh Vy. 3930-3950 m, *Dickoré 849!*.

N **Mustagh Ata:** N 3650 m, *Miehe 5455*! (with *C. parva*). **Yarkand:** 10 km WSW Mazar 3760 m (*Dickoré*). **Karakash:** W Xaidulla 4380 m, *Miehe 7847!*.

W **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26921A* (K!, with *Trichophorum pumilum*: *26921B*).

S **Leh:** Keenaoots [Kinutse] in Rongdo, *Winterbottom 806* (K!). Leh 3500 m, 1993-07-12, *Holzner & Kriechbaum* s.n.!. Near Leh, 1925-06, *Meinertzhagen* s.n. (BM!). Likir 3700 m, 1993-07-14, *Holzner & Kriechbaum* s.n.!. Kartse 4130 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. S Rumtse, Taglang P. NW 4500 m, *H.Hartmann 4126!*. Puga 4720 m, *Koelz 2180* (K!).

E **Upper Shyok:** [Sassir - Murgai] (4570-5180 m), 1848-08-28, *T.Thomson* s.n. (K!).

Unloc.: Baltistan 3960-4270 m, *Duthie 11, 973* (CLARKE 1898). Ladakh, *T.Thomson* (CLARKE 1898). Xinjiang-Tibet Rd., 27 km W Maygayti, *Li 481* (Pl.As.Centr.).

A: W Kunlun: Upper Tiznap Vy. 3650 m, *Miehe 8538b!*; N Mazar P. 4300 m, *Miehe 7807!*. E Pamir (Fl.Tadzh.). Wakhan: 4000 m, *Anders 7436* p.p. (hb. Podlech!; PODLECH & ANDERS 1977). Badjens Vy. 4200 m, *Roemer 373* (W!). Deosai: 3960 m, *C.B.Clarke 29826* (CLARKE 1898; BM!; K!); Deosai E (3530-4000 m), 1991-07-15, *J.Poelt* s.n.!. Dras: *Schlagintweit 6467* (CLARKE 1898). Karpuchu Vy. 3960-4270 m, *Duthie 11973* (BM!; K!). Kashmir: 1848-04-28, *T.Thomson* s.n. (K!). Musjid Vy. 3660-3960 m, *Duthie 13203* (CLARKE 1898; BM!; K!). Tilail 3740 m, *C.B.Clarke 30653* (CLARKE 1898; K!). [Butna Vy., Chatargarh - Umasi P.], 1848-06-20, *T.Thomson* s.n. (K!). Himachal Pr.: Kunzum, *Bhattacharyya 48986* (BSD; ASWAL & MEHROTRA 1994). Rupshu: Saltmarsh [Parang P. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Startsa Puk Tso 4550 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!. Hanle 4360 m, *Koelz 2312* (K!). W Tibet: 4570-4880 m, *T.Thomson* (CLARKE 1898). Lungmu Co 5050 m, *Miehe 8118?*.

D: Circumarctic: N Eurasia (in the mountains S to Caucasus, Pamir-Alai, Karakorum, Himalaya, Tibet), N America, ?S America (Patagonia). *Holarct.*

E: 3650-4720 (5180) m, subalp. (-alp.), not common. Fens and turf by springs and flushes, (seasonally) wet or shallowly flooded places (*Carex orbicularis, C. pseudofoetida*), irrigated pastures, among *Kobresia schoenoides*-tufts in naka-moors.

N: The height of the plants is very variable and not suitable as a differential mark against *C. parva*. Some plants of *C. microglochin* have a culm length of 30-35 cm (*Dickoré 849*), whereas European, but also many Himalayan and Tibetan specimens are much smaller (5-15 cm). *C. microglochin* sometimes grows together with *C. parva*, but it is more continental in its distribution and occurs even in C. Tibet. Young specimens of *C. microglochin* may resemble *C. sagaensis* (*C. maritima* group), *Kobresia pygmaea* or even *Blysmus rufus*. There may be some affinities between either of these, and certainly a

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close relationship between the *C. microglochin* group and *Kobresia* sect. *Hemicarex* (*K. pygmaea* group) does exist.

* **Carex montis-everestii** KÜKENTHAL 1934 - **Ic.: fig. 3** (4). **A**: Zanskar: Debring 4830 m, *H.Hartmann 4067!*. W Tibet: Shiquanhe - Aong Co (N 32°28' E 81°20'), 4900 m, *Miehe+9672a!;* (N 32°38' E 81°20') 4870-4950 m, *Miehe+9674!*. E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680b!*; 4800-5200 m, *Miehe+9679a!*. N Moincer (N 31°15' E 80°15') 5000-5280 m, *Miehe+9641a!; 9642a!; +9644a!*. **D**: S Tibet, Inner Himalaya. **E**: Humid alpine turf. **N**: *C. montis-everestii* differs from *C. borii* by the long subterranean, scaly rhizomes, usually well separated spikes with the lowest female spike usually long peduncled, and the utricles with a few small spines towards the beak. The spikes are highly congested, however, in the type specimen of *C. montis-everestii*: Mt. Everest, Camp I, in moraine 18200' [5550 m], 1933-07-02, *H.Wager* s.n. (B! **holotype**, K! **isotype**), as well as in *Hartmann 4067*, which makes it difficult to distinguish from *C. borii*. This probably led to confusion between both species in Fl.Tadzh. and DICKORÉ 1991. Presently, with abundant material of *C. montis-everestii* from the Lhasa region of S Tibet at hand, this appears to be a quite variable, usually much stronger species, which clearly belongs to sect. *Aulocystis* and sometimes is difficult to delimit against the *C. melanantha* group and *C. haematostoma*. The locality in NE Zanskar probably represents a western outpost of the species.

36. Carex moorcroftii FALC. ex BOOTT, Trans. Linn. Soc. London **20**. 140. 1851

Carex melanantha C. A MEYER var. *moorcroftii* (BOOTT) KÜKENTHAL 1909

Ic.: Fl.Xizang.5: fig.245. Fl.Desert.Sin.1: fig.60(9-12).

N **Yarkand:** 3 km W Mazar 3850 m, *Dickoré 322!; 343!*; 10 km WSW Mazar 3760 m (*Dickoré*). **Upper Yarkand:** Plateau on the foot of the Karakorum, Karakorum P. NE, 1856-08-10/11, *Schlagintweit*; Kiük-Kiöl Lake, 1856-08-13/14, *Schlagintweit* (Pl.As.Centr.). **Karakash:** Upper Hotan Rv., Kirgiz P. 10-12 km W Xaidulla 3900 m, 1959-06-03, *Junatov* (Pl.As.Centr.). SE Dahongliutan 4650 m, *Miehe 8258!*; 4800-4850 m, *Miehe 7885!*; 4900-5240 m, *Miehe 7899!*.

S **Leh:** [Kardong P. S < 4790 m], 1848-07-19, *T.Thomson* s.n. (K!). Taglang P. 4800 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. **Pangong:** Pangong Lake - Mogaleb 4350 m, *Roero* (PAMPANINI 1930). Pangong Tso [c. 4300 m], 1927-07-25, *Bosshard* s.n. (Z!); 1927-07-27, *Bosshard* s.n. (Z!; SCHMID 1932: "spikes mainly androgynous").

E **Changchenmo:** Cone P., *Grenard* (RHINS 1898). Changchenmo 4480 m, [1925-] 06, *Meinertzhagen* s.n. (BM!). **Depsang:** Chipchak Vy. 5250-5450 m, *Antilli* (PAMPANINI 1930). Upper Shyok, Guado Camp 4830 m, *Dainelli & Marinelli* (PAMPANINI 1930). **Upper Karakash:** Karakash watershed, *Cayley* (CLARKE 1898; K!). Near Chisil Gilga 5100 m, *Dainelli & Marinelli* (PAMPANINI 1930). **Aksai Chin:** Sirigh-Jilganang Lake 5300 m, 1927-08-31, *Bosshard* s.n. (Z!; SCHMID 1932). Aksai Chin 5000 m, 1927-09-05, *Bosshard* s.n. (Z!; SCHMID 1932: "spikes all androgynous").

Unloc.: "Common from Chagra to the Karakash Valley" [**Pangong**, **Changchenmo**, **Aksai Chin**, **Karakash**] 4570-5490 m (HENDERSON & HUME 1873). Yarkand Exp. 1870-07-13, *Henderson 116* (K!). "Kashmir" [Yarkand Exp.: probably E Karakorum / W Tibet], *Bellew* (K!). Tibet 4570 m, 1851-09, *Strachey & Winterbottom* s.n. (K!). Tibet [E of Lanak P. ?], 1896-06-24, *Deasy & Pike 812* (K!). Tibet, Dali (35°08'N 83°E) 5030 m, [1896]-06-25, *Wellby & Malcolm* s.n. (K!). Central Tibet, 1892-06-21, *Rockhill* s.n. (K!). N Tibet, Camp 12 - 13 (35-37° N 85-96° E), 1896-08-27, *S.Hedin* (K!).

A: [?]Deosai: Chillam - Deosai (STEWART 1961). Suru: N Sanmodangsa 4170 m, *H.Hartmann 2376!*. Zanskar: Pensi P. E 4360 m, *H.Hartmann 2589!*. Kargia 4110 m, *Koelz 5536* (W!: *C. moorcroftii* X *C. melanantha* ?). Lingti, *Bor 15026* (DD; ASWAL & MEHROTRA 1994). Himachal Pr.: Parang Vy., 1847-09-11, *T.Thomson* s.n. (K!). Lahul, Dartse - Tsanskar Sumdo, 1856-06-17, *Schlagintweit 4127* (K!). Spiti, Phang - Ruktsin, *Schlagintweit 2538* (K!). Rupshu: Lanak P. and Parang Vy. 3660-4880 m, *T.Thomson* (CLARKE 1898); Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!). Banks of Salt Lake [Tso Kar 4720 m], 1847-09-24, *T.Thomson* s.n. (K!). Tsakzhun Tso 4570 m, *Koelz 2388* (K!). Tso Kar 4270 m, *Koelz 6573* (W!). N Tso Kar 4600 m, 1992-07-22, *Holzner & Kriechbaum* s.n.!. W Tibet: W Wuma (N 32°23' E 83°08') 5180 m, *Miehe+9677a!*. N Moincer (N 31°15' E 80°15') 5030 m, *Miehe+9647a!*. Manasarovar Lakes, S Langa Co (30°34' E 81°14') 4700 m, *Miehe+9638a!* (veg.). Changtang: Lungmu Co 5170 m, *Miehe 8119!*.

D: Tibet. **Map:** Pl.As.Centr.3: map 8. *Tibet.*

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E: (3760) 4300-5300 (5490) m, alp. - subniv., locally common in the E Karakorum. Superficially dry sandy depressions, gravel slopes, permafrost swamps.
N: Certainly no good fodder plant due to its hard, pungent leaves, but occurring in considerable quantity in the most barren regions and reported to be a main fodder for the Tibetan ass (*Equus kiang*). HENDERSON & HUME 1873: "sometimes it was met with in patches of several acres, each plant being several feet apart from the adjoining ones. It was almost the only food for the baggage animals for more than a week. It is very locally distributed and is usually found on dry gravel slopes, often at a distance from water". "The commonest grass in this district. Very little of it in flower. Only two kinds of grass noticed this side of Lanik-La. The other, no. 823, is scarce." (*Deasy & Pike*). Recorded, probably in error, from Swat (KITAMURA 1964) [? *C. melanantha*].

37. **Carex nivalis** BOOTT, Proc. Linn. Soc. 1: 256. 1845

Carex hymelayensis STEUDEL 1855, *Carex griffithii* BOOTT 1851, *Carex olivieri* BOECK. 1880, *Carex luteobrunnea* (KÜKENTHAL) NELMES 1939, *Carex gilesii* NELMES 1939, *Carex lepus-aestatis* KOYAMA 1956

Ic.: KÜKENTHAL 1909: fig.91 A-D. **Fig. 3** (9).

CN **K2-North:** Crevasse Gl. 4570 m, 1937-07-27, *M.A.Spender* s.n (BM!, f. *cinnamomea*). K2-N Gl. W 4380-4550 m, *Dickoré 657!; 741!*; ? K2-N Gl. E 4750 m (veg.).

CS **Biafo:** Biafo Gl., Snow Lake, right bank 5180 m, *R.Scott Russell 1593* (BM!). Skoro P. - Nang Brok 4700 m, 1956-08-04, *G.Weiler* s.n. (W!). Skoro P. N 4200; 4380 m; Mango 3700-3880 m; 3880 m, *H.Hartmann 254!*; Baintha 4060-4880 m (HARTMANN 1966). Karakorum [Skoro P. - Askole] 4200 m, 1876-08-09, *C.B.Clarke 30235* (K! **type** *C. luteobrunnea* NELMES). **Baltoro:** Vigne Gl. 5000 m, *De Filippi* (PIROTTA & CORTESI 1912: "*C. atrata*", PAMPANINI 1930). Baltoro Gl., Liligo - Urdokas 3700 m, 1955-07-09, *Nakao* s.n. (KYO **type** *C. lepus-aestatis*; KOYAMA 1956; KITAMURA 1964). **Saltoro:** Hushe - Brumi Rama, 1856-07-16, *Schlagintweit 6004* (BM!). Tsogosbang above Barol Brok, right side of the Sospor Gl., 1856-07-17, *Schlagintweit 6091* (BM!). Chogolisa Gl. N, base of cliffs 3660 m, *Nasir & Webster 6003* (WEBSTER & NASIR, RAYMOND 1965: *C. luteobrunnea*). Above Hushe 4350 m, *Miehe 2012!* (f. *cinnamomea*). Hushe Vy., 1970-07-07, *Österr.Karak.Exp.* s.n. (W! "*C. tristis*"). Chiaveri [Kaberi] Gl. 3700 m (CALCIATI 1914). Kondus Gl. 4200 m, 1961-06, *W.Axt* s.n. (W!). **Nubra:** [Lower] Nubra Vy. (3660-4570 m), 1848-08-01, *T.Thomson* (K!; CLARKE 1898); 1848-09-01, *T.Thomson* s.n. (K!). [Sassir P. W], 1848-08-12, *T.Thomson* s.n. (K!). Shangposhi 4800 m, *Visser-Hooft* (HENRARD 1923). **Nubra/Upper Shyok:** Sassir P. 4880 m, *F.Ludlow 478* (BM!).

N **Mustagh Ata:** Yam-Bulak-Bashi 4440 m, 1894-08-16, *S.Hedin* (OSTENFELD 1922). **Yarkand:** Aghil P. N 4620 m, *Dickoré 548!*.

W **Ghizar:** Diwangal - Ghizar 3900 m, *Ogino 223; 227* (KITAMURA 1964: var. *griffithii*). **Yasin:** Tui [Thui] P. 12-14000' [3660-4270 m], *Giles 475* (K! **type** *C. gilesii* NELMES). Naz Bar 3930-4550 m, *Miehe 3044!; 3099!; 3103!; 3152!; 3237!; 3262!; 3367!; 3557!*. Panji P. N, towards Yasin 4220 m, *Miehe 6968!*. Yasin - Darkot E side 3870 m, *Bowes Lyon 8127* (K!). **Ishkoman:** Panji P. S, above Holojut 4100-4300 m, *Miehe 6932!; 6939!; 7012!*. Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Jutial Nullah, *R.R.Stewart 26924* (K!). Naltar Lakes 3660 m, *R.R.Stewart 26922b*; *26928*; *26929* (K!). Naltar Vy. 3350-3960 m, *R.R.Stewart 26930* (f. *cinnamomea*); *26934a*; *26935*; *26929* (K!). Shinghai Gah - Pahot Gali 4150-4470 m, *Miehe 971!; 1236!; 1257!; 1262!; 1287!; 1623!*. Baghrot Vy. 4270-4480 m, *Miehe 3695!; 3709!*. **Hunza:** Daintar (3200-3900 m), *F.Lobbichler 58* (M!). Baltar 3200 m, *Paffen 91* (M!); 3500 m, *Paffen 154* (M!, W!). Minapin Gl. 3660 m, *Lloyd & Megan 70* (BM!; LLOYD & LLOYD 1968). Rakaposhi, Jaglot Nullah, *W.M.Deacock 5* (BM!). Rakaposhi N, above Nilt 3900 m, *Miehe 6610!; 6611!* (typical and f. *cinnamomea*). **Hispar:** Hispar Gl., N lateral moraine 4000 m; 4700 m (CALCIATI & KONCZA 1909). Hispar Gl., above Kanibassar Gl. 4570 m, *R.Scott Russell 1579* (BM!). **Batura:** Gulmit - Atabad 4300 m, *Miehe 2906!*. **Khunjerab:** Dhee Sar Vy. 4150-4420 m, *P.Ebenhöh* s.n. (M!).

S **Shigar:** Kero Lungma Gl. 3660-4720 m, *R.Scott Russell 1241* p.p. (BM!); *1242* (BM!); *1302* (BM!). Sokha Gl., right bank 4570 m, *R.Scott Russell 1645* (BM!). [Skoro P. S] 3960 m, 1876-08-07,

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C.B.Clarke s.n. (BM!). **Leh:** Leh - Kaltse [Khalsi], right side of Indus Vy., 1856-07-12/14, *Schlagintweit 1506* (BM!; f. *cinnamomea*). Taglang P. 5330 m, [1925-]08, *Meinertzhagen* s.n. (BM!).

E **Upper Shyok:** [Sassir P. E - Murgai], 1848-08-13, *T.Thomson* s.n. (K!). Upper Sassir Vy. 4850 m, *Dainelli* (PAMPANINI 1934). **Depsang:** Camp Grande Cumdan 4750 m, *Dainelli & Marinelli* (PAMPANINI 1930).

Unloc.: Karakorum 3960-4270 m, *C.B.Clarke 30244; 30439; 30441* (CLARKE 1898). Ladakh (3660-4570 m), *T.Thomson* (CLARKE 1898). 1848-06-06, *T.Thomson* s.n. (K!).

A: W Pamir, E Pamir 2800-4000 m (Fl.Tadzh.). Wakhan: 3900-4770 m (PODLECH & ANDERS 1977). Kotale Wazit N 3700 m, *Breckle 1325* (M!). Mandaras Vy. (3900-4500 m), *Roemer 223* (W!). Kishnikhan Vy. 3600-4000 m, *R.Senarclens de Grancy 51* (W!); *52* (W!); 4200 m, *H.Gamerith 87* (W!). Chitral: Madaglast 3660 m, Toppin 561 (K!). Barum Gol 3500 m, 1950-07-26, *Wendelbo* s.n. (K!). Medial moraine on Main Barum Gl. 3300 m, 1950-07-20, *Wendelbo* s.n. (K!). Baroghil P. 3660 m, *Stainton 3025* (W!). Ishporili Gol S Mastuj 4270 m, *Stainton 3125* (W!). Rosh Gol, NE Tirich Mir 3660 m, *Stainton 2830* (W!). Oihor Gol 3350 m, *Bowes Lyon 821* (W!). Golen (Krui Uts) 4110 m, *Bowes Lyon 130* (W!); *131* (W!). Chatiboi Gl. 4360 m, *Stamm & Wöhrl 112* (W!). Pechus Gl. 4800 m, *Stamm & Wöhrl 196* (W!). Owir P. 4000 m, *C.L.Behm 58* (K!). Chilas: Raikot Gl., left lateral moraine, nunatak 4180-4550 m, *Nüsser 377!* (f. *cinnamomea*); *378!; 400!*. Upper Kosto Vy. 4300 m, *Nüsser 1422!*. Uppermost Pattaro Vy., Guttum Sagar - Kosto Gali 4830 m, *Nüsser 1404!*. Astor: Rama Vy. SW Astor 3660 m, *Lankester & Pearson 1413* (BM!). Kamri P., Gilgit Rd., *R.R.Stewart 18861* (K!). Upper Rupal Vy., ascent to Mazeno High Camp 4600-4700 m, *Nüsser 1503!;* 4700 m, *Nüsser 1510!*. Upper Rupal Vy., Shaigiri 3750 m, *Nüsser 1569!;* Rupal Gl. ablation Vy. 3950 m, *Nüsser 1559!* (f. *cinnamomea*); Uppermost Rupal Vy. (Toshain Gah), ascent to Mazeno Gali moraine 5010 m, *Nüsser 1519!*. Deosai: 4110 m, *B.B.Osmaston 6* (K!); 4020 m, *Meinertzhagen* s.n. (BM!). Dras: Dras Vy. (HENDERSON & HUME 1873). Zanskar: 4110 m, 1848-06-23, *T.Thomson* s.n. (K!); (3660-4570 m), *T.Thomson* (CLARKE 1898). Pensi P. 4110 m, *Southampton Univ. 182* (BM!). Sarchu 4500 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Gamburanjon 4300 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Shingo P. 4700 m, 1993-07-30, *Holzner & Kriechbaum* s.n.!. Swat: Batain above Ushu 2740 m, *R.R.Stewart & A.Rahman 25722* (K!, W!). Hazara: Kaghan Vy., Rayibhoyi, 1897-07-23, *Duthie* s.n. (K!). Kashmir: Burzil P. 3960-4270 m, *R.R.Stewart 22067* (K!). Above Gulmarg 3960 m, *Aitchison 114* (K!). Sonamarg 3660 m, *R.R.Stewart 9905* (K!); 3810 m, *R.R.Stewart 9850* (K!). Mt.Kolahoi 4880 m, *R.R.Stewart 9421* (K! f. *cinnamomea*). Qasi Nag, Karna, 1967-09-24, *Jan Mohd* s.n. (K!). Liddar Vy., Badzulkod Nullah 3960-4270 m, *Duthie 13392* (K! f. *cinnamomea*); *Duthie 13393* (K!). Tulion near Pahlgam 3960 m, *R.R.Stewart 8152* (K!) (K!). Himachal Pr. Parang P., *T.Thomson* (CLARKE 1898). Bara Lacha P. 4880 m, *N.L.Bor 13979* (K! f. *cinnamomea*); 5030 m, *Koelz 6814* (W!: very dwarf specimens, 5-10 cm high). Baralacha P., *Aswal 10973* (f. *nivalis*); 10994 (f. *cinnamomea*) (ASWAL & MEHROTRA 1994). Lahul, Rorig 3660 m, *Koelz 5313* (W!); Kinlung 4110 m, *Koelz 6728* (f. *cinnamomea*). Poo (Kashmir - Tibet border), 1923, *Peter* (Z!).

D: Tian Shan, Pamir-Alai, Hindukush (Afgh.: Paghman, Bamian, Kunar, Nuristan), Karakorum, W Himalaya: Afgh. - Nepal. *W Centr.As.*

E: (2400) 3200-4880 (5180) m, alp., locally common. Block screes, community-building and stabilizing screes and moraines with higher contents of fine soil, in boulder-strewn alpine turf and in *Salix karelinii* scrub; by periodical water-courses. Forming characteristical tall-sedge communities, often with *Delphinium brunonianum* and other tall herbs.

N: Usually a very distinctive tall and stout sedge, with nodding female spikes which have short, black glumes and large flat, whitish utricles. *C. nivalis* certainly exhibits a large amount of variation and it has been divided into several taxa, which are sometimes regarded as good species (NELMES 1939; RAYMOND 1965). These include: *Carex olivieri* BOECK. (*Carex nivalis* BOOTT f. *cinnamomea* KÜKENTHAL), *Carex griffithii* BOOTT (*Carex nivalis* BOOTT f. *griffithii* (BOOTT) KÜKENTHAL), *Carex luteobrunnea* NELMES (*Carex lepus-aestatis* KOYAMA) and *Carex gilesii* NELMES. We cannot follow the segregation of these species, but further studies in the complex, including the closely related *C. atrofusca* - *C. cruenta* group, are desirable to resolve its variation, which perhaps is due to hybridisation and may result in subspecific segregation.

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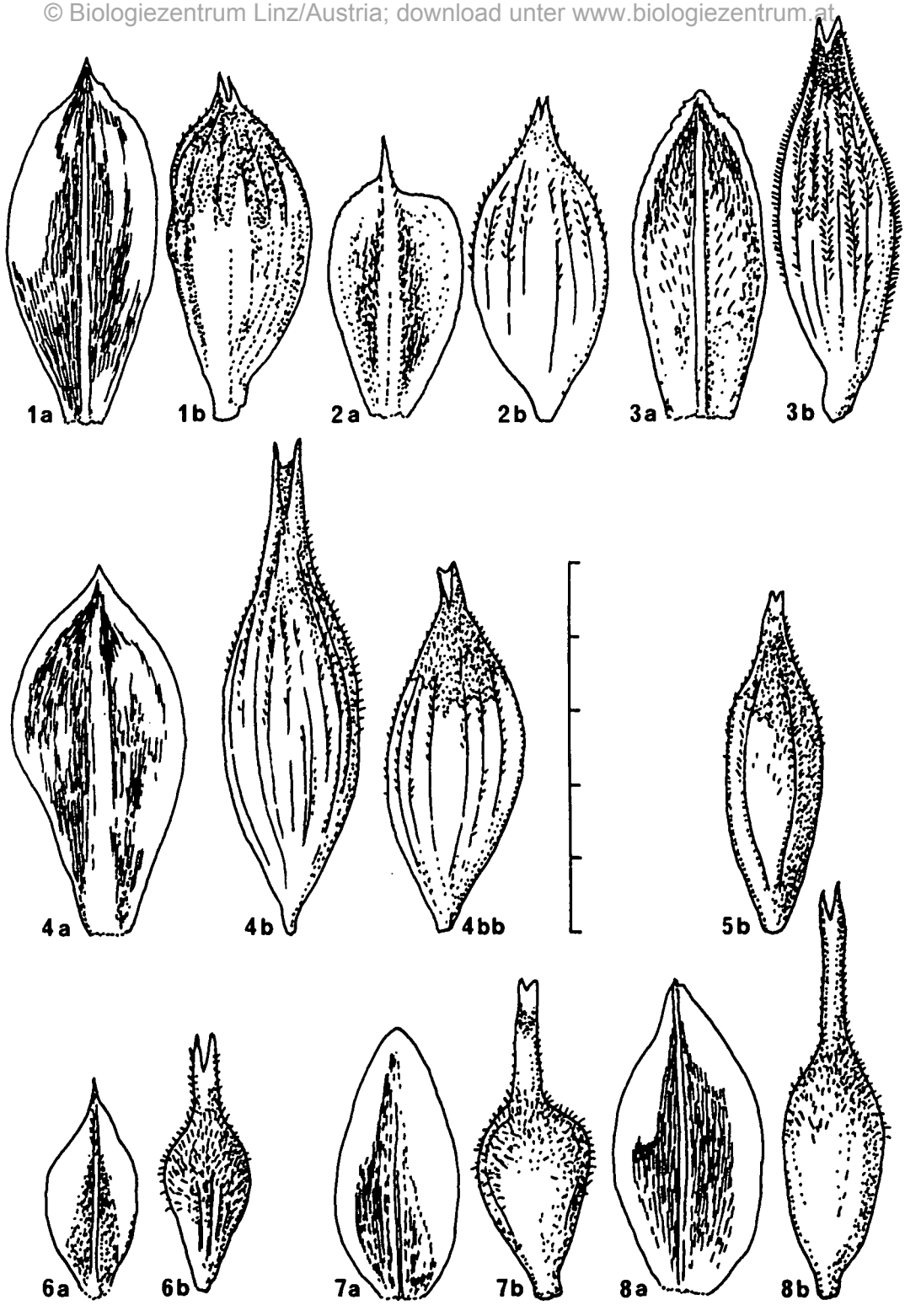

Fig. 2: *Carex* (§ Aulocystis and related species).
Female bract (a), utricle (b), nut (c). Scale = 5 mm.
1: C. alexeenkoana (*Miehe 5313*). **2: C. macrogyna** (Magadan, *Petrovsky & Norkina*, Gerb.Fl.SSSR 6010, M). **3: C. haematostoma** (Kunawar, 1847-08-19, *T.Thomson* s.n., K). **4: C. plectobasis** (*Royle 120* **type**, K; bb: *Klötzli & al. 728.47*). **5: C. pachyrrhiza** (Lhasa, *Dickoré 3290*). **6: C. kashmirensis** (Kaghan Vy., *Miehe 93*). **7: C. oligocarya** (*Miehe 6662*). **8: C. alaica** (Kongur, *Miehe 8666*).

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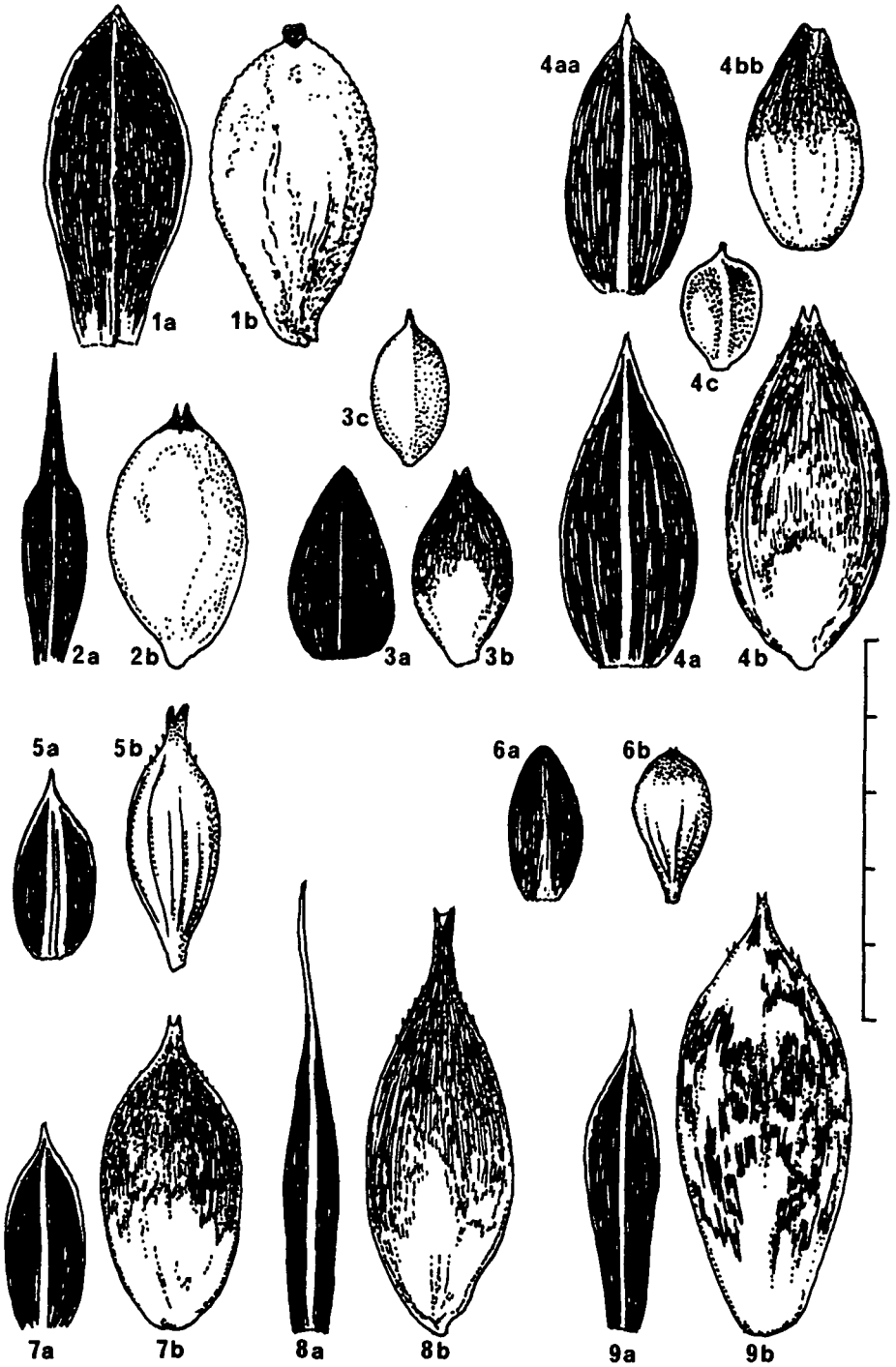

Fig. 3: ***Carex*** **(§ Atratae and related species).**
Female bract (a), utricle (b), nut (c). Scale = 5 mm.
1: C. duthiei (*C.B.Clarke 29722* **type** *C. nigerrima*, K). **2: C. decaulescens** subsp. **alsia** (*Bowes Lyon 8108B*, K). **3: C. borii** (*Dickoré 783*). **4: C. montis-everestii** (Nyainqentanglha Shan 4900 m, *Dickoré 3532*; aa, bb: Everest, *H.Wager* s.n. **type** K, young / depauperate specimen). **5: C. infuscata** (Bichgari 3200 m, *Gartner* s.n., GZU). **6: C. pseudobicolor** (*Webster & Nasir 6121*, M). **7: C. atrofusca** (*Strachey & Winterbottom 1742* **type** *C. hypsobates*, K). **8: C. cruenta** (Nepal, *Wallich 3389* **type**, K). **9: C. nivalis** (*Dickoré 548*).

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* **Carex nubigena** D. DON 1824 - **Ic.**: Fl.Xizang.5: fig.253. **A**: Hazara. Kashmir 1400-3000 m. **D**: Himalaya (E Afgh., Hazara, Kashmir - Bhutan); China.

* **Carex obscura** NEES in WIGHT 1834 (*Carex tibetica* BOECK. 1888, non FRANCHET 1888) - **A**: Kashmir. Himachal Pr.: Rohtang P., *Aswal 10544* (ASWAL & MEHROTRA 1994). **D**: Himalaya (Kashmir - SE Tibet).

38. Carex oligocarya C. B. CLARKE in HOOKER f., Fl. Brit. India 6: 746. 1894

(non *C. oligocarpa* SCHKUHR ex WILLD. 1805)

Carex annulata KÜKENTHAL 1909, *Carex oligocarya* C. B. CLARKE var. *websteri* RAYMOND 1965

Ic.: **fig. 2** (7).

CS **Biafo:** Karakorum [? near Askole] 3890 m, 1876-08-12, *C.B.Clarke 30436* (K!; CLARKE 1898). **Saltoro:** Upper end of Hushe Vy., E side, above mouth of Chogolisa Gl. (abundant on steep slopes) 12500' [3810 m], 1955-07-22, *Nasir & Webster 6257* (WEBSTER & NASIR 1965, RAYMOND 1965; K!, M! **type** *C. oligocarya* var. *websteri*). Above Hushe 3660 m, *Miehe 1902!*.

W **?Ishkoman:** Imit 3600-3800 m, 1974-07-10, *F.Gartner* s.n. (GZU!, veg.). **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26933* (K!). Naltar Vy., Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!, veg.). Shinghai Gah - Pahot Gali 2910-3550 m, *Miehe 727!; 753!; 789!; 815!; 1425!; 1531!; 1718!* (cf.). Kar Gah 3190 m, *Schickhoff 2090!*. Baghrot Vy. 3520-3960 m, *Miehe 3848!* (cf.); *3858b!; 3923!; 4043!; 4278!* (cf.); above Gutumi Nullah 2980 m, *Schickhoff 527!* (veg.). **Hunza:** Chaprot 3400-3600 m, *G.Braun 619!*. N Chaprot (3150-) 3500-3650 (-4000?) m, *Klötzli & al. 4.119!; 6.20,22!* (cf.); *58.18!; 727.19!* (cf.). Chaprot Vy. 3130 m, *Schickhoff 2128!* (cf.). Rakaposhi N, above Nilt 3470 m, *Miehe 6425!*. Rakaposhi NW & W, opposite Chalt 3570 m, *Miehe 6656!; 6662!*. Minapin 3300-3400 m, 1974-07-22, *F.Gartner* s.n. (GZU!). Minapin Gl., above Hapakund, *Paffen 413* (M!); 2970 m, *Schickhoff 298!* (veg.); 3030 m, *Schickhoff 350!* (veg.). Shispar Vy. 3500-3800 m, *Paffen 231* (M!). Pisan 2900 m, *G.Braun 539!*; 2800-3000 m, 1974-07-24, *F.Gartner* s.n. (GZU!, veg.).

S **Shigar:** Ganto P. E 3600 m, *Miehe 4890!*. Above Gon 3160-3320 m, *Miehe 5020!*. **Skardu:** Ganto P. W 4040 m, *Miehe 4765!*. Pakora, Ganto P. W 3600-3700 m, 1991-07-02/04, *J.Poelt* s.n. ! (yg.). Upper Stak Nala, above Khotia Lungma Gl. 3360 m, *Schickhoff 881!*. Above Bashu 3230 m, *Schickhoff 915a!*.

A: ?Dras: Dras - Skardu 3810 m, 1876-08-18, *C.B.Clarke 30533* (K! **type**; CLARKE 1898).

D: SW Karakorum, NW Himalaya (Gilgit, Hunza, Baltistan). *Endem.*

E: (2800) 2900-4040 m, subalp., frequent in the SW. Shady, usually N-facing, little disturbed forests (*Betula jacquemontii*, *Picea smithiana, Pinus wallichiana*, more rarely *Juniperus excelsa*), on relatively humid open slopes.

N: Closely related to *C. alaica*, but separated geographically. Sometimes difficult to distinguish from and perhaps hybridising with *C. plectobasis*: **Gilgit:** Baghrot Vy. 3690 m, *Miehe 3858c?*. When infested with a smut, the normally flat utricles of *C. plectobasis* become very similar to those of *C. oligocarya*.

39. Carex orbicularis BOOTT, Proc. Linn. Soc. 1: 254. 1845

Carex melanolepis BOECK. 1888, *Carex cyclocystis* BOECK. 1888, *Carex erostrata* BOOTT ex C. B. CLARKE in HOOKER f. 1893, *Carex arcatica* MEINSH. 1901, *Carex taldycola* MEINSH. 1901, *Carex satakeana* KOYAMA 1954, *Carex pakistanica* KOYAMA 1958, *Carex rigida* auct. non GOOD. 1794: HOOKER f. 1894, CLARKE 1898, DEASY 1901, HEMSLEY 1902, FEDTSCHENKO 1903-1915, PAMPANINI 1934, *Carex cespitosa* auct. non L. 1753: var. *vulgaris* et var. *microstachys* REGEL 1880, *Carex glauca* auct. non SCOP. 1772: var. *typica* et var. *brachylepis* REGEL 1880, *Carex vulgaris* auct. non FRIES 1842: CLARKE 1898

Ic.: KÜKENTHAL 1909: fig.46 G-H. Fl.Tadzh.2: fig.22(1-4 subsp. *hissarodarvasica*); (5-8 subsp. *orbicularis*); (9-11 *C. arcatica*). Fl.Xizang.5: fig.252. Fl.Desert.Sin.1: fig.62(5-9).

CN **K2-North:** Muztagh Vy. 3930-3950 m, *Dickoré 847!; 852!*. **Shaksgam:** Upper Shaksgam Vy. 4060 m, *Dickoré 913!*.

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CS **Biafo:** Karakorum [near Askole] 3960 m, 1876-08-10, *C.B.Clarke 30342* (CLARKE 1898). **Nubra:** [Lower] Nubra Vy., 1848-08-04, *T.Thomson* s.n. (K!). Siachen Gl., base camp 4750-4800 m, *Dainelli* (PAMPANINI 1934: "*C. rigida* var. *dacica*" and "*C. orbicularis*"). **Nubra/Upper Shyok:** Sassir P. 5120 m, [1925]-07, *Meinertzhagen* s.n. (BM!).

N **Mustagh Ata:** N 3650 m, *Miehe 5446!; 5451!; 5470!.* 25 km S Bulunkul, Kashgar - Taxkorgan Rd., 1959-06-12, *Junatov* (Pl.As.Centr.). **Yarkand:** 10 km WSW Mazar 3760 m; 3 km W Mazar 3850 m, *Dickoré 342!.*

W **Ghizar:** Diwangal - Ghizar 3900 m, 1957-07-25, *K.Ogino* (KYO! **type** *C. pakistanica*; KOYAMA 1958; KITAMURA 1964). **Ishkoman:** Panji P. S, above Holojut 3800 m, *Miehe 6904!.* **Gilgit:** Gilgit, *Giles 197* (CLARKE 1898). Naltar Lakes 3660 m, *R.R.Stewart 26925* (K!); 3170 m, *Schickhoff 52!.* **Batura:** Khaibar 2800 m, *Klötzli & al. 802.76!.*

S **Leh:** Keenaoots [Kinutse] in Rondu, 1847-07-13, *Winterbottom 511(894)* (K!). Kardong P. (STEWART 1916). Fotu P. 3960 m, *B.B.Osmaston 22* (K!: dwarf specimens). Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.!. Kartse 4100 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!.

E **Upper Shyok:** [Sassir - Murgai], 1848-08-15, *T.Thomson* s.n. (K!).

A: W Kashg.: Kashgar 1330 m, 1935-05-12, *Persson 634* (PERSSON 1938); 12 km S Upal, Kashgar - Taxkorgan Rd., 1959-06-11, *Junatov* (Pl.As.Centr.). S Kashg.. Kongur: Chumbus Rv., Kosh-Terek, 1909-06-06, *Divnogorskaya.* Kenkol Rv., Tom-Kara 1909-06-14, *Divnogorskaya.* Kanlyk Rv. 2500-3200 m, 1942-07-12, *Serpukhov* (Pl.Centr.As.). W Kunlun: Tiznap Vy., N Kudi 3080 m, *Miehe 7544!*; Upper Tiznap Vy. 3650 m, *Miehe 8539!.* C.Kunlun: Muzlyk-Atas Mts., Muzlyk Rv. 3300 m, 1890-08-16, *Roborovsky.* W Pamir, E Pamir 1500-4300 m (Fl.Tadzh.). Wakhan: 2740 m, *Giles 87* (CLARKE 1898); 3040-4400 m (PODLECH & ANDERS 1977). Chitral. Astor: Suti Suce - Das Kurrum [Das Kirim, below Burzil P.], 1847-07-01, *Strachey & Winterbottom 662*; *675* (K!). Descent from Deotso [Deosai] to Das Kirim, *Winterbottom 511(807)* (K!). Rama Vy. SW Astor 3510 m, *Lankester & Pearson 1493* (BM!). Kalapani 3010 m, *Schickhoff 1293!; 1295!.* Lower Rupal Vy., Gageh 3080 m, *Nüsser 767!;* Tarishing, 2910 m, *Nüsser 749!.* Deosai: 3960 m, *C.B.Clarke 29825* (CLARKE 1898); 3900 m, 1925-08, *Meinertzhagen* s.n. (BM!); 3800-3900 m, *Miehe 2225!.* Shingo Vy., near Gulteri 3050-3350 m, *R.R. & I.D.Stewart 22228* (K!). Dras: Mitsahoi - Matayan, 3350-3660 m, *R.R.Stewart 10013* (K!). Suru: Middle Wakha Vy. 3600 m, *H.Hartmann 2592!.* Rangdum 3960 m, *B.B.Osmaston 25* (K!). Swat: C5 (Takatari) - C6 (Pitchar) 4000 m, *K.Honda 214* (KYO!). Hazara: Kaghan Vy., Babusar P. 4000-4200 m, *Miehe 576!.* Kashmir: Burzil P., 3050-3660 m, *C.B.Clarke 29612; 29614; 29711* (CLARKE 1898). Badarwar, just N of Chumba, 2.6/48, *T.Thomson* s.n. (K!). Himachal Pr.: Khoksar, *Aswal 10236*; frequent (ASWAL & MEHROTRA 1994). Rupshu: Kyung Tso 5030 m, *Koelz 2245* (K!: "var. *exigua* KÜKENTHAL; in wet sand, in masses"; very reduced 2-3 cm high specimens with single spikes). Starsa Puk Tso 4550 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!. Grassy plain [Parang P. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!). W Tibet: Laptel 4420 m, *Strachey & Winterbottom 1714* (CLARKE 1898; K!); 4570 m, *Strachey & Winterbottom 12* (CLARKE 1898; K!). Laptel to Selchell, *Schlagintweit 7042* (BM! **type** *C. cyclocystis*).

D: C. Asia, Siberia, Mongolia; Altai, Tian Shan, Pamir-Alai, Hindukush, Karakorum, Kashmir, Himalaya (Afgh. - Nepal), Tibet, Qinghai (subsp. *orbicularis*). **Map:** Pl.As.Centr. 3: map 7. *Centr.As.*

E: (2800) 3170-4100 (5120) m, subalp. (-alp.), scattered, locally common. Wet habitats: community-building in flushes and fens, on margins of *Kobresia schoenoides* naka moors, in *Salix pycnostachya* scrub (with *Carex melanantha, C. microglochin*). Dwarf forms in moist grazed turf, on lake-shores and between *Kobresia schoenoides* tufts.

N: The very variable taxon is treated and discussed in a wide species-concept in Pl.As.Centr. (see for synonyms). The Karakorum plants represent subsp. **orbicularis**. *Carex orbicularis* BOOTT subsp. *kotschyana* (BOISS. & HOHENACKER) KUKKONEN 1984 (*Carex kotschyana* BOISS. & HOHENACKER 1854) is a western plant, occuring from Turkey to Iran: Semnan, Kerman, Luristan (KUKKONEN 1984). *Carex orbicularis* BOOTT subsp. *hissarodarvasica* OVCZ. & CZUK. 1963, from W Pamir appears to be somewhat intermediate between these.

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40. Carex pamirensis C. B. CLARKE, Kew Bull., Add. ser. **8**: 87. 1908

Carex vesicaria L. var. *pamirica* O. FEDTSCH. 1903, *Carex pamirica* (O. FEDTSCH.) B. FEDTSCH. 1908, *Carex obscuriceps* KÜKENTHAL 1909, *Carex vesicaria* L. var. *alpigena* B. FEDTSCH. 1924, *Carex vesicaria* auct. non L. 1753: CLARKE 1898, *Carex rostrata* auct. non STOKES in WITH. 1787: CLARKE 1898

Ic.: Fl.Tadzh.2: fig.32.

CS **Baltoro:** Paiju, near snout of Baltoro Gl. 3300 m, *Nakao* s.n. (KITAMURA 1964).

W **Ghizar:** Diwangal - Ghizar 3650 m, *Honda 160* (KITAMURA 1964).

S **Pangong:** Shushal 4330 m, *Koelz 2433* (K!).

A: E Pamir (Fl.Tadzh.). Wakhan 3110-4200 m (PODLECH & ANDERS 1977!). Chitral: Baroghil P. 3960 m, *Stainton 2994* (W!). Astor: Rama 3050 m, *Nasir & Webster 6441* (K!). Deosai: 4110 m, *C.B.Clarke 29822* (CLARKE 1898); 3960 m, *R.R.Stewart 20048* (K!). Dras: Dras Vy., below Matayan 3050-3350 m, *Duthie 11728* (K!); *13696* (K!). Chatpani Nala 3660-3960 m, *Duthie 13868* (K!). Suru: Above Rangdum 3350 m, *Koelz 2938* (K!); Rangdum 3960 m, *B.B.Osmaston 24* (K!). Hazara: Kaghan Vy., below Gittidas 4300 m, *F.Schmid 492* (BM!). Kashmir: Kishenganga Vy., *Winterbottom 603* (K!). Zoji P., 1848-09-27, *T.Thomson* s.n. (K!). Gurais 2440 m, *C.B.Clarke 29484* (K!). Margan P. 3510 m, *W.S.Atkinson* (K!; CLARKE 1898). Himachal Pr.: Near Kandang, *Drummond 24145* (K!). Khoksar, *Aswal 11090* (ASWAL & MEHROTRA 1994).

D: Dzungaria, C. Tian Shan, E Pamir-Alai, Hindukush, S Karakorum, Himalaya: Afgh. (Nuristan) - Bhutan. *W Centr.As.*

E: 3300-4330 m, subalp., rare in the S Karakorum. Wet habitats, *Salix*-groves on river gravel, shallowly flooded lake shores.

N: Records of *Carex rostrata* STOKES and *Carex vesicaria* L. from W Himalaya (CLARKE 1898) apparently entirely refer to *C. pamirensis*. In Afghanistan and perhaps elsewhere, *C. pamirensis* locally seems to intergrade with *C. songarica*. A second record of *C. pamirensis* from **Baltoro** Paiju 3480 m (HARTMANN 1966) is transferred to *C. songarica*.

41. Carex parva NEES in WIGHT, Contr. Bot. India 120. 1834

Kobresia parva (NEES) WANG & TANG ex Y. C. YANG 1987

Ic.: Fl.Tadzh.2: fig.26(6-9).

N **Mustagh Ata:** N 3650 m, *Miehe 5458!* (with *C. microglochin*).

W **Ishkoman:** Panji P. S, above Holojut 3800 m, *Miehe 6911!* (with *Trichophorum pumilum*).

A: E Pamir (Fl.Tadzh.). Kashmir: Burzil P., *Winterbottom 635* (CLARKE 1898; K!); 3960 m, *R.R.Stewart 22054a* (K!). Yamhar P., *R.R.Stewart 12443* (K!). Rupshu: Hanle 4360 m, *Koelz 2313* (K!).

D: Mongolia, Dzung., Tian Shan, Pamir-Alai, Afgh. (Bamian: Koh-i-Baba), Kashgaria, Karakorum, S Tibet, Himalaya, China. *Centr.As.*

E: 3650-3800 m, subalp., rare. Fens and wet turf (*Carex orbicularis*), among *Kobresia schoenoides* tufts. Often with *C. microglochin*, but perhaps preferring more humous situations with ± constant water-supply.

N: The racheola does not protrude from the 7-8 mm long utricles in *C. parva*, whereas it is exserted even at a very young state from the c. 5 mm long utricles in *C. microglochin*. Ecologically, the requirements of both species are rather similar, but *C. parva* appears to be confined to localities with a more constant and less salty water-supply. Accordingly it is not reported from C. Tibet.

42. Carex plectobasis V. KRECZ., Not. Syst. (Leningrad) **9**: 192. 1946

Carex tenuis NEES in WIGHT 1834 non HOST 1809, *Carex hirtella* DREJER 1844 non J. F. GMELIN 1791,

Ic.: KÜKENTHAL 1909: fig.92 (*C. hirtella*). **Fig. 2** (4).

CS **Shimshal:** Upper Shimshal, Zardgar Bin 3900-4050 m, *Miehe 5978!; 5996!*. Shachmirk P. W 4030-4440 m, *Miehe 6006!*. **Biafo:** Ste Ste - Gense 3380 m; 3520 m; Gense Blok 3780 m; Drinsang 3630 m, *H.Hartmann 278* (Z!); *279!*; 3730 m, *H.Hartmann 275!*; Cho Blok 4120 m, *H.Hartmann 282!*; 4180

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m; 4200 m, *H.Hartmann 281* (Z!); Laskam 4120-4610 m; Mango 3780 m, *H.Hartmann 276* (Z!); 3850 m (HARTMANN 1966). Karakorum [? near Askole], 1876-08-12, *C.B.Clarke 30438* (K!, cf., smutted). **Baltoro:** Paiju, near snout of Baltoro Gl. 3300 m, *Nakao* s.n. (KITAMURA 1964). **Saltoro:** Chogolisa Gl. N, base of cliffs 3660 m, *Nasir & Webster 6004* (WEBSTER & NASIR 1965, RAYMOND 1965).

W **Yasin:** Panji P. N 4170-4180 m, *Miehe 4985!*. **Ishkoman:** Pekova 3960 (-4420) m, *Bowes Lyon 8231* (K!). Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). Upper Ishkoman, Baru Gah 3450-3850 m, *Miehe 6781!; 6854!*. **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26934* (K!, smutted). Shinghai Gah - Pahot Gali 3610-4050 m, *Miehe 841!; 1185!*. Baghrot Vy. 3690-3920 m, *Miehe 3768!; 3858a!; 4252!; 4570!*. **Hunza:** Baltar 3600 m, *Paffen 160* (M!). N Chaprot (3400-) 3500-3650 (?-4400) m, *Klötzli & al. 4.20!; 58.21!; 726.16!; 728.47,55!*. **Hispar:** 4 miles NW Hispar Village 3960 m, *O.Polunin 6331* (B!, BM!). **Batura:** Gulmit - Atabad 4040-4260 m, *Miehe 2730!* (cf.); *2806!* (cf.); *2849!* (cf.). Khaibar 4000 m, *Miehe 2596!; 2610!*. W Khaibar (? 2500-) 3300-3920 m, *Klötzli & al. 29.27!; 78.04,10!; 802.02,19,47!*. E Morkhoon 3910-4300 m, *Klötzli & al. 39.03,05!; 101.10!; 105.02!*.

S **Shigar:** Matumdus, Ganto P. E 3620 m, 1991-07-06, *J.Poelt* s.n.!. **Skardu:** Ascent to Deotsoo [Deosai] from Skardu, 1847-07-22, *Winterbottom 863* (K!); *864* (K!; CLARKE 1898). Tormik Vy., Ganto P. W 2900 m, 1991-07-01, *J.Poelt* s.n.!. Ganto P. W 3000-4040 m, *Miehe 4661!; 4732!; 4734!; 4765!*.

A: Chilas: Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1340!*. Deosai: Shingo Vy. below Deosai 3050-3350 m, *R.R.Stewart 22225* (K!). Dras: S above Matayan 3550 m, *H.Hartmann 2373!*. Zanskar: Gamburanjon 4350 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Hazara: Kaghan Vy. Kashmir: common 2900-4270 m. Zoji P. 3050 m, *R.R. & I.D.Stewart 22367* (K!). Sind Vy., near Baltal 3050-3350, *Duthie 11624* (K!). Above Gulmarg, *R.R.Stewart 10520* (K!). Pir Panjal 3050 m, *C.B.Clarke 28838* (BM!). Alibad 3200 m, *C.B.Clarke 28893* (BM!). Margan P. 2900 m, *C.B.Clarke 24173* (K!). Liddar Vy., Pahlgam 3350-3660 m, *R.R.Stewart 21799* (K!). Himachal Pr.: Kunawur, "supra Pangi", *Jacquemont 1415* (K!). Sissu - Gondhla, *Aswal 10472* (ASWAL & MEHROTRA 1994).

D: S Karakorum, W Himalaya: E Afgh. (Nuristan) - Nepal. *W Himal.*

E: (2400) 3300-4300 (4610) m, subalp.-alp., common in the SW. Alpine turf (*Kobresia capillifolia*) and subalpine scrub steppes, more rarely in *Salix karelinii* scrub.

N: Literature records of "*C. hirtella*" may include *C. oligocarya* from relatively low altitudes and *C. alexeenkoana* (? HARTMANN 1966) from high altitudes. **Carex pachyrrhiza** FRANCHET 1895, **Ic.:** Fl.Xizang.5: fig.240, **fig. 2** (5), from S & E Tibet and W China (Gansu, Qinghai, Xizang, Sichuan, Yunnan) appears to come very close to the W Himalayan *C. plectobasis*. Apart from the somewhat less flattened utricles and the fewer male spikes in *C. pachyrrhiza*, there may be few other characters which justify a specific distinction of the W Himalayan plants.

43. Carex pseudobicolor BOECK., Cyp. Nov. 1: 44. 1888

Carex alpina SWARTZ var. *erostrata* BOOTT 1885, *Carex alpina* SWARTZ subsp. *infuscata* var. *erostrata* (BOOTT) KÜKENTHAL 1909, ? *Carex atrofurfur* KOYAMA 1956

Ic.: **fig. 3** (6).

CS **Saltoro:** Ghondakoro Gl. 3960-4110 m, *Nasir & Webster 6121* (WEBSTER & NASIR 1965, RAYMOND 1965; K!; W!).

W **Ghizar:** Camp 7 - Camp 8 [Dadarili P. - Amberzth] 3650 m, *K.Honda 204* (KYO!; KITAMURA 1964: *C. infuscata*). **Yasin:** Darkot SW side 3510 m, *Bowes Lyon 8138* (K!). Naz Bar 4150 m, *Miehe 3448!* (utricles dark); 4400 m, *Miehe 3084!*. **Gilgit:** Shinghai Gah - Pahot Gali 3950 m, *Miehe 1187!*. Baghrot Vy. 4270-4340 m, *Miehe 3717!; 3720!; 3810!* (cf.); *4132!;* 3780 m, *Nüsser 1228!*. **Hunza:** Minapin Gl. 3510 m, *Lloyd & Megan 64* (BM!). N Chaprot 3530 m, *Klötzli & al. 728.12!*; (3600-4400 m), *Klötzli & al. 728.54!*. Rakaposhi N, above Nilt 3900 m, *Miehe 6594!*. **Hispar:** Hispar Gl., near Kanibassar Gl. 4420 m, *R.Scott Russell 1567* (BM!).

S **Shigar:** Kero Lungma Gl., right bank 3960 m, *R.Scott Russell 1851* (BM!).

Unloc.: Himalaya occ., *Schlagintweit 8643* (BOECKELER 1888: **type** *C. pseudobicolor*).

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A: Chilas: Middle Pattaro Vy. 3950 m, *Nüsser 1355!*. ?Swat: Batain above Ushu 2740 m, *R.R.Stewart & A.Rahman 25292* (W!: *C. infuscata* X *C. pseudobicolor* ?). Kashmir: Nichinai Vy., 22 km NW Sonamarg 3400 m, *C.C.Townsend 87/208* (K!). Himachal Pr.: Bara Lacha P. 5030 m, *Koelz 6813* (W!). Marrhi.
D: ?Hindukush, W Himalaya (?Swat - Nepal, Sikkim). *W Himal.*
E: 3510-4420 m, (subalp.) - alp., scattered in the SW. Moist turf with long snow cover (*Kobresia nitens*, *Carex nivalis*), near snow-patches and meltwater-streams, more rarely in flushes; "common in mud, wet flats along lateral moraine" (*Nasir & Webster 6121*).
N: See under *C. infuscata*. Apparently rare in Kashmir.

* **Carex pseudocyperus** L. 1753 - **A**: Kashmir: 1830-2130 m. Pir Pinjal 3350 m, *H.C.Levinge* (K!; CLARKE 1898). **D**: Temp. N hemisphere.

44. Carex pseudofoetida KÜKENTHAL, Bot. Tidsskr. **28**: 225, pl. 1. 1908

Carex incurva auct. non LIGHTF. 1777, *Carex maritima* auct. non GUNN. 1772: Ann.Cat.Pak., *Carex vulpinaris* NEES var. *pseudofoetida* Y. C. YANG in C. Y. WU 1987

Ic.: Fl.Tadzh.2: fig.21(5,6). HARTMANN 1990: fig.7. **Fig. 1** (4).

CN **Braldu:** Pamir P. S, near Shuwart 4550-4770 m, *Miehe 6100!; 6109!; 6132!* (veg.). **K2-North:** Muztagh Vy. 3930-3950 m, *Dickoré 620!; 876!; 896!.*

CS **Shimshal:** Pamir P. 4700-4860 m, *Miehe 6290!* (veg.); *6304!; 6326!* (very dwarf); *6340!; 6363!.* **Nubra:** [Sassir P. W], 1848-08-12, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** Little Karakul Lake 3720 m, 1894-07-15, *S.Hedin* (OSTENFELD 1922); 3600 m, *Miehe 5477b; 5479!.* Mustagh Ata N 3650 m, *Miehe 5451!; 5471!*; W 4340-4380 m, *Miehe 5506!; 5595!*; SW 4460 m, *Miehe 5905!; 5916!.* **Yarkand:** Mazar P. S 4910 m, *Miehe 8343!.* Yarkand Vy. (Raskem Rv.), Mazar, 1959-06-04, *Junatov* (Pl.As.Centr.). E Mazar 3800-3900 m, *Miehe 7821!*; W below Yarkand / Karakash P. 4670 m, *Miehe 8338!.* Aghil P. N 4560-4800 m, *Dickoré 531!; 547!; 582!.* **Karakash:** W Xaidulla 4310-4840 m, *Miehe 7845!; 7848!; 7851!; 8278!; 8309!.* Karakash, Upper Hotan Rv., 15 km E Kirgiz-Dzhangil, Rd. to Xaidulla, 1959-06-02, *Junatov*; 4500 m, *Li & al. 469* (Pl.As.Centr.).

W **Yasin:** [?]Yaltar 3600 m, *Nakao* s.n. (KITAMURA 1964). Naz Bar 4460 m, *Miehe 3141!.* **Hispar:** Gharesa Gl. base camp, 13 miles E Nagar 4820 m, *O.Polunin 6210* (B!; BM!). **Khunjerab:** Khunjerab P. SW 4500-4750 m, *Klötzli & al. 112.02,08!; 115.04!, 130/131.21*(*C. pseudofoetida* X *C. stenophylla* ?),*25!; 807.27!, Miehe 2268!; 2303!; 2414!; 2422!; 2473!; 2483!.*

S **Shigar/Lower Shyok:** Thalle P. 4570-4880 m, *R.R.Stewart 20749* (K!). **Skardu:** Ganto P. W 3530 m, *Miehe 4856!* (very dwarf). Burji P. 4420 m, *C.B.Clarke 29842* (K!). **Leh:** Stok - Stok Phu 4000 m, *H.Hartmann 2596!.* Stok Phu 4700 m, *H.Hartmann 2595!.* W above Matho 4900 m, *H.Hartmann 2371!.* Himis Shukpa 3680 m, *Holzner & Kriechbaum* s.n.!. Khardong P. N of Leh 4270 m, *Ludlow & Sherriff 8400* (BM!). **Shyok:** [Calzar], 1848-07-23, *T.Thomson* s.n. (K!). Above Chortren Chen 5180 m, *Koelz 2663* (K!).

E **Upper Shyok:** [Sassir P. - Murgai] 1848-08-15, *T.Thomson* s.n. (K!). [Murgai], 1848-08-22, *T.Thomson* s.n. (K!).

Unloc.: N Kashmir to Karakorum 3660-4880 m (Zanskar, Parang Vy., Piti, Nubra), *T.Thomson* (CLARKE 1898). Yarkand Exp., 1870-09-10, *Henderson 781 "Elyna capillifolia"* (K!).
A: Kongur: Turugart, URSS-China border 3500 m, 1959-06-20, *Junatov*; Kashgar - Turugart Rd. 3500 m, 1959-06-20, *Li & al. 9744* (Pl.As.Centr.). W Kunlun: Tiznap Vy., N Kudi 3080 m, *Miehe 7545!*; W Kudi 4410 m, *Miehe 8402!*; Upper Tiznap Vy. 3960-4000 m, *Miehe 7607!; 7728!*; Mazar P. N 4300-4880 m, *Miehe 7806!; 7811!; 8370!; 8569!.* Keria Mts., Kjuk-Egil Rv. 3750-3900 m, 1885-07-11, *Przhevalsky*. C.Kunlun: Muzlyk-atas Mts. 3300-3900 m, 1890-08-15, *Roborovsky*. Przhewalsk Mts., N slope 4200 m, 1890-08-19, *Roborovsky*. W Pamir, E Pamir 2400-4300 m (Fl.Tadzh.). Wakhan 4000-4500 m (PODLECH & ANDERS 1977); Sabazkatsch Vy. S Kotale Wazit 4700 m, *Breckle 1381* (hb. Podlech!). Chitral: Lutkoo 3660 m, *Toppin 257A* (K!, cf.). Astor: Lower Rupal Vy., Tarishing, 2910 m, *Nüsser 781!.* Rama Vy. 3180 m, *Nüsser 897!.* Latobo Plain, Upper Rupal Vy. 3540

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m, *Nüsser 726!*. Deosai: Deosai 3860-4050 m, *Miehe 2118!* (cf.); *2174!* (cf.); 3660 m, 1925-08, *Meinertzhagen* s.n. (BM! p.p., with *Kobresia karakorumensis*). Deosai E 4290-4300 m, *Miehe 5157!*; 3950-4000 m, 1991-07-14/16, *J.Poelt* s.n.!. Chota Deosai, Rd. to Skardu 3960 m, *R.R.Stewart 19940* (K!). Ascent Burji P., Deosai side 4420-4570 m, *R.R.Stewart 20013* (K!). Dras: Chatpani nullah, W Dras 3960 m, *Duthie 13887* (K!). Suru: W above Sankoo 3880 m, *H.Hartmann 2373!*. Wakha Vy., SE Mulbekh 3600 m, *H.Hartmann 2597!*. Zanskar: [Umasi P. S], 1848-06-20, *T.Thomson* s.n. (K!). [Umasi P.] 2.6/48 [1848-06-20/23], *T.Thomson* s.n. (K!). Chumikmarpo 4110 m, *Koelz 5349* (W!). Kanda P. S 4880 m, *H.Hartmann 2594!*. Markha Vy., Nimaling 4750 m, *H.Hartmann 3005!*; 5170 m, *H.Hartmann 3006!*. Kongmaru P. SW 5100 m, *H.Hartmann 3004!*. Pensi P. 4350 m, *H.Hartmann 2593!*. Serchu 3960 m, *Bor 15046* p.p. (K!). Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Hazara: Kaghan Vy. Kashmir: [Pampur - Avantipur], 1848-05-03, *T.Thomson* s.n. (K!). Gadasar 3500 m, *C.C.Townsend 89/273* (K!). Himachal Pr.: Parang Vy., 1847-09-11, *T.Thomson* s.n. (K!). Bara Lacha P. 4880 m, *N.L.Bor 15443* (K!); 5030 m, *Koelz 6822* (W!). Lahul, Jispa 3200 m, *Koelz 2052* (K!). Patseo, *Bor 15161* (DD; ASWAL & MEHROTRA 1994).

D: Altai, Tian Shan, Pamir-Alai, Kashgaria, Kunlun, Hindukush, Karakorum, W Tibet, Himalaya (Afgh. - Bhutan), ?SE Tibet (subsp. *pseudofoetida*). **Map:** Pl.As.Centr.3: map 6. *W Centr.As.*

E: (3530) 3600-4910 (5180) m, (subalp.) - alp., common in the N, scattered to locally frequent in the W & S, rare in the E & C.Karakorum. Alpine turf and steppes on moraines, gravel and deflation pavements, up to the lower subnival belt (*Carex borii*), locally dominant on somewhat wet periglacial turf. Zonally lacking in the most continental areas (Mustagh Ata, K2-North), but present and also sometimes dominant in subalpine groundwater habitats, turf on riverside sands and in fens (*Kobresia schoenoides, Carex microglochin, Blysmus compressus*).

N: The complex around **Carex maritima** GUNN. 1772 (*Carex incurva* LIGHTF. 1777; non *Carex maritima* O. F. MUELLER 1777) is a most difficult one in Tibet and presents an extensive variation, but few clear-cut characters. Although the three taxa distinguished here (*C. curaica, C. pseudofoetida, C. sagaensis*) usually appear to be distinct, they may represent little more than extremes of a very wide eco-geographical variation. *C. pseudofoetida*, a widespread plant of alpine turf and subalpine flushes, is substituted by the dwarf *C. sagaensis* on the high alpine Tibetan Plateau. On the other hand, *C. curaica* is a tall plant which occurs in flushes of the most continental inner Karakorum ranges. Although still very variable in its dimensions, the vast majority of the specimens from the Karakorum and adjacent regions as cited above match exactly the type of *C. pseudofoetida*: [NE Iran, Prov. Kerman,] Kuh-i-Lalesar, in regione alpina, 3600 m, 1892-07-16, *Bornmüller 4801* (B! **holotype**). The **type** of *Carex pseudofoetida* KÜKENTHAL subsp. *afghanica* KUKKONEN 1984: from Wakhan probably belongs to *C. enervis* (see there), and at least is different from the Karakorum plants. **Carex pseudofoetida** KÜKENTHAL subsp. **acrifolia** (V. KRECZ.) KUKKONEN 1984 is a western plant, which occurs from Caucasus to the Elburz Mts. (KUKKONEN 1984). The circumarctic *C. maritima* GUNN. (*C. incurva* LIGHTF.), **Ic.: fig. 1** (6), differs in the suborbicular female bracts and larger utricles. Records of this from the Himalaya, Karakorum and Tibet may refer to *C. pseudofoetida* or *C. sagaensis*. *C. stenophylla* usually grows at lower altitudes, but its delimitation against *C. pseudofoetida* sometimes also presents problems. Records of *C. pseudofoetida* from **Biafo** of HARTMANN (1966), partly corrected by HARTMANN (1984), are here transferred to *C. stenophylla*.

* **Carex psychrophila** NEES in WIGHT 1834 - **Ic.**: KÜKENTHAL 1909: fig.97 A-E. **A**: Chitral: Shishi Gol, E of Drosh 2130 m, *Stainton 2378* (W!). Zanskar 2440-3660 m, *T.Thomson* (C. B. CLARKE 1898). Kashmir (common). **D**: Himalaya (Kashmir - W China). **N**: Primarily a plant of the humid outer Himalaya. A record from **Gilgit** (Ann.Cat.Pak.) probably is erroneous since a specimen under this name is *C. infuscata*.

* **Carex remota** L. subsp. **stewartii** KUKKONEN 1984 - **Ic.**: KUKKONEN 1984: fig.4b. **A**: Chitral. Swat: Near Kulali 6000' [1830 m], 1952-08-19, *R.R.Stewart 24557* (RAW **type**; KUKKONEN 1984). ?Hazara. ?Kashmir. **D**: W Himalaya: Afgh. (Nuristan) - NW India (Uttar Pradesh: Garhwal). **N**: **Carex remota** L. subsp. **remota** is reported to occur eastwards to Iran: Khorasan (KUKKONEN 1984). **Carex remota** L. subsp. **rochebrunii** (FRANCHET & SAVAT.) KÜKENTHAL 1909 (*Carex rochebrunii* FRANCHET & SAVAT. 1879; *Carex remota* L. var. *rochebrunii* (FRANCHET & SAVAT.) C. B. CLARKE 1878, *Carex monopleura* V. KRECZ. 1937) occurs in the C. & E Himalaya (Nepal - SE Tibet), China, Japan.

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45. Carex sagaensis Y. C. YANG, Fl. Xizang. 5: 439. 1987

Carex incurva auct. non LIGHTF. 1777: C. B. CLARKE in HOOKER f. 1894 p.p.

Ic.: Fl.Xizang.5: fig.256. **Fig. 1** (3).

N **Karakash:** W Xaidulla 4900-5250 m, *Miehe 8296!*. SE Dahongliutan 4650-5240 m, *Miehe 7881!; 7882!; 7888!; 7901!; 7902!; 8261!*.

S **Leh:** Kartse 4130 m, 1992-07-21, *Holzner & Kriechbaum* s.n.! (cf.). Taglang P. 4900 m, *Holzner & Kriechbaum* s.n.! (cf.).

E **Aksai Chin:** 5000 m, 1927-09-04, *Bosshard* (Z!; SCHMID 1932: "*C. stenophylla*"); 4950-5160 m, *Miehe 8045!; 8052!; 8239!*.

A: ?Zanskar: [Phutaksha P. - Hanupata, (3960-4880 m)], 1848-07-04, *T.Thomson* s.n. (K! det. uncertain, may also be *C. pseudofoetida*). Rupshu: [Hanle Plain], 1847-09-14, *T.Thomson* s.n. (K!). Kyung Tso 5030 m, *Koelz 2244* (K!: "*C. pseudofoetida* var. *leptorhizodes*"); *2247!* (K!). Nuruchan 4650-4680 m, *Holzner & Kriechbaum* s.n.!. W Tibet: Upper Domar Vy. 5100-5320 m, *Miehe 7926!; 7942!; 7960!; 8012; 8071!*. S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9660c!*. NW Gar (N 32°24' E 79°44') 4400 m, *Miehe+9661b!*. E Shiquanhe (N 32°26' E 81°00') 4500 m, *Miehe+9666b!*. E Wuma (N 32°34' E 83°22') 4790 m, *Miehe+9681a!*. Garyarsa - Moincer, Indus-Sutlej divide (N 31°24' E 80°38') 4750 m, *Miehe+9654a!* (cf.). N Moincer (N 31°15' E 80°15') 5050 m, *Miehe+9639a!;* 5500 m, *Miehe+9640a!*. S Manasarovar Lakes, Upper Burang Vy. (N 30°26' E 81°07') 4290 m, *Miehe+9637b!*. Changtang: Lungmo Co 5100-5350 m, *Miehe 8053!; 8117!; 8191!; 8196!*.

D: Tibet: W (NE Karakorum, Changtang), C. (Tangula Shan), S & SE (Upper Tsangpo Vy., Nyainqentanglha Shan, Tibetan Himalya: Yamdruk, Pomo Co, Lhünze); imperfectly known. *Tibet.*

E: (4130) 4650-5250 m, subniv., locally common in the extreme E Karakorum / Tibetan Plateau. Alpine desert (*Kraschenninnikovia compacta*) on permafrost slopes, usually on slightly inclined, often salty, water-saturated patterned ground, often forming one species-aggregations; in flushes (*Kobresia pygmaea*).

N: A tentative determination, since the variation of the recently described taxon and its relation to other species of the *C. maritima* complex is unknown. *C. sagaensis* comes very close to the circumarctic *Carex maritima* GUNN., but differs in the smaller utricles which are ± toothed towards the short beak. The specimens from NE Karakorum, West Tibet, and others from Tangula Shan and Nyainqentanglha Shan (leg. *Dickoré*) are usually distinct, but sometimes difficult to distinguish from *C. pseudofoetida*, and they perhaps intergrade (NE Karakorum ?) with this species.

* **Carex sanguinea** BOOTT 1846 (*Kobresia sanguinea* (BOOTT) RAYMOND 1965 - **A**: Swat: Khawazakhiela - Shangla (1300-1900 m), *Rechinger 30598* (W!). ?Hazara. Kashmir. **D**: W Outer Himalaya: Afgh. (Kurram, Laghman, Nuristan) - N Pakistan, Kashmir. **N**: Superficially close to *Kobresia laxa*, and occasionally confused with this.

* **Carex schlagintweitiana** BOECK. 1888 (*Carex setigera* D. DON var. *schlagintweitiana* (BOECK.) KÜKENTHAL 1909 *Carex inanis* KUNTH var. *schlagintweitiana* (BOECK.) KOYAMA 1978) - **A**: Hazara. Kashmir: 2130-2440 m. Banihal P., *Henderson 249* (K!; "*C. haematostoma*"). Near Taulipir 2130-2440 m, *R.R.Stewart 25627* (BM!). **D**: W Himalaya (Hazara, Kashmir, - Kumaon). Himachal Pr.: *Schlagintweit 5050* (BM! **type**). **N**: A species of the humid Outer Himalaya. The record from Yarkand (KÜKENTHAL 1909) is erroneous, since the specimen (Yarkand Exp., *Henderson 249*) was collected in Kashmir. *C. schlagintweitiana* is closer to *C. inanis* than to *C. setigera*, but differs specifically from both.

* **Carex setigera** D. DON 1824 - **A**: Reported from Kashmir. **D**: Himalaya (Kashmir - Bhutan).

46. Carex setosa BOOTT, Illustr. Carex **3**: 108, pl. 327-329. 1862

W **Gilgit:** Naltar Lakes 3350 m, *R.R.Stewart 26931* (BM!); 3660 m (K!). Naltar Vy., above Bichgari 3120 m, *Schickhoff 23!*.

A: Hazara: Kaghan Vy. 3780 m, *Inayat 20280* (K!). Saiful Maluk, *Shaukat Ali 181* (K!). Kashmir: Upper Kishenganga, Sansangar, *Inayat 23280* (K!). Sind Vy., Baltal 2740-3050 m, *Duthie 11585* (K!). Khillanmarg above Gulmarg 3350 m, *R.R.Stewart 8681* (K!). Nichinai Vy., c. 22 km NW Sonamarg

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3400 m, *C.C.Townsend 87/210* (K!). Sonamarg 3660 m, *R.R.Stewart 9180* (K!). Above Pahlgam 2290 m, *C.R.Lancester 83* (BM!). Pir Panjal 3050 m, *C.B.Clarke 28857* (BM!); 3350 m, *C.B.Clarke 28883* (K!). Fras Nag 2740-3050 m, *R.R.Stewart 23243* (K!). Himachal Pr.: Lahul, Koksar 3660 m, *Bor 12269* (DD, K!; ASWAL & MEHROTRA 1994). W Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!.

D: Himalaya (SW Karakorum, Hazara, Kashmir - Sikkim), ?SW China. *W Himal.*

E: 3120-3660 m, subalp., rare. *Pinus wallichiana* forest (*Schickhoff 23*), probably extrazonal water-surplus habitats. On humid alpine turf and moist rock ledges in Kashmir.

N: Although this widespread Himalayan species is usually very distinct by its narrow spikes with red-brown female glumes, it shows some variability. Plants from the W part of its distribution area usually have less distinctly and shorter beaked utricles with a shorter, denser indumentum than the type. It occurs together with *C. karoi* in the Karakorum; both species are very similar in habit. *C. karoi* may be distinguished by the paler glumes and the utricles which are hairy only along the beak.

? 47. Carex songorica KAR. & KIR., Bull. Soc. Nat. Moscou **15**: 525. 1842

Carex fedtschenkoana KÜKENTHAL 1910, *Carex heterostachya* auct. non BUNGE 1832: KÜKENTHAL 1909

Ic.: Fl.Desert.Sin.1: fig.58(9-11).

CS **?Baltoro:** Paiju 3480 m, *H.Hartmann 284* (Z!); *285!* (HARTMANN 1966: "*C. pamirensis*").

A: E Pamir (Fl.Tadzh.). Astor: Kalapani 3010 m, *Schickhoff 1287!*. Dras: Dras Vy., below Matayan 3050-3350 m, *Duthie 13702* (BM!, K!; CLARKE 1898). Suru: Paskyum 2830 m, *B.B.Osmaston 19* (K!). Kashmir: Gurais - Burzil 2440-2740 m, *C.B.Clarke 29484; 29605* (BM!, K!; CLARKE 1898).

D: Caucasus - Siberia, Mongolia; Tian Shan, Pamir, Afgh. (Bamian, Parwan, Baghlan, Takhar, Kabul, Kunar), S Karakorum, SW Ladakh, Kashmir. *Ir.-Tur.*

E: ? 3480 m, mont., rare in the S Karakorum. Wet habitats.

N: The specimens *Hartmann 284; 285* are referred to here on account of the small (2.5 mm long), shortly beaked utricles. The material, however, is too young and not typical. *C. songorica* is common in many parts of Afghanistan. It seems to intergrade locally with *C. pamirensis* where both species come into contact.

48. Carex stenocarpa TURCZ. ex V. KRECZ. in KOMAROV, Fl. URSS 3, addenda II: 607. 1935

Carex sempervirens VILL. subsp. *tristis* var. *asiatica* B. FEDTSCH. 1924, *Carex tristis* M. BIEB. var. *asiatica* LITV. 1910, *Carex lineariterminalis* KOYAMA 1958, ? *Carex longicuspis* BOECK. 1888, ? *Carex stenocarpa* TURCZ. ex BESSER 1834, *Carex tristis* auct. non M. BIEB. 1819: HARTMANN 1966

Ic.: Fl.Tadzh.2: fig.25 (5-7). KOYAMA 1958 (*C. lineariterminalis*).

CN **Braldu:** Pamir P. S, near Shuwart 4720-4750 m, *Miehe 6141!*.

CS **Shimshal:** Pamir P. 4700 m, *Miehe 6361!*. **Biafo:** Skoro P. N 4130-4600 m; Gense 3700-4660 m; Cho Blok 4130 m, *H.Hartmann 292!*; 4210 m; Laskam 4430-4850 m; Mango 3700-4220 m; 3700 m, *H.Hartmann 286!*; Baintha 4100-4700 m (HARTMANN 1966). Biafo Gl. 4110 m, *R.Scott Russell 1795* (BM!). **Biafo/Shigar:** Karakorum [? probably Skoro P.] 4420 m, 1876-08-08, *C.B.Clarke 30224* (K!; CLARKE 1898). **Saltoro:** Above Chogolisa basin, 3960 m, *Nasir & Webster 6249* (RAYMOND 1965). Above Hushe 4150-4350 m, *Miehe 1927!; 1965!; 1988!; 2017!*.

N **Mintake:** S Taxkorgan, above Mazar 4300 m, *Miehe 5634!*.

W **Yasin:** Naz Bar P. 4300 m, 1957-08-11, *Honda 249* (KYO **type** *C. lineariterminalis*; KOYAMA 1958; KITAMURA 1964). Naz Bar 4120-4150 m, *Miehe 3247!; 3276!; 3446!*. **Gilgit:** Shinghai Gah - Pahot Gali 3750-4300 m, *Miehe 876!; 1101!; 1074!; 1093!; 1135!; 1148!; 1193!; 1228!; 1273!; 1366!; 1553!*. Baghrot Vy. 3820-4340 m, *Miehe 3735!; 4127!; 4263!;* 3780-3970 m, *Nüsser 1222!; 1249!*. **Hunza:** Zangia Harar 3960 m, *R.Scott Russell 1030* (BM!); 4270 m, *R.Scott Russell 1011* (BM!). NE Chaprot 3910-4100 m, *Klötzli & al. 11.10,24!; 15.07!*. Above Masot Gl. 3630 m, *Schickhoff 193!*. **Hispar:** Hispar Gl., Makerum 3810-4110 m, *R.Scott Russell 1398* (BM!); *1437*

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(BM!). Gharesa Gl., 12 miles E Nagar 3960 m, *O.Polunin 6301* (B!, BM!); base Camp 13 miles E Nagar 4750 m, *O.Polunin 6110* (B!, BM!); junction with Gl. from Momhil Sar 4820 m, *O.Polunin 6197* (B!, BM!). **Batura:** Gulmit - Atabad 4000-4300 m, *Miehe 2750!; 2889!; 2913!; 2964!*. E Morkhoon 3970-4140 m, *Klötzli & al. 38.17!; 46.03!; 49.11!*. **Khunjerab:** P. 4600-4650 m, *Miehe 2355!; 2417!*.

S **Shigar:** Skoro P. S 4600 m (HARTMANN 1966). Ganto P. W 3970-4050 m, *Miehe 4753!; 4812!; 4857!*. **Skardu:** Burji P. 3960-4270 m, *C.B.Clarke 29837* (BM!, K!), *29863* (CLARKE 1898). **Leh:** Kardong P., Leh 4720 m, *Ludlow & Sherriff 8428* (BM!).

A: Kongur: Kingtau Mts., 3-4 km from Koshkulak, *Junatov* (Pl.As.Centr.). Upper Oytag Vy. 3620-3900 m, *Miehe 8719!; 8741; 8746!; 9124!; 9160!*. W Kunlun: Tiznap Vy., W Kudi 4200 m, *Miehe 8441!*. ?Wakhan 3650-4400 m (PODLECH & ANDERS 1977 [*C. alexeenkoana* ?]). Chilas: Kosto Vy., right ridge 4310 m, *Nüsser 1314!;* ridge above Jiliper High Camp 4200 m, *Nüsser 1319!*. Raikot Vy., Jut 3330 m, *Nüsser 932!*. Raikot Gl., left lateral moraine, nunatak, Base camp area 3970-4400 m, *Nüsser 458!; 463!* (cf.); *467!; 487!* (cf.); *497!*. Upper Kosto Vy., Jiliper High Camp 4210 m, *Nüsser 1437!; 1438!*. Upper Pattaro Vy., Guttum Sagar 4490 m, *Nüsser 1377!; 1390!*. Right lateral moraine Ganalo Gl., nunatak, Base camp area 4200 m, *Nüsser 515!* (cf.). Astor: Waylari, *Winterbottom 771* (K!). Upper Rupal Vy., ascent to Mazeno High Camp 4600 m, *Nüsser 1499!*. Deosai: E 4300-4600 m, *Miehe 5108!; 5136!*. Dras: Lamchan Nullah, above Dras 3350-3660 m, *Duthie 13797* (K!; CLARKE 1898). Suru: Kartse Vy. 4140 m, *H.Hartmann 2368!*. Zanskar: Sarchu 4500 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Surichan P. - Kargiakh 4900 m, 1993-07-27, *Holzner & Kriechbaum* s.n.!. Hazara: Kaghan Vy. 3780 m, *Duthie 20280* (K!). Kaghan Vy., Babusar P. 3630-4060 m, *Miehe 127!; 147!; 179!; 212!; 234!; 239!; 296!; 483!; 543!; 580!*. Kashmir 3350-3960 m. Muzzafarabad, Bangas, *Inayat 22649a* (K!). Above Kilanmarg, *Aitchison 115* (K!). Liddar Vy., Badzulkod Nullah 3960 m, *Duthie 13390* (K!). Apharwat, above Gulmarg 4270 m, *R.R.Stewart 10457* (K!). Himachal Pr.: Kandang Hill, *Drummond 24146* (K!). Kardang, *Bor 14893* (DD; ASWAL & MEHROTRA 1994: *C. tristis*). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4000-4300 m, *Miehe+9629a!* (cf.).

D: Altai, ?Mongolia, ?W & E Sib., Turkestan, Dzung., Tian Shan, Pamir-Alai, Kashgaria, W Kunlun, NE Afgh. (Wakhan), Karakorum, W Himalaya (Hazara - W Nepal) ?eastwards. **Map:** Pl.As.Centr. 3: map 12. *W Centr.As.*

E: 3630-4850 m, alp., locally common in the SW, rare in the central ranges. A dominant species of the relatively humid belt of closed alpine turf (*Kobresia nitens*), occasionally descending to the *Betula jacquemontii* forest. "Forming tufted meadow on earthy slopes, dominant" (*Polunin 6301*), "steep grassy slopes" (*Nasir & Webster 6249*). The species seems to be a main alpine fodder-plant in the SW Karakorum. Its bright olive-green colour is very characteristic from a distance.

N: *Carex longicuspis* BOECK., Cyper. Novae 1: 49. 1888 may be the oldest name for the taxon, but the type was apparently lost. BOECKELER's description is too inadaequate to prove this identity. Records of *Carex stenocarpa* of PODLECH & ANDERS 1977 (in part ?) and DICKORÉ 1991 are misidentifications of *C. alexeenkoana*.

49. Carex stenophylla WAHLENB., Kungl. Svenska Vet.-Akad. Handl. **24**: 142. 1803

Carex longepedicellata BOECK. 1888, *Carex stenophylla* WAHLENB. var. *longepedicellata* (BOECK.) KÜKENTHAL 1909, *Carex stenophylloides* V. KRECZ. 1932, *Carex duriusculiformis* V. KRECZ. 1935, *Carex rigescens* (FRANCHET) V. KRECZ. 1935, *Carex discessa* V. KRECZ. ex GRUBOV 1955, *Kobresia hyalinolepis* BOECK. 1888

Ic.: Fl.Tadzh.2: fig.20(3-4) (*C. stenophylloides*). Fl.Desert.Sin.1: fig.64(6-10). **Fig. 1** (7).

CN **Braldu:** Swamps of Chikor 3800 m, *Miehe 6188!*. Upper Braldu tributary, above Chikor 4050-4220 m, *Miehe 6203!; 6211!*. **K2-North:** Muztagh Vy. E, towards Sarpolaggo Gl. 4090 m, *Dickoré 863!*.

CS **Biafo:** Ashkoley [Askole] 3510 m, *C.B.Clarke 30419* (K!). Biafo Gl., terminal moraine 3080-3120 m; 3100 m, *H.Hartmann 262* (Z!); Ste Ste - Gense 3520 m (HARTMANN 1966: "*C. pseudofoetida*"); Drinsang 3780 m, *H.Hartmann 261!; 266* (Z!); Cho Blok 4100 m, *H.Hartmann 263!*; 4180 m, *H.Hartmann 265* (Z!); (HARTMANN 1984). **Nubra:** [Lower] Nubra Vy., 1848-08-01, *T.Thomson* s.n. (K!); 1848-08-04, *T.Thomson* s.n. (K!; CLARKE 1898).

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N **Mustagh Ata:** N 3930 m, *Miehe 5433!*; W 3800-4190 m, *Miehe 5559!; 5566!*. **Taxkorgan:** 1959-06-13, *Junatov*; 1-2 km W Taxkorgan 3150 m, *Li & al. 303*; 3-4 km S Taxkorgan 3200 m, *Li & al. 337* (Pl.As.Centr.). Dafdar 3510 m, 1935-06-30, *Persson 673* (PERSSON 1938). **Mintake:** Above Mazar 3810 m, *Miehe 5697!*.

W **Yasin:** Kha Bar 3400 m, *Ogino 402* (KITAMURA 1964). Naz Bar 3050-3360 m, *Miehe 3017!; 3671!*. NE Yasin, Jud Bar 3820-3900 m, *Miehe 7046!*. Darkot 3110 m, *Bowes Lyon 8098* (K!). **Ishkoman:** Chatarkhand & Imit, *Kazmi 5825* (M!). Upper Ishkoman, Upper Baru Gah 3470-3570 m, *Miehe 6899!*. **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12435* (CLARKE 1898; K!); Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!); Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). **Hispar:** Barpu Gl., left bank 3050-3350 m, *R.Scott Russell 1102* (BM!). Bhrashakha 3000 m, 1955-06-16, *S.Nakao* s.n. (KYO!; KITAMURA 1964: "*C. pseudofoetida*"). **Batura:** E Morkhoon 3490-3560 m, *Klötzli & al. 87/88.10!*. **Khunjerab:** Khunjerab P. SW 3600-4650 m, *Klötzli & al. 108.05,06,17!; 111.03!; 111/112.05!, Miehe 2502!; 2519!; 2533!; 2379!; 5211!*.

S **Shigar:** S Gon 3000-3100 m, 1991-07-09, *J.Poelt* s.n.!. **Skardu:** near water, 1925-07, *Meinertzhagen* s.n. (BM!). Parkuta, 1848-04, *T.Thomson* s.n. (K!). Tormik Vy., Ganto P. W 2730 m, 1991-07-01, *J.Poelt* s.n.!. **Leh:** Keenaots in Rondu, 1847-07-13, *Winterbottom 808* (K!). Leh, *T.Thomson* (CLARKE 1898); 3500 m, 1992-07-13, *Holzner & Kriechbaum* s.n.!. Left side of the Indus Vy., opposite, 500 ft. higher than Leh, 1856-07-11, *Schlagintweit 1842* (BM!). N above Leh 3620 m, *H.Hartmann 4061!*. Matho 4310 m, *H.Hartmann 2370!*. NE above Spituk 3380 m, *H.Hartmann 4060!*. Chimre 3630 m, 1925-05, *Meinertzhagen* s.n. (BM!). Carru 5000 m, 1927-07-14, *Bosshard* (SCHMID 1932). Taglang P. 5310 m, *H.Hartmann 4066!*. Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.!. **Shyok:** [Calzar - Diskit], 1848-07-25, *T.Thomson* s.n. (K!).

E **Upper Shyok:** [Sassir P. - Murgai], 1848-08-15, *T.Thomson* s.n. (K!). **? Depsang:** Chipchak Vy. 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930).

Unloc.: Karakorum 3510 m, *C.B.Clarke 30419* (CLARKE 1898). Ladakh, Nea P., 1856-09-13, *Schlagintweit 1862* (BM! **isotype** *Kobresia hyalinolepis*). Ladakh, *Schlagintweit 1642* (BOECKELER 1888: **type** *C. longepedicellata*).

A: W Kashg. Kongur: Chumbus Rv., Kosh-Terek, *Divnogorskaya*. W Kunlun: Tiznap Vy., above Kudi 3000 m, *Miehe 7502!*; W Kudi 3500-3700 m, *Miehe 8507!*; Upper Tiznap Vy. 3650-3950 m, *Miehe 8531!; 8541!*. W Pamir, E Pamir 600-4500 m (Fl.Tadzh.). Wakhan: *Giles 55; 96* (CLARKE 1898); 3180-4250 m (PODLECH & ANDERS 1977). Chitral: Shokor Shal, E side of Main Barum Gl. 3400 m, 1950-07-21, *P.Wendelbo* s.n. (K!); 3500 m (BM!). Deosai: 3820 m, *Miehe 2227!*. Shingo Vy., near Gulteri 3350 m, *R.R.Stewart 22224* (K!). Dras: 3200 m, *Ludlow & Sherriff 8330* (BM!). Pan Dras, Kashmir - Ladakh Rd. 3350 m, *R.R.Stewart 9984* (K!). Dras - Mitsahoi, Ladakh Rd. 3050-3350 m, *R.R.Stewart 22350* (K!). Yasghum E Dras 3520 m, *H.Hartmann 2369!*. Suru: W Panikhar 3600 m, *H.Hartmann 2372!*. Namika P. S 3950 m, *H.Hartmann 2375!*. Zanskar: [Tongde - Zangla], 1848-06-28, *T.Thomson* s.n. (K!). Pensi P. 4380 m, *H.Hartmann 2598!*. SW above Tungri 3870 m, *H.Hartmann 2599!*. Hemeling 3510 m, *Southampton Univ. 141* (BM!). Kurgiakh, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Kashmir: [Umasi P. S] 1848-06-20, *T.Thomson* s.n. (K!). Himachal Pr.: Piti, *T.Thomson* (CLARKE 1898); Chango, 1847-07-27, *T.Thomson* s.n. (K!). Jispa, *Koelz 2043* (DD; ASWAL & MEHROTRA 1994). Rupshu: Vy. SE of Salt Lake [Tso Kar 4720 m], 1847-09-24, *T.Thomson* s.n. (K!). Near Tso Kar 4680 m, *H.Hartmann 4062!*.

D: Continental Eurasia: E Spain and N Italy (very local), SE-Europe - temp. Asia - Korea (*C. stenophylla*; the closely related *C. eleocharis* in N America). Subsp. **stenophylloides** (V. KRECZ.) IVANOVA: Turkey, Caucasus, N Iran, Afgh., S Kasakh., Kopet Dagh, Pamir-Alai, Tian Shan - W Mongolia; Kashg., Karakorum - S Tibet. **Map:** Pl.As.Centr.3: map 5 (*C. stenophylloides*). *Euras.*

E: (2730) 3050-4650 (5310) m, (mont.-) subalp. (-alp.), generally not common, frequent in the NW. Subalpine *Artemisia brevifolia* scrub-steppes and desert-steppes *(Oxytropis microphylla, Artemisia pamirica)*, up to lower alpine steppes, rarely in extremely dry *Krascheninnikovia ceratoides-Stipa glareosa* semideserts, where restricted to water surplus habitats (gravel fans, periodical water-courses). Often on well drained and not too compact soils of moraines, gravel fans, or on rapidly weathering silts, but usually not in pronounced ground-water habitats.

N: The widely distributed species had been split into numerous taxa. RAYMOND (1965) gives a valuable account on its classification. The N American *C. eleocharis* BAILEY (*C. stenophylla*

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WAHLENB. subsp. *eleocharis* (BAILEY) HULTÉN) seems to be the best defined taxon of the group. Incomplete specimens of *C. stenophylla* may be recognised by the relatively slender rhizomes, the well developed and very delicate root system, and the rather narrow and relatively many leaves. Reduced forms of *C. stenophylla* may be confused with *C. divisa*. The morphologically similar *C. pseudofoetida*, which occurs on alpine turf and in subalpine groundwater habitats acts as an "altitudinal vicariant" of *C. stenophylla*. Unconfirmed records of *C. stenophylla* from above 4500 m are generally doubtful, and may often refer to *C. pseudofoetida*. However, *C. stenophylla* ascends to very high altitudes in SE Ladakh, where it was found on black slates (*H.Hartmann*, pers. comm.) as high as 5310 m. *Kobresia hyalinolepis* BOECK. 1888 is cited from: Ladakh, Zanskar, Spiti, *Schlagintweit 1154; 1862; 6953; 7180* (BOECKELER 1888). A record of *C. stenophylla* from [?]**Karakash:** Head of lower Karakash Vy. 4270-4570 m (HENDERSON & HUME 1873), may belong to *C. curaica*.

* **Carex supina** WAHLENB. 1803 - **A**: W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4570 m, *Miehe+9619a!;* 4500-4600 m, *Miehe+9631a!*. **D**: Temp. Eurasia. **N**: Including probably minor segregates (*Carex aridula* V. KRECZ. 1946, *Carex korshinskyi* KOMAROV 1901, *Carex minutiscabra* KÜKENTHAL ex V. KRECZ. 1935), the (collective) species occurs widely scattered around the Tibetan Plateau in Dzungaria, Tian Shan, Inner Central Himalaya and S, E & NE Tibet.

* **Carex tangulashanensis** Y. C. YANG 1980 - **Ic.**: YANG 1980: fig.2. **A**: Kongur: Upper Oytag Vy. 3900 m, *Miehe 9141!*. W Kunlun: Tiznap Vy., W Kudi 3970-4340 m, *Miehe 8422!; 8456!; 8474!*; Upper Tiznap Vy. 4220-4370 m, *Miehe 7556!* (veg.); *7586!* (veg.); *7593!* (veg.). **D**: E Tibet, Tangula Shan (Upper Yangtse, Upper Mekong, Upper Salween): Yushu 4750 m; Zadoi (YANG 1980); Wenquan - Yanshiping 4800 m (leg. *Dickoré*); Nagqu - Denqen 4600 m (leg. *Dickoré*); W Kunlun (new!); C. Tian Shan: Urumqi - Shengli Daban 3700 m (new: leg. *Miehe 9036!*). **E**: (Kunlun:) 3900-4370, alp., rare. Steppe-turf on loess-covered slopes (*Carex alexeenkoana, Kobresia capillifolia, K. kashgarica*), apparently preferring S-exposition. **N**: Very distinct morphologically by its low creeping habit with the female spikes crowded at the base and a single long stalked male spike. Although the new localities in the W Kunlun are some 1400 km distant from those of the Tangula Shan, no morphological differences can be found. The Tian Shan locality again gives a large extension of the species' area of distribution. The dwarf and ecologically highly specialized high alpine species may be hitherto overlooked and is to be expected in the high mountain ranges around the Tarim basin. In the W Kunlun, *C. tangulashanensis* seems to be confined to a narrow belt of rather humid alpine steppe-turf of the loess covered northernmost ranges (mainly on S-facing slopes), together with other "relict" species (*Kobresia kashgarica, Viola tianschanica, Oxytropis melanocalyx*).

* **Carex turkestanica** REGEL 1880 (*Carex nitida* auct. non HOST: ? B. FEDTSCH., *Carex nitida* HOST var. *aspera* KÜKENTHAL 1909) - **Ic.**: Fl.Tadzh.2: fig.28(7-10). Fl.Desert.Sin.1: fig. 59(1-4). **A**: Kongur: Koshkulak - Upal 2800 m, 1959-06-10, *Li & al. 243*. Kingtau Mts. N, 3-4 km SE Koshkulak, 1959-06-10, *Junatov*. Upper Oytag Vy. 2900-3280 m, *Miehe 8759!; 8791!; 8798!*. W Pamir 900-3500 m (Fl.Tadzh.). Wakhan: Ishmurkh 2750 m, *Daniel 46* (PODLECH & ANDERS 1977). **D**: Altai, Tian Shan, Pamir-Alai, Dzung., Kashg., E Afgh. (Baghlan, Wakhan). **Map:** Pl.As.Centr.3: map 9. **E**: Subalp. *Juniperus-Artemisia* scrub- and forest-steppe (W Kunlun). **N**: Records from Swat, Hazara, Kashmir may refer to *C. kashmirensis*.

50. Carex viridula MICHX., Fl. Bor. - Amer. 2: 170. 1803

Carex serotina MÉRAT 1821, *Carex philocrena* V. KRECZ. 1935, *Carex flava* auct. non L. 1753, *Carex oederi* auct. non RETZ 1779, *Carex serotina* MÉRAT subsp. *philocrena* (V. KRECZ.) KUKKONEN 1984

Ic.: Fl.Tadzh.2: fig.30(1-3 *C. philocrena*).

W **Gilgit:** 1450 m, *O.Polunin 6024* (B!, BM!).
A: W Pamir 350-2700 m (Fl.Tadzh.). Wakhan (PODLECH & ANDERS 1977). Dras: 3350 m, 1848-09-26, *T.Thomson* s.n. (K!; CLARKE 1898). Swat: Kalam 2130 m, *R.R.Stewart & A.Rahman* s.n. (K!). Kashmir 1830-2740 m. Gurais 2440 m, *C.B.Clarke 29493* (BM!, K!; CLARKE 1898); 2650 m, *B.B.Osmaston 2* (K!). Sind Vy., near Ganderbal, *Drummond 14377* (K!). Sonamarg 2740 m, *R.R.Stewart 9801* (K!). Pir Panjal, Nil Nag 1830-2130 m, *R.R.Stewart 23049* (K!). Ramoo 1830 m, *C.B.Clarke 28492* (K!).

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D: Temp. N Hemisphere, S to Himalaya, SE Tibet; ?S Hemisphere: S Africa, Tasmania, New Zealand, S America (Chile, Patagonia). *Holarct.*
E: 1450 m, coll., rare. Wet habitats: "irrigation channel side, cultivated area" (*Polunin 6024*).
N: Nomenclature of the *C. flava* group see SCHMID (1983).

51. Carex vulpinaris NEES in WIGHT, Contr. Bot. India 121. 1834

Carex henningsiana BOECK. 1888, ? *Carex slobodovii* V. KRECZ. in KOMAROV 1935, *Carex wendelboi* NELMES in WENDELBO 1952

Ic.: **fig. 1** (1).

W **Gilgit:** Naltar Vy., near waterfall 3660-3960 m, *R.R.Stewart 26914* (K!: yg.).
A: Chitral: Tirich Mir, Barum Gol 3600 m, 1950-07-23, *P.Wendelbo* s.n. (K!; W! **isotypes** *C. wendelboi*). Oihor Gol 3200 m, *Bowes Lyon 838* (W!). Himachal Pr.: Lahul, Kardong - Dartse in the Bhaga Vy., 1856-06-15/18, *Schlagintweit 2813* (K! **type** *C. henningsiana*). Khardong, up to the limit of the trees, *Schlagintweit 3698* (BM!). Above the limit of the trees on the slopes to Kardong (left side of the Bhaga Vy., 1856-06-13, *Schlagintweit 4081* (BM!). Bhaga Vy., Tsangtsi, Kolong 3660 m, *Thakur Rup Chand 562* (W!). Jaspa - Lahul, *Bor's coll. 138* (K!). Sissu 3260 m, *Bor 12386* (DD, K!; ASWAL & MEHROTRA 1994).
D: Turkestan, Hindukush, (C. E, NE Afgh.), W Himalaya (Chitral - Kumaon). *W Himal.*
E: 3660-3960 m, subalp., rare (SW Karakorum). Wet habitats.
N: *C. wendelboi* is a xerophytic form which, except for the relatively short lower bract and the slightly (not significantly) smaller utricles, is identical to *C. vulpinaris* (*Royle 73* K! **type**).

Putative hybrids (hybrids in *Carex* are mostly sterile and thus usually not recognized with certainty among scanty or insufficient material; some of the putative hybrids are therefore cited under the respective parent to which they come closest):

Carex alexeenkoana X C. borii (*Carex haematostoma* NEES var. *submacrogyna* auct. non KÜKENTHAL 1909: DICKORÉ 1991)

CN **K2-North:** K2-N Gl. E 4750 m, *Dickoré 677!*; 4800-4920 m, *Dickoré 786!*.
N: Found in two populations on the nunatak between Upper K2-N and Skyang Kangri Glaciers. Alp. - subniv. turf spots on stable, slighly inclined gravel *(Carex borii* [common], *C. alexeenkoana* [rare], *Stipa concinna, Viola kunawarensis, Potentilla pamirica*) on the lower margin of the free gelifluction belt. The plant is ± intermediate between the putative parents (which are of a very different habit !). Although the utricles appear to be sterile, the plant forms a quite extensive population, probably by means of its stolons.

Carex atrofusca X C. pseudobicolor ?

Carex atrofusca X C. nivalis ?

Both hybrids may rarely occur among populations of the putative parents in a few locations of **Gilgit** and **Hunza**, but the material is too young to come to a definite conclusion.

Carex melanantha X moorcroftii ?

Fertile plants which apparently combine the characters of the closely related vicarious species locally occur in the areas of contact.

Carex melanantha X orbicularis ?

There is some confusion in the determination of both species, which often occur together. Usually they are well defined, but sometimes they are completely alike and a few specimens apparently combine 2 and 3 stigmas on the same plant.

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Carex oligocarya X plectobasis ?
It may locally occur in the SW Karakorum where both species come into contact.

Carex pseudofoetida X sagaensis ?
Fertile plants which combine the characters of the closely related vicarious species locally occur in the areas of contact. - **Carex curaica X C. pseudofoetida ?** is another possible hybrid.

52. Cladium mariscus (L.) POHL, Tent. Fl. Bohem. 1: 32. 1809

Schoenus mariscus L. 1753

Ic.: Fl.Tadzh.2: fig.14(2-4).

S **Shigar:** *R.R.Stewart 20483; Koelz 9659* (Ann.Cat.Pak.).
A: S Tadzh. 500-900 m (Fl.Tadzh.). Kashmir: "Circa urbem Kashmir", *Jacquemont 645* (K!). Srinagar 1580 m, *C.B.Clarke 29075* (K!). Pir Panjal, Nil Nag 1830 m, R.R.Stewart 23060 (K!).
D: Trop. - temp. regions. *Cosmopol.*
E: c. 2400 m, coll. - mont., rare in the SW. (Generally:) Wet habitats, swamps or on the borders of lakes.
N: No specimen seen from the Karakorum, but not likely to be confused.

Cyperus (see also *Pycreus*):
Little material of *Cyperus* s.l. was available for the present study. Most species are lowland plants of wet habitats, only occasionally found in the deep valleys of the S & W Karakorum. The following treatment is not satisfactory and most literature records have to be confirmed. A more thorough examination with the specimens at hand, may result in a further reduction of the number of reported species. Other species, however, may be found in the field, or introduced into the Karakorum with the increasing traffic.

? 53. Cyperus cuspidatus KUNTH, Nov. Gen. Sp. 1: 204. 1815

Ic.: Fl.Xizang.5: fig.202.

W **?Ghizar:** Gupis 2170 m, *Ogino 583* (KITAMURA 1964).
A: Kashmir: 1220 m, *C.B.Clarke 31570* (Ann.Cat.Pak.).
D: Trop. - subtrop. regions. *Pantrop.*
E: 2170 m, coll. - mont., ? rare in the SW. (Generally:) Seasonally wet habitats.
N: To be confirmed; no specimen seen. Possibly confused with *C. squarrosus*.

* **Cyperus fuscus** L. 1753 - **Ic.**:Fl.Desert.Sin.1: fig.55(10-13). **A**: W Kashg.: Kashgar 1330 m, 1933-07-16, *Persson 486* (PERSSON 1938). Yengisar 1929-08-25, *Popov* (Pl.As.Centr.). S Tadzh. (Fl.Tadzh.). **D**: Eurasia, atlantic N America.

54. Cyperus haspan L., Sp. Pl. 45. 1753

Ic.: Fl.Males.7(3): fig.56 ("*C. halpan*"; see Cyperaceae Newsletter 9: 8. 1991).

W **Gilgit:** *R.R.Stewart 26517a* (Ann.Cat.Pak.).
A: Kashmir.
D: Trop. - subtrop. regions. *Pantrop.*
E: c. 1500 m, coll., rare in the SW. (Generally:) Wet habitats "abundant especially in rice fields" (Ann.Cat.Pak.).
N: No specimen seen from the Karakorum.

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* **Cyperus niveus** RETZ. 1789 - **A**: Chitral. Swat. Hazara. Kashmir. Himachal Pr.. **D**: Iran, Afgh., Himalaya, N India, Burma, SW China.

55. Cyperus rotundus L., Sp. Pl. 45. 1753

Ic.: Fl.Males. 7(3): fig.49.

W **Gilgit:** *Winterbottom* (K!, CLARKE 1898). Minawar 1520 m, *Giles 246* (K!, CLARKE 1898). Gorapul - Gilgit, *Honda* s.n. (KITAMURA 1964).
D: Warm-temp. - trop. regions. *Pantrop.*
E: 1520 m, coll., rare in the SW. Irrigated ground. "A frequent pest in gardens" (Ann.Cat.Pak.).

56. Cyperus squarrosus L. Cent. Pl. 2: 6. 1756

Cyperus aristatus ROTTB. 1772

S **Skardu:** Skardu, *Schlagintweit 663*; *6314* (CLARKE 1898). **Leh:** 1848-09, *T.Thomson* (K!).
A: Swat. Hazara. Kashmir. Himachal Pr.: [Kunawar] Ravine, 1847-08-12, *T.Thomson* (K!). Keylong - Kardang, *Aswal 10052* (ASWAL & MEHROTRA 1994).
D: Trop. & S Africa; trop. & subtrop. Asia: NE Afgh., Himalaya - S China; Australia; N & S America (S Canada - Chile). *Pantrop.*
E: c. 2300-3500 m, mont., scattered in the S. (Generally:) Wet open alluvial sands.

Eleocharis:

A provisional treatment of a critical genus. The complex of *E. palustris* is still insufficiently known in C.Asia, and the delimitation of taxa within the aggregate is ± tentative.

Key to *Eleocharis*:

1. Stems capillary, 4-angled. Spikelet 2-4 mm long. Nut longitudinally ribbed ..... (**E. acicularis**)
\+ Stems stout, terete. Spikelet 4-30 mm long. Nut smooth or faintly striate **2**
2. Style-base not clearly demarcated from the nut, not or scarcely constricted at the base. Spikelet with 2-8 flowers ..... **E. quinqueflora**
\+ Style-base usually swollen and constricted at the base, clearly demarced from the nut. Spikelet with more than 8 flowers **3**
3. Stem septate, very thick, > 3 mm in diameter. Rhizomes with large tubers ..... (**E. dulcis**)
\+ Stem weaker, < 3 mm in diameter. Rhizomes without tubers **4**
4. Only the lowest glume of the spikelet empty, encircling base of spikelet **5**
\+ Two lowest glumes of spikelet empty, subequal, and each half-encircling base of spikelet **6**
5. Style-base minute, c. 1/4 as wide as nut. Lowest glume up to 1/2 as long as spikelet. Stem weak, easily cracked ..... (**E. oxylepis**)
\+ Style-base at least 1/3 as wide as nut. Lowest glume rarely more than 1/3 as long as spikelet. Stem firm ..... **E. uniglumis**
6. Style-base longer than wide. Bristles 0-4 ..... **E. palustris**
\+ Style-base mitriform, wider than long. Bristles 4(-5) ..... (**E. argyrolepis**, **E. mitracarpa**)

* **Eleocharis acicularis** (L.) ROEMER & SCHULTES 1817 - **A**: Wakhan: *Paulsen 1454* (C; KUKKONEN 1990a: an outlying and much doubted, but authentical record). **D**: Circumarctic: Eurasia (S to Caucasus, Wakhan, Dzungaria, N Mongolia), N America.

* **Eleocharis argyrolepis** KJERULFF ex BUNGE 1851 - **Ic.**:Fl.Desert.Sin.1: fig.54(5-8). **A**: Reported from N Kashg.: Maralbashi 1070 m, 1932-06-14, *Persson 258* (PERSSON 1938); Kongur: Bostan-terek 2400 m, 1934-08-14, *Persson 611* (PERSSON 1938). **D**: Dzungaria, Kashgaria, Tian Shan, Pamir-Alai. **N**: Close to *E. mitracarpa*.

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• **Eleocharis dulcis** (BURM. f.) HENSCHEL 1833 - **A**: Hazara. Reported probably in error from the Karakorum: Hunza, *Schmid* (Ann.Cat.Pak.). "Occurs in the easternmost area of Flora Iranica and is sometimes cultivated as the Chinese Water-Chestnut." (KUKKONEN 1990a). **D**: Trop. Africa (W; Madagascar), India - S.China, Japan - SE Asia, Oceania, Australia.

* **Eleocharis mitracarpa** STEUDEL 1855 - **A**: Swat: Ushu 2440 m, *R.R.Stewart 25403* (K!). Kashmir: Pir Panjal, Nil Nag 1830-2130 m, *R.R.Stewart 23035* (K!). **D**: Kasakhstan, Iran, Afgh., Himalaya - China, Mongolia - S Kamtschatka; ?Japan (according to SVENSON 1939); insufficiently known. **N**: The species appears to be rather characteristic in the irano-turanian region and may occur also further west. In the Himalaya, it seems to be restricted to the lower outer ranges. Reported in error for *E. palustris* (*R.R.Stewart 26918*) from Hunza.

* **Eleocharis oxylepis** (MEINSH.) B. FEDTSCH. 1915 - **D**: Ukrania - Kasakhstan. **N**: Apparently intermediate between *E. uniglumis* and *E. quinqueflora*.

57. **Eleocharis palustris** (L.) ROEMER & SCHULTES, Syst. Veg. **2**: 151. 1817

Scirpus palustris L. 1753, *Eleocharis intersita* ZINSERL. 1935, ? *Eleocharis kitamurana* KOYAMA 1957

W **Hunza:** Chalt 1830 m, *R.R.Stewart 26918* (K!). **Hispar:** Nagar 2440 m, *O.Polunin 6077* (B!).
A: ? N, E, W Kashg., S Kashg. (Pl.As.Centr.: *E. intersita*). Suru: Suru Vy. 2830 m, *B.B.Osmaston 23* (K!). Zanskar: Pensi P. 4390 m, *Koelz 7934f* (K!). Himachal Pr.: Sissu Lake, *Aswal 6769* (ASWAL & MEHROTRA 1994).
D: Temp. N hemisphere. *Holarct.*
E: 1830-2440 m, coll., rare. Wet habitats with ± permanent water supply, less tolerant of salt than *E. uniglumis* and apparently restricted to the outer mountain ranges, and in high altitudes S just outside the Karakorum.

58. **Eleocharis quinqueflora** (F. X. HARTMANN) O. SCHWARZ, Mitt. Thür. Bot. Ges. **1**: 89. 1949

Scirpus quinqueflorus F. X. HARTMANN 1767, *Scirpus pauciflorus* LIGHTF. 1777, *Eleocharis pauciflora* (LIGHTF.) LINK 1827, *Eleocharis meridionalis* ZINSERL. 1935, *Eleocharis quinqueflora* var. *meridionalis* (ZINSERL.) RAYMOND 1965, *Eleocharis quinqueflora* subsp. *meridionalis* (ZINSERL.) EGOROVA 1981, *Eleocharis obscura* KOYAMA 1958

Ic.: KITAMURA 1964: fig.44 (*E. obscura*). Fl.Xizang.5: fig.192.

CN **K2-North:** Muztagh Vy. 3930-3950 m, *Dickoré 856b!; 897!*. **Shaksgam:** Upper Shaksgam Vy. 4060 m (*Dickoré*).

CS **Saltoro:** Above Hushe 3200-3300 m, *Miehe 1861!*. **Nubra:** [Lower] Nubra Vy., 1848-08-01, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** N 3650 m, *Miehe 5447!*. **Yarkand:** 10 km WSW Mazar - Mazar 3760-3850 m, *Dickoré 264!; 339!*. Ilyk 3520 m, *Dickoré 404!*.

W **Ishkoman:** Upper Baru Gah, Panji P. S 3800 m, *Miehe 6905!*. Imit 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Hunza:** Minapin Gl. (LLOYD & LLOYD 1968). **Batura:** Khaibar 2700 m, *Klötzli & al. 801.01,110,115!*. E Morkhoon 3000 m, *Klötzli & al. 803.09!* p.p.

S **Shigar:** Shigar Vy., near Tandoro 2500 m, *H.Hartmann 230!* (HARTMANN 1966). **Leh:** Leh 3500 m, 1992-07-10, *Holzner & Kriechbaum* s.n.!. Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.!. Likir 3700 m, 1993-07-14; 1993-07-15, *Holzner & Kriechbaum* s.n.!. **Shyok:** [Calzar], 1848-07-23, *T.Thomson* s.n. (K!). [Calzar - Diskit], 1848-07-25, *T.Thomson* s.n. (K!).
A: W Kashg.: 25 km S Kashgar 1300 m, 1935-05-12, *Persson 636* (PERSSON 1938). Kongur: Gez Vy., 100 km [SW] Kashgar, Rd. to Bulunkul and Taxkorgan, *Junatov*. W Kunlun: Kentalek 2700 m, 1931-07-12, *Persson 207* (PERSSON 1938). Kudi 3050 m, *Dickoré 228!*. Tiznap Vy., N Kudi 3080 m, *Miehe 7541!*. Upper Tiznap Vy. 3650 m, *Miehe 8538a!*. Wakhan: 2800-3450 m (PODLECH & ANDERS 1977). Astor: Kalapani 3010-3050 m, *Schickhoff 1291!; 1296a!*. Suru: Wakha Vy., SE Mulbekh 3600 m, *H.Hartmann 2609!*. Zanskar: Kenlung, *Bor 16486* (DD, ASWAL & MEHROTRA

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1994). Swat: 3600 m. Kashmir: 2590 m, *C.B.Clarke 29523* (CLARKE 1898). Himachal Pr.: Piti Vy., W of Lara, 1847-09-04, *T.Thomson* s.n. (K!; CLARKE 1898). W Tibet: E Shiquanhe (N 32°26' E 81°00') 4500 m, *Miehe+9666c!.*

D: Temp. Eurasia, N Africa, N America, S America (Chile). *Holarct.*

E: 2400-4060 m, mont. - subalp., not common. (Periodically) wet habitats, on river sands, in fens and flushes.

N: Sometimes difficult to distinguish from and often together with *Trichophorum pumilum.*

59. **Eleocharis uniglumis** (LINK) SCHULTES in SCHULTES & SCHULTES f., Mantissa 2: 88. 1824

Scirpus uniglumis LINK 1820

CS **Biafo:** Ashkoley [Askole] 3060 m, 1876-08-11, *C.B.Clarke 30405* (K!). **Nubra:** Liagtsung - Panamik, left side of Nubra, 1856-07-24/31, *Schlagintweit 2065* (K!; CLARKE 1898).

W **Batura:** Khaibar 2700 m, *Klötzli & al. 801.46!* (p.p.).

S **Leh:** Kardong P. (STEWART 1916). Leh - Thikse, base of Shey Gompa 3300 m, *Billiet & Leonard 6850* (K!); Shey Gompa 3300 m, *H.Hartmann 4070!.*

Unloc.: Baltistan 3660 m, *C.B.Clarke 30405* (CLARKE 1898). Ladakh < 4570 m (HENDERSON & HUME 1873). Ladakh, *Schlagintweit 1082; 1446* (CLARKE 1898).

A: W Kashg.: Kashgar 1330 m, 1935-05-12, *Persson 632* (PERSSON 1938). 10 km S Upal, Rd. to Taxkorgan, *Junatov* (Pl.As.Centr.); S Kashg.. Astor: Rama 3050 m, *R.R.Stewart 22943b* (K!). Dras: Dras - Mitsahoi 3050-3350 m, *R.R.Stewart 22346* (K!). Kashmir. Himachal Pr. Rupshu: Vy. below Hanle, 1847-09-17, *T.Thomson* s.n. (K!).

D: Eurasia (S to Caucasus, Afgh., W Himalaya). *Euras.*

E: 2700-3300 m, mont., scattered in the S & W. Wet, moderately saline habitats.

* **Eriophorum scheuchzeri** HOPPE 1800 - **A**: Astor: Nanga Parbat (TROLL 1939). Hazara: Upper Kaghan Vy, *F.Schmid* (Ann.Cat.Pak.). Kashmir: Tilail, *C.B.Clarke 30674* (K!). Yamhar P. 4270 m, *R.R.Stewart 12453* (K!). **Unloc.**: "NW Himalaya or Tibet", *Lance 287* (K!). **D**: Circumarctic, S to Alps, NW Himalaya. **N**: Rare and disjunct in the NW Himalaya.

* **Erioscirpus comosus** (WALL.) PALLA 1896 (*Scirpus comosus* WALL. in ROXB. 1820, *Eriophorum comosum* (WALL.) NEES in WIGHT 1834) - **A**: Chitral. Swat. Hazara: Lower Indus, Dassu - Chilas 900 m, *Klötzli & al. 811.09,16!.* Kaghan Vy. Kashmir: common < 1500 m.

* **Erioscirpus microstachyus** (BOECK.) PALLA 1896 (*Eriophorum microstachyum* BOECK. 1874) - **A**: Kashmir. **D**: Himalaya (Kashmir - Bhutan).

Fimbristylis:

1. Styles 2. Glumes glabrous or nearly so. Achene conspicuously ridged ..... **F. bisumbellata**

+ Styles 3. Glumes ± densely grey tomentose towards the apex. Achene minutely reticulated ..... **F. sieberiana**

60. **Fimbristylis bisumbellata** (FORSKAL) BUBANI, Dodecanthea 30. 1850

Fimbristylis dichotoma auct. non (L.) VAHL 1805

Ic.: Fl.Iraq 8: pl.84. ?Fl.Xizang.5: fig.195 (*F. dichotoma*).

W **Gilgit:** Minor [Minawar], *Winterbottom 921* (K!; CLARKE 1898). Gilgit Aerodrome 1520 m, *R.R.Stewart 26915* (K!).

A: Kashmir.

D: Canaries, Africa, warm-temp. - trop. Eurasia (E to Turkmenia, W Himalaya), Malesia, Australia. *Palaeotrop.*

E: 1520 m, coll., rare in the SW. (Generally:) Wet habitats.

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61. Fimbristylis sieberiana KUNTH, Enum. Pl. **2**: 237. 1837

Fimbristylis ferruginea auct. non (L.) VAHL 1805

W **Gilgit:** 1490 m, *R.R.Stewart 26346* (K!).

A: Chilas: Lower Indus, Dassu - Chilas 900 m, *Klötzli & al. 811.13!*.

D: SW Asia (Cyprus - W Himalaya), Africa, Malesia, N Australia. *Palaeotrop.*

E: 1490 m, coll., rare in the SW. (Generally:) Wet habitats. "Moist meadows and rice fields" (Ann.Cat.Pak.).

62. Isolepis setacea (L.) R. BR., Prodr. **1**: 222. 1810

Scirpus setaceus L. 1753, *Schoenoplectus setaceus* (L.) PALLA in KOCH 1907

Ic.: Fl.Xizang.5: fig.190(8-10).

S **Skardu:** Skardu, 1847-11, *T.Thomson* s.n. (K!); 2330 m, *C.B.Clarke 30028* (K!); 2440 m, *C.B.Clarke 29523* (CLARKE 1898). Skardo to Satpar Vy., S of Skardo, 1856-08-12, *Schlagintweit 5867* (BM!). **Leh:** 1848-09, *T.Thomson* s.n. (K!).

Unloc.: Baltistan, *Schlagintweit 5867* (CLARKE 1898).

A: S Tadzh., W Pamir 850-2600 m (Fl.Tadzh.). Astor: Das via Goltere or Naugaum to Hasora or Astor, 1856-09-08/20, *Schlagintweit 6414* (BM!; CLARKE 1898). Himachal Pr.: Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!. Sissu, *Aswal 6774* (ASWAL & MEHROTRA 1994).

D: Temp. Eurasia (E to W Siberia, China, S to Himalaya), N Africa; Australia. *?Euras.*

E: 2330-2440 (c. 3500) m, coll. - mont., scattered in the S. Wet habitats: river terraces on moist gravel, flushes.

Kobresia:

Kobresia-species form an important part of the alpine vegetation of the Karakorum. Although the species are usually well defined, the plants are generally very plastic in their vegetative morphology and the differential characters are often rather subtle. Literature records are often not interpretable, because of frequent misidentifications of scarce or juvenile material.

Synopsis of *Kobresia* (CLARKE 1883, KÜKENTHAL 1909, IVANOVA 1939):

Sect. *Pseudocobresia* KÜKENTHAL: *K. macrantha*

Sect. *Hemicarex* (BENTHAM) C. B. CLARKE: *K. pygmaea*

Sect. *Elyna* (SCHRADER) C. B. CLARKE: *K. capillifolia*, (*K. kashgarica*), (*K. filifolia*), *K. nitens, K. robusta, K. schoenoides*

Sect. *Kobresia*: (*K. humilis*), *K. karakorumensis, K. laxa*, (*K. persica*), (*K. pusilla*), *K. royleana*

K. laxa is sometimes (IVANOVA 1939) included into the genus *Schoenoxiphium*. It seems, however, to be also closely related to *K. royleana*. The monotypic genus *Blysmocarex* was established on *Kobresia macrantha* by the same authority. This may be substantial for phylogenetic reasons.

Key to *Kobresia* of the Karakorum:

1. Rhizomatous, stigmas two ..... **K. macrantha**
+ Usually densely tufted plants, rarely stoloniferous; stigmas mostly three, sometimes two (but then densely tufted) **2**
2. Lower dead sheaths without leaf-blades, brown to black, shining; leaves linear-subulate to navicular or flat, but not distinctly plicate; inflorescence a narrowly cylindric to ovate spike, rarely proliferating ... **3**
+ Lower dead sheaths with leaf-blades, dull to shining brown; leaves broader, flat, folded. Inflorescence a panicle or an ovoid spike **8**

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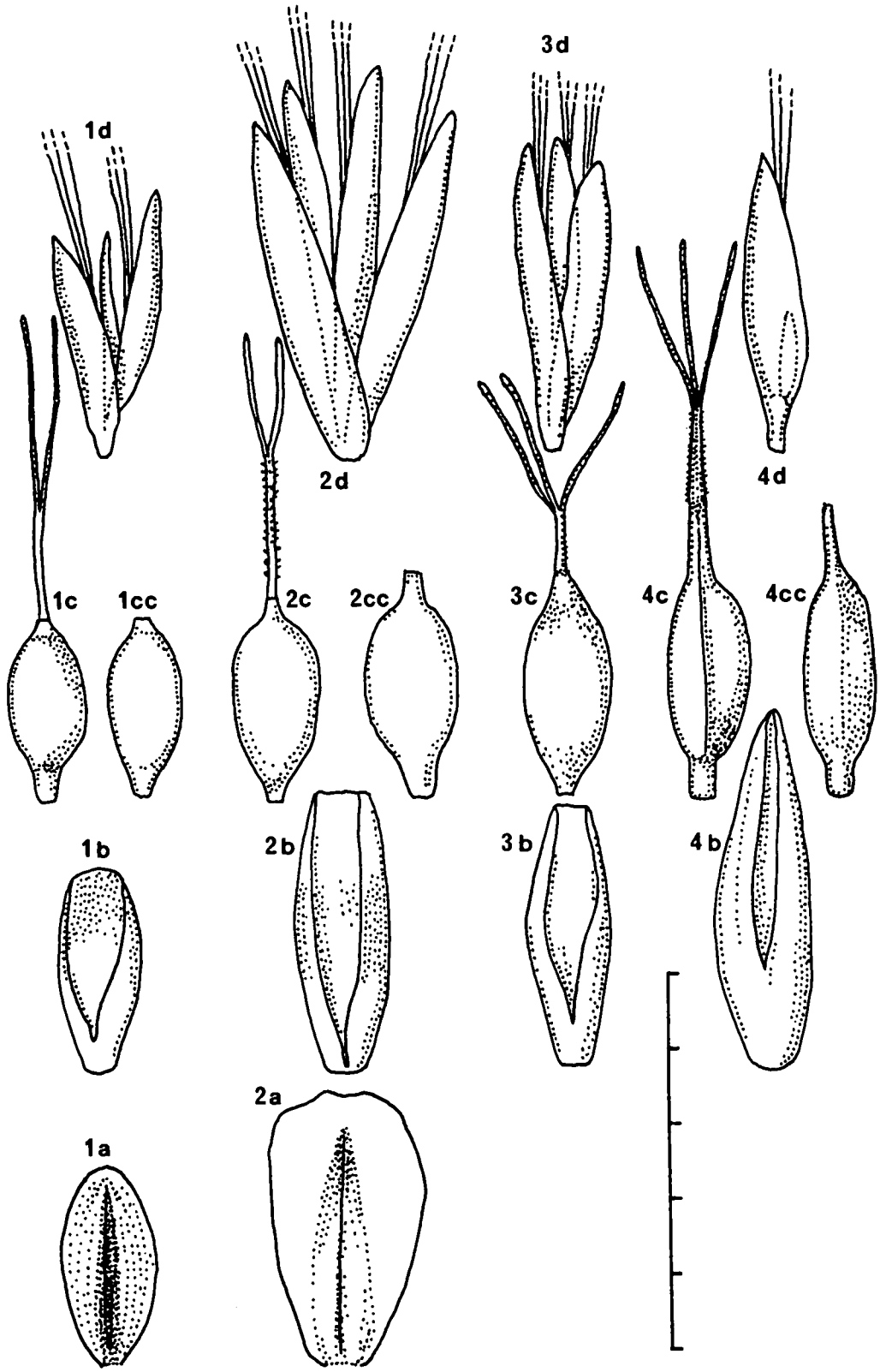

Fig. 4: ***Kobresia*** **(§ Kobresia)**.
Spikelets: bract (a), perigyne (b), nut (c), male flowers (d). Scale = 5 mm.
1: K. karakorumensis sp. nov. (*Dickoré 784* **type**) **2: K. pusilla** (Qinghai, *Kuo Pung-Chao & Ho Ting-Nung 65-6418*, GOET). **3: K. humilis** (Turkey, *Strid & al. 23993*, B). **4: K. royleana** (*Miehe 5463*; cc: *Dickoré 850*).

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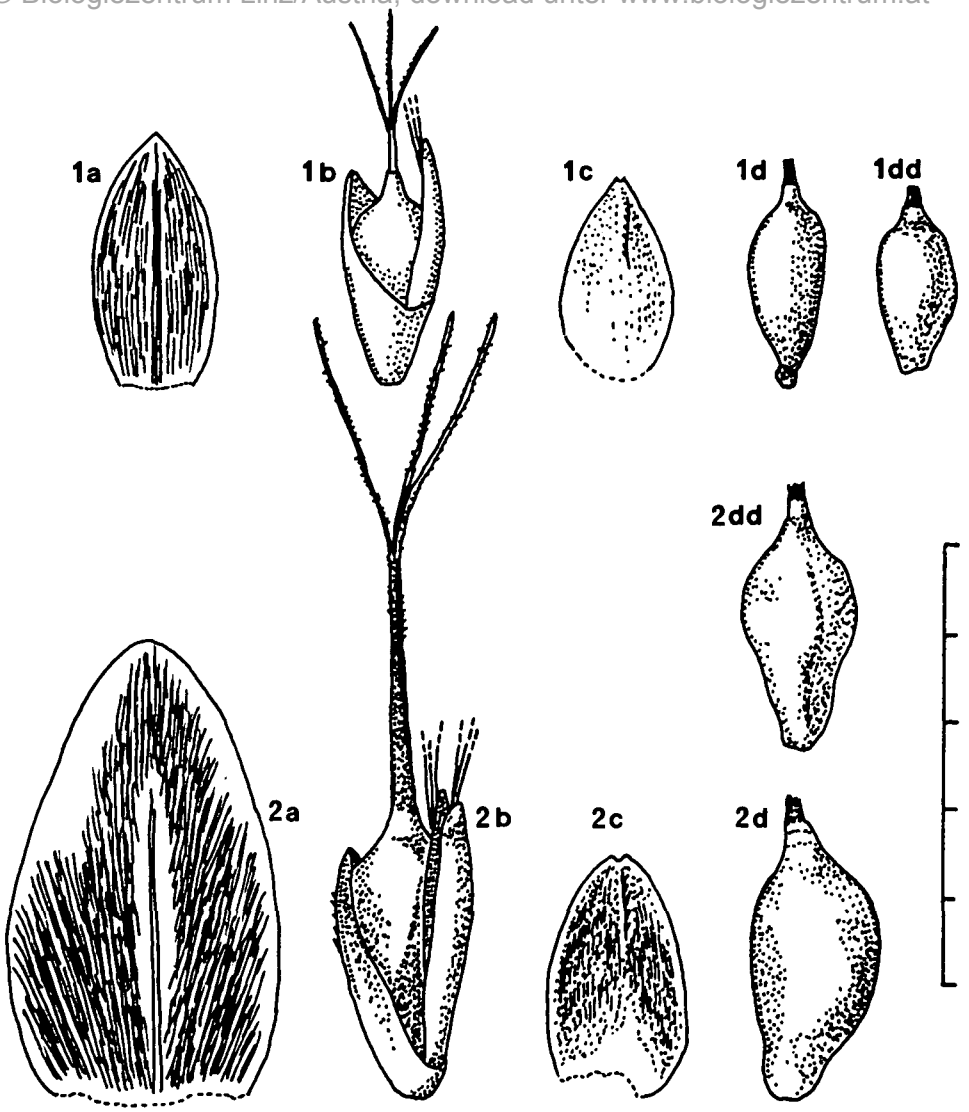

	K. ovczinnikovii (*K. capillifolia* subsp. *pamirica*)	**K. capilliformis** (*K. capillifolia* subsp. *capilliformis*)	**K. capillifolia** (s. str.)	**K. kashgarica**
culm length [cm]	(15) 25-40	15-30	15-40	(1) 2-5 (8)
glume length [mm]	< 6.0	c. 4.0	4.0-5.0 (7.0)	2.5-3.0
perigyne length [mm]	(3.8) 4.0-5.0	(2.0) 2.5-3.2 (3.5)	(3.0) 4.0-4.5 (5.0)	2.1-2.3
achene length [mm]	2.5-2.7 (3.0)	2.0-3.0	3.3-3.5	1.8-2.3
colour of glume	cinnamon-brown	castaneous	dark brown-black	greenish-cinnamon

Comparison of *K. capillifolia*-segregates: *K. ovczinnikovii*, *K. capilliformis*, *K. capillifolia* s.str. (data from IVANOVA 1939, OVCZINNIKOV 1963, EGOROVA 1967) and *K. kashgarica* (data from cited collections)

Fig. 5: ***Kobresia* (§ Elyna)**.
Spikelets: bract (a), spikelet with perigyne, male flowers and nut (b), perigyne (c), nut (d). Scale = 5 mm.
1: K. kashgarica sp. nov. (*Miehe 8471* **type**; dd: Tian Shan, *Miehe 9047*).
2: K. capillifolia (*Miehe 8313*; dd: Tian Shan, *Miehe 9061*).

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3. Inflorescence few(2-5)-flowered. Plants very dwarf, 1-4 cm high, stems shorter than leaves ..... **K. pygmaea**
+ Inflorescence a many-flowered spike. Plants usually higher than 5 cm, stems often exceeding the leaves 4
4. Inflorescence a narrow spike, rarely lobed in the lower part; stems weak, leaves subulate 5
+ Spike broadly cylindric to ovoid; stems weak or stout, leaves subulate or linear-lanceolate 6
5. Glumes long, dark brown to black. Nut (excluding beak) c. 2.5-3.5 mm, distinctly reticulate on surface, ripe nut falling naked, the open prophyll not separating from the axis; male flowers two ..... **K. capillifolia**
+ Glumes short, greenish-cinnamon. Nut (excluding beak) c. 1.8-2.3 mm, very faintly reticulate; prophyll fused in the lower third, easily separated from the axis, enclosing and falling together with the ripe nut and the single male flower ..... (**K. kashgarica**)
6. Stems very stout, 1-2 mm thick; leaves linear-lanceolate, oval to navicular in cross-section. Prophylls open; glumes entirely brown with hyaline margin ..... **K. schoenoides**
+ Stems < 1 mm thick, leaves subulate. Prophylls closed to at least half of their length; glumes with prominent green midrib 7
7. Glumes with a narrow hyaline margin (up to 0.5 mm wide). Spikes ovoid. Leaves ± soft ..... **K. nitens**
+ Glumes with a broad (c. 1 mm) hyaline margin. Spikes narrowly ovoid to cylindric. Leaves rigid ..... **K. robusta**
8. Plants weak, with short stolons, not densely tufted; basal leaves scarcely recurved ..... **K. laxa**
+ Plants stout, densely tufted; basal leaves often strongly recurved 9
9. Stigmas 2; nut flat, without ribs, with a very short, broad stylopodium. Prophylls shortly ovate, with two faint keels; spikelet with 2 male flowers (+ 1 sterile). Inflorescence a short spike. Plants low, cushion-forming ..... **K. karakorumensis**
(**K. pusilla**: beak of nut longer, male flowers 3-4)
+ Stigmas 3, nut triangular-ovate in cross-section, with three prominent longitudinal ribs, with a long beak. Prophylls obliquely 2-keeled, one of which incrassate and spiny on the back; spikelet with 1 male flower (+ 1 sterile). Inflorescence nearly always lobed, paniculate. Plants dwarf to very tall ..... **K. royleana**
(**K. humilis** differs in having a single spike, somewhat narrower leaves and nuts with shorter beak).

63. **Kobresia capillifolia** (DECNE.) C. B. CLARKE, J. Linn. Soc. London (Bot.) **20**: 378. 1883

Elyna capillifolia DECNE. in JACQUEM. 1844, *Kobresia brunnescens* BOECK. 1888, *Kobresia capilliformis* IVANOVA 1939, *Kobresia capillifolia* (DECNE.) C. B. CLARKE subsp. *capilliformis* (IVANOVA) OVCZ. 1963, *Kobresia ovczinnikovii* EGOROVA 1967, *Kobresia scirpina* auct. non WILLD. 1805: AITCH. 1881, *Kobresia bellardii* auct. non (ALL.) DEGL. in LOISEL. 1807, *Kobresia myosuroides* auct. non (VILL.) FIORI & PAOL. 1895

Ic.: Fl.Tadzh.2: fig.17(9-12). Fl.Xizang.5: fig.213. **Fig. 5** (2).

CS **Shimshal:** Shimshal Vy., *Visser-Hooft* (DOLK 1929). **Biafo:** Ste Ste - Gense 3520 m; Gense 3700-4660 m; 4250 m, *H.Hartmann 297* (Z!); 4660 m, *H.Hartmann 296* (Z!); Cho Blok 4100 m; 4180 m, *H.Hartmann 294* (Z!); *295!*; 4230 m, *H.Hartmann 293!; 298* (Z!); 4300 m; Mango 3730 m; 3850 m; Baintha 4150-4530 m; Skoro P. N 4450 m; 4670 m (HARTMANN 1966). **Saltoro:** Steep grassy slopes above Chogolisa basin 3960 m, *Nasir & Webster 6244* (WEBSTER & NASIR 1965, RAYMOND 1965). Above Hushe 4150-4330 m, *Miehe 1939!; 1959!; 2016!.*

N **Mustagh Ata:** N 3650-4330 m, *Miehe 5469!; 5515!.* **Mintake:** S Taxkorgan, above Mazar 4110-4300 m, *Miehe 5639!; 5718!.* **Yarkand:** Aghil P. N 4560-4820 m, *Dickoré 525!; 580!.* **Karakash:** W Xaidulla 4150 m, *Miehe 8313!.*

W **Gilgit:** Shinghai Gah - Pahot Gali 3950-4300 m, *Miehe 871!; 994!; 1027!; 1050!; 1077!; 1100!; 1133!; 1147!; 1227!; 1551!; 1569!; 1577!; 1597!.* Baghrot Vy. 3730-4340 m, *Miehe 3746!; 3778!; 3876!; 4125!; 4259!;* 3740-4030 m, *Nüsser 1226!; 1229!; 1242!; 1248!; 1250!.* Upper Darchan Vy., above Khaltaro 3190 m, *Schickhoff 662!*; 3210 m, *Schickhoff 687!.* **Hunza:** Baltar 3650 m, *Paffen 141* (M!: "*K. schoenoides*"). N Chalt, N Chaprot, 3650-4250 m, *Klötzli & al. 4.42!; 5.10!; 10.05!* (veg.); *14.08!; 102.01!.* Rakaposhi N, above Nilt 3860 m, *Miehe 6513!; 6568a!.* Minapin Gl. 3510 m, *Lloyd*

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& Megan 61 (BM!). Above Masot Gl. 3750 m, *Schickhoff 176!*. **Hispar:** Along Hispar Gl. 4500 m, *Nakao* (KITAMURA 1964: "*K. bellardii*"). Gharesa Gl., 12 miles E of Nagar 3890 m, *O.Polunin 6254* (B!; BM!). Barpu Gl., left bank 3050-3350 m, *R.Scott Russell 1086* (BM!). Makerum 3810-4110, *R.Scott Russell 1423* (BM!). **Batura:** Gulmit - Atabad 4000-4050 m, *Miehe 2963!*. Khaibar 4000 m, *Miehe 2619!*. E Morkhoon 3420 m, *Klötzli & al. 90.12!*. **Khunjerab:** Bara-Khun Vy. 3500 m; Ghujerab Vy.; Chengerab Vy., *Visser-Hooft* (DOLK 1929). Khunjerab P. SW 4650 m, *Miehe 2344!*.

S **Shigar:** Kero Lungma Gl., left bank 3660-3960 m, *R.Scott Russell 1309* (BM!). Skoro P. S 4450 m; 4670 m (HARTMANN 1966). **Leh:** Stok Phu 4750 m, *H.Hartmann 2601!*. Taglang P. NW 4950 m, *H.Hartmann 4069!*.

Unloc.: Ladakh 3960 m (HENDERSON & HUME 1873).

A: Kongur: King-Tau Mts., 3-4 km SE Kosh-Kulak 3250 m, 1959-06-10, *Junatov* (Pl.As.Centr.). Upper Oytag Vy. 3770-3900 m, *Miehe 8693!; 9139!*. W Kunlun: Tiznap Vy., W Kudi 3700-4340 m, *Miehe 8420!; 8454!; 8472!; 8499!*. Upper Tiznap Vy. 4000-4160 m, *Miehe 7605!; 7737!*. C.Kunlun: Keria Mts., Kyuk-Egil Vy. 3750 m, 1885-07-11, *Przewalsky* (Pl.As.Centr.). Seravshan. W Pamir, E Pamir 2850-4600 m (Fl.Tadzh.); W Pshart Vy. 3350 m, *Lukanenkova*, Gerb.Fl.SSSR *4360* "*K. capilliformis*" (K!); "5 km supra ostium Dzahn-Kainda" 3350 m, *N.N.Tzvelev* (Pl.As.Centr.; LE **type** *K. ovczinnikovii*). Wakhan: 3900-4000 m (PODLECH & ANDERS 1977). Chilas: Gor 3520 m, *Schickhoff 1485!*. Right slope above Fairy Meadows 3660 m, *Nüsser 991!*. Raikot Gl., left lateral moraine, nunatak 3950-4120 m, *Nüsser 371!; 374!; 445!;* Base camp area 3970-4400 m, *Nüsser 447!; 476!; 485!; 496!; 525!*. Ganalo Gl., right lateral moraine, nunatak, Base camp area 4200 m, *Nüsser 510!*. S Bezar Gali, "Fulu" 4180 m, *Nüsser 543!*. Upper Kosto Vy. 4300 m, *Nüsser 1425!;* Upper Kosto Vy., Jiliper High Camp 4210 m, *Nüsser 1439!*. Upper Pattaro Vy., Guttum Sagar 4260 m, *Nüsser 1358!*. Astor: [Rama Vy. SW Astor] 3660 m, *Lankester & Pearson 1503* (BM!). Bulan Ridge, 4180 m, *Nüsser 178!* (cf.). Rama Vy., left slope 3620 m, *Nüsser 205!*. Upper Rupal Vy., S of Latobo 3950 m, *Nüsser 68!;* upper Mazeno Base Camp 4320 m, *Nüsser 1479!*. Rupal Vy., Nagachakali, "nunatak" 3440-3870 m, *Nüsser 598!; 612!; 619!; 626!*.Upper Rupal Vy., Latobo 3950 m, *Nüsser 68!* (cf.). Deosai: common 3050-3960 m (STEWART 1961). Deosai E 4200-4300 m, *Miehe 5087!; 5162!*. Dras: Above Dras, Lamchan Nullah, *Duthie 13799* (K!). Marpu Nullah 3960 m, *Duthie 11857* (K!). Khorbula Nullah 4270 m, *Duthie 11985* (BM!; K!). Suru: Kartse Vy. 4160 m, *H.Hartmann 2367!*. Zanskar: [NW Zangla c.4150 m], 1848-06-30, *T.Thomson* s.n. (K!; CLARKE 1898). Pensi P. 4360 m, *H.Hartmann 2600!*. More 4800 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Spiti, Bara Latsa [Lacha] P. to Tsala, NE slopes of the P., 1856-06-19, *Schlagintweit 2472* (BM! **type** *K. brunnescens*). Swat. Hazara: Kaghan Vy., Babusar P. 3200-4320 m, *Miehe 38!; 128!; 181!; 247!; 330!; 542!*. Saiful Maluk, *Shaukat Ali 225* (K!). Kashmir: 2740-3950 m, frequent (CLARKE 1898, etc.). Alibad 3350 m, *C.B.Clarke 28918* (K!). Above Gulmarg 3350-3660 m, *Duthie 11341* (K!). Kajnag Range 3660-3960 m, *Duthie 11041* (K!). Himachal Pr.: "Inter Kanam et Sungnam, Kunawur", *Jacquemont 1598* (K! **isotype**). Lahul, Por-Kar-Jot, *Bor's coll. 112* (K!). Biling Lungsa 3960 m, *Bor 14756* (K!). Spiti [? see above], *Schlagintweit* (CLARKE 1898).

D: ?Caucasus (*K. macrolepis* MEINSH.); Pamir-Alai, Tian Shan, ?Altai, ?E Siberia; Karakorum, W Kunlun, W Himalaya: E Afgh. (Kurram, Nuristan) - Nepal, ? W, S & E Tibet (Qinghai, Xizang), ? W China (Gansu, Sichuan). **Map:** IVANOVA 1939: map 2 (*K.capillifolia, K. capilliformis*). Pl.As.Centr.3: map 2 (*K. ovczinnikovii, K. capilliformis*). *Centr.As.*

E: (3190) 3420-4950 m, alp., locally common. *Salix karelinii* scrub, meadows and alpine turf, usually rather stable gravel slopes (granite) with more or less frost activity and solifluction. In the driest areas ± restricted to groundwater-habitats on N-facing slopes of the upper alpine and subnival belt (flushes, margins of naka-moors; *K. schoenoides*). *K. capillifolia* forms large mats, which are connected by its dead sheaths and give a very hard sod. This community resembles the Elynetea-communities (*Kobresia myosuroides*) of the European Alps. *K. capillifolia* is also common in the C. Tian Shan (Urumqi Vy., Shengli Daban, leg. *Miehe*), where it occurs from the upper forest belt (*Picea schrenkiana, Betula*) to the highest alpine turf.

N: The species is very variable in all of its dimensions and has been divided up variously. OVCZINNIKOV (1963) in Fl.Tadzh.2 distinguishes *Kobresia capillifolia* (DECNE.) C. B. CLARKE subsp. *capilliformis* (IVANOVA) OVCZ. and *Kobresia capillifolia* (DECNE.) C. B. CLARKE subsp. *pamirica* OVCZ. (*K. capilliformis* IVANOVA p.p.). These taxa represent hardly more than ecological variants; and the specimens cited above, as well as most of material seen from Pamir and Tian Shan

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must be considered typical. A different plant (*K. kashgarica*), apparently combining characters of some of the previously described subspecies of *K. capillifolia*, but which is also close to *K. myosuroides*, occurs at high altitudes of the Kunlun Shan N slope and of the Central Tian Shan. *Kobresia macrolepis* MEINSH. 1900, from the Caucasus, is close to *K. capillifolia*, but may be a distinct species (cf. KUKKONEN 1990b). The distribution of *K. capillifolia* towards Tibet is very uncertain, due to frequent misidentifications.

* **Kobresia duthiei** C. B. CLARKE in HOOKER f. 1894 (*Kobresia rostrata* C. B. CLARKE ex IVANOVA 1939 - **A**: ?Kashmir. Himachal Pr. (ASWAL & MEHROTRA 1994). **D**: W Himalaya: ?Kashmir, Himachal Pr. - Sikkim.

* **Kobresia esenbeckii** (KUNTH) NOLTIE 1993 (*Carex esenbeckii* KUNTH 1837, *Kobresia trinervis* BOECK. 1875, *Kobresia hookeri* BOECK. 1875, *Kobresia seticulmis* BOECK. 1875, *Kobresia angusta* C. B. CLARKE in HOOKER f. 1894) - **A**: Himachal Pr.: Rothang P. 4000 m, 1993-08-08, *Holzner & Kriechbaum* s.n.!. W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4530 m, *Miehe+9617b!;* 4500-4600 m, *Miehe+9631b!.* **D**: Himalaya (Lahul - SE Tibet), SW China (Yunnan). **N**: For morphological variation and synonymy see NOLTIE (1993).

* **Kobresia filifolia** (TURCZ.) C. B. CLARKE 1883 - A species of NE Asia: Siberia, Altai, Mongolia and [?]NE Tibet (IVANOVA 1939: map 2). The identity of the plants cited by CLARKE (1898) is uncertain: Nubra Vy., *Schlagintweit 2018; 2426* [probably *K. capillifolia*]; [?]Ladakh, *Schlagintweit 1344* [which was the **type** *K. macrantha* BOECK. from Spiti].

* **Kobresia humilis** (C. A. MEYER) SERG. 1935 (*Elyna humilis* C. A. MEYER ex TRAUTV. 1871) - **Ic.: fig. 4** (3). **A**: N Kashg. (Pl.As.Centr.); W Pamir 3000-4000 m (Fl.Tadzh.). **D**: Pamir-Alai, Tian Shan, Dzungaria. **Map:** IVANOVA 1939: map 5. **N**: Sometimes difficult to distinguish from *K. royleana* (see there) and substituting this in the C. Tian Shan, e.g. Urumqi Vy., Shengli Daban: common from the upper forest belt to the highest alpine turf, 2300-3700 m. *K. persica* (see there) may be the same species.

64. **Kobresia karakorumensis** DICKORÉ sp. nov. (§ *Kobresia*)

Kobresia pusilla auct. non IVANOVA 1939: ?RAYMOND 1965a, DICKORÉ 1991, *Kobresia royleana* (NEES) BOECK. var. *humilis* auct. non (C. A. MEYER) KÜKENTHAL, *Kobresia simpliciuscula* auct. non (WAHLENB.) MACKENZIE 1923: WENDELBO 1952, ?Ann.Cat.Pak., *Kobresia persica* auct. non KÜKENTHAL & BORNM. 1897: ?OVCZ. 1963 p.p., *Kobresia macrantha* auct. non BOECK. 1888: ?PAMPANINI 1934, HARTMANN 1966

Ic.: fig. 4 (1).

Diagnosis

Differt a *K. pusilla* perigyniis brevioribus basi connatis, nuce minore 2,4-2,7 mm (nec 2,7-3,2 mm) in styli basin cylindricam subsensim abiente (nec abrupte contracta), spiculis partialibus androgynis floribus masculis 2 (nec 2-4), glumis ovatis 2,5-3 mm longis (nec 3-4 mm) brunneis anguste hyalino-marginatis (nec obovatis late hyalino-marginatis). Differt a *K. persica, K. humile, K. royleana* stylibus 2 (nec 3).

Descriptio

Rhizoma dense ramificatum, lignosum. Planta caespitem nanum formans.

Culmus (2) 3-15 (20) cm altus strictus rigidus obtusangulus striatus superne triqueter laevis.

Folia culmo breviora conferta 1-2,5 mm lata, plana, rigida. Vaginae basilares brunneae foliiferae ± recurvatae.

Spicula solitaria (raro composita) breviter cylindrica 5-12 mm longa 2-4 mm lata.

Spiculae partiales androgynae 3-4-florae, flos basilaris femineus, flores superiores 2 masculini (1 sterilis).

Glumae ovatae, 2,5-3 mm longae, obtusae, brunneae, anguste hyalino-marginatae.

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Perigynium squamam aequans, ellipticum, marginibus fere ad 1/4 connatis; glabrum basi hyalinum, apice castaneum.

Nux parva (2,4-2,8 mm), oblonga, applanata in styli basin cylindricam subsensim abiens.

Stigmata 2 exserta basi breviter connata.

Typus:

China, Xinjiang, Central North Karakorum. "Nunatak" between K2-North Glacier and Skyang Kangri Glacier 4800 m. Dry alpine turf, dominant on margin of frost scree, with *Carex borii*. 1986-09-23. leg. *B.Dickoré 784* (**type**: **holo-** K, **iso-** PE).

Diagnosis

Differs from *K. pusilla* by the shorter perigyne which is connate at the base, the smaller nut which is 2.4-2.7 mm long (not 2.7-3.2 mm), and which is gradually tapering into the cylindric base of the style (not abruptly contracted), the androgynous partial spikes which contain 2 male (and one sterile) flowers (not 2-4 male flowers), the ovate glumes which are 2.5-3 mm long (not lanceolate, 3-4 mm) with a narrow (not broad) hyaline margin. Differs from *K. persica*, *K. humilis*, *K. royleana* by the two (not three) stigmas.

Description

Rhizome densely ramificating, woody, plants forming low cushions.

Culm (2) 3-15 (20) cm high, straight, rigid, subterete, striate, triquetrous above, smooth.

Leaves (usually) shorter than the culm, crowded, 1-2.5 mm broad, flat (to plicate), rigid, usually strongly recurved, basal sheaths brown, with (dead) leaf-blades.

Spike solitary, rarely compound, shortly cylindric, 5-12 mm long, 2-4 mm broad.

Partial androgynous spikes with 3-4 flowers, the basal one feminine, the upper two male (and one sterile).

Glumes ovate, 2.5-3 mm long, obtuse, brown, with a narrow hyaline margin.

Perigyne as long as the glume, elliptic, margin connate up to 1/4 of its length, glabrous, hyaline at base, castaneous above.

Nut small (2.4-2.8 mm), oblong, applanate, gradually tapering into the cylindric base of the style.

Stigmas 2, long exserted, at the base shortly connate.

CN **Braldu:** Pamir P. S, near Shuwart 4720-4770 m, *Miehe 6105!; 6149!*. **K2-North:** K2-N Gl. W 4380-4460 m, *Dickoré 658!*. K2-N Gl. E 4750-5030 m *Dickoré 680!; 683!; 784!; 796!; 809!*.

CS **Shimshal:** Pamir P. 4700-4820 m, *Miehe 6342!; 6360!*. **Biafo:** Laskam 4430 m; 4540 m, *H.Hartmann 273!*; Cho Blok 4130 m; 4180 m, *H.Hartmann 268!*; *269* (Z!); 4210 m; Gense 4000-4660 m; Baintha 4130-4960 m; 4850 m, *H.Hartmann 269* (Z!); *270!*; Skoro P. N 4130 m; 4600 m (HARTMANN 1966: "*K. macrantha*"). **Saltoro:** Above Hushe 4150-4330 m, *Miehe 1962!; 2018!*.

N **Taxkorgan:** S Taxkorgan, W KKH 4640-4660 m, *Miehe 5850!*.

W **Yasin:** Yasin - Darkot E side 3720 m, *Bowes Lyon 8128* (K!). Naz Bar 4440 m, *Miehe 3133!*. **Ishkoman:** Upper Ishkoman, Baru Gah 3050-3130 m, *Miehe 6769!*; Panji P. S, above Holojut 3800 m, *Miehe 6906!*. **Gilgit:** Shinghai Gah - Pahot Gali 4150-4240 m, *Miehe 1241!; 1608!*. Baghrot Vy. 4160-4300 m, *Miehe 3812!; 4160!*. **Hunza:** Minapin Gl. 3510 m, *Lloyd & Megan 92* (BM!). N Chaprot (3600-4400 m), *Klötzli & al. 20.01!*; 3530 m, *Klötzli & al. 728.11!*. **Batura:** Gulmit - Atabad 4000-4300 m, *Miehe 2890!; 2909!; 2918!; 2970!; 2973!*. Khaibar 4000 m, *Miehe 2607!*. **Khunjerab:** SW 4600-4700 m, *Miehe 2332!; 2347!; 2404!; 2421!*.

S **Shigar:** Skoro P. S 4600 m (HARTMANN 1966: "*K. macrantha*"). **Skardu:** Pakora, Ganto P. W 3600-3700 m, 1991-07-02/04, *J.Poelt* s.n.!. **Leh:** Keenaots [Kinutse] in Rondu, *Winterbottom 790* (K!). Stok Phu 4750 m, *H.Hartmann 2603!*.

A: Kongur: Upper Oytag Vy. 3760-3900 m, *Miehe 8724!; 9159!*. W Kunlun: Upper Tiznap Vy. 4200-4400 m, *Miehe 7617c!; 7700!*. Wakhan: Kotale Wazit N 4620 m, *Breckle 1320* (hb. Podlech!). Side

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Vy. to the E of the Tergan Qurum Vy., S of Lake Bishutik 4700 m, *Grey-Wilson & Hewer 1532* (K!: not typical, 2-3 styles). Chitral: Barum Gol, near camp 2, N side of Barum Gol Gl. 4500 m, 1950-07-27, *Wendelbo* s.n. (K!). Turikho Rv. 3200 m, *Stainton 2496* (RAYMOND 1965a: *K. pusilla*). Chilas: Gor Region, above Kahlimay, 3770m , *Nüsser 1111!*. Astor: Upper Rupal Vy., Upper Mazeno Base Camp 4320 m, *Nüsser 1481!*. Deosai: 3660 m, 1925-08, *Meinertzhagen* s.n. (BM! p.p. with *Carex pseudofoetida*). Deosai E 4600 m, *Miehe 5103!*. Zanskar: Pensi P. 4360 m, *H.Hartmann 2602!*. Shingo P. 4700 m, 1981, *W.Holzner* s.n.! (with *K. nitens*); 1992-08-08, *Holzner & Kriechbaum* s.n.!. Sarchu 4400 m, 1993-07, *Holzner & Kriechbaum* s.n.! (cf., not typical). Shingo P. - Ramjak 4500 m, 1993-07-31, *Holzner & Kriechbaum* s.n.!. Himachal Pr.: Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!. W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4500-4600 m, *Miehe+9631c!*.

D: ?E Pamir, Kongur, Wakhan, Chitral, Karakorum, Inner W Himalaya, Karakorum, NW Himalaya (Ladakh - W Nepal). *Endem.*

E: (3100-) 3800-5030 m, alp. - subniv., scattered, in high altitudes of the C. Karakorum locally common. High alpine turf on earthy, silty, usually slightly inclined permafrost slopes, up to the highest turf spots (*Carex borii, Stipa concinna, Potentilla pamirica*), often in contact with free gelifluction gravels (*Sibbaldia tetrandra, Saussurea gnaphalodes*); rarely below of the alpine belt in water-surplus habitats.

N: Except for the 2 stigmas and the somewhat narrower leaves sometimes difficult to distinguish from depauperate specimens of *K. royleana*. In the W Karakorum plants are found with variable stigma numbers (2-3, rarely 4), which might represent intermediates / hybrids with three-stigmatic species (*K. royleana, K. persica, K. humilis* ?). *K. karakorumensis* is to be expected in E Pamir, but obviously subject to some confusion with these species. The total distribution area and ecological requirements of *K. karakorumensis* apparently are very similar to those of *Carex borii*. Both are common in high altitudes in the western C. Karakorum and, apparently rather disjunct, also occur in SE Zanskar. *Kobresia royleana* (NEES) BOECK. var. *himalaica* RAJBHANDARI & H. OHBA, Univ. Tokyo Bull. **34**: 150, from Nepal, is possibly another segregate of *K. royleana*, which may also merit specific rank.

* **Kobresia kashgarica** DICKORÉ sp. nov. (§ *Elyna*)

Ic.: fig. 5 (1).

Diagnosis

Differt a *K. capillifolia* perigyniis basi ad tertiam partem connatis (nec subliberis) ab axe spiculae facile secedentis, nuce minore, 1,8-2,3 mm (nec 2,5-3,5 mm), spiculis partialibus androgynis flore masculo 1 (nec 2), glumis ovatis 2,5-3 mm longis (nec 3,5-5,5 mm) pallide viridi-cinnamomeis (nec atrofuscis), antheris 1-1,5 mm (nec 1,5-3 mm).

Descriptio

Rhizoma dense caespitosum.

Culmus (1) 2-5 (8) cm altus, gracilis, obtusangulus, laevis, ad basin vaginis efoliatis brunneis lucidis obtectus.

Folia culmum subaequantia, filiformia, convoluta, marginibus scabriuscula.

Spicula lineari-cylindrica, (5) 7-10 (15) mm longa, 2-2,5 mm lata.

Spiculae partiales laterales androgynae 2-florae (flos inferior femineus, superior masculus).

Glumae ovatae, 2,5-3 mm longae, pallide cinnamomeae, carina viridi.

Perigynium 2,2-2,6 mm, ovatum, subacutum basi ad tertiam partem connatum, hyalinum subter, pallide-brunnescens superne.

Nux parva (1,8-2,3 mm) obovata obtuse trigona breviter stipitata.

Stigmata 3.

Antherae 1-1,5 mm.

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Typus:

China, Xinjiang, Kunlun Shan. Tiznap, tributary valley W of Kudi, 36°51'N/76°57'E, 4040 m. Alpine *Cyperaceae* mats (grazed loess slope with *Carex tangulashanensis*), 1992-07-09, *G. & S. Miehe 8471* (**type**: **holo-** K, **iso-** GOET, PE).

Diagnosis

Differs from *K. capillifolia* by the perigyne which is connate up to 1/3 (not almost free) and which is easily separating from the spike-axis (not difficult), the smaller nut which is 1.8-2.3 mm long (not 2.5-3.5 mm), the androgynous partial spikes which contain 1 male flower (not 2), the glumes which are 2.5-3 mm long (not 3.5-5.5 mm), ovate (not lanceolate), pale greenish-cinnamon coloured (not brown to black), the anthers which are 1.1.5 mm (not 1.5-3 mm) long.

Description

Rhizome densely caespitose.

Culm (1) 2-5 (8) high, delicate, subterete, glabrous, covered at the base by brown lucid, blade-less sheaths.

Leaves about the same length than the culm, filiform, convolute, margin scabrous.

Spike linear-cylindric, (5) 7-10 (15) mm long, 2-2.5 mm broad.

Lateral androgynous spikes 2-flowered (the lower flower feminine, the upper male).

Glumes ovate 2.5-3 mm long, pale cinnamon mith green midrib.

Perigynium 2.2-2.6 mm ovate, subacute, connate up to 1/3, hyaline below, pale brown above.

Nut small, 1.8-2.3 mm, obovate, obtuse trigonous in cross-section, shortly stipitate.

Stigmas 3.

Anthers 1-1.5 mm long.

A: W Kunlun: Tiznap Vy., W Kudi 4040-4340 m, *Miehe 8434!; 8471!.* ?Mazar P. N 4880 m, *Miehe 8365!* (young). **D**: W Kunlun, C.Tian Shan. **E**: (Kunlun:) 4040-4340 (-4880?) m, alp., loess covered, grazed slopes (*Kobresia capillifolia, Carex tangulashanensis*). **N**: Also found under very similar situations in the C. Tian Shan: Urumqi Vy., Shengli Daban 3700 m, *Miehe 9047!,* highest alpine turf (*Kobresia capillifolia, K. humilis, Carex tangulashanensis*). Probably a high alpine relict species of the mountains bordering to the Tarim basin, which may be expected in connecting localities; sympatric and perhaps intergrading with *K. capillifolia*. Although the chromosome numbers are unknown, it suggests a diploid (or lower level of polyploidy) in relation to *K. capillifolia*. The combination of the characters distinguishes *K. kashgarica* from previously described segregates, which seem to come much closer to *K. capillifolia*.

65. Kobresia laxa NEES in WIGHT, Contr. Bot. India 119. 1834

Elyna laxa (NEES) KUNTH 1837, *Hemicarex laxa* (NEES) BENTHAM 1881, *Kobresia pseudolaxa* C. B. CLARKE 1883, *Schoenoxiphium laxum* (NEES) IVANOVA 1939, ? *Schoenoxiphium hissaricum* PISSJAUK. 1950

Ic.: KÜKENTHAL 1909: fig.11. ?Fl.Tadzh.2: fig.15 (*Schoenoxiphium hissaricum*). RAJBHANDARI & OHBA 1991: pl.67b, fig.5 g-l, fig.24.

CS **Biafo:** Shingtsakbi [Shinchapbi Biaho] on the left side of the Mustak Gl. [Panmah Gl.] below Tsoka [c. 4050 m], 1856-09-19, *Schlagintweit 6040* (K!).

W **Yasin:** Naz Bar 3350-3400 m, *Miehe 3615A!.* **Gilgit:** Gilgit 1520 m, *R.R.Stewart 26939* (K!); 1500 m, *Nakao* s.n. (KITAMURA 1964; RAJBHANDARI & OHBA 1991; TNS). **Hunza:** Ulter Nullah 3050 m, *R.R.Stewart 26932* (K!). Baltit 2300 m, *F.Lobbichler 2* (M!). Torbutuo Das 2250 m, *Paffen 170* (W!); "NW Karakorum 2250 m", *Paffen 170* (M!). Oltali Chish 3000 m, 1955-06-10, *S.Nakao* s.n. (KYO!; KITAMURA 1964).

S **Skardu:** Skardu - Dras 2770 m, 1876-08-18, *C.B.Clarke 30526* (K!; Z!; CLARKE 1898). Satpura Nullah 3050-3350 m, *Duthie 12027* (K!: dwarf specimen; RAJBHANDARI & OHBA 1991).

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A: ?W Pamir 1100-2800 m (Fl.Tadzh.: *Schoenoxiphium hissaricum*). Nuristan: Pashki 2300 m, *Edelberg 604* (K!); *614* (K!). Chitral: Shokor Shal, Main Barum Gl. E 3600 m, 1950-07-23, *P.Wendelbo* s.n. (K!: *K. laxa X K. royleana* ?). Chilas: Martal 2970 m, *Nüsser 1146!*. Muthat, Buldar Vy. 2960m, *Nüsser 1034!*. Astor: Kalapani 3200 m, 1885, *Giles 19* "*Carex sanguinea* BOOTT" (K!). Rama Vy. SW Astor 2740 m, *Lankester & Pearson 1437* (BM!). Rupal Vy., Tarishing 2910 m, *Nüsser 573!*. Deosai: Shingo Vy., Gulteri - Sumbal (STEWART 1961). Dras: *C.B.Clarke* (CLARKE 1898). Swat: Sho Nala 2290 m, *R.R.Stewart & A.Rahman 25189* (K!, W!). Above Ushu 2440-2740 m, *R.R.Stewart 25403* (W!). Hazara: Siran Vy., *Inayat 20261* (K!). Siran Range, Darakelu 3170 m, *Inayat 23278* (K!). Kagan Vy. 2740 m, *Inayat 20263* (K!); *20264* (K!). Saiful Maluk, *Shaukat Ali 177* (K!). Kashmir: Gurais 2440 m, *C.B.Clarke 29491* (K!). Kishenganga Vy., near Thaubat 2290 m, *R.R.Stewart 17913* (K!). Sonamarg 3200 m, *C.B.Clarke 9742* (K!). Mapanon 2740 m, *C.B.Clarke 29566* (K!). Barumgalli 1980 m, *C.B.Clarke 28412* (K!). Alibad 3050 m, *C.B.Clarke 28693* (K! **type** *K. pseudolaxa*). Tulion above Pahlgam 3660 m, *R.R.Stewart 21850* (K!). Pir Panjal 2740 m, *Drummond 13912* (K!). Himachal Pr.: Lahul, Gurungatal - Gondla, *Drummond 24143* (K!). Darcha, *Aswal 10342*; common (ASWAL & MEHROTRA 1994).

D: ?W Pamir; W Himalaya: Afgh. (Nuristan) - Sikkim. *W Himal.*

E: (1500) 2250-3400 (c. 4050 m) m, mont. - subalp., scattered, but locally abundant in the SW. Wet habitats: moist meadows, flushes, wet rocks.

* **Kobresia hissarica** (PISSJAUK.) DICKORÉ comb. nov.

Basionym: *Schoenoxiphium hissaricum* PISSJAUK., Not. Syst. (Leningrad) 12: 72. 1950.

- **A**: W Pamir. **D**: W Pamir-Alai. **N**: This is perhaps conspecific to *K. laxa*.

66. Kobresia macrantha BOECK., Cyper. Novae **1**: 39. 1888

Blysmocarex macrantha (BOECK.) IVANOVA 1939

Ic.: Fl.Xizang.5: fig.220. RAJBHANDARI & OHBA 1991: pl.68a, fig.7, fig.27.

CS **Nubra:** Nubra Vy., Liangtsung to Panamik [N 34°47' E 77°32'] (left side of the Nubra Vy.), 1856-07-24/31, *Schlagintweit* s.n. (KÜKENTHAL 1909, RAJBHANDARI & OHBA 1991; BM! [**?neotype**]).

Unloc.: Ladakh (HOOKER 1894; ? no specimen seen).

A: Himachal Pr.: Spiti, *Schlagintweit 1344* (BOECKELER 1888: **type** ? B destroyed). Baralacha P., *Bhattacharyya 40828* (BSD; ASWAL & MEHROTRA 1994).

D: Tibet (E Karakorum, SE Tibet), Inner Himalaya (Nepal, rare), W China (Gansu, Qinghai, Xizang, Sichuan). *Tibet.*

E: ? c. 3300 m, mont. - subalp., rare in the SE. Habitat in the Karakorum unknown. (Tibet:) alp., open dry to moderately moist turf on ± groundwater-influenced, loose (rhizome geophyte!) but stable substrates (moraines, fluvioglacial gravels); often as a pioneer.

N: A species of S Tibet, which enters the Karakorum from the E, the Nubra locality possibly being the westernmost outpost of its area. *K. macrantha* is very similar to *Carex pseudofoetida*, and perhaps closely related with the *Carex maritima* group, but differs in the open prophyll. Most easy, without causing destruction on herbarium specimens, *K. macrantha* is distinguished by the 3-4 mm long anthers, which are 2-2.5 mm in *C. pseudofoetida*. The records of HARTMANN (1966) are referable to *K. karakorumensis*, which is easily distinguished by the tufted habit and lacking stolons. *K. macrantha* is apparently erroneously reported from: Astor: *R.R.Stewart 18975* [= *Blysmus compressus* !]; **Gilgit:** *R.R.Stewart 26917* [= *Blysmus compressus* !]; Deosai: Marpo P., *R.R.Stewart 22274* [= *Kobresia royleana* !] (Ann.Cat.Pak.); *Meinertzhagen* s.n. [= *Carex pseudofoetida* + *Kobresia karakorumensis* !] Kashmir: Burzil P., *R.R.Stewart 19025* [= *Carex pseudofoetida*]. The following records are doubted although no herbarium material was seen: **Leh:** Himis, *Koelz 2557* (Ann.Cat.Pak.); **Nubra:** Siachen Gl., base camp 4850-4950 m, *Dainelli* (PAMPANINI 1934 [? perhaps *K. karakorumensis*].

* **Kobresia nepalensis** (NEES) KÜKENTHAL 1909 (*Uncinia nepalensis* NEES in WIGHT 1834, *Carex linearis* BOOTT 1858) - **Ic.**: Fl.Xizang.5: fig.216, RAJBHANDARI & OHBA 1991: pl.69a, fig.9 a-g, fig.25. - **A**: Swat. Hazara. Kashmir 2900-4300 m. Pir Panjal 3350 m, C.B.Clarke 28754 (BM!). Himachal Pr.: Khoksar - Sissu,

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Aswal 11141 (ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 3800 m, *Miehe+9601d!;* (N 30°09' E 81°18') 4680 m, *Miehe+9627b!.* **D**: Himalaya - SE Tibet, Sichuan, Yünnan. **N**: Reported from Baltistan (Ann.Cat.Pak.), without further details, unconfirmed and probably erroneous.

67. Kobresia nitens C. B. CLARKE, J. Linn. Soc. London (Bot.) **20**: 379, pl. 30, f. 7. 1883
? *Kobresia burangensis* Y. C. YANG 1987, *Kobresia tibetica* auct. non MAXIM. 1883: PODLECH & ANDERS 1977 p.p.

Ic.: RAJBHANDARI & OHBA 1991: pl.69b, fig.10, fig.26.

CS **Shimshal:** Shimshal Vy., *Visser-Hooft* (DOLK 1929). **Biafo:** Cho Blok 4130-4210 m; Baintha 4610 m, *H.Hartmann 238!; 240* (Z!); 4850 m (HARTMANN 1966). Along Biafo Gl. 4000 m, 1955-06-24, *S.Nakao* s.n. (KYO! not typical). **Saltoro:** Above Hushe 4350 m, *Miehe 2000!.*

W **Yasin:** Naz Bar 4090-4440 m, *Miehe 3085!; 3105!; 3140!; 3168!; 3202!; 3270!; 3213!.* **Gilgit:** Naltar Vy. 3050-3350 m, 1892-08-04, *Duthie* s.n. (K!; CLARKE 1898, RAJBHANDARI & OHBA 1991). Shinghai Gah - Pahot Gali 3950-4230 m, *Miehe 1051!; 1083!; 1102!; 1140!; 1240!; 1561!.* Baghrot Vy. 4060-4340 m, *Miehe 3715!; 3785!; 3811!; 4096!; 4107!; 4110!; 4126!; 4157!.* **Hunza:** Rakaposhi N, above Nilt 3900 m, *Miehe 6593!.* **Hispar:** Gharesa Gl. base camp, 13 miles E Nagar 4820 m, *Polunin 6213* (B!; BM!). **Batura:** Gulmit - Atabad 4000-4300 m, *Miehe 2908!; 2915!; 2782!; 2936!.* **Khunjerab:** Bara-Khun Vy. 3500 m; Ghujerab Vy.; Chengerab Vy., *Visser-Hooft* (DOLK 1929).

S **Shigar:** Kero Lungma Gl., left bank 4420 m, *R.Scott Russell 1254* (BM!). Sokha Gl., left bank 3960 m, *R.Scott Russell 1682; 1863* (BM!). **Leh:** Kinutse in Rongdo, *Winterbottom 790* (K!). Burji P. 4420 m, *C.B.Clarke 29840* (K!).

A: ?Wakhan: Kotal-e Qara Qabchal (36°59'N 73°30'E) - Zemestan-e Baharak (37°00'N 73°36'E) (3300-4050 m), *Anders 7303* (M!: *K. schoenoides* X *K. nitens* ?; PODLECH & ANDERS 1977: "*K. tibetica*"). Chilas: Raikot Gl., left lateral moraine, nunatak 4270 m, *Nüsser 391!;* Base camp area 4300-4430 m, *Nüsser 484!; 505!.* Upper Pattaro Vy., Guttum Sagar, moraine 4490 m, *Nüsser 1388!.* Astor: Rama ridge 4000 m, *Nüsser 212!* (cf.). Deosai: Chota Deosai (STEWART 1961). Dras: W Dras, Chatpani Nala 3960 m, *Duthie 13882* (K!). Zanskar: Shingo P. 4700 m, 1981, *W.Holzner* s.n.!. Hazara: Kaghan Vy. 3810-4060 m, *Miehe 159; 194!; 215!; 281!; 288!; 317!*; 4390 m, *Inayat 20259* (K!); Nila, *Inayat 22638* (K!). Kashmir: 3350-4270 m (CLARKE 1898, etc.). Barzil 12000' [Burzil P. 3660 m], *C.B.Clarke 29697* (K! **type**); 4270 m, *R.R.Stewart 22072* (K!). Above Gulmarg 3960 m, *R.R.Stewart 8863* (K!). Alibad 3350 m, *C.B.Clarke 28918* (K!). Liddar Vy., Sonsal Nullah 3960-4270 m, *Duthie 13383* (K!). Kolohoi Vy. 4400 m, *O.Polunin 56/548* (B!). Himachal Pr.: Bara Lacha P., *Bor's coll. 171* (DD, K!; ASWAL & MEHROTRA 1994); 5030 m, *Koelz 6822* (W!). Lahul, Kailing-Ka-Joh, *Bor's coll. 69* (K!). [?]Rupshu: Tsokar, *Koelz 6600* (Ann.Cat.Pak.). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4400 m, *Miehe+9616d!.*

D: ?Wakhan, S Karakorum, W Himalaya (Hazara - W Nepal). *W Himal.*

E: (3050) 3950-4440 (4850) m, alp., locally common (SW). Closed turf, meadows and meadow-steppes, preferably under rather humid situations and with relatively long snow-cover; rarely in subalpine *Salix karelinii* scrub, flushes and high alpine free gelifluction slopes.

N: Specimens from the extreme W (Yasin) demonstrate a high variability of the culm length: 3-30 cm. The species is substituted by *K. robusta* on the Tibetan plateau, which appears to be closely related, but generally well separated. Hybrids and introgression between *K. nitens* and *K. schoenoides* may occur (?Wakhan, SW Tibet), but is not definitely verified. *K. burangensis* may represent a plant of *K. nitens* with unusually deeply split prophyll, or such a hybrid.

* **Kobresia persica** KÜKENTHAL & BORNM. 1897 - **A**: W & [?]E Pamir 2800-4300 m (Fl.Tadzh.). [?]Kashmir (Ann.Cat.Pak.) **D**: Turkey, Caucasus, Iran, Afgh., Pamir-Alai. **Map:** IVANOVA 1939: map 5. **N**: *Kobresia persica*: Persiae austro-orientalis, Prov. Kerman, Kuh-i-Lalesar 3800-4000 m, *Bornmüller 4800* (B! **type**) is at least poorly understood in the E part of its range. It may be synonym to *K. humilis*. Records from E Pamir (Fl.Tadzh.) may refer to *K. karakorumensis*, from Kashmir (Ann.Cat.Pak.) to *K. karakorumensis* or *K. royleana*.

* **Kobresia pusilla** IVANOVA 1939 - **Ic.: fig. 4** (2). **D**: C. & NE Tibet. **Map:** IVANOVA 1939: map 5. **N**: Plants which are ± intermediate between *K. pusilla* and *K. persica* are distinguished as *K. karakorumensis* (see there).

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68. Kobresia pygmaea (C. B. CLARKE) C. B. CLARKE in HOOKER f., Fl. Brit. India 6: 696. 1894

Hemicarex pygmaea C. B. CLARKE 1883, *Elyna myosuroides* auct. non (VILL.) FRITSCH: SCHMID 1932

Ic.: Fl.Xizang.5: fig.214.

S **Leh:** Taglang P. 4980 m, 1993-07-21, *Holzner & Kriechbaum* s.n.!. **Pangong:** Keptung P. [5200 m], 1927-07-29, *Bosshard* (Z!; SCHMID 1932).

E **Changchenmo:** Lanak P., Lacarpo 5400 m, 1927-08-13, *Bosshard* (Z!; SCHMID 1932).

Unloc.: Ladakh 3660-4570 m, *T.Thomson* (HOOKER 1894, CLARKE 1898).

A: [?]Deosai: Burji P. S 3660-4570 m (STEWART 1961). Himachal Pr.: Kunawar, "in altissimis supra Yurpo", *Jacquemont 1783* (K!). Baralacha P., *Aswal 10998* (ASWAL & MEHROTRA 1994). Rupshu: Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K! **type**). Khyung Tso 5030 m, *Koelz 2246b* p.p. (W!). Nuruchan 4600 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. W Tibet: Upper Domar Chu 5100-5230 m, *Miehe 7941!; 7961!; 8000!; 8090! 8097!*. Garyarsa - Moincer, Indus-Sutlej divide (N 31°24' E 80°38') 4750 m, *Miehe+9654b!*. N Moincer (N 31°15' E 80°15') 5050 m, *Miehe+9639c!;* 5500 m, *Miehe+9640c!*.

D: Tibet (W, C., N, E, S, SE to Kongbo); Inner Himalaya (Rupshu, Himachal Pradesh - Bhutan), W China (Gansu, Qinghai, Xizang, Sichuan, Yunnan). **Map:** IVANOVA 1939: map 5. *Tibet.*

E: 4980-5400 m, alp. - subniv., on turf in water-surplus habitats. The species has a very wide ecological amplitude in Tibet (see below).

N: The Ladakh record perhaps refers to the type locality on the SE extremity of Ladakh/Rupshu. The record from Deosai would represent a far western outpost and needs to be confirmed. It does not seem to be quite impossible regarding the Tibetan character of the Deosai Plains, but *K. pygmaea* is easily confused with depauperate specimens of other *Kobresia* species, as well as with small *Carex* species. *K. pygmaea* appears to be rather common, but ± restricted to water-surplus habitats on the E boundary of the area. This dwarf (only 1-2 cm high) species is the most common and characteristic plant of the Tibetan Plateau. It usually dominates often species-rich turf and forms a very hard sod which covers an immense area of the plateau (except for the driest parts), zonally between c. 4000 and 5300 m. The sods rather uniformly attain an average thickness of c. 15 cm (in C. Tibet / Tangula Shan, less in the dry areas of S and W Tibet) and apparently represent humus accumulation since the deglaciation of the Tibetan Plateau. Economically, *K. pygmaea* probably is the most important plant of Tibet, highly adapted and tolerant to grazing. Instead of its small size, it appears to be a main fodder-plant, and its distribution apparently coincides with the area of large-scale Yak-pasturing. The sods are used for building-purposes (walls, roofs, living erosion-control buildings). Under dry conditions, the *K. pygmaea* turf is more vulnerable to overgrazing and hardly regenerates after destruction by erosion or sod-plugging. Heavy grazing and large *Ochotona*-populations may cause a degradation towards dwarf nitrophilous weed-communities (*Microgynoeceun tibeticum*, *Microula tibetica*) or cushion-communities on deflation ground. Large areas in S Tibet (SW of Lhasa) apparently suffer from desertification and erosion following the destruction of the *K. pygmeaea* turf. "*Kobresia koelzii* KÜKENTHAL" (ined. ?): the "**type**" material is a mixture: Rupshu: Khyung Tso 5030 m, *Koelz 2246b* (K! = *Carex sagaensis* and *Carex microglochin*; W! = *Kobresia pygmaea* and *Carex microglochin*).

69. Kobresia robusta MAXIM., Bull. Sci. Acad. Imp. Sci. Pétersb. **29**: 218. 1883

Kobresia sargentiana HEMSLEY 1894, *Kobresia robusta* MAXIM. var. *sargentiana* (HEMSLEY) KÜKENTHAL 1909, *Kobresia capillifolia* auct. non (DECNE.) C. B. CLARKE: SCHMID 1932

Ic.: KÜKENTHAL 1909: fig.7. Pl.As.Centr.3: fig.7(1). Fl.Xizang 5: fig.207. Fl.Desert.Sin.1: fig.63(14-17).

E **Aksai Chin:** Sirigh Jilga [c. 5200 m], 1927-09-03, *Bosshard* (Z!; SCHMID 1932: "*K. capillifolia*, reduced form"). N Tibetan Mts. 5100 m, *Miehe 8230!*.

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A: W Tibet: Upper Domar Chu 5100-5160 m, *Miehe 7955!; 8112!*. Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670b!;* (N 32°28' E 81°20') 4900 m, *Miehe+9672c!*. Changtang: Lungmu Co 5110-5310 m, *Miehe 8143!; 8193!; 8205!*.

D: N, W, C., E & S Tibet (Qinghai, Xizang). **Map:** IVANOVA 1939: map 3. Pl.As.Centr.3: map 1. *Tibet.*

E: 5100-5200 m, subniv., rare in the extreme E. Steppes and deserts on open sands, gravels and stone-pavements (limestone preferred ?), ± level, well-drained and superficially dry permafrost ground (*Krascheninnikovia compacta, Saussurea glanduligera, Artemisia minor*).

70. **Kobresia royleana** (NEES) BOECK., Linnaea **39**: 8. 1875

Trilepis royleana NEES 1834, *Elyna stenocarpa* KAR. & KIR. 1842, *Kobresia stenocarpa* (KAR. & KIR.) STEUDEL 1855, *Elyna kokanica* REGEL 1880, *Kobresia paniculata* MEINSH. 1901, *Carex paniculata* auct. non L. 1759: REGEL 1869

Ic.: Fl.Tadzh.2: fig.17(1-3: *K. stenocarpa*). Fl.Xizang.5: fig.224 (*K. stenocarpa* var. *simplex* Y. C. YANG); fig.225 (*K. royleana*). RAJBHANDARI & OHBA 1991: pl.70b, fig.12, fig.28. **Fig. 4** (4).

CN **K2-North:** Muztagh Vy. 3930-3950 m, *Dickoré 850!*. **Shaksgam:** Upper Shaksgam Vy. 4060 m, *Dickoré 915!*.

CS **Shimshal:** Pamir P. 4720-4880 m, *Miehe 6300!; 6307!; 6312!; 6322!*. **Biafo:** Skoro P. N 3700 m, *Nakao* s.n. (KITAMURA 1964: "var. *parvinux*"). **Saltoro:** Ghondokoro Gl. 4880-5030 m, *Nasir & Webster 6218* (WEBSTER & NASIR 1965, RAYMOND 1965). **Nubra:** [Lower] Nubra Vy., *T.Thomson* (CLARKE 1898). Siachen Gl., base camp 4850-4950 m, *Dainelli* (PAMPANINI 1934).

N **Mustagh Ata:** N 3650 m, *Miehe 5463!; 5468!*. W 4330 m, *Miehe 5517!*. SW 4460 m, *Miehe 5906!*. **Taxkorgan:** Dafdar 3510 m, 1935-06-29, *Persson 669* (PERSSON 1938). **Yarkand:** Mazar P. S 4910 m, *Miehe 8344!*. 3 km W Mazar 3850 m, *Dickoré 344!*. Ilyk 3520 m, *Dickoré 403!*. Surukwat Vy. 3700 m; Aghil Gorge 3880 m, *Dickoré 447!*; Aghil Vy. 4070 m; Aghil P. N 4460-4800 m, *Dickoré 500!; 526!; 527!; 574!; 575!*. **Karakash:** 10-12 km W Xaidulla / 25-30 km E Kirgiz-Dzhangil 3900 m, *Junatov*. W Xaidulla 4150-4350 m, *Miehe 8311!; 8318!*. SE Dahongliutan 4650-4850 m, *Miehe 7887!; 8260!*.

W **Batura:** Khaibar 2700 m, *Klötzli & al. 801.106,107,111!*. N Morkhoon 2740 m, *Klötzli & al. 99.18!*. E Morkhoon 3000 m, *Klötzli & al. 803.04, 10!*. **Khunjerab:** Bara-Khun Vy. 3500 m, *Visser-Hooft* (DOLK 1929: "*K. caricina*"). Khunjerab P. SW 4600 m, *Klötzli & al. 130/131.05!*.

S **Leh:** 3960 m, *Stoliczka* (CLARKE 1898); 3500 m, 1992-07-10, *Holzner & Kriechbaum* s.n.!. Leh, Sabu Vy., 1847-10-11, *T.Thomson* s.n. (K!). NW Leh 3610 m, *H.Hartmann 4068!*. S Matho 4450 m, *H.Hartmann 2364!*. Nimo [Nimu 3170 m], 1848-07-10, *T.Thomson* s.n. (K!). Gia [Gya] - Upshi, 1856-06-27, *Schlagintweit 1421* (BM!; K!). Kartse 4100 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. **Shyok:** [Calzar], 1848-07-22, *T.Thomson* s.n. (K!); 1848-07-23, *T.Thomson* s.n. (K!). **Pangong:** Pancong Tso [c. 4300 m], 1927-07-25, *Bosshard* (W!; Z!; SCHMID 1932: "*K. macrantha*").

E **Changchenmo:** 3660 m, 1925-06, *Meinertzhagen* s.n. (BM!). Lanak P., Lacarpo 5400 m, 1927-08-13, *Bosshard* (W!; SCHMID 1932). **Depsang:** Chipchak Vy., Camp XIV 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930). **Aksai Chin:** Lingzi Tang & Aksai Chin 5100 m, *Picot* (HEMSLEY 1895; PAMPANINI 1930).

Unloc.: Pamir region 3960-4270 m, *Alcock 17768* (BM!, K!).

A: W Kunlun: Tiznap Vy., Kudi 3000 m, *Dickoré 167!*; W Kudi 4200-4410 m, *Miehe 8396!; 8437!*. Upper Tiznap Vy. 3650-4300 m, *Dickoré 240!; 960!*; *Miehe 7606!; 7617a!; 7731!; 7742!; 8537!; 8549!*. Mazar P. N 4680-4880 m, *Miehe 7810!; 8372!; 8570!*. Alai: Kizil-su, Kashka-su 2400 m, 1904-07, *A.Kronenburg* s.n. (B!). W Pamir, E Pamir 2200-4200 m (Fl.Tadzh.). Sassykkul Lake, *Fedtschenko* s.n. (K!). In alveo flum. Mardianai, ad lac. Jashil Kul 3800 m, *O.Paulsen* s.n. (B!). Wakhan 3180-4020 m ("*K. stenocarpa*": PODLECH & ANDERS 1977). 2 miles W of Sarhad 3200 m, *Grey-Wilson & Hewer 1417B* (K!). Sast-e-Bala, banks of Ab-e-Panj 2900 m, *Grey-Wilson & Hewer 1390A* (K!). Deosai: Deosai region, Marpo P. above Dras, near top 4570 m, *R.R.Stewart 22274* (K!: typical & one aberrant specimen); *22274a* (K!: sterile, aberrant specimens). Dras: Dras 3080 m, *B.B.Osmaston 14* (K!). Suru: Kargil 2710 m, *B.B.Osmaston 9* (K!). W above Sankoo 3880 m, *H.Hartmann 2368!*. Zanskar: [NW Zangla c.4150 m], 1848-06-30, *T.Thomson* s.n. (K!). Zanskar - Zu,

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Drummond 24141 (K!). Chumikmarpo 4110 m, *Koelz 5348* (W!). Markha Vy., Nimaling 4860 m, *H.Hartmann 3007!*. Pogmar P. SE 4900 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. [Umasi P.], 1848-2.6 (1848-06-20/23), *T.Thomson* s.n. (K!). Lahul, Serchu 4390 m, *Koelz 2089* (W!). Swat: Bedori 3350 m, *R.R.Stewart & E.Nasir 24020* (K!). Kashmir: 2740-3350 m, *C.B.Clarke 28863; 28870* (CLARKE 1898). Kashmir - Ladakh Rd., Mitsahoi 3660 m, *R.R.Stewart 9990A* (K!). Khillanmarg above Gulmarg, 1926-07-23, *R.R.Stewart* s.n. (K!). Pir Panjal 3050 m, *C.B.Clarke 28870* (K!). [N Chamba], 1848-07-06, *T.Thomson* s.n. (K!). Himachal Pr.: Gundla, Tibetan border 3050 m, *Koelz 9895* (K!). Kunawur 3350 m, 1881-05, *Brandis* s.n. (K!). Khoksar, *Aswal 10245* (ASWAL & MEHROTRA 1994). Rupshu: Nuruchan 4600 m, 1992-07-24, *Holzner & Kriechbaum* s.n.!. W Tibet: Upper Domar Chu 5100-5200 m, *Miehe 7959!; 8013!; 8095!; 8096!*. NW Gar (N 32°24' E 79°44') 4400 m, *Miehe+9661c!*. W Gar (N 32°10' E 79°57') 4330 m, *Miehe+9662a!*. N Moincer (N 31°15' E 80°15') 5030 m, *Miehe+9648!*. Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4680 m, *Miehe+9603!*.

D: Dzung. Alatau, Tian Shan, Pamir-Alai, Kunlun, Karakorum, Afgh., Himalaya, Tibet (Qinghai, Xizang; W, N, C., NE, S, SE), Sichuan. **Map:** IVANOVA 1939: map 4 (*K. royleana, K. stenocarpa*). Pl.As.Centr. 3: map 4 (*K. stenocarpa*). *Centr.As.*

E: 2700-5100 m, (mont.-) subalp. - alp. (-subniv.), locally common. Usually in water-surplus habitats: flushes and fens (*Carex pseudofoetida*), among *K. schoenoides* tufts, riverside turf (*Blysmus compressus*) and scrub (*Salix pycnostachya, Carex orbicularis*), relatively rare zonally on high alpine turf (under relatively humid conditions / pass-situations, on loess, sedimentary rock-slopes). In Tibet a common component of water-saturated permafrost-bogs (*Kobresia pygmaea, K. schoenoides*).

N: A very protean species with a large altitudinal range. According to the ecological conditions, the height of flowering plants varies from c. 2 cm (high alpine turf) to 50 cm (montane sedge-flushes). The distinction of *K. stenocarpa* on account of nut characters does not seem to be practicable. The beak of the nut is of variable, but always evident length and easily breaks off together with the style and stigmas. From the spike-like inflorescences, the somewhat narrower leaves and the more fibrous dead leaf-sheaths *K. humilis* (Tian Shan populations) appears well set apart, but this and *K. royleana* may intergrade in the Pamirs. The two-stigmatic *K. karakorumensis*, which is always relatively dwarf, is a well-distinguished species, substituting *K. royleana* on high-alpine slopes in the central (granite) ranges of the Karakorum. Some records of *K. royleana* from the C. Karakorum, e.g. "abundant on `Green Island', upper arm of Ghondokoro Gl. at 16000-16500', here the commonest component of the vegetation but not seen at lower altitudes" (WEBSTER & NASIR 1965), may refer to *K. karakorumensis*, but not necessarily do so.

71. **Kobresia schoenoides** (C. A. MEYER) STEUDEL, Syn. Pl. Glum. 246. 1855

Elyna schoenoides C. A. MEYER in LEDEB. 1833, *Kobresia deasyi* C. B. CLARKE 1908, *Kobresia pamiroalaica* IVANOVA 1939, *Kobresia septatonodosa* KOYAMA 1956 (syn. nov.), *Kobresia tibetica* auct. non MAXIM. 1884

Ic.: Fl.Tadzh.2: fig.16 (*K. pamiroalaica*). Fl.Xizang.5: fig.210.

CS **Shimshal:** Pamir P. 4700 m, *Miehe 6362!*. **Biafo:** Cho Blok 4130 m; 4200 m, *H.Hartmann 304!*; 4210 m, *H.Hartmann 203* (Z!); Baintha 4100-4530 m; 4100 m, *H.Hartmann 299!; 300* (Z!); Skoro P. N 4130-4600 m (HARTMANN 1966). **Baltoro:** Paiju 3450 m (HARTMANN 1966). **Saltoro:** Ghondokoro Gl., 4110-4270 m, *Nasir & Webster 6182* (WEBSTER & NASIR 1965, RAYMOND 1965). **Nubra**: Nubra Vy., *Schlagintweit 2085* (CLARKE 1898). Siachen Gl., base camp 4750-4800 m, *Dainelli* (PAMPANINI 1934).

N **Mustagh Ata:** N 3650 m, *Miehe 5450!; 5459!*. W 4330 m, *Miehe 5520!*. SW 4460 m, *Miehe 5919!*. **Yarkand:** Mazar, *Junatov* (Pl.As.Centr.). N Mazar 3900 m; 3 km W Mazar 3850 m, *Dickoré 346!*; Mazar Dala 3600 m; Surukwat Vy. 3700 m; Aghil Vy. 4020-4150 m; Aghil P. N 4460-4780 m, *Dickoré 503!; 530!*. **Karakash:** 10-15 km W Xaidulla 3900 m, *Junatov* (Pl.As.Centr.). W Xaidulla 4150-4380 m, *Miehe 7844!; 8315!*.

W **Gilgit:** Naltar Vy., 3050-3350 m, *Duthie 12387* (K!; RAJBHANDARI & OHBA 1991). Shinghai Gah - Pahot Gali 4050-4250 m, *Miehe 1026!; 1184!; 1192!; 1387!; 1550!; 1568!; 1616!*. Baghrot Vy. 4140 m, *Miehe 4089!*. **Hunza:** Above Toltar (3750-4300 m), *Paffen 58* (M!: "*K. royleana*"). NE Chaprot

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3910-4100 m, *Klötzli & al. 11.09!; 15.06.* **Hispar:** 3000 m, 1955-06-16, *S.Nakao* s.n. (KYO! **type** *K. septatonodosa*; KOYAMA 1956; KITAMURA 1964). **Batura:** Gulmit - Atabad 4260-4370 m, *Miehe 2767!; 2858!.* **Khunjerab:** Khunjerab P. 4750 m, *Klötzli & al. 115.08!.*

S **Shigar:** Skoro P. S 4600 m (HARTMANN 1966). **Leh:** Leh, 1848-07, *T.Thomson* s.n. (K!). Gia - Upshi, *Schlagintweit 1421* (CLARKE 1898; RAJBHANDARI & OHBA 1991). Ladakh > 4570 m (HENDERSON & HUME 1873). Kardong P. (STEWART 1916). Bod Kharbu 3510 m, *B.B.Osmaston 21* (K!). Kanda P. N 4890 m, *H.Hartmann 2606!.* Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.! (very dwarf specimens from pasture, large from enclosure).

E **Changchenmo:** Kiam 5100 m, 1927-08-11, *Bosshard* (Z!; SCHMID 1932). **Upper Shyok:** [Sassir - Murgai], 1848-08-15, *T.Thomson* s.n. (K!). **Aksai Chin:** 5000 m, 1927-09-05, *Bosshard* (Z!; SCHMID 1932).

Unloc.: Upper Indus, *T.Thomson* (CLARKE 1898). Yarkand Exp., 1870-07-09, *Henderson 59* (K!, "*K.schoenoides*"). Yarkand Exp., 1870-07-10, *Henderson 82* (K!).

A: W Kunlun: Tiznap Vy., Kudi 3030 m, *Junatov*; *Li & al.* (Pl.As.Centr.: *K. tibetica*). Upper Tiznap Vy. 3960 m, *Miehe 7729!.* W Pamir, E Pamir 3100-4500 m (Fl.Tadzh.). Wakhan 3300-4500 m (PODLECH & ANDERS 1977). Mt.Noshaq, Qasideh Vy. 4000 m, *R.Yoshii 641* (KYO!). Nuristan: Namgel P. 3800 m, 1935-06, *Kerstan* s.n. (B!). Chilas: Gor Region, above Kahlimay, 3870m, *Nüsser 1100!.* Raikot Gl., left lateral moraine, nunatak, Base camp area 4030 m, *Nüsser 518!.* Astor: Upper Rupal Vy., Upper Mazeno Base Camp 4320 m, *Nüsser 1480!.* Rama Vy. SW Astor 3660 m, *Lankester & Pearson* s.n. (BM!). Deosai: Deotsu, Balti, *Winterbottom* s.n. (K!). Deosai 3860 m, *Miehe 2179!*; 4050 m, *Miehe 2089!; 2113!; 2122!; 2163!*; 3900 m, *Schickhoff 1945!; 1954!.* Deosai E 4000-4300 m, *Miehe 5078!; 5086!; 5096!; 5107!; 5134!; 5152!*; 4000-4050 m, 1991-07-14/16, *J.Poelt* s.n.!. Suru: Sanmodangsa 4190 m, *H.Hartmann 2366!.* Rangdum swamp 3960 m, *B.B.Osmaston 27* (K!). Zanskar: [Umasi P. N 3690-4210 m], 1848-06-23, *T.Thomson* s.n. (K!); 1848-2.6 (1848-06-20/23), *T.Thomson* s.n. (K!). Pensi P. 4180 m, *Southampton Univ. 148* (BM!); 4360 m, *H.Hartmann 2605!.* Dzonkul Gompa 3800 m, *H.Hartmann 2604!.* Markha Vy., Nimaling 5170 m, *H.Hartmann 3008!.* Chumikmarpo 4110 m, *Koelz 5363* (W!). Chumik Marpo 4700-4950 m, 1992-08-04, *Holzner & Kriechbaum* s.n.!; 1993-07-25, *Holzner & Kriechbaum* s.n.!; 1993-07-26, *Holzner & Kriechbaum* s.n.!. Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Chumik Marpo - Surichun P. 4950 m, 1993-07-26, *Holzner & Kriechbaum* s.n.!. Surichun P. - Kargjak 4900 m, 1993-07-27, *Holzner & Kriechbaum* s.n.!. Gamburanjon 4400-4450 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Shingo P. 4800 m, 1993-07-30, *Holzner & Kriechbaum* s.n.!. Lahul, Serchu 3960 m, *Bor 15046* p.p. (K!). Swat. Hazara Gittidas, *Mutz 224* (K!). Babusar P. 4050-4300 m, *Miehe 463!*; *482!.* Kashmir 3960-4270 m *C.B.Clarke 31069* (CLARKE 1898). Mt.Apharwat above Gulmarg 3960 m, *R.R.Stewart 8806* (K!). Himachal Pr. Heights above Kibar, 1847-09-06, *T.Thomson* s.n. (K!). Bara Lacha P. 4880 m, *Bor 13961* (K!). Rothang P., *Jaeschke* s.n. (K!). Kunawar, *Jacquemont 1596* (K!). Spiti, 1856-06-17, *Schlagintweit 6791* (K! dwarf, culms 2-3 cm). Rupshu: Salt plain [Parang P. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Nuruchan 5050 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. Nuruchan, Tso Kar 4680 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. W Tibet Hotee 4570 m, *Strachey & Winterbottom* s.n. (K!). Kurnali Rv. 4720 m, *Strachey & Winterbottom* s.n. (K!). Upper Domar Chu 5100-5320 m, *Miehe 7939!, 8014!, 8070!.* W Gar (N 32°10' E 79°57') 4330 m, *Miehe+9662b!.* N Moincer (N 31°15' E 80°15') 5030-5050 m, *Miehe+9639d!;. +9645b!; +9647b!.*

D: Caucasus, Armenia, Afgh., Pamir-Alai, Tian Shan, ?Altai, ?Siberia; Karakorum, Kashmir, Himalaya, Tibet, W China (Gansu, Qinghai, Xizang, Sichuan). **Map:** IVANOVA 1939: map 1 (*K. schoenoides, K. pamiroalaica, K. tibetica*). Pl.As.Centr.3: map 3 (*K. tibetica*). *Centr.As.*

E: (3450) 3700-4800 (5100) m, (subalp.) alp. (-subniv.), locally common. Meadow steppes of the S Karakorum; in the N Karakorum almost entirely confined to water-surplus habitats: flushes, fens, forming characteristic tufted naka-moors (with *K. royleana* often in the depressions); "flats along lateral moraine" (*Nasir & Webster 6182*), "growing in extremely tough tussocks 9" to a foot in diameter near wet ground" (*Osmaston 21*).

N: The thick, stout stems of *K. schoenoides* are very resistant against grazing and remain standing as dead stumps for years. The large and very hard tufts are a very characteristic component of Tibetan flushes. IVANOVA (1939) and EGOROVA (1983) considered *K. schoenoides* s.str. to be restricted to the Caucasus. *K. schoenoides* is extremely variable in the himalayo-tibetan area, but a very coherent complex, which apparently cannot be divided up. It includes very strong plants with broad

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inflorescences as well as small Tibetan forms with narrow spikes. Undisturbed flowering plants growing under favourite conditions may have culms of up to 1 m, while dwarf forms are only 2-3 cm high. The variation appears to be largely dependent on climate conditions, growth-rhythm and grazing, without any clear taxonomic consequences. The inflorescence is apparently paniculate in well developed specimens, because of the high number of male flowers in the spikelets. Thus we consider *K. deasyi* and *K. pamiroalaica* extremes of an ecocline. *K. tibetica* MAXIM. (K! **isotype?**) apparently does not refer to the *K. schoenoides* group (*K. filifolia* ?). The identity of plants from NE Asia, Siberia and E Tibet is also dubious (*Kobresia smirnovii* IVANOVA, *Kobresia sibirica* TURCZ.). Few specimens are somewhat transitional between *K. schoenoides* and *K. nitens*. In Zanskar, where *K. nitens* occurs rarely, there may be intermediates, though hybridisation is not definitely proven. Wakhan specimens (KYO), referred tentatively to *K. nitens*, but differing in the open propyll, may represent a hybridogenous relict population.

* **Kobresia vidua** (C. B. CLARKE) KÜKENTHAL 1909 (*Carex vidua* BOOTT ex C. B. CLARKE in HOOKER f. 1894 - **A**: W Tibet: N Moincer (N 31°15' E 80°15') 5000 m, *Miehe+9644b!*. **D**: Inner Himalaya: Nepal, Sikkim; S & SE Tibet.

Putative hybrids:

There are morphological intermediates which may represent hybrids, such as **Kobresia laxa X K. royleana ?, Kobresia karakorumensis X K. royleana ?, Kobresia nitens X K. schoenoides ?**. There is, however, no indication to the nature of these plants since most *Kobresia* species are highly polymorphic.

? 72. Pycreus flavescens (L.) REICHENB. in MÖSSLER, Handb. Gewächsk., ed. 2, 1829

Cyperus flavescens L. 1753

S **?Skardu:** *R.R.Stewart 20407a* (Ann.Cat.Pak.).

A: Kashmir: Pir Panjal, Yusi Marg 2440 m, *R.R.Stewart 23262* (K!).

D: Trop. - temp. regions, in Eurasia E to W Himalaya. *Cosmopol.*

E: c. 2300 m, coll. - mont., ? rare in the S. (Generally:) Seasonally wet, eutrophic habitats.

N: To be confirmed; the only specimen seen from Kashmir is also not quite certain.

73. Pycreus flavidus (RETZ.) KOYAMA, J. Jap. Bot. 51(10): 316. 1976

Cyperus flavidus RETZ. 1789, *Cyperus globosus* ALL. 1789, non FORSKAL 1775, *Pycreus globosus* (ALL.) REICHENB. 1830, *Cyperus nilagiricus* HOCHST. ex STEUDEL 1855, *Pycreus nilagiricus* (HOCHST. ex STEUDEL) E. G. CAMUS in LECOMTE 1912,

Ic.: Fl.Tadzh.2: fig.1(1-4). Fl.Xizang.5: fig.203. Fl.Desert.Sin.1: fig.57(1-3: *Pycreus globosus*).

W **Gilgit:** 1520 m, *R.R.Stewart 26911* (K!).

S **Shigar:** 2440 m, *C.B.Clarke* (CLARKE 1898). **Skardu:** *T.Thomson* (CLARKE 1898).

A: S Tadzh. 300-1400 m (Fl.Tadzh.). Chitral. Swat. Hazara: Kaghan Vy. Kashmir: 1848-10-01, *T.Thomson* (K!); 1848-10-03, *T.Thomson* (K!).

D: Warm-temp. Eurasia, Africa, Australia. *Palaeotrop.*

E: 1520-2440 m, coll. - mont., scattered in the S & W. (Generally:) Wet open habitats, shores, swamps, in rice fields.

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74. Pycreus sanguinolentus (VAHL) NEES, Linnaea 9: 283. 1835

Cyperus sanguinolentus VAHL 1806

Ic.: Fl.Xizang.5: fig.204.

W **Yasin:** Sultanabad 2500 m, *G.Stöber 111!*. **Ishkoman:** Imit - Ishkuman, *Honda* s.n.; Phakor - Imit, *Honda* s.n. (KITAMURA 1964). **Hunza:** Minapin - Chalt 1830 m, *R.R.Stewart 26912* (K!). Chalt 1830 m, *O.Polunin 6471* (B!).

S **Lower Shyok:** Khapalu, left side of the Shyok, 1856-07-12, *Schlagintweit 5760* (K!).

Unloc.: Baltistan, *Schlagintweit 792*; *1917*; *C.B.Clarke 30021* (CLARKE 1898).

A: Swat. Hazara. Kashmir.

D: Africa, warm-temp. Asia, Oceania. *Palaeotrop.*

E: 1830-2500, coll. - mont., not common. Wet open habitats: riversides, seasonally wet gravel and sands; damp ground by swamp (*Polunin 6471*).

75. Schoenoplectus lacustris (L.) PALLA, Bot. Jahrb. 10: 299. 1889

Scirpus lacustris L. 1753

CS **Nubra:** [Lower Nubra Vy.], 1848-09-04, *T.Thomson* s.n. (K!).

Unloc.: Ladakh, *Schlagintweit 1631* (CLARKE 1898). Yarkand Exp., 1870-08-22, *Henderson 494* (K!).

A: W Kashg.: 25 km S Kashgar 1330 m, 1935, *Persson 628* (PERSSON 1938). S Tadzh. 400-900 m (Fl.Tadzh.). Kashmir: *J.L.Stewart 789* (CLARKE 1898); Srinagar 2290 m, *C.B.Clarke* (CLARKE 1898). Nil Nag 1830-2130 m, *R.R.Stewart 23051* (K!).

D: Temp. Eurasia. *Euras.*

E: c. 3200 m, mont., rare in the S. (Generally:) wet habitats.

N: Stigmas 3, but easily confused and intergrading with *S. tabernaemontani* (stigmas 2).

* **Schoenoplectus litoralis** (SCHRADER) PALLA 1889 (? *Scirpus subulatus* VAHL 1805, *Scirpus litoralis* SCHRADER 1806) - **A**: Reported from N, E, & S Kashg., Takla Makan (Pl.As.Centr.).

* **Schoenoplectus mucronatus** (L.) PALLA 1889 (*Scirpus mucronatus* L. 1753) - **Ic.**: Fl.Xizang.5: fig.191. **A**: Reported from W Kashg.: Kashgar 1330 m, 1933-06-18, *Persson 471*; Opal 1400 m, 1934-08-15, *Persson 619* (PERSSON 1938). Kashmir: Liddar Vy., Batakut in paddy fields, *O.Polunin 56/430* (BM!). **D**: Eurasia, ?Australia. **N**: Sometimes confused with *S. triqueter*, the records from Kashgaria may refer to this, or to *S. ehrenbergii*. - *Scirpus ehrenbergii* BOECK. 1870, **Ic.**: Fl.Desert.Sin.1: fig.51(1-3), is also reported from E Kashg. (Pl.As.Centr.). This taxon is sometimes regarded as a hybrid between *Bolboschoenus maritimus* and *Schoenoplectus triqueter* (Fl.Eur.).

76. Schoenoplectus tabernaemontani (C. C. GMELIN) PALLA, Bot. Jahrb. **20**: 229. 1889

Scirpus tabernaemontani C. C. GMELIN 1806, *Scirpus lacustris* L. subsp. *tabernaemontani* (C. C. GMELIN) SYME in SOWERBY 1870, *Schoenoplectus validus* (VAHL) OVCZ. & CZUK. 1963, *Scirpus hippolytii* V. KRECZ. 1940, *Scirpus lacustris* auct. non L. 1753: HENDERSON & HUME 1873, ? PAMPANINI 1930

Ic.: Fl.Tadzh.2: fig.9(4-6: *S. validus*), fig.9(9-10). Fl.Xizang.5: fig.190(4-7: S. *validus*). Fl.Desert.Sin.1: fig.50(1-5).

S **Leh:** Leh - Thikse, base of Shey Gompa 3300 m, *F.Billiet & J.Leonard 6853* (K!). Shey Gompa 3300 m, *H.Hartmann 4071!*.

A: W Kashg.: Kashgar 1260 m, *Wingate* (veg., SCHMID 1932). 25 km S Kashgar (PERSSON 1938). Kashgar - Fajsabad, *Li & Chu 7546*. Yengisar 1927-07-25, *Popov* (Pl.As.Centr.: *S. validus*). Common near Yarkand City (HENDERSON & HUME 1873), S Kashg. (Pl.As.Centr.). S Tadzh. 1600-2200 m (Fl.Tadzh.: *S. tabernaemontani*), W Pamir 700-1800 m (Fl.Tadzh.: *S. validus*). Wakhan 3120-3300 m (PODLECH & ANDERS 1977). Kashmir.

D: Temp. Eurasia, N & S America. *Holarct.*

E: 3300 m, coll.-mont., rare. (Generally:) Wet fresh to ± saline habitats.

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77. Schoenoplectus triqueter (L.) PALLA, Bot. Jahrb. **20**: 229. 1889

Scirpus triqueter L. 1767

Ic.: Fl.Desert.Sin.1: fig.50(6-9).

W **Hunza:** Chalt 1830 m, *R.R.Stewart 26916* (K!). **Hispar:** Nagar 2440 m, *O.Polunin 6078* (BM!).

S **Shigar:** 2350-2360 m, *C.B.Clarke 30487* (BM!; K!). **Skardu:** Skardu 2320 m, *C.B.Clarke 30023* (K!); Floodplain of Indus c. 1.5 miles E of Skardu 2290 m, *G.L.Webster 6587* (K!).

Unloc.: Baltistan, *Schlagintweit 5421*; 2590 m, *C.B.Clarke 29957* (CLARKE 1898).

A: W Kashg.: Yengisar, 1929-08-25, *Popov* (Pl.As.Centr.). Kashmir: Ganderbal 1680 m, *R.R.Stewart 9690* (K!). Sumbal 1520 m, *B.B.Osmaston 1* (K!).

D: Temp. Eurasia. ? N America. *Euras.*

E: 1830-2440 m, coll., rare in the S & W. Wet habitats.

78. Trichophorum pumilum (VAHL) SCHINZ & THELL., Viert. Naturf. Ges. Zürich **66**: 265. 1921

Scirpus pumilus VAHL 1806, *Isolepis pumila* (VAHL) ROEMER & SCHULTES 1817, *Baeothryon pumilum* (VAHL) KOYAMA 1978, *Eriophorella pumila* (VAHL) KIT TAN in DAVIES 1985

Ic.: Fl.Tadzh. 2: pl. 6, fig. 1-3.

CN **K2-North:** Muztagh Vy., Sughet Jangal 3950 m, *Dickoré 856a!*.

N **Taxkorgan:** Jurgal 3510 m, 1935-06-29, *Persson 668* (PERSSON 1938: var. *distigmaticus*). **Yarkand:** Raskem Rv., Mazar, 1959-06-04, *Junatov* (Pl.As.Centr.). 3 km W Mazar 3850 m, *Dickoré 320!*. Surukwat Vy. 3700 m (*Dickoré*, specimen cultivated from seed). **Karakash:** Upper Hotan Rv., 10-12 km W Xaidulla 3900 m, 1959-06-03, *Junatov* (Pl.As.Centr.).

W **Yasin:** Naz Bar 3350-3400 m, *Miehe 3616!*. **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26921B* (K!); 3170 m, *Schickhoff 49!*. **Batura:** Khaibar 2700 m, *Klötzli & al. 801.110, 113!*. E Morkhoon 3000 m, *Klötzli & al. 803.09!* p.p. N Morkhoon 2740 m, *Klötzli & al. 99.21, 22!*.

S **Shigar:** Shigar [c. 2330 m], 1848-03, *T.Thomson* s.n. (K!). **Skardu:** Skardu [c. 2300 m], 1848-03, *T.Thomson* (K!; CLARKE 1898). Tormik Vy., Ganto P. W 2730 m, 1991-07-01, *J.Poelt* s.n. (with *Carex karoi*); 2900 m, 1991-07-01, *J.Poelt* s.n.!. **Leh:** Bod Kharbu 3510 m, *B.B.Osmaston 20* (K!). Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.!.

E **Changchenmo:** 4880 m [from hot spring ?], 1925-06, *Meinertzhagen* s.n. (BM!).

Unloc.: 1848-07-06, *T.Thomson* s.n. (K!).

A: Kongur: Kenkol Rv., Tom-Kara, 1909-06-14, *Divnogorskaya*. W Kunlun: Tiznap Vy., N Kudi 3080 m, *Miehe 7541a!*. E Pamir (Fl.Tadzh.). Wakhan: Sir Had 3200 m, *Giles 64* (K!; CLARKE 1898). 3120-3300 m (PODLECH & ANDERS 1977). Zanskar: [Umasi P.], 1848-2.6 (1848-06-20/23), *T.Thomson* s.n. (K!). Kashmir: Gurais on Kashmir - Skardu Rd., *Winterbottom 551* (K!). Near Burzil on the Iskardo Rd., 1847-06-20, *Winterbottom 636* (K!). [Sind Vy., near Kangan], 1848-04-20, *T.Thomson* s.n. (K!). Below Baltal 2740-3050 m, *Duthie 11537* (K!). Himachal Pr.: Zingingbar, *Bor 16371* (DD; ASWAL & MEHROTRA 1994). Rupshu: Hanle plain (4270-) 4570 (-5180) m, 1847-09-14, *T.Thomson* s.n. (K!; CLARKE 1898).

D: Circumarctic: Eurasia (S to Caucasus, Iran, Afgh., Karakorum, Kashmir, S Tibet); N America (E). **Map:** RAYMOND 1957. *Holarct.*

E: (2300) 2700-3950 (4880) m, (mont.-) subalp. (-alp.), scattered. Moist open places, by springs and flushes, in fens, on wet turf, sometimes edaphically moist places in forests (*Betula utilis* subsp. *jacquemontii*); often with *Eleocharis quinqueflora*, but apparently preferring habitats which are somewhat more humous and drier, but have a more constant ground-water level.

N: Easily confused with *Eleocharis quinqueflora*, both have been mixed up by DICKORÉ (1991).

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*** Dioscoreaceae;**

Lit.:

WENDELBO, P. 1958: *Dioscoreaceae*. - In: Symbolae Afghanicae 4. - Biol. Skr. Dan. Vid. Selsk. **10** (3): 185.

* **Dioscorea deltoidea** WALL. ex KUNTH 1850 - **A**: Chitral. Swat: Sho village 2130 m, *A.Rahman 37* (W!). Hazara: Kaghan Vy. Kashmir: < 2740 m (Ann.Cat.Pak.). Himachal Pr.: Thirot-Udaipur, *Aswal 10810* (ASWAL & MEHROTRA 1994). **D**: Himalaya: E Afgh. (Nuristan) eastwards. **E**: Mainly in *Cedrus deodara* forests.

*** Eriocaulaceae**

Lit.:

GHAZANFAR, S. A. 1982: *Eriocaulaceae*. - In: NASIR, E. & ALI, S. I. (eds.), Flora of Pakistan **142**: 1-4.
OVCZINNIKOV, P. N. (ed.) 1963: *Eriocaulaceae*. - In: Flora Tadzhikskoy SSR **2**: 156-159.
RUHLAND, W. 1903: *Eriocaulaceae*. - In: ENGLER, A.: Das Pflanzenreich **13** (IV. 30): 30-117.

* **Eriocaulon cinereum** R. BR. 1810 (*Eriocaulon sieboldianum* SIEB. & ZUCC. ex STEUDEL 1855 - **Ic.**: Fl.Tadzh.2: fig.38(6-11): *E. sieboldianum*. Fl.Pak.142: fig.1 (*E. cinereum* var. *sieboldianum*). **A**: Hazara. Kashmir (Ann.Cat.Pak.). **D**: Africa, SW Asia (S Kasakhstan, S Pamir-Alai), Himalaya (Kashmir - Assam), SE Asia, Australia.

Gramineae (Poaceae)

Lit.:

ALEXEEV, E. 1980: Genus *Festuca* L. in Pakistano, India, Nepalo et Burma - Nov. Syst. Pl. Vasc. **17**: 10-42.
ALEXEEV, E. 1981: Genus *Paracolpodium* (Tzvel.) Tzvel. (*Poaceae*) - Nov. Syst. Pl. Vasc. **18**: 86-95.
BOR, N. L. 1948: New species of *Poa* from India, Burma and Tibet. - Kew Bull. 1948: 138-144.
BOR, N. L. 1949: A new species of *Deyeuxia* from Tibet. - Kew Bull. **1949**: 66.
BOR, N. L. 1950: The Genus *Poa* in India. - J. Bombay Nat. Hist. Soc. **50**: 787-838.
BOR, N. L. 1951: *Stipa hookeri* STAPF. - Kew Bull. **1950** (3): 319-320.
BOR, N. L. 1951: *Timouria* ROSHEV. and *Psammochloa* HITCHC. - Kew Bull. **1951**: 186-192.
BOR, N. L. 1952: The Genus *Poa* in India. - J. Bombay Nat. Hist. Soc. **50**: 787-838, **51**: 62-103.
BOR, N. L. 1953: Notes on asiatic grasses: XII. New species. - Kew Bull. **1953**: 269-276.
BOR, N. L. 1953-1954: The genus *Cymbopogon* SPRENG. in India, Burma and Ceylon. - J. Bombay Nat. Hist. Soc. **51**: 890-916 (1953); **52**: 149-183 (1954).
BOR, N. L. 1960: The Grasses of Burma, Ceylon, India and Pakistan. - Oxford, London, New York & Paris (Pergamon Press).
BOR, N. L. & MELDERIS, A. 1965: *Gramineae*. - In: KÖIE, M. & RECHINGER, K. H. (eds.), Symbolae Afghanicae 6. - Biol. Skr. Kongl. Danske Vid. Selskab **14** (4): 36-94.
BOR, N. L. 1968: *Gramineae*. - In: TOWNSEND, C. C., GUEST, E. & ALI-RAWD, A. (eds.), Flora of Iraq **9**. Baghdad.
BOR, N. L. 1970: *Gramineae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **70**: 1-573, pl. 1-72.
CONERT, H. J. 1959: Beiträge zur Monographie der Gattungen *Cleistogenes* und *Neyraudia*. - Bot. Jahrb. **78** (2): 208-345.
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CUI, D. F. & CUI, N. R. 1987: New Taxa of *Poa* from Xinjiang. - Acta Bot. Bor. Occid. Sin. **7** (2): 83-103.
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DUTHIE, J. F. 1888: The fodder grasses of northern India. Roorkee.
FREITAG, H. 1975: The Genus *Piptatherum* (Gramineae) in Southwest Asia. - Notes Roy. Bot. Gard. Edinb. **33** (3): 341-408.
FREITAG, H. 1985: The Genus *Stipa* (*Gramineae*) in Southwest and South Asia. - Notes Roy. Bot. Gard. Edinb. **42** (3): 335-489.
GRISEBACH, H. R. A. 1868: Über die *Gramineen* Hochasiens. - Nachr. Akad. Ges. Wiss. Göttingen **1868**: 61-93.
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ROSHEVITZ, R. Yu. 1924: *Stipae* novae asiaticae. - Not. Syst. (Leningrad) **5**: 11-14.
ROSHEVITZ, R. Yu., SHISHKIN, B. K. & al. 1934: *Gramineae*. - In: KOMAROV, V. L. (ed.), Flora URSS **2**. Leningrad.
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Note: *T. Cope* determined much material of various genera from the new collections; larger parts of the cited collections of *Piptatherum* and *Stipa* were determined by *H. Freitag*, part of the cited specimens of *Bromus, Elymus, Festuca* and *Leymus* were determined by *H. Scholz*.

* **Acrachne racemosa** (HEYNE ex ROEMER & SCHULTES) OHWI 1947 (*Eleusine racemosa* HEYNE ex ROEMER & SCHULTES 1817) - **A**: Swat, Hazara, Kashmir <1070 m. **D**: Old world tropics.

* **Aeluropus littoralis** (WILLD.) PARL. 1850 (*Aeluropus pungens* (M. BIEB.) C. KOCH 1848, *Aeluropus micrantherus* TZVELEV 1968) - **Ic.**: Fl.Desert.Sin.1: fig.12. **A**: W Kashg.: Yarkand (Z!). Yangigisar, 1909-05-06, *Divnogorskaya* (Pl.As.Centr.: *Ae. micrantherus*). S Kashg.: Keria, 1959-05-09, *Junatov*; Hotan, 1959-05-27, *Li & al.* (Pl.As.Centr.: *Ae. pungens*). **D**: Medit., Arabia, SW Asia - C. Asia (Dzungaria, Kashgaria, Mongolia).

* **Agropyron cristatum** (L.) GAERTNER 1770 1812 (*Bromus cristatus* L. 1753) - **Ic.**: Fl.Iraq 9: pl.70. Fl.Desert.Sin.1: fig.28(9-13). **A**: Kongur: Jerzil 2800 m, 1930-07-08, *Persson 64* (PERSSON 1938). **D**: C. Europe, Medit., SW Asia - Afgh., C. Asia, Siberia.

* **Agrostis filipes** HOOKER f. 1896 - **A**: Kashmir. Himachal Pr.: Khoksar, *Bhattacharyya 40527* (BSD; ASWAL & MEHROTRA 1994). **D**: Himalaya: Kashmir, Himachal Pr. - E Himalaya, Khasia Hills.

79. **Agrostis gigantea** ROTH, Tent. Fl. German. **1**: 31. 1788

Agrostis stolonifera L. subsp. *gigantea* (ROTH) MAIRE & WEILLER 1953, *Agrostis alba* auct. non L. 1753: HOOKER f. 1896, BOR 1940

Ic.: Fl.Iraq 9: pl.100. Fl.Pak.143: fig.53. Fl.Xizang.5: fig.121(1-5). Fl.Desert.Sin.1: fig.35(1-5).

CS Saltoro: Upper Hushe Vy., below Shahircho 3050-3350 m, *Nasir & Webster 6276* (WEBSTER & NASIR 1965).

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W **Ghizar:** Shandur 3720 m, *Bowes Lyon 87* (BM!). Gupis - Gakuch, *M.Qaiser & al. 8429* (BM!). **Yasin:** Darkot - Yasin, 1956-10-11/12, *K.Honda* s.n. (KYO!). Sultanabad 2500 m, *G.Stöber 29!, 30!, 75!, 76!*. **Ishkoman:** Imit 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Naltar Vy. 1830-2130 m, *Duthie 12345* (K!). Naltar Vy., Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). Gilgit 1460 m, *O.Polunin 6047* (BM!). Kargah Vy. 1800 m, 1974-07-29, *F.Gartner* s.n. (GZU!). **Hunza:** Pisan 2230 m, 1974-07-23; 2600 m, 1974-07-25, *F.Gartner* s.n. (GZU!). **Hispar:** Hispar Gl. snout 3230 m, *O.Polunin 6361* (BM!). **Batura:** W Khaibar 3020 m, *Klötzli & al. 27.10, 11!*.

S **Skardu:** 2330 m, *C.B.Clarke 29942* (BM!, K!). Around Skardu Airport 2500 m, 1955-08-05, *S.Nakao* s.n. (KYO!). **Leh:** Yugu - Leh (right side of the Indus), 1856-08-01/31, *Schlagintweit* s.n. (BM!). Leh 3200 m, *Koelz 25976* (BM!). Himis Shukpa 3680 m, 1993-07-17, *Holzner & Kriechbaum* s.n.!. ? Likir 3700 m, 1993-07-15, *Holzner & Kriechbaum* s.n.! (cf.). **Lower Shyok:** Khapalu (on the left side of the Shayok), 1856-07-12, *Schlagintweit 5873* (BM!). Kunes on the right side of the Shayok) via Kiris to Neru (right side of the Indus, 1856-08-02/12, *Schlagintweit 5700* (BM!).
A: E Pamir 2700-3100 m (Pl.As.Centr.). Wakhan 2800-3180 m (PODLECH & ANDERS 1977). Ishkashim, *R.Yoshii 786* (KYO!); *R.Yoshii 833* (KYO!). Chitral: Mastuj - Baroghil track, Paur 2440 m, *Stainton 2936* (BM!). Laspur Gol SE Mastuj 3350 m, *Stainton 3098* (BM!). Beorai Gol S of Drosh 1830 m, *Stainton 3269* (BM!). Golen Gol 1980 m, *Bowes Lyon 16* (BM!). Astor: Rupal Vy., Tarishing - Churit 2830 m, *Nüsser 143!;* Tarishing 2910 m, *Nüsser 578!*. Swat. Hazara: Kagan, near Burawai 3050 m, *C.Wright 73* (BM!). Kashmir: Kashmir Vy. 1680 m, 1875-09-08, *Levinge* s.n. (BM!). Himachal Pr.: Sissu, *Aswal 10068*; frequent (ASWAL & MEHROTRA 1994).
D: Temp. Eurasia S to N Pakistan: Punjab, Gilgit; Kashmir - Himachal Pr.; introduced in N America, New Zealand. *Euras.*
E: 1460-3720 m, coll. - mont., scattered in the S & W. Ruderal, by cultivated fields, meadows on river gravel, irrigation canals. "It is a more aggressive species than *A. stolonifera* and can become a troublesome weed." (Fl.Pak.).

* **Agrostis griffithiana** (HOOKER f.) BOR 1960 (*Calamagrostis griffithiana* HOOKER f. 1896 - **A**: Himachal Pr.: Sissu, *Aswal 10095* (ASWAL & MEHROTRA 1994). **D**: Himalaya.

* **Agrostis hissarica** ROSHEV. 1923 (*Agrostis tianschanica* PAVL. 1938, *Agrostis stewartii* BOR 1956, *Polypogon hissaricus* (ROSHEV.) BOR 1970) - **A**: E Pamir (subsp. *pamirica*). Astor: Rama above Astor 3050 m, *R.R. & I.D.Stewart 22929* (K). Swat. Hazara: Kaghan Vy. **D**: Tian Shan, Pamir-Alai, C. Afgh., NW Pakistan. **N**: **Agrostis hissarica** subsp. **pamirica** (OVCZ.) TZVELEV 1976 (*Agrostis pamirica* OVCZ. 1957) is apparently known only from the **type**: SW Ak-Tash 4000 m, 1953-08-22, *Ikonnikov* (LE).

80. **Agrostis munroana** AITCH. & HEMSLEY, J. Linn. Soc. London (Bot.) **19**: 192. 1882

Calamagrostis munroana (AITCH. & HEMSLEY) BOISS. 1884

W **Gilgit:** Baghrot Vy. 4270 m, *Miehe 3718* (K!). **Hunza:** Minapin Gl. 3510 m, *Lloyd & Megan 94* (BM!; LLOYD & LLOYD 1968: "*A. pilosula*").
A: Swat. Hazara: Kaghan Vy. 3940 m, *Miehe 351!*. Kashmir: Sonamurg 3050 m, 1875-08-25, *Levinge* s.n. (BM!). Khelanmarg 3290 m, *O.Polunin 56/260* (BM!). Kolohoi Vy. 3200 m, *O.Polunin 56/518* (BM!). Himachal Pr.: Khoksar, *Aswal 10121* (ASWAL & MEHROTRA 1994).
D: W Himalaya (Kurram, Dir, Swat, Hazara, Kashmir - Nepal). *W Himal.*
E: 3510-4270 m, subalp.-alp., rare in the SW. Humid *Kobresia capillifolia* turf, forest clearings. "silty and gravelly areas liable to flooding, grazed" (*Lloyd & Megan 94*).

81. **Agrostis pilosula** TRIN., Mém. Acad. Sci. Pétersb., sér. 6, **6**: 372. 1841

Agrostis ciliata TRIN. 1841, *Calamagrostis pilosula* (TRIN.) HOOKER f. 1896, *Calamagrostis jacquemontii* HOOKER f. 1896

W **Gilgit:** Baghrot Vy. 3800 m, *Miehe 3906!*.

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A: Astor: Hasora, Sangu Sar, on the right side of the Tsunger Gl. (Diamer Gl. group), 1856-09-12, *Schlagintweit 6570* (BM!). Swat: Bahrein 1520 m, *R.R.Stewart 24602* (BM!). Sho Nala 3350 m, *A.Rahman 236* (BM!). Hazara: Kaghan Vy. Kashmir: 1200-3800 m. Khelanmarg 3290 m, *O.Polunin 56/266* (BM!). Himachal Pr.: Keylong, *Bor 16415* (DD; ASWAL & MEHROTRA 1994).

D: Himalaya: Swat - SE Tibet, N & S India. *Sino-Himal.*

E: 3800 m, subalp. - alp., rare. *Salix karelinii* scrub / pasture. (Kashmir:) *Abies* forest.

N: A record (LLOYD & LLOYD 1968) has been transferred to *A. munroana* on account of the specimen.

82. Agrostis stolonifera L., Sp. Pl. 62. 1753

Agrostis alba auct. non L. 1753

CS **Shimshal:** 3000 m, *Visser·Hooft* (DOLK 1929). **Biafo:** Below Munjung 3050 m, *H.Hartmann 62!.*

W **Gilgit:** Gilgit - Chalt 1800 m, *Klötzli & al. 724.05!.* Baghrot Vy. 3130 m, *Miehe 4347!.* **Hunza:** Minapin Gl. 3050 m, *Lloyd & Megan 10* (BM!); 3510 m, *Lloyd & Megan 103* (BM!; LLOYD & LLOYD 1968); above Hapakund 2970 m, *Schickhoff 316!.* Chalt - Chaprot 2120 m, *Klötzli & al. 120.03!.* N Chaprot 2380-3150 (?-4000 m), *Klötzli & al. 1.16!; 77.07, 11, 15!; 727.93!.* Baltit 2600 m, *F.Schmid 1918* (K, RAW). **Hispar:** Nagar 2440 m, *O.Polunin 6087* (BM!). **Batura:** W Khaibar (2500-3000 m), *Klötzli & al. 801.25, 28!.*

S **Shigar:** Shigar 3050 m, *C.B.Clarke 30481* (K). **Leh:** Likir - Khalsi, Tingsmogang 3350 m, *H.Hartmann 3012!.*

Unloc.: Ladakh, common (STEWART 1916).

A: Wakhan 2700-3800 m (PODLECH & ANDERS 1977). Zanskar: Tungri 3600 m, *H.Hartmann 2548!.* Himachal Pr.: Kardang, *Bor 14009* (DD; ASWAL & MEHROTRA 1994).

D: Temp. Eurasia S to Pakistan: Punjab, Gilgit; Kashmir, N America; introduced in Australia, New Zealand, S America. *Holarct.*

E: 1800-3350 m, coll. - mont., not common in the SW (apparently rarer than *A. gigantea* in the Karakorum). *Artemisia* semi-deserts, scrub-steppes and open forest (*Juniperus excelsa, Pinus wallichiana*), on somewhat ruderal, eutrophic moist places. "It forms a close turf and is important in alpine pastures where it contributes significantly to the available fodder".

N: Difficult to distinguish from *A. gigantea*. The development of stolons (*A. stolonifera*) or rhizomes (*A. gigantea*) apparently is also depending on edaphical conditions. Provisionally, plants with an anther length of 1.0 - 1.2 mm are placed under *A. stolonifera*, those with anthers c. 1.5 mm long under *A. gigantea*, but the different levels of ploidy are said not to be distinctive. Both taxa grow on ± ruderal and water-surplus habitats, and there seems to be no clear cut chorological and ecological difference. Perhaps they are better regarded as subspecies. "*Agrostis* sp. = sp. H.f. & T. dist.", reported from Karakash Vy. 4570 m (HENDERSON & HUME 1873), probably belongs to another genus.

83. Agrostis vinealis SCHREBER, Spicil. Fl. Lips. 47. 1771

Agrostis stricta J. F. GMELIN 1791, *Agrostis coarctata* EHRH. ex HOFFM. 1800, *Agrostis tenuifolia* M. BIEB. 1808, non CURTIS 1787, *Agrostis canina* L. subsp. *montana* (HARTMAN) HARTMAN 1846, *Agrostis canina* auct. non L. 1753: ? HENDERSON & HUME 1873, ? KITAMURA 1964, ? PODLECH & ANDERS 1977, BOR 1970

W **Ghizar:** Shandur P. SE of Mastuj 3660 m, *Stainton 3083* (BM!). Diwangal - Ghizar 3200 m, *K.Ogino 248* (KITAMURA 1964: "*A. canina*"). **Gilgit:** Jutial Nullah, *R.R.Stewart 26614* (K). Kar Gah 3190 m, *Schickhoff 2055b!.* Sai Vy. 2850-3100 m, *Schickhoff 1970!; 2031!.* Naltar Vy. 3660 m, *R.R.Stewart 26616* (K, RAW); Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!); Jagot 2950-3300 m, 1974-03-03, *F.Gartner* s.n. (GZU!); 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). Baghrot Vy. 3870 m, *Miehe 3946* (K!); above Sat 3010-3050 m, *Schickhoff 458!; 496!.* Upper Darchan Vy., above Khaltaro 3210-3230 m, *Schickhoff 685!; 719!.* Above Phuparash 2870 m, *Schickhoff 751!.* Haramosh Range, Mani, right basin, *R.C.Culbert 124* (BM!).

S **Skardu:** Skardu - Satpura Lake, *A.Ghafoor & Z.L.Butt 543* (KUH). Satpura Lake 3050 m, *Nasir & Webster 5826* (RAW). Upper Stak Nala, Above Khotia Lungma Gl. 3360 m, *Schickhoff 871!.* Above

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Bashu 3210 m, *Schickhoff 933!; 944!*. Ganji Forest 3300 m, *Schickhoff 1918!*. Talu Brok 3330 m, *Schickhoff 1830!; 1834!*. Bilamik Nullah 3550 m, *Schickhoff 1894!*.

Unloc.: Ladakh (HENDERSON & HUME 1873: "*A. canina*").

A: W Pamir. Wakhan: Qazideh Vy. 3040 m, *Yoshii 536* (PODLECH & ANDERS 1977: "*A. canina*"). Chitral: Guger 2560 m, *Harriss 16811* (BM!). Chilas: Gor 3520 m, *Schickhoff 1500!*. Tangir Vy. 2730 m, *Schickhoff 2232!*. Babusar Vy. 3200 m, *Schickhoff 1693!*. Rakhiot Vy. 3220 m, *Schickhoff 1671!*. Raikot Vy., Jut 3310 m, *Nüsser 939!*. Lake Funtory 3300 m, *Nüsser 346!*. E Bezar Gali ("Sagar") 3750 m, *Nüsser 532!* (cf.). Astor: Rama Vy., SW of Astor 3200 m, *T.E.Lankester 1488* (BM!). Rama Vy. 3180 m, *Nüsser 892!.;* left slope 3620 m, *Nüsser 204!* (cf.); Middle Rupal Vy., Village Lower Rupal 3100 m, *Nüsser 1585!*. Rupal Vy., Bayals 3160 m, *Nüsser 591!;* Tarishing 2910 m, *Nüsser 579!;* Nagachakali, "nunatak" 3500-3620 m, *Nüsser 606!; 607!; 636!*. Above Zaipur 3120-3140 m, *Schickhoff 1057!; 1063!; 1094!; 1109!*. Below Sachen Gl. 3080 m, *Schickhoff 1017!; 1033!*; 3380 m, *Schickhoff 998!*. Mushkin Forest 2900-3000 m, *Schickhoff 1394!; 1427!*. Faqirkot 2980-3220 m, *Schickhoff 1304!; 1360!*. Kalapani 3050 m, *Schickhoff 1270!; 1276!*. Deosai: Shingo Vy. 3050-3350 m, *Duthie 11920* (K). Dras: Chatpani Nullah 3660-3960 m, *Duthie 13876* (K). Suru: Dras, Kargil via Suru to Tsringmat, 1856-10-10/11, *Schlagintweit* s.n. (BM!). W Panikhar 3640 m, *H.Hartmann 2326!*. W above Sankoo 3880 m, *H.Hartmann 2327!*. SW above Sankoo 3460 m, *H.Hartmann 2328!*. Sanmodangsa 4050 m, *H.Hartmann 2325!*. Zanskar: Padam 3350 m, *Southampton Univ. 26* (BM!). Dzongkul Gompa 3800 m, *H.Hartmann 2580!*. Swat. Hazara: Kaghan Vy. 3200-3450 m, *Schickhoff 90/556!, 90/589!, 90/590* (K!), *90/591!, 90/592!, 90/1096* (K!). Kashmir. Himachal Pr.: Chikka near Darcha 3700 m, 1993-08-01, *Holzner & Kriechbaum* s.n.!. Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!. Khoksar, *Aswal 6554* (ASWAL & MEHROTRA 1994).

D: N Africa, temp. Eurasia S to Pakistan: Punjab, Gilgit; Kashmir; N America (NE), Greenland. *Holarct.*

E: 3050-3870 (-3960) m, subalp., locally common in the SW. Relatively humid forests (*Picea smithiana, Picea wallichiana, Juniperus excelsa*), *Salix karelinii*-scub, meadows, *Kobresia*-turf.

N: "A drought-resistant grass which spreads by means of its rhizomes to form a fine, compact turf." (Fl.Pak.).

84. Agrostis viridis GOUAN, Hort. Reg. Monsp. 546. 1762

Phalaris semiverticillata FORSKAL 1775, *Agrostis semiverticillata* (FORSKAL) C. CHRIST 1922, *Polypogon semiverticillatus* (FORSKAL) HYL. 1945, *Agrostis verticillata* VILL. 1779, *Polypogon littoralis* SM. var. *muticus* HOOKER f. 1896, *Polypogon viridis* (GOUAN) BREISTR. 1963

Ic.: Fl.Iraq 9: pl.116 (*Polypogon semiverticillatus*). Fl.Pak.143: fig.52.

W **Gilgit:** 1954-07-13, *R.R.Stewart* s.n. (RAW).

S **Shigar:** *A.Ghafoor & Z.L.Butt 639* (KUH).

A: Chitral: Broz 1590 m, *Harriss 16822* (BM!). Kashmir.

D: Medit. - Middle Asia, Pakistan: Baluch., Punjab, Gilgit; Kashmir, NW India. *Medit.*

E: Habitat not indicated from the Karakorum, probably (periodically) wet, ± ruderal habitats (river-gravels, irrigated fields); coll. - mont.

Agrostis munroana X A. pilosula

? *Agrostis royleana* TRIN. 1841

W **Gilgit:** Shinghai Gah - Pahot Gali 3950 m, *Miehe 1058!*. Baghrot Vy. 3820-4280 (-4340) m, *Miehe 3762!; 4099!; 4128!*.

A: Deosai: 3660-3960 m, *R.R.Stewart 22151a* (K!); *22260a* (K!). Upper Shingo Vy., Deosai region 3660-3960 m, *R.R.Stewart 22707a* (K!). Swat. Hazara. Astor: Gudai Vy. 3350-3660 m, *Duthie 12218* (K!). Kashmir: Burzil P. 3050-3350 m, *R.R.Stewart 22122b* (K!).

E: 3820-4280 (-4340 m), alp., not common in the SW. Humid *Carex-Kobresia* turf, sometimes in *Rhododendron anthopogon-Salix karelinii* scrub.

N: "Fairly common where the parents grow together. It is largely male-sterile, but some caryopses develop in some plants and these may be viable." (Fl.Pak.).

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* **Alopecurus aequalis** SOBOL. 1799 (*Alopecurus aristulatus* MICHX. 1803, *Alopecurus fulvus* SM. 1805) - **Ic.**: Fl.Iraq 9: pl.106. Fl.Xizang.5: fig.123. **A**: Nuristan. Chitral. Astor: Rama 3050 m, *Nasir & Webster 6443* (RAW). Deosai: Deosai plains, road to Baltistan 3960 m, *R.R.Stewart 20031A* (KUH); *R.R.Stewart 19963* (RAW). Dras: Near Dras, Ladakh Road 3050 m, *R.R.Stewart 21151* (KUH). Swat. Hazara. Kashmir: common 2130-3660 m. **D**: Temp. N hemishere: Eurasia, S to Himalaya: Afgh., N Pakistan, Kashmir, Nepal; (? introduced in) N America.

85. **Alopecurus arundinaceus** POIRET in LAM., Encycl. Méth. Bot. **8**: 776. 1808

Alopecurus ventricosus PERS. 1805, non HUDSON 1778, ? *Alopecurus mucronatus* HACKEL ex PAULSEN 1903, ? *Alopecurus apiatus* OVCZ. in KOMAROV 1934, ? *Alopecurus serawschanicus* OVCZ. in KOMAROV 1934, *Alopecurus pratensis* auct. non L. 1753: ? HENDERSON & HUME 1873, DUTHIE 1888, KITAMURA 1964

Ic.: Fl.Desert.Sin.1: fig.32(1-5).

N **Taxkorgan:** 1913-07-25, *Knorring* s.n.; W Taxkorgan, 1959-06-13, *Junatov* s.n. (Pl.As.Centr.).

W **Ghizar:** Dadarili P. - Amberzth 3700 m, *Honda 198* (KITAMURA 1964: "*A. pratensis*"). **Yasin:** Darkot 2930-2960 m, *Bowes Lyon 8049; 9058* (K!). Naz Bar Vy., Yasin - Batakush, *Honda* s.n.; ? Mush Bar 4100 m, *K.Ogino 429* (KITAMURA 1964: "*A. pratensis*"). **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26659* (K!, RAW). **Hunza:** Baltar 3500 m, *Paffen 121* (M!); 3650 m, *Paffen 142!* (M!), NE Chaprot (?3600-) 4000 (?-4400) m, *Klötzli & al. 12.21!; 728.78!*. Minapin Gl. (LLOYD & LLOYD 1968).

Unloc.: P. to Darawa, 1847-06-14, *Winterbottom* s.n. (K!).

A: Alai, W Pamir, E Pamir (Fl.Tadzh.: *A. apiatus*, *A. mucronatus*, *A. serawschanicus*, *A. ventricosus*). Wakhan: Futur Vy. 3800 m, *Roemer 82* (M!; PODLECH & ANDERS 1977: *A. serawschanicus*). 4000-4100 m (PODLECH & ANDERS 1977: *A. apiatus*). Nuristan: Bashgal sources, Darrah-i-Pushal (3300-4020 m), *Podlech 16415* (M!); *16440* (M!). Chitral: Oihor Gol 3050 m, *Bowes Lyon 854* (RAW). Yarkhun 4000 m, *F.Schmid 2345* (K!). Baroghil P. 3810 m, *Stainton 2983* (RAW). Astor: Upper Rupal Vy., Rupal Gl. ablation Vy. 3950 m, *Nüsser 1555!*. Deosai: Deotso [Deosai], *Winterbottom 228* (K!). Deosai 4050 m, *Miehe 2138!*. Burzil P. N slope 3350 m, *R.R. & I.D.Stewart 22006* (K!). Dras: Marpo P., Dras side 4270 m, *R.R. & I.D.Stewart 22309a* (K!). Chatpani Nullah, W of Dras 3350-3660 m, *Duthie 13184* (K!); *13833* (K!). Matayan 3350 m, 1891-07-31, *G.A.Gammie* s.n. (K!). Suru: Panichar, 500 m W union of Suru Rv. and Chalang Nar Rv. 2900 m, *Southampton Univ. 33* (K!). W Sanmodangsa 4190 m, *H.Hartmann 2344!*. Hazara: Siran Vy. 3350 m, *R.R. & I.D.Stewart 21728a* (K!). Kaghan Vy., Naran - Saiful Muluk, *Shaukat Ali 189* (K!). Kashmir: Burzil P. 2820 m, *C.B.Clarke 29604* (K!). Zoji P. (HENDERSON & HUME 1873: "*A. pratensis*"); 3350-3660 m, 1848-09-27, *T.Thomson* s.n. (K!). Kiyang Range 2770 m, *Duthie 10955* (K!). Gulmarg 2440-2740 m, *Duthie 13040* (K!); *Kuldeep Kumar Koul 1731* (K!). Above Gulmarg 2440-2740 m, 1892-05-19, *Duthie* s.n. (K!); 2740-3050 m, *Duthie 11272* (K!). Alibad, *C.B.Clarke 29010* (K!). Liddarwat, *Inayat 25772* (K!). Above Pahlgam 3050 m, *R.R. & I.D.Stewart 21728a* (K!). Above Dubjan 2130 m, *J.R.Drummond 13926* (K!). Himachal Pr.: Lahol, Kardong to Dartse in the Bhaga Vy., 1856-06-15/18, *Schlagintweit 2831* (K!). Jispa, *Aswal 9384*; common (ASWAL & MEHROTRA 1994).

D: Temp. Eurasia, S to Caucasus, N Pakistan (Baluch., Chitral, Hazara, Gilgit), Kashmir, W Himalaya; introduced in N America. *Euras.*

E: (2960-) 3600-4000 (-4400) m, subalp. - alp., SW Karakorum, not common. Relatively humid (water-surplus) meadows. "A valuable constituent of alpine pastures."(Fl.Pak.).

86. **Alopecurus himalaicus** HOOKER f., Fl. Brit. India **7**: 238. 1896

W **Ghizar:** Diwangal - Ghizar 3900 m, *K.Ogino 222* (KITAMURA 1964). **Yasin:** Naz Bar 4400 m, *Miehe 3097!*. **Ishkoman:** Ishkoman Aghost 4210-4540, *F.Schmid 2432* (K!).

S **Shigar/Lower Shyok:** Thalle P. 4270 m, *R.R.Stewart 20648* (RAW). **Skardu:** Burji P. 4420 m, *C.B.Clarke 29844* (K!).

A: W Pamir. Nuristan: Bashgal sources, Darrah-i-Suyengal (3350-5100 m), *Podlech 16495* (M!). Chitral: Tirich Mir, S Barum Gl., medial moraine 3800 m, 1950-07-12, *P.Wendelbo* s.n. (K!). Agram, Arkari Gol W Tirich Mir 3200 m, *Stainton 2639* (RAW). Astor: S Jakpi P., ascent to Deosai, *Winterbottom 646* (K!). Deosai: Burzil P. N 3660 m, *R.R. & I.D.Stewart 21995* (K!). Shingo Vy.,

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Golteri Nullah 3350 m, *Duthie 11875* (K!). Marpo P. Top, Deosai - Dras 4570 m, *R.R. & I.D.Stewart 22269* (K!). Dras: Khorbula Nullah 3960-4270 m, 1892-07-12, *Duthie* s.n. (K!). Kargah Vy., W of Dras 3960-4270 m, *Duthie 13910* (K!). Suru: 16 km S Zuildo, 2 km N Suru Rv. 3820 m, *Southampton Univ. 158* (K!). Swat: Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25345* (K!). Hazara: Kaghan Vy., *Metz 190* (K!). Nila, 1899-07-24, *Inayat* s.n. (K!). Chapran, 1899-07-16, *Inayat* s.n. (K!). Kashmir: Barzil 3660 m, *C.B.Clarke 29693* (K!). Sonamarg 3050 m, *W.S.Atkinson, C.B.Clarke 24205* (K!). Gulmarg 3350 m, *Levinge, C.B.Clarke 27462* (K!). Pahlgam 3960 m, *R.R.Stewart 8147* (K!). Kolahoi 3350-3660 m, *Duthie 13506* (K!).

D: C. Iran, NE Afgh. (Nuristan), Pamir-Alai, Pakistan (Chitral, Gilgit, Karakorum), Kashmir, W Himalaya. *W Himal.*

E: (3900-) 4200-4400 m (-4540) m, alp., rare (S & W Karakorum). Fairly moist closed turf, in gravel, by streams.

* **Alopecurus mucronatus** HACKEL ex PAULSEN 1903 - **A**: Wakhan 4600 m (PODLECH & ANDERS 1977). **D**: Iran, Afgh., Pamir.

* **Alopecurus myosuroides** HUDSON 1762 (*Alopecurus agrestis* L. 1762) - **A**: Swat. Kashmir. **D**: Temp. Eurasia, S to Caucasus, W Himalaya; introduced in N America, New Zealand.

* **Anthoxanthum odoratum** L. 1753 - **A**: Hazara. **D**: Temp. Eurasia, introduced in N America. **Map:** HEGI 1(3): fig 64.

87. Aristida adscensionis L., Sp. Pl. 82. 1753

Aristida depressa RETZ. 1786, *Aristida caerulescens* DESF. 1798, *Aristida pumila* DECNE. 1835, *Aristida heymannii* REGEL 1881

Ic.: Fl.Pak.143: fig.6. Fl.Desert.Sin.1: fig.37(1-2).

W **Ghizar:** Gupis 2170 m, *K.Ogino 575* (KITAMURA 1964). **Gilgit:** Gilgit Vy. 1220 m, *Duthie 12485* (K!). **Hunza:** Chalt 1900 m, *Klötzli & al. 124.02!*. Maiyun 1830-2130 m, *R.R.Stewart 26662* (K!).

S **Skardu:** Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 677* (K!); Skardu 2130-2440 m, *C.B.Clarke 29977; 30506* (K!). Around Skardu airport 2500 m, *Nakao* s.n. (KITAMURA 1964).

A: W & S Kashg. (Pl.As.Centr.: *A. heymannii*). Chitral. Swat: Near Madian 1520 m, *R.J.Rodin 5521* (K!, RAW). Above Dargai (N 34°30'E 71°55') 400 m, *Rechinger 19627* (M!). Hazara: 3 miles from Garhi Habibullah on way to Abottabad, *S.A.Faruqi & M.Qaiser 3392* (KUH). Kashmir: Muzaffarabad, *Sultanul Abedin & M.Qaiser 9193* (KUH).

D: S Europe, SW, C. & SE. Asia, N & trop. Africa, N, C. & S America. *Pantrop.*

E: 1220-2440 m, subtrop.-coll., not common in the SW. Ruderal water-surplus habits in deserts and desert-steppes: roadsides, culivated areas.

88. Aristida cyanantha (NEES) STEUDEL, Syn. Pl. Glum. 1: 141. 1854

Chaetaria cyanantha NEES in ROYLE 1839

CS **Shimshal:** Shimshal Gorge, Jurujur - Dut 2600-2730 m, *Miehe 5947!*.

W **Gilgit:** Rakaposhi W, above Barti 2650 m, *Miehe 6723!*. **Hunza:** Chalt - Nagar 1830 m, *R.R.Stewart 26660* (K!, RAW). Chalt 2000 m, *Paffen 11* (M!). Chalt - Nomal 2000 m, *Nakao* s.n. (KITAMURA 1964).

A: Chitral: Shishi Gol NE of Drosh 1830 m, *Stainton 3149* (RAW). Chilas: Batogah Vy. 1500 m, *Schickhoff 2175!*. Indus Vy. 40 km below Chilas 900 m, *Klötzli & al. 811.15!*. Swat: Madian 1520 m, *R.J.Rodin 5516* (K!, RAW). Hazara: Safaidgali 1830 m, *E.W.Trotter 101* (K!). Near Abottabad, 1939, *Hassan Din* s.n. (KUH). Kashmir: Near Garhi Habibullah, on Kashmir - Abottabad Rd. 1070 m, *R.R. & I.D.Stewart 3724* (K!, RAW). Jhelum Vy. (900-1520 m), *J.E.T.Aitchison 886* (K!). Kishtwar 1220 m, *C.B.Clarke 31426* (K!). Batol P. to Chenab 910 m, *R.R.Stewart 12515* (K!). Murree Hills, Potha 1340 m, *R.R.Stewart 23272* (K!).

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D: W Himalaya: E Afgh., N Pakistan, Kashmir, NW India, Nepal. *W Himal.*
E: 1830-2650 (2730) m, subtrop. - coll., rare. Dry rocky hillsides, water-surplus habitats (river-sides) of the lower desert-steppes.

* **Aristida funiculata** TRIN. & RUPR. 1842 - **A**: Kashmir. Trop. E Africa, SW Asia - India.

* **Aristida mutabilis** TRIN. & RUPR. 1842 (*Aristida articulata* EDGEW. 1862) - **A**: Hazara. Kashmir. **D**: N & E Africa, SW Asia - India.

* **Arthraxon hispidus** (THUNB.) MAKINO 1912 - **Ic.**: Fl.Desert.Sin.1: fig.48(7-11). **A**: Reported from N & E Kashg. (Pl.As.Centr.). **D**: C. & E Africa, SW (Caucasus), ?C., S, SE & E Asia, ?Australia; introduced in N & C. America.

89. Arthraxon lancifolius (TRIN.) HOCHST., Flora (Jena) 39: 188. 1856

Andropogon lancifolius TRIN. 1832

Ic.: Fl.Pak.143: fig.35(1-2).

W **Gilgit:** Chalt - Nomal 1520-1830 m, *R.R.Stewart 27044* (K!). **Hunza:** Chalt - Chaprot 2120 m, *Klötzli & al. 120.13!.*
A: Hazara. Kashmir.
D: C. & E Africa (Mali - Mozambique), Arabia; N Pakistan, Kashmir, India - China, Indonesia. *Palaeotrop.*
E: 1520-2120 m, subtrop. - coll., rare (SW Karakorum). Hot desert-steppe belt, probably in ruderal water-surplus habitats (old walls, waste places).

* **Arthraxon prionodes** (STEUDEL) DANDY in ANDREWS 1956 (*Andropogon prionodes* STEUDEL 1854) - **A**: Swat. Hazara. Kashmir. Himachal Pr.: Trilokinath, *Bhattacharyya 45386* (BSD; ASWAL & MEHROTRA 1994). **D**: N Africa, Medit., warm temp. Asia E to SE Tibet.

* **Arundinella nepalensis** TRIN. 1826 - **A**: [?]W Kashg.: Yarkand Plains (HENDERSON & HUME 1873). Hazara. Kashmir. **D**: Old world tropics.

* **Arundo donax** L. 1753 - **Ic.**: Fl.Xizang.5: fig.29. **A**: Swat. Hazara: Kaghan Vy. Kashmir. **D**: Medit., warm-temp. & trop. Asia; introduced in America.

90. Avena fatua L., Sp. Pl. 80. 1753

Ic.: Fl.Tadzh.1: fig.40(4). Fl.Iraq 9: pl.124. Fl.Xizang.5: fig.102. Fl.Desert.Sin.1: fig.30(4-5).

CS **Biafo:** Chongo, *Y.Takamura* s.n. (KITAMURA 1964). Askole, *Y.Takamura* s.n.; 3200 m, *Nakao* s.n. (KITAMURA 1964).

W **Ghizar:** Ghizar - Shamaran 2900 m, *Honda 268* (KITAMURA 1964). **Yasin:** Sultanabad 2500 m, *G.Stöber 36* (GOET!). **Gilgit:** Gilgit 1500 m, *Nakao* s.n. (KITAMURA 1964). Naltar 2440-2740 m, *R.R.Stewart 26667* (K). **Hunza:** Pisan 2230 m, 1974-07-23, *F.Gartner* s.n. (GZU!).

S **Shigar:** 2440 m, *C.B.Clarke 30494* (K). **Skardu:** 2330 m, *C.B.Clarke 29972* (K); 2440 m, *Nasir & Webster 5795* (RAW). Around Skardu airport, *Nakao* s.n. (KITAMURA 1964).
A: Wakhan. Chitral. Swat. Kashmir. Himachal Pr.: Spiti, Kaza 3650 m, 1993-08-03, *Holzner & Kriechbaum* s.n.!. Keylong, *Bhattacharyya 45222* (BSD; ASWAL & MEHROTRA 1994).
D: Temp. Eurasia, N Africa; introduced in N & S America. *Euro-Sib.*
E: 2330-3200 m, mont., occasional in the S & W. Cultivated fields, "a common weed of cereal crops" (Fl.Pak.).
N: Represented by subsp. **fatua** in the area, *Avena fatua* L. subsp. *meridionalis* MALZ. 1930 (*Avena meridionalis* (MALZ.) ROSHEV. in B. FEDTSCH. 1932) seems to be confined to warmer regions.

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* **Avena hybrida** PETERM. 1841 (*Avena septentrionalis* MALZ. 1913, *Avena fatua* L. subsp. *septentrionalis* (MALZ.) MALZ. 1930) - **A**: Reported from Wakhan 2600-3300 m (PODLECH & ANDERS 1977). **D**: Continental Eurasia: Russia - Pamir-Alai - Mongolia). **N**: Included into *A. fatua* L. subsp. *fatua* by TZVELEV (1976).

• **Avena sativa** L., Sp. Pl. 79. 1753 - **Ic.**: Fl.Tadzh.1: fig.40(3). KENG 1959: fig.419. Fl.Iraq 9: pl.127 - Cultivated: **A**: W & S Kashg. (Pl.As.Centr.). ? S & W Karakorum.

? 91. Avena sterilis L. Sp. Pl., ed. 2, 118. 1762
subsp. **ludoviciana** (DUR.) GILLET & MAGNE, Fl. Franc., ed. 3, 532. 1875
Avena trichophylla C. KOCH 1848, *Avena ludoviciana* DURIEU 1855

Ic.: Fl.Tadzh.1: fig.40(1). Fl.Iraq 9: pl.125; 126.

S **Skardu:** Skardu, 1848-02, *T.Thomson* s.n. (K).
A: W Kunlun: Kentalek 2700 m, 1931-07-10, *Persson 204* (PERSSON 1938). Chitral. Swat. Hazara. Kashmir.
D: Medit. - Pakistan (Baluch., NWFP); Kashmir, NW India. *Medit.*
E: 2400 m, coll. - mont., rare. "A common weed of cultivation" (Fl.Pak.).

92. Bothriochloa bladhii (RETZ.) S. T. BLAKE, Proc. R. Soc. Queensl. **80**: 62. 1969
Andropogon bladhii RETZ. 1781, *Andropogon caucasicus* TRIN. 1832, *Sorghum caucasicum* (TRIN.) GRISEB. 1853, *Bothriochloa caucasica* (TRIN.) C. E. HUBBARD 1939

W **Hunza:** Above Chalt 1830 m, *R.R.Stewart 26635* (K!); Chalt - Chaprot 2120 m, *Klötzli & al. 120.07!.*
A: Hazara. Kashmir.
D: Old World trop. & subtropics. *Palaeotrop.*
E: 1830-2120 m, subtrop. - coll., rare in the SW Karakorum. Semideserts.

93. Bothriochloa ischaemum (L.) KENG, Contr. Biol. Lab. Sci. Soc. China, Bot. Ser. **10**: 201. 1936
Andropogon ischaemum L. 1753

Ic.: Fl.Iraq 9: pl.195. Fl.Xizang.5: fig.180.

CS **Biafo:** Below Askole (HARTMANN 1966); Askole 3000 m, *H.Hartmann 65!*; *66* (K!). **Nubra:** [Lower] Nubra Vy., 1848-08-02, *T.Thomson* s.n. (K!).

W **Ghizar:** Rawat 2700 m, *K.Ogino 497*; Gupis 2170 m, *K.Ogino 569*; Dahimal - Gupis 2450 m, *Honda 232*; Shawraw 2500 m, *K.Ogino 472* (KITAMURA 1964). **Yasin:** Sultanabad 2500 m, *G.Stöber 37!* (GOET). **Ishkoman:** Imit - Ishkuman, *Honda* s.n. (KITAMURA 1964). Imit 2400 m (rivulet), 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** 1500 m, *Nakao* s.n. (KITAMURA 1964). Jutial Nullah 2130 m, *R.R.Stewart 26627* (K!). **Hunza:** Chalt - Chaprot 2120 m, *Klötzli & al. 120.15!*; N Chaprot 2380 m, *Klötzli & al. 77.12!.* Pisan 3000-3300 m, 1974-07-24, *F.Gartner* s.n. (GZU!). Minapin 2700 m, 1974-07-22, *F.Gartner* s.n. (GZU!). **Batura:** W Khaibar 2500-3000 m, *Klötzli & al. 118.01!; 801.21!.*

S **Shigar:** Skardu - Shigar 2380 m, *R.R.Stewart 20488* (RAW). **Skardu:** Iskardo, 1847-01-20, *T.Thomson* s.n. (K!); Skardo 1847-07-21, *Winterbottom 84* (K!). Tukht-i-Sulaiman, 1847-05-29, *Winterbottom 200* (K!). Satpura Nullah, above Skardu 3050-3350 m, *Duthie 11990* (K!). Skardu airport 2500 m, *Nakao* s.n. (KITAMURA 1964). **Leh:** 3500 m, 1992-07-14, *Holzner & Kriechbaum* s.n.!. S Leh 3450 m, *H.Hartmann 2552!.* ? Calatze (THOMSON 1852: "*Andropogon* sp."). Ladakh, "common" (STEWART 1916).

Unloc.: Sungal 1830 m, *Giles 514* (K!).
A: W Kashg.: Yarkand Plains (HENDERSON & HUME 1873); Yarkand Exp. 1870-08-19, *Henderson 448* (K!). S Kashg.: N Kunlun foothills, 1889-06-13, *Roborovsky*; N & E Kashg. (Pl.As.Centr.). Wakhan 2930-3090 m (PODLECH & ANDERS 1977). Chitral. Swat. Hazara. Astor: Rama - Gurikot 2440 m, *R.R.Stewart 22947a* (K!). Dras: Dras 3050 m, *Duthie 11990* (K!). Suru: Dras, Kargil via Suru

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to Tsringmat, 1856-10-10/11, *Schlagintweit 7186* (K!). N Sankoo 2900 m, *Southampton Univ. 171* (K!). Kashmir: 1848-05-15, *T.Thomson* s.n. (K!). Kashmir, 1848-10, *T.Thomson* s.n. (K!). Himachal Pr.: Gondhla, *Bor 10277* (DD; ASWAL & MEHROTRA 1994).
D: Temp. Eurasia: S Eur. - C. Asia (N to W Siberia, SW Altai), China, Korea; Himalaya, S Tibet; N Africa. *Euras.*
E: 1500-3500 m, mont., scattered in the S & W Karakorum. Meadow steppes, by cultivated fields, roadsides.

* **Brachiaria eruciformis** (J. E. SMITH) GRISEB. in LEDEB. 1853 (*Panicum eruciforme* J. E. SMITH in SIBTH. & SM. 1806) - **Ic.**: Fl.Iraq 9: pl.181. **A**: Hazara. Kashmir. **D**: Africa - Medit. - India.

* **Brachiaria ramosa** (L.) STAPF in PRAIN 1919 (*Panicum ramosum* L. 1767) - **A**: Swat. Hazara. Kashmir. **D**: Old world tropics.

94. **Brachypodium sylvaticum** (HUDSON) P. BEAUV., Ess. Agrost. 101, 155. 1812

Festuca sylvatica HUDSON 1762, *Festuca nepalensis* NEES ex STEUDEL 1854 *Brachypodium wattii* C. B. CLARKE 1889

Ic.: Fl.Xizang.5: fig.75.

W **Gilgit:** 1520 m, *R.R.Stewart 26637* (K!). **Hunza:** Minapin - Chalt 1830 m, *R.R.Stewart 26636* (K!, RAW). Chalt - Chaprot 2120 m, *Klötzli & al. 120.01, 18!*. N Chaprot 2380 m, *Klötzli & al. 77.10!*.
A: Chitral. Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1784!*. Kashmir. Himachal Pr.: Billing Nala, *Bor 16591* (DD; ASWAL & MEHROTRA 1994).
D: Eur., temp. Asia (S to Himalaya, SE Tibet); mountains of trop. Africa (var. *sylvaticum*); var. *luzoniense* (HACKEL) HARA 1938: Nepal - SE Asia, New Guinea. *Euras.* (var. sylvaticum).
E: 1520-2380 m, mont., rare in the SW. Dry open forests, moist pastures.

* **Briza media** L. 1753 - **Ic.**: Fl.Xizang.5, fig.66. - **A**: Astor: Kamri Vy., near Kalapani 3050-3350 m, *Duthie 12655* (K!). Dras: Chatpani Nala 3960 m, *Duthie 13885* (K!). Kashmir: Deosai P., head of upper Kishenganga Vy. 3960 m, *R.R.Stewart 22155* (K!, RAW). Burzil 3350 m, *C.B.Clarke 29713* (K!). Above Gulmarg 3050 m, *R.R.Stewart 10424* (K!). Sonamarg 2820 m, *C.B.Clarke 30865* (K!). Himachal Pr.: Rohtang slope, *Aswal 10518* (ASWAL & MEHROTRA 1994). **D**: Temp. Eurasia, S to Himalaya (Kashmir - Bhutan). **N**: The Himalayan plants generally are very robust, with culms up to 1 m tall, they may comprise var. *elatior* SIBTH.

95. **Bromus confinis** NEES ex STEUDEL, Syn. Pl. Glum. **1**: 310. 1854

Bromus munroi BOISS. 1884, *Bromus inermis* LEYSSER var. *confinis* (NEES ex STEUDEL) STAPF in HOOKER f. 1896, *Bromus biebersteinii* auct. non ROEMER & SCHULTES 1817

CS **Biafo:** Karakorum [near Askole] 3960 m, 1876-08-10, *C.B.Clarke 30368* (K!). Gense - Ste Ste 3530 m, *H.Hartmann 72!; 75* (K!). Ste Ste - Gense 3380 m; 3520 m; Gense 3700-4090 m (HARTMANN 1966, corr. HARTMANN 1984).

W **Gilgit:** Naltar Vy. 2740-3350 m, *Duthie 12393; 12395* (K!); Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). Naltar Lakes 3660 m, *R.R.Stewart 26628* (K!, RAW). Shinghai Gah - Pahot Gali 2910-3800 m, *Miehe 731!; 790!; 823!; 1292!; 1519!; 1689!*. Kar Gah 3190 m, *Schickhoff 2087!*. Sai Vy. 2850-3100 m, *Schickhoff 1972!; 2021!*. Baghrot Vy. 3130-3920 m, *Miehe 4264!; 4332!; 4365!; 4485!; 4492!;* 3600-4030 m, *Nüsser 1244!* (cf.); *1253!* (cf.); *1254!* (cf.). Above Jaglot Rv. 3210 m, *Schickhoff 616!*. Upper Darchan Vy., above Khaltaro 3190-3230 m, *Schickhoff 647!; 713!*. Upper Haramosh Vy., above Iskere 2970 m, *Schickhoff 832!*. Haramosh range, Mani, right basin, *R.C.Culbert 131* (BM!). **Hunza:** Chaprot, *Winterbottom 963* (K!). N Chaprot (2600-) 3000-3780 m, *Klötzli & al. 3.07,17,20!; 4.22,114,129!; 6.32!; 7.05!; 50/51.05!; 59.09!; 729.36!*. Chaprot Vy. 3130-3310 m, *Schickhoff 2105!; 2111!; 2166!*. Minapin Gl. 3510 m, *Lloyd & Megan 118* (BM!). Rakaposhi N, above Nilt 3670 m, *Miehe 6484!*. Above Nilt, Masot Gl. 3170 m, *Schickhoff 263!*. Rakaposhi NW & W opposite Chalt 3150-3200 m, *Miehe 6672!; 6678!*. Pisan 2800-3000 m, 1924-07-24, *F.Gartner* s.n. (GZU!). **Hispar:**

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Bualtar Gl., left hillside 3800 m, 1955-08-19, *S.Nakao* s.n. (KYO!; KITAMURA 1964: "*B. inermis* var. *villosus*"). Barpu Gl., left bank 3810 m, *R.Scott Russell 1124* (BM!).

S **Shigar:** Sokha Gl., right bank 4570 m, *R.Scott Russell 1628* (BM!); (3810-4270 m), *R.Scott Russell 1711* (BM!). Solu Gl., right bank 3810 m, *R.Scott Russell 1747* (BM!). Upper Basna Vy., above Gon 3160-3320 m, *Miehe 5021!*. **Skardu:** Upper Stak Nala, Above Khotia Lungma Gl. 3360 m, *Schickhoff 872!*. Above Bashu 3210-3230 m, *Schickhoff 913!*; *954!*. Deosai N - Satpara 3640 m, *Miehe 5195!*. Talu Brok 3330 m, *Schickhoff 1857!* (cf.).

A: Chilas: Babusar Vy. 3200 m, *Schickhoff 1695!*. Rakhiot Vy. 3220 m, *Schickhoff 1668!*. Astor: Kalapani 3200 m, *Giles* s.n. (K!). Shankargarh 2930 m, *Giles* s.n. (K!). Above Zaipur 3120-3140 m, *Schickhoff 1068!*; *Schickhoff 1102!*. Mushkin Forest 3000 m, *Schickhoff 1424!*. Faqirkot 2980-3220 m, *Schickhoff 1306!*; *1348!*. Deosai: Shingo Vy., above Gulteri 3350 m, *R.R.Stewart 22199a* (K!); near Gulteri 3350 m, *R.R.Stewart 22222* (K!: with galls). Dras: Chatpani Nullah, W of Dras 3350-3660 m, *Duthie 13841* (K!). Marpu Nullah 3350-3660 m, *Duthie 11845* (K!). Marpo P. - Dras 3350-3660 m, *R.R.Stewart 22316* (K!). Matayan 3660 m, *R.R.Stewart 9980* (K!). S above Matayan 3550 m, *H.Hartmann 2361!*. Rimochagma Nullah 3660-3960 m, *Duthie 12152* (K!). Swat: Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25289* (K!). ?Hazara. Kashmir: Kamri Vy. 2900 m, Duthie 12505 (K!: *B. confinis* X *inermis* ?). Kolohoi Vy. 3660 m, *O.Polunin 56/565* (K!). Liddar Vy., Sonsal nala 3660-3960 m, *Ward 17813* (K!). Himachal Pr.: Ramjak - Darcha 3750 m, 1993-08-01, *Holzner & Kriechbaum* s.n.!. Keylong, *Bor 14912* (DD; ASWAL & MEHROTRA 1994).

D: N & C. Iran; SW Karakorum, W Himalaya (Kurram, Swat - Nepal). *W Himal.*

E: (2740-) 2910-3920 m, mont.-subalp., frequent in SW Karakorum. Relatively humid forests (*Picea smithiana, Pinus wallichiana, Betula jacquemontii*), dwarf scrub (*Juniperus sibirica*) and meadows, less common in *Juniperus excelsa-Artemisia brevifolia* forest-steppes and meadow steppes.

N: *B. confinis* seems to be restricted to the relatively humid monsoon-influenced summer-rain areas around the Lower Indus and the Hunza Valley. *B. stenostachyus* replaces it in dry extreme W bordering to Chitral, which however, gets some winter rain.

* **Bromus danthoniae** TRIN. in C. A. MEYER 1831 (*Triniusa danthoniae* (TRIN.) STEUDEL 1854, *Bromus macrostachys* DESF. var. *triaristatus* HACKEL 1879) - **Ic.**: Fl.Iraq 9: pl.47. Fl.Iran.70: pl.20. Fl.Pak.143: fig.64. **A**: Dras: Tasgam, *Bimal Misri 346* (K!); *353* (K!). **D**: Cyprus, SW & Middle Asia - Pakistan (Baluchistan, Kurram), NW India (Ladakh).

96. **Bromus gracillimus** BUNGE, Mém. Acad. Sci. Pétersb. sav. étr. 7: 527. 1851

Bromus crinitus BOISS. & HOHEN. in BOISS. 1854, *Nevskiella gracillima* (BUNGE) V. KRECZ. & VVED. 1934

Ic.: Fl.Tadzh.1: tab.34. Fl.Xizang.5: fig.68(1-2).

CS **Saltoro:** Hushe Rv., c.2 miles N of Hushe 3050 m, *Nasir & Webster 5962* (K!, RAW). Kande - Hushe 2740 m, *Nasir & Webster 5964* (RAW); Upper Hushe Vy., common (WEBSTER & NASIR 1965).

W **Yasin:** Naz Bar 3050 m, *Miehe 3662!*.

S **Leh:** Fotu P. Base, *Bimal Misri 304* (K!).

A: Wakhan: 3200-4550 m (PODLECH & ANDERS 1977). Ishkashim 2650 m, *Giles 153* (K!). Killa Panja 2740 m, *Giles 117* (K!). W Pamir. E Pamir. Chitral: Servir Gol 3200 m, *Bowes Lyon 784* (BM!). Lutkho 2740 m, *Bowes Lyon 786* (K!). Baroghil P. 3810 m, *Stainton 2981* (BM!: very large specimens). Deosai: Shingo Vy. 3050-3350 m, 1892-09-08, *Duthie* s.n. (K!). Dras: Dras Vy., below Matayan 3050-3350 m, *Duthie 11714* (K!); *11759* (K!). Kharbu, *Bimal Misri 312* (K!). Tasgam, *Bimal Misri 349* (K!); *350* (K!). Suru: Kargil, 1848-09-23, *T.Thomson* s.n. (K). Zanskar: [NW Zangla] 4270 m, 1848-06-29, *T.Thomson* s.n. (K!); 1848-06-30 (K!). Pader (Shinku P. N) - Sulle, 1856-06-20/21, *Schlagintweit 6243* (K!). Pensi P. - Tungri 3850 m, *H.Hartmann 2581!*. Lingti Chu, Chumik Marpo, 1993-07-25, *Holzner & Kriechbaum* s.n.!. Kenlung, *Bor 16471* (DD; ASWAL & MEHROTRA 1994). Himachal Pr.: Spiti, Takenak to Giam, 1856-06-21/22, *Schlagintweit 2489* (BM!).

D: E Anatolia, Iran, Afgh., Pamir - W Himalaya. *Ir.-Tur.*

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E: 2740-3050 m, mont., scattered in the S & W Karakorum. Dry mountain slopes, but often in water-surplus habitats; somewhat ruderal.

* **Bromus inermis** LEYSSER 1761 (*Zerna inermis* (LEYSSER) LINDM. 1918, *Bromus ciliatus* auct. non L. 1753) - **A**: [?]Wakhan 4000 m (PODLECH & ANDERS 1977). Chitral. Astor: Gudhai Vy. 3350-3660 m, *Duthie 12210* (K). Shankargarh, Upper Astor Vy. 3350 m, *R.R.Stewart 22753* (K). Dras: Chatpani Nullah, W of Dras 3050-3350 m, *Duthie 13819* (K!). Dras Vy. 3050-3350 m, *Duthie 13711* (K!). Kashmir: Kunzlwan 2360 m, *C.B.Clarke 29441* (BM!). Bangla 2740 m, *C.B.Clarke 29562* (BM!). Himachal Pr.: Sissu, *Bor 12306* (DD; ASWAL & MEHROTRA 1994). **D**: Eur., temp. Asia; Kashmir. **E**: "A very useful fodder grass introduced into the British Islands and North America for this reason." **N**: "It is part of a species complex grading into awned and/or hairy forms especially in Asia. It shows quite clear connections with *B. stenostachyus* BOISS. and the Caucasian *B. biebersteinii* ROEMER & SCHULTES. Its distinction from *B. confinis* is also rather ill-defined." (Fl.Pak.).

97. **Bromus japonicus** THUNB. ex MURRAY, Syst. Veg. 119. 1784

Bromus patulus MERT. & KOCH in ROEHL. 1823

Ic.: Fl.Desert.Sin.1: fig.13(1-3).

W **Hunza:** Pisan 2250 m, 1974-07-23, *F.Gartner* s.n. (GZU!).

S **Shigar:** Tandoro 2450 m, *H.Hartmann 71* (Z!). Chutran [?]1830 m [2500 m], 1928-05-11, *F.Ludlow 266* (BM!). **Skardu:** 2440 m, *Nasir & Webster 5796* (RAW). **Leh:** Ladakh <3660 m (HENDERSON & HUME 1873); "Yarkand Exped.", 1870, *Henderson* s.n. (K!).

A: W Kashg.: Hangcheng, *Törnquist* (Z!). Kongur: Jerzil 2800 m, 1930-07-12, *Persson 96* (PERSSON 1938). W Kunlun: Kentalek 2700 m, 1931-07-16, *Persson 190* (PERSSON 1938). Kudi 3000 m, *Dickoré 201!*. Wakhan: 2780-3300 m (PODLECH & ANDERS 1977). Chitral: Bashgalian SW of Chitral 2900 m, *Stainton 2700* (BM!). Madaklasht, NE Drosh 3050 m, *Stainton 3141* (BM!). ? Chitral Village 1520 m, *Stainton 2157* (BM!; K!, to *B. oxyodon* ?). Astor: Gurikot 2440 m, *R.R.Stewart 22958* (K!). Lower Astor Vy., below Doyan 1680 m, *Nüsser 717!*. Mushkin Forest, Mushkin Rest House - Dashkin 2660 m, *Nüsser 269!* (cf.). Swat: Khwaja Khel 1070 m, *S.Ali 26079* (BM!). Hazara: Kaghan Vy., near Burawai 3050 m, *C.Wright 69* (BM!). Kashmir: Bangulla 2900 m, *Giles 83* (K!). Hirpoor 2440 m, *C.B.Clarke 28713* (BM!). Gund - Gagangu, 1880-09, *A.P.Young* s.n. (BM!). Tangmarg 1830 m, *O.Polunin 56/321* (BM!). Himachal Pr.: Khoksar, *Aswal 6617* (ASWAL & MEHROTRA 1994).

D: Eurasia: C. Eur. - Japan, S to Afgh., Pakistan (Baluch.), Kashmir; widely introduced in Europe, N America and elsewhere. *Euras.*

E: 2440-2450 (?3660) m, coll. - mont., rare. Cultivated fields.

N: 2n = 14, diploid. Easily confused with the tetraploid *B. pectinatus*, and the above records perhaps partly referring to this.

* **Bromus koieanus** MELDERIS in KÖIE & RECH. f. 1965 - **Ic.**: MELDERIS in KÖIE & RECHINGER 1965: pl.3, 4. **A**: Wakhan: Futur Vy. 3700 m, *Roemer 77* (PODLECH & ANDERS 1977). **D**: C. & E Afgh. (Bamian, Kabul, Wakhan). **N**: See under *B. stenostachyus*.

* **Bromus lanceolatus** ROTH 1797 - **Ic.**: Fl.Iraq 9: pl.50. **A**: Reported from Wakhan 3400 m (PODLECH & ANDERS 1977). **D**: S Europe, N Africa, temp. Asia (Caucasus - Siberia; Afgh., Kurram). **N**: Next specimen seen from: Near Kyber P., 1915-05, *Precott-Decie* (BM!). Apparently a Irano-Turanian species.

* **Bromus oxyodon** SCHRENK 1842 - **A**: Wakhan 2700 m (PODLECH & ANDERS 1977). ?Chitral. Astor: Chugan 2530 m, *Giles 70* (K! "*B. racemosus*"). Rupal Nullah 2590 m, *R.R. & I.D.Stewart 18902* (RAW). Rupal - Gurikot 2440 m, *R.R.Stewart 22862* (K!). Kalapani - Shankargarh 3350 m, *R.R.Stewart 22743* (K!). Deosai: Shingo Vy. 3050-3350 m, *Duthie 11899* (K!). Dras: Dras, *Bimal Misri 360* (K!). Chokyal, *Bimal Misri 317* (K!). Dras, Ladakh Road 3050 m, *R.R.Stewart 2403* (KUH), *10046* (K!). Karpuchu Vy. 3350-3660 m, *Duthie 11950* (K!). Marpo P. - Dras 3350 m, *R.R.Stewart 22329* (K!). Below Matayan 3050-3350 m, *Duthie 11742* (K!). Suru: W Panikhar 3350 m, *H.Hartmann 2362!*. W above Sankoo 3320 m, *H.Hartmann 2363!*. Rungoum, 1.5 km W Zuildo 4000 m, *Southampton Univ. 83* (K!). Zanskar: Sulle - Padum, 1856-06-22-24, *Schlagintweit* s.n. (BM!). Hemeling 3510 m, *M.Grace & al. 138* (K!). Pensi P. - Tungri 3850 m, *H.Hartmann 2553!*. Kashmir: Zoji P. 3350

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m, *R.R.Stewart 22366a* (K!). Himachal Pr.: Lahol, Dartse to Tsanskar Sumdo, 1856-06-17, *Schlagintweit* s.n. (BM!). Kyelang 3200 m, *Bor 15202* (K!). Gondhla, *Bor 9514* (DD; ASWAL & MEHROTRA 1994). **D**: W Mongolia, C. Asia, Dzungaria, Tian Shan, Pamir, Afgh., W Himalaya (Baluch., Chitral, Astor, Baltistan, Kashmir, Zanskar, Himachal Pr.). **E**: In Suru and Zanskar apparently a characteristic species of block scree slopes (*Stachys tibetica*). **N**: To be expected in the S Karakorum.

* **Bromus pamiricus** DROBOV 1925 (*Zerna pamirica* (DROBOV) NEVSKI 1934, *Zerna paulsenii* (HACKEL ex PAULSEN) NEVSKI subsp. *pamirica* (DROBOV) TZVELEV 1970) - **A**: Wakhan 4000-4400 m (PODLECH & ANDERS 1977). **D**: C. & NE Afgh., Pamir-Alai.

* **Bromus paulsenii** HACKEL ex PAULSEN 1903 (*Zerna paulsenii* (HACKEL ex PAULSEN) NEVSKI 1934) - **A**: Wakhan 3900-4000 m (PODLECH & ANDERS 1977). **D**: Pamir-Alai, Wakhan.

98. **Bromus pectinatus** THUNB., Prodr. Fl. Cap. 1: 22. 1794

Bromus vestitus SCHRADER 1822, *Bromus gedrosianus* PENZÉS 1936, *Bromus rechingeri* MELDERIS in BOR 1970

Ic.: Fl.Iran.70: pl.17 (*B. rechingeri*).

CS **Biafo:** Ste Ste 3080 m, 1962-07-07, *H.Hartmann 68!*; *H.Hartmann* s.n. (K!; HARTMANN 1966, corr. HARTMANN 1984). **Saltoro:** Above Hushe 3300 m, *Miehe 1854!*.

W **Yasin:** Darkot 3140 m, *Bowes Lyon 8047* (K!). **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12650* (K!). Naltar 3050-3660 m, *R.R.Stewart 26630* (K!). Naltar - Nomal, *A.Ghafoor & Z.L.Butt 842* (KUH). Naltar Vy., Jagot 3100-3300 m, 1974-08-03, *F.Gartner* s.n. (GZU!). **Hispar:** Hispar village area 3230 m, *O.Polunin 6354* (BM!, very robust specimen).

S **Shigar:** Chirka Khalti, c.5 miles from Shigar, *A.Ghafoor & Z.L.Butt 669* (KUH). Kero Lungma Gl., left bank 3050-3350 m, *R.Scott Russell 1340* (BM!). **Skardu:** 2590 m, *C.B.Clarke 30016* (K!). Satpura 2740-3050 m, *Duthie 12036* (K!); *Nasir & Webster 6325* (RAW). **Leh:** Environs of Gia, 1856-07-30/31, *Schlagintweit 1683* (K!). Gia - Upshi, 1856-06-27, *Schlagintweit 1431* (BM!). Bodh Kharbu, *Bimal Misri 327* (K!). Mathu, *Bimal Misri 341* (K!). Alchi 3200 m, *Holzner & Kriechbaum* s.n.!. Kartse 4130 m, *Holzner & Kriechbaum* s.n.!. **?Lower Shyok:** Saling (right side of the Shayuk opposite Khapalu to Hushe (on the Tsetanga Rv.), 1856-07-13/15, *Schlagintweit 5482* (BM!, *B. japonicus* X *B. pectinatus* ?). **Shyok:** Shayuk Vy. [Calzar], 1848-07-22, *T.Thomson* s.n. (K!). Kardong to Diskit on the left side of Shayuk, 1856-07-26/28, *Schlagintweit 2288* (BM!).

A: Kurram. Wakhan: Ptukh 3300 m, *Huss* (cult.; Pl.Graecenses) *211* (W!). Chitral: Bundai, *Harriss 16824* (BM!). Yarkhun, *Bowes Lyon 943* (W!). Shogoz - Yarkhun 2700 m, *Stamm & Wöhrl 233* (W!). Pechus 3250 m, *Stamm & Wöhrl 49* (W!). Chilas: Gor Region, below Martal 2680 m, *Nüsser 1168!;* Village Ranote 2120 m, *Nüsser 1186!*. Raikot Vy., Village Fary 2680 m, *Nüsser 1014!;* Tato - Fairy Meadows 2480 m, *Nüsser 961!*. Astor: Chugam 2530 m, *Giles 35* (K!). Rama 3050 m, *R.R.Stewart 22926a* (K!). Lower Rupal Vy., Churit - Bulashbar 2480 m, *Nüsser 807!*. Dras: Matayan - Mechschor, 1880-09, *A.P.Young* s.n. (BM!). Suru: Mulbekh, *Bimal Misri 352* (K!). Zanskar: Kurgiakh 4150 m, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Swat. Hazara: Kaghan Vy. Kashmir: Pahlgam - Aishmakam, 1880-09, *A.P.Young* s.n. (BM!). Himachal Pr.: Lahul, Dartse - Patseo (Bhaga Vy.), 1856-06-17, *Schlagintweit 4095* p.p. (K!: with *B. tectorum*). Kishtvar, Triloknath to the Kali P. (SW of Triloknath), 1856-06-24/27, *Schlagintweit 3836* (BM!). Jispa 3200 m, *Koelz 2055* (BM!). Spiti, Kaza 3650 m, 1993-08-03, *Holzner & Kriechbaum* s.n.!. Darcha, *Aswal 9326* (ASWAL & MEHROTRA 1994). Rupshu: Hanle 4330 m, *Koelz 2320* (BM!).

D: Eur., S & E Africa, Arabia - Pakistan (Baluch., Punjab, NWFP, Gilgit; more widespread than *B. japonicus*), Kashmir - India - Nepal, China. *Euras.*

E: Cultivated fields (*Triticum, Hordeum, Pisum sativum, Solanum tuberosum*), sandy ground, dry hillsides and open (grazed) *Juniperus excelsa* forest.

N: 2n = 28, tetraploid, counted on Wakhan material (HUSS 1980: *B. gedrosianus*).

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* **Bromus porphyranthos** T. A. COPE 1982 (*Bromus himalaicus* STAPF var. *grandis* STAPF in HOOKER f. 1896, *Bromus grandis* auct. non (SHEAR) HITCHC. 1912: (STAPF) MELDERIS in HARA, STEARN & WILLIAMS 1978) - **A**: Hazara. **D**: Himalaya.

* **Bromus ramosus** HUDSON 1762 (*Bromus asper* MURRAY 1762, *Zerna ramosa* (HUDSON) LINDM. 1918, *Bromus chitralensis* MELDERIS in BOR 1970) - **A**: Chitral: Yarkhun (N 36°30'-48' E 72°40'-73°05') 8500' [2590 m], hedgerow (stone wall), 1958-06-17, *Bowes Lyon 943* (BM! type *B. chitralensis*). Bumburet Vy., 2670-2700 m, *Miehe 7092!*. Swat. Hazara: Kaghan Vy. Kashmir. Himachal Pr.: Tandi, *Rau 5983* (BSD; ASWAL & MEHROTRA 1994). **D**: Europe, W & C. Asia (SE to Kashmir, Himachal Pr.). **E**: Temperate forests (in Chitral: *Abies pindrow, Pinus wallichiana, Cedrus deodara*). *Stewart 22222* (K!) probably belongs to *B. confinis*. Similar galls are found in *B. ramosus*, *B. inermis* and *B. confinis*.

99. Bromus stenostachyus BOISS., Fl. Orient. 5: 643. 1884

Bromus inermis auct. non LEYSSER 1761: WENDELBO 1952, *Bromus frigidus* auct. non BOISS. & HAUSSKN. ex BOISS. 1884: BOR 1970

W **Ghizar:** Chumarkhan P., E Mastuj 3660 m, *Stainton 2901* (BM!, W!). **Yasin:** Naz Bar 3410-4200 m, *Miehe 3293!; 3308!; 3426!; 3474!; 3495!; 3540!; 3541!; 3550; 3583!; 3586!; 3598!.*

Unloc.: Pamir region 3960-4270 m, *Alcock 17775* (BM!). Gilgit [?area], cult., *J.R.Harlan 826* (K!).

A: Nuristan. Wakhan: 2930-4550 m (PODLECH & ANDERS 1977). Pamir P. E Sarhad (3600-4200 m), *Roemer 336* (W!). Kishnikhan Vy. 3600 m, *H.Gamerith 69* (W!); (3600-4000 m), *H.Gamerith 84* (W!, "*B. frigidus*"). Futur Vy. 3700 m, *Roemer 77* (W! "*B. koieanus*"). Chitral: Barum Gol, Och Anzukht 3500 m, 1950-07-26, *Wendelbo* s.n. (BM!). Drosh P. - Gabur 3300-3400 m, *Kerstan 1523* (W!). Pechus Gl., *Stamm & Wöhrl 4* (W!). Khot An, N Mastuj 3050 m, *Stainton 2862* (BM!, W!). Shah Jinali, *Bowes Lyon 1021* (BM!); 3200 m, *Stainton 1021* (W!). Tirich Gol 3200 m, *Stainton 1071* (BM!, W!). Baroghil P. 3810 m, *Stainton 2984* (BM!, W!).

D: Iran, Afgh., Pakistan (Chitral, Gilgit). *Ir.-Tur.*

E: 3410-4200 m, mont. - subalp., locally frequent in the extreme W. *Artemisia brevifolia* and *A. santolinifolia* scrub steppes, often with *Acantholimon* spp., sometimes with *Juniperus excelsa* trees or *J. sibirica* dwarf-scrub and meadow steppes.

N: A typical Irano-Turanian species; descibed from: Afgh., Kurrum Vy., Sikaram (3350-3960 m), 1879-08, *Aitchison 1255* (BM! **type**). "*B. stenostachyus* is similar to *B. confinis* but has glabrous spikelets. *B. tomentosus* is also similar but has a much shorter and very much denser indumentum on the stems as well as on the leaves and sheaths." (Fl.Pak.). *B. stenostachyus* is a rather xerophytic plant. **Bromus koieanus** MELDERIS in KÖIE & RECH. f. 1965 is very near to *B. stenostachyus* and may be only an introgressive form somewhat transitional to *B. confinis*.

100. Bromus tectorum L., Sp. Pl. 77. 1753

Anisantha tectorum (L.) NEVSKI 1934

Ic.: Fl.Tadzh.1: fig.33. KENG 1959: fig.224.

W **Ghizar:** 3000 m, *K.Ogino 289* (KITAMURA 1964). **Gilgit:** Kargah Vy. 2500 m, *Bowes Lyon 8020* (K!). ? Jutial Nullah 1830-2130 m, *R.R.Stewart 26629* (K!, cf.). Basni - Kargah, *A.Ghafoor & Z.L.Butt 754* (KUH).

S **Leh:** Leh, 1856-07-15/08-05, *Schlagintweit 993* (BM!). Ladakh, Fotu P. Base, *Bimal Misri 305* (K!). **Lower Shyok:** Above Kasurmik, Shyok watershed 3050 m, *R.R.Stewart 20713* (RAW).

A: Wakhan 2900-3180 m (PODLECH & ANDERS 1977). Chitral: Arkari Gol W Tirich Mir 2590 m, *Stainton 2602* (BM!). Astor: Chugam 2530 m, *Giles 102* (K!). Above Rattu 2740 m, *R.R.Stewart 22801* (K!). Deosai: Shingo Vy. 3050-3350 m, *Duthie 11900* (K!). Dras: Kharbu, *Bimal Misri 316* (K!). Suru: W Panikhar 3350 m, *H.Hartmann 2360!*. Himachal Pr.: Lahul, Dartse - Patseo (Bhaga Vy.), 1856-06-17, *Schlagintweit 4095* p.p. (K!: with *B. pectinatus*). Keylong - Jispa, *Aswal 10258* (ASWAL & MEHROTRA 1994).

D: Macaronesia, N Africa, Eur., Medit. - C. Asia, Siberia, China; SW Asia - Himalaya, SE Tibet. *Euras.*

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E: (?1830-) 2500-3050 m, coll. - mont., rare. Dry waste places. **N**: Probably all subsp. **tectorum**. **Bromus tectorum** L. subsp. **lucidus** SALES, Fl. Veg. Mundi **9**: 32. 1991 (*Bromus sericeus* DROBOV 1925, *Bromus tectorum* L. var. *grandiflorus* HACKEL ex B. FEDTSCH. 1915 nomen nudum) - **Ic.**: Fl.Iraq 9: pl.53. **D**: Turkey - C. Asia, Afgh., Pakistan (Baluch., ?Gilgit), ?W Tibet, NW India. *Ir.-Tur.*, may be found in the area as well.

* **Bromus tomentosus** TRIN. 1818 (*Bromus persicus* BOISS. 1853) - **Ic.**: Fl.Iraq 9: pl.56. **A**: ?Chitral. **D**: Caucasus, Iran - C. & E Afgh., ? Pakistan.

Bromus confinis X B. stenostachyus ?

W **Gilgit:** Shinghai Gah - Pahot Gali 3460 m, *Miehe 1448!*. Baghrot Vy. 3130 m, *Miehe 4348!*. Rakaposhi W above Barti 3200-3500 m, *Miehe 6752!*. Upper Darchan Vy., above Khaltaro 3210 m, *Schickhoff 677!*. Above Phuparash 2870 m, *Schickhoff 745!*. **Hunza:** Minapin, above Hapakund 2970-3030 m, *Schickhoff 296!*; *341!*.

A: Astor: above Zaipur 3120 m, *Schickhoff 1064!*.

N: An arbitrary selection of specimens within of the distribution area of *B. confinis*. Lemmas with very short hairs, but not of the xeromorphic habit of *B. stenostachyus*;.perhaps only a glabrescent form of the former.

Bromus japonicus X B. pectinatus ?- The species have different levels of ploidy and are usually vicarious, but polymorphic and possibly hybridising in areas of contact.

Key to *Calamagrostis:*

1. Lemma not more than half as long as the glumes, hyaline, smooth. Callus hairs 2-3 times the length of the floret **2**

\+ Lemma at least two-thirds the length of the glumes, hyaline or firmly membranous, smooth or scaberulous. Callus hairs at most as long as the floret **4**

2. Awn subterminal, exceeding the tip of the lemma by 1.5-2.5 times the length of the floret ..... **(C. emodensis)**

\+ Awn subterminal or dorsal, exceeding the tip of the lemma by no more than the length of the floret .. **3**

3. Awn subterminal, arising from within 0.3 mm from the tip of the lemma ..... **C. pseudophragmites**

\+ Awn dorsal, arising from below the top third of the lemma, usually at about the middle, rarely below ..... **C. epigejos**

4. Panicle dense, ovoid to shortly lanceolate, 1.5-6 (-10) cm long, culms 10-40 cm high **5**

\+ Panicle usually lax, (8-) 10-25 cm long, culms 60-150 cm high **8**

5. Lemma blunt, ± sinuate (4 to many-tipped), awn distinctly geniculate in the free part. Panicle very congested, forming a compact ovoid head. Plant shortly rhizomatous, ± tufted **6**

\+ Lemma ± acute or 2-tipped, free part of the awn ± straight. Panicle usually not as compact. Plants usually with ± long creeping rhizomes **7**

6. Lemma c. $^{2}/_{3}$ the length of the glumes. Panicle shortly ovoid. Plants low, stout ..... **C. anthoxanthoides**

\+ Lemma c. $^{4}/_{5}$ the length of the glumes. Panicle shortly cylindric. Plants taller, ± lax..... **(C. laguroides)**

7. Glumes usually whitish hyaline. Lemma short, hyaline. Palea narrowly lanceolate, acute. Anthers short. Panicle usually dense, with relatively few spikelets. Surface of leaves usually with short soft hairs (SW Tibet, Himalaya) ..... **C. holciformis**

\+ Glumes dull grey-brown. Lemma longer, blackish at apex. Palea broadly lanceolate, 2-tipped. Anthers longer. Panicle dense to fairly lax, with many spikelets. Surface of leaves usually with short stiff spines (Tian Shan, Kunlun, N Karakorum, Pamir, Wakhan) ..... **C. tianschanica**

8. Awn arising from about the middle of the lemma or subterminal. Glumes usually deeply suffused with purple **9**

\+ Awn arising from near the base of the lemma. Glumes green, brown or ± tinged with purple **10**

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9. Lemma 4-toothed at the tip, the teeth shortly aristulate. Awn subterminal, arising from the base of the teeth ..... **C. stoliczkae**
\+ Lemma 2-toothed at the tip. Awn dorsal, arising from at about the middle of the lemma ..... **(C. pulchella)**
10. Callus hairs about as long as the floret or slightly shorter..... **C. decora**
\+ Callus hairs not more than half as long as the floret..... **(C. arundinacea)**

? 101. Calamagrostis alaica LITV., Not. Syst. (Leningrad) **2**: 122. 1921
? *Calamagrostis arundinacea* (L.) ROTH var. *purpurascens* auct. non (R. BR.) GELERT 1902: OSTENFELD 1922

N **?Mustagh Ata:** Little Karakul Lake 3720 m, 1894-07-16, *S.Hedin* (OSTENFELD 1922: *C. arundinacea* var. *purpurascens*). Tagarma Vy., 1909-07-25, *Divnogorskaya* s.n. (Pl.As.Centr.).
A: E Pamir: Gorno-Badakhshan, Bilyand-Kiik Vy. 3740 m, *Tzvelev 1238* (K!).
D: C. Tian Shan, Pamir-Alai. *E Pamir.*
N: The records have to be confirmed. A poorly understood taxon, perhaps of hybrid origin (*C. pseudophragmites* X *C. tianschanica ?*). *C. alexeenkoana* LITV. ex ROSHEV., and *C. turkestanica* HACKEL appear to be almost the same.

* **Calamagrostis alexeenkoana** LITV. ex ROSHEV. 1934 - Reported from C.Kunlun: Cherchen Vy., 6-7 km S Isachan 3400 m, *Li & al. 936*. E Pamir: Tagdumbash-Pamir, Kara-Chukur Vy., Tekezi-Kerik 4300 m, 1901-07-18, *Alexeenko* s.n. (**type**; Pl.As.Centr.).

102. Calamagrostis anthoxanthoides (MUNRO) REGEL, Acta Horti Petrop. 7: 639. 1880
Deyeuxia anthoxanthoides MUNRO in HENDERSON & HUME 1873, *Stilpnophleum anthoxanthoides* (MUNRO) NEVSKI 1937

Ic.: HENDERSON & HUME 1873: p. 340 / 341. Fl.Iran.70: pl.42.

CN **Braldu:** Pamir P. S, near Shuwart 4800-4820 m, *Miehe 6096!*.

N **Mustagh Ata:** Yam-Bulak-Bashi Gl. 4440 m, 1894-08-17, *S.Hedin* (OSTENFELD 1922). Mustagh Ata W 4330 m, *Miehe 5509!*. **Mintake:** S Taxkorgan, above Mazar 4220 m, *Miehe 5671!*; 4500 m, *Miehe 5785!*.

W **Khunjerab:** P. SW 4620-4800 m, *Miehe 2377* (K!); *2462!*; 4800 m, *Klötzli & al. 113.01!*.
A: Kongur: Bostan-Terek 2400 m, 1925, *Persson 47a* (PERSSON 1938); near Bostan-Terek, *Popov* s.n. (Pl.As.Centr.). Upper Oytag Vy. 3700-3800 m, *Miehe 9193!*. Mt. Kongur, 1982-07/08, *W.J.Budenberg & S.T.Meech* s.n. (K!). W Kunlun: Sanju Pass above Kitchik Yilak, 1870-08-09, *Henderson* s.n. (K! **type**). E Pamir: 3100-4770 m, common. Wakhan: Urghend Vy. 4200 m, *Roemer 241* (M!, W!). Darya-e Uch Jelga Vy., Kol-e Chaqmaqtin 4150-4350 m, *Anders 7484* (M!). Tergan Qurum Vy., S of Lake Bishutik 4500 m, *Grey-Wilson & Hewer 1521* (W!). Waldbai Vy. 4500 m, *Breckle 1354*; Sargaz - Sargaz P. [?2930-] 4550 m, *Anders 8017*; Qizil Qabtshal Vy. 4150-4350 m, *Anders 7458* (PODLECH & ANDERS 1977).
D: Tian Shan, E Pamir Alai, NE Hindukush, NW Karakorum, W Kunlun. *E Pamir.*
E: (4220-) 4330-4820 m, alp. - subniv., rare, but locally common in the NE. Relatively humid alpine turf, open cushion-communities of the free gelifluction belt. (Pamir:) sandy and rocky moraines and hillsides, up to the snow line, "wide variety of soils and habitats" (*C.Clarke*).
N: The type locality apparently is the easternmost station known. Usually a very distinct plant, though sometimes difficult to distinguish from *Calamagrostis laguroides* REGEL.

* **Calamagrostis arundinacea** (L.) ROTH 1788 (*Agrostis arundinacea* L. 1753, *Deyeuxia arundinacea* (L.) P. BEAUV. 1812, *Calamagrostis sylvatica* (SCHRADER) BESSER 1809, non HOST 1809) - **A**: Kashmir: 1847-08-13, *T.Thomson* s.n. (K!). Apparently rare. **D**: W Eurasia to E Turkey; Himalaya (Kashmir - Bhutan, ?Assam). **N**: The Himalayan localities of *C. arundinacea* are widely separated from those of W Eurasia (E Turkey). The callus hairs are relatively long in plants from Turkey and Kashmir (see *C. decora*).

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103. Calamagrostis decora HOOKER f., Fl. Brit. India 7: 260. 1896

Deyeuxia hackelii BOR 1954 non PARODI 1953, *Deyeuxia kashmeriana* HACKEL ex BOR 1955

W **Hunza:** Rakaposhi N, above Nilt 3670-3780 m, *Miehe 6488!* (cf.); *6523!*.

A: Astor: Mushkin forest 2740-3050 m, 1892-09-27, *Duthie 12660* (K! **type**). Above Doian 3350-3660 m, *Duthie 12454* (K! **type** *Deyeuxia kashmiriana*). Deosai: 3660-3960 m, *R.R.Stewart 22157* (K!). Shingo Vy. near Gulteri 3660 m, *R.R.Stewart 22244* (K!, RAW). Kashmir: Burzil Vy., near Minimarg 3050-3350 m, *Duthie 14071* (K!). Upper Kishenganga Vy., beyond Minimarg, Deosai P. 3660 m, *R.R.Stewart 22169* (K!). Above Pahlgam, Zur Nar 3350 m, *R.R.Stewart 21570* (K!).

D: Gilgit (Rakaposhi, Nanga Parbat), Baltistan, Kashmir. *Endem.*

E: 3670-3780, subalp. - alp., rare in the SW. Alpine turf, *Juniperus sibirica* dwarf scrub, otherwise apparently primarily a species of rather humid forests.

N: Close to *C. arundinacea* and perhaps also to *C. pulchella* (of hybrid origin ?).

* **Calamagrostis emodensis** GRISEB. 1868 - **Ic.**: Fl.Xizang.5: fig.107. **A**: Chitral: Mirga 2440 m, *Gatacre 17605* (K!). Hazara: Kankoli, 1899-07-27, *Inayat* s.n. (K!). Kashmir: Kishenganga Vy.; common in Liddar Vy. 2190-2740 m. Himachal Pr.: Tandi, *Aswal 10757* (ASWAL & MEHROTRA 1994). **D**: Himalaya (?Afgh., Chitral - Bhutan, SE Tibet). **N**: An unconfirmed and not very probable record from W Pamir (Fl.Tadzh.). Records from the Karakorum: *Calamagrostis emodensis* var. *breviseta* HACKEL ex PAULSEN 1903 - **Batura**: Chengerab Vy. 3000 m, common, *Visser-Hooft* (DOLK 1929), and others are almost certainly misidentifications.

104. Calamagrostis epigejos (L.) ROTH, Tent. Fl. German. 1: 34. 1788

Arundo epigejos L. 1753, *Calamagrostis macrolepis* LITV. 1921, *Calamagrostis gigantea* ROSHEV. 1932

Ic.: Fl.Xizang.5: fig.106. Fl.Desert.Sin.1: fig.34(1-4).

CN **?K2-North:** K2-N Vy., Gl. tongue 4100 m, *Dickoré 845!* (cf.).

CS **Biafo:** Biafo Gl. 3080-3100 m, *H.Hartmann 82* (K!); *86* (K!; HARTMANN 1984).

W **Gilgit:** Haramosh Range, Mani, right basin, *R.C.Culbert 116* (BM!). **Hunza:** Pisan 3000-3300 m, 1974-07-24, *F.Gartner* s.n. (GZU!).

S **Skardu:** 2330 m, 1876-08-01, *C.B.Clarke 29937* (K!). Indus Vy., near Katzura 2440-2740 m, *Duthie 12070* (K!).

E **Upper Karakash:** Karakash watershed, 1870, *Cayley* s.n. (K!).

Unloc.: Pamir & Tian Shan Journey 1906, *Appleton 916* (K!).

A: Astor: Das Kirim - Sarda Kothi, Burzil P. N 3350 m, *R.R.Stewart 22030* (K!). Deosai: Shingo Vy. near Gulteri 3350 m, *R.R.Stewart 22205* (K!). Dras: Chatpani Nullah W Dras 3350-3660 m, *Duthie* (K!). Suru: Sanmodangsa 4040 m, *H.Hartmann 2359!*. Hazara: Kaghan Vy. Kashmir: Minimarg, Upper Kishenganga Vy. 2740-3050 m, *R.R.Stewart 22117* (K!). Himachal Pr.: Spiti, Ki 3750 m, 1993-08-06, *Holzner & Kriechbaum* s.n.!.

D: Eurasia; var. *capensis* STAPF in E & S Africa. *Euras.*

E: 2330-4100, mont. - subalp., rare. River and moraine gravels, "a plant of dryish habitats of little account as fodder." (Fl.Pak.).

105. Calamagrostis holciformis JAUB. & SPACH, Ill. Pl. Orient. 4: 61, pl. 340. 1851

Deyeuxia compacta MUNRO ex HOOKER f. 1896, *Calamagrostis compacta* (MUNRO) HACKEL ex PAULSEN 1903, *Deyeuxia holciformis* (JAUB. & SPACH) BOR 1960, *Calamagrostis tianschanica* auct. non RUPR. 1869: PAMPANINI 1930

Ic.: Fl.Xizang.5: fig.118.

S **Leh:** S Rumtse, Taglang P. N 4500 m, *H.Hartmann 4110!; 4111!*. Kartse 4100 m, 1992-07-20, *Holzner & Kriechbaum* s.n.!.

E **Changchenmo:** 4450 m, [1925]-06, *Meinertzhagen* s.n. (BM!). **Upper Shyok:** [Murgai 4880 m], 1848-08-22, *T.Thomson* s.n. (K!).

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Unloc.: Tibet, 1896/1997, *Deasy & Pike* s.n. (K!). Valleys of Tibet 4570 m, *Strachey & Winterbottom 1* (BM!, K! **type** *Deyeuxia compacta*).

A: Zanskar: Chumik Marpo 4600-4800 m, 1992-08-04; 1993-07-25; 1993-07-26, *Holzner & Kriechbaum* s.n.!. Kenlung 4570 m, *N.L.Bor 15440* (K!). Lahul, Serechu 3960 m, *N.L.Bor 15103* (K!). Himachal Pr.: Ascent towards Parang P., 1847-09-07, *T.Thomson* s.n. (K!). Khoksar, *Aswal 10129* (ASWAL & MEHROTRA 1994). Rupshu: "Rukshu", [?]Chimhana Lake, *Lance 307* (K!). Nuruchan 4600 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. Starsa Puk Tso 4550 m, 1992-07-25, *Holzner & Kriechbaum* s.n.!. Descent from Parang P. 1847-09-08, *T.Thomson* s.n. (K!). W Tibet: Laptel to Seychell and Hoti (S of the Satlej), 1855-07-16/19, *Schlagintweit 7074* (GOET! ["*Avena subspicata* (var.) *pallida*" det. GRISEBACH]). In humidis altissimis Emodae Thibeta [NW Tibet, Bekar] 1831-08, *Jacquemont 1828* (K! **type**). Manasarovar Lakes, E Mapam Yumco, SE Hor (N 30°41' E 81°46') 4850 m, *Miehe+9594!*.

D: E Ladakh, NW & C. Himalaya (Zanskar - Nepal: Dhaulagiri region), SW Tibet. *S Tibet.*

E: 4100-4880 m, alp. - subniv., rare in the S & E. *Caragana* scrub, steppes, deserts, permafrost gravels, lake-shores.

N: The record from "Nubra" (HOOKER 1896) probably refers to the **Upper Shyok** locality. (Probably) in error reported from E Pamir: Tagdumbash Pamir, Pistan 4600 m, 1901-07-15, *Alexeenko* s.n. (Pl.As.Centr. "*C. compacta*" [? = *C. anthoxanthoides*]), Wakhan (PODLECH & ANDERS 1977 [*C. tianschanica*]) and N Karakorum (DICKORÉ 1991 [*C. tianschanica*]). Closely allied to and perhaps conspecific with *C. tianschanica*, which differs in the slightly smaller, usually not whitish florets, which usually are arranged in a higher number in a larger and more effuse panicle. The glumes of *C. holciformis* are either distinctly yellowish-white, variegated or dull brown, and also forms with rather effuse panicles occur. The rather long hairs on the leaf surface of *C. holciformis* (short stiff spines in *C. tianschanica*) are fairly distinctive. Reduced specimens of *C. holciformis* sometimes imitate *Trisetum spicatum* and are easily confused with this. *Calamagrostis przewalskyi* TZVELEV; 1968 from C. (E, SE) Tibet differs in the very dense globose heads and the long spines on glumes, pedicels and panicle branches.

* **Calamagrostis laguroides** REGEL 1881 (*Calamagrostis anthoxanthoides* (MUNRO) REGEL subsp. *laguroides* (REGEL) TZVELEV 1967, *Stilpnophleum laguroides* (REGEL) NEVSKI 1936) - **A**: W Pamir: common. E Pamir: Gorno-Badakhshan, W Pshart Vy. 3660 m, *Tzvelev 422* "*C. compacta*" (K!). **D**: Pamir-Alai. **N**: Similar to *C. anthoxanthoides* and replacing this in the W Pamir at relatively lower altitudes.

106. Calamagrostis pseudophragmites (HALLER f.) KOELER, Descr. Gram. 106. 1802

Arundo pseudophragmites HALLER f. 1797, *Calamagrostis littorea* (SCHRADER) DC. 1806, *Calamagrostis laxa* HOST 1809, *Calamagrostis glauca* (M. BIEB.) RCHB. 1830, *Calamagrostis nepalensis* NEES ex STEUDEL 1854 (non *Deyeuxia nepalensis* BOR 1958), ? *Calamagrostis dubia* BUNGE 1855, *Calamagrostis hedinii* PILGER in HEDIN 1922, ? *Calamagrostis garhwalensis* C. E. HUBBARD & BOR 1942

Ic.: Fl.Iraq 9: pl.108. Fl.Xizang.5: fig.108 (*C. hedinii*). Fl.Desert.Sin.1: fig.34(5-8).

CN **K2-North:** Muztagh Vy. 3930 m, *Dickoré 872!*. **Shaksgam:** Upper Shaksgam Vy. 3980 m, *Dickoré 908!*.

CS **Biafo:** Ashkoley [Askole] 3050 m, 1876-08-10, *C.B.Clarke 30394* (K!). Braldo Rv. 3060-3450 m; Drinsang 3780 m; Laskam 4220 m; Mango 3700 m; 3920 m; Baintha 4060 m; 4200 m (HARTMANN 1966). Biafo Gl., terminal moraine 3080 m, *H.Hartmann 85* (Z!); 3100 m, *H.Hartmann 84!; 87* (Z!). **Baltoro:** Paiju 3450-3460 m (HARTMANN 1966). **Saltoro:** Hushe to Brumi Rama (on the way from Hushe up to the Sospor Gl. 1856-07-16, *Schlagintweit 5989* (M!). **Nubra:** [Lowermost] Nubra Vy., 1848-07-27, *T.Thomson* s.n. (K!).

N **Yarkand:** Kunlun S slope 15 km E Mazar 3900 m, *Dickoré 308!*. Ilyk - Mazar 3520-3800 m, *Dickoré 267!; 361!; 405!*. Surukwat Vy. 3580-3700 m, *Dickoré 938!*.

W **Yasin:** Rawshan, *Kazmi 5659* (M!). 1 mile from Yasin towards Taus, *Kazmi 6137* (M!); *6140* (M!); *6145* (M!). Sultanabad 2500 m, *G.Stöber 103!, 104!*. Naz Bar 3350-3700 m, *Miehe 3309!; 3377!; 3603!*. **Ishkoman:** Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Gilgit 1520 m,

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R.R.Stewart 26641 (K!); *26643* (K!); 1450 m, *O.Polunin 6028* (BM!). Jutial Nullah 2130 m, *R.R.Stewart 26639* (K!). E of Rest House, near old house of Amir, *Kazmi 5972* (M!). Shinghai Gah - Pahot Gali 3200 m, *Miehe 1549!*. Baghrot Vy. 3050 m, *Miehe 4409!*; above Sat 3010 m, *Schickhoff 488!*. Nomal 1680 m, *R.R.Stewart 26642* (K!). Naltar Vy. 1830-3660 m, *Duthie 12340* (K!); *12342* (K!); *12412* (K!); *12636* (K!); *12649* (K!). Gilgit - Chalt 1800 m, *Klötzli & al. 724.03!*. Above Phuparash 2860 m, *Schickhoff 803!*. Upper Haramosh Vy., above Iskere 2970 m, *Schickhoff 848!*. **Hunza:** Minapin - Chalt 1830 m, *R.R.Stewart 26638* (K!). Maiyun 2130 m, *R.R.Stewart 26644* (K, RAW). Chalt 2000 m, *F.Lobbichler 608* (M!); *620* (M!). Daintar, (3200-3900 m), *F.Lobbichler 127* (M!). Baltar 3500-3800 m, *Paffen 157* (M!). Chaprot 2380 m, *Klötzli & al. 77.17!*. Chaprot Vy. 3130 m, *Schickhoff 2125!*. Upper Rashumaling Vy. 2700 m, *Schickhoff 165!*. Pisan 2230-2600 m, *F.Gartner* s.n. (GZU!). **Hispar:** Nagar Village area 2300 m, *O.Polunin 6441A* (B!, BM!). Hispar Village area 3230 m, *O.Polunin 6357* (BM!). Hispar Vy. 2740-3050 m, *R.Scott Russell 1174* (BM!). Hispar Gl., left bank, Chokutens 3350 m, *R.Scott Russell 1198* (BM!, *C. pseudophragmites* X *C. stoliczkae* ?). Hispar Gl., left bank, Turmun Makerum 3350-3510 m, *R.Scott Russell 1218* (BM!). **Batura:** Khaibar 2500-3600 m, *Klötzli & al. 32.01!; 801.24, 66!; 803.14!*. W Khaibar 3020 m, *Klötzli & al. 27.43!*. E Morkhoon 2800 m, *Klötzli & al. 806.01!*.

S **Shigar:** Skardu - Shigar 2440 m, *R.R.Stewart 20482* (KUH, RAW). Kero Lungma Gl. 3050-3350 m, *R.Scott Russell 1332* (BM!). **Shigar/Lower Shyok:** Thalle P. 2740 m, *R.R.Stewart 20625* (RAW). **Skardu:** Skardu, 1847-11, *T.Thomson* s.n. (K!). Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 861* (BM!, K!). Skardu, *R.R.Stewart 20444* (RAW). **Leh:** Khalsi, *Bimal Misri 329* (K!). Leh, *Hajra Thakur 330* (K!). Ladakh, common (STEWART 1916). Indus Vy., W of Leh, 1848-09-16, *T.Thomson* s.n. (K). S Leh, Choglamsar 3300 m, *H.Hartmann 4093!*. Indus Vy. [Upper, below Hanle - Pugha], 1847-09-19, *T.Thomson* s.n. (K!: subsp. *tartarica*). **Lower Shyok:** Khapalu, on the left side of the Shayuk, 1856-07-12, *Schlagintweit 5699* (BM!).

Unloc.: Very abundant in Yarkand 2440-4570 m (HENDERSON & HUME 1873).

A: W Kunlun: Kudi 3000 m, *Dickoré 197!*. E Pamir: Gorno-Badakhshan, Bilyand Kiik Rv. 3730 m, 1958-08-04, *Tzvelev 116* (K! "*C.turkestanica*"). Wakhan 2850-4250 m; 2700-2750 m (subsp. *tartarica*); 2800-3600 m (*C. dubia*) (PODLECH & ANDERS 1977). Chitral: Beorai Gol S Drosh 1830 m, *Stainton 3270* (BM!). Bang Gol N Mastuj 2740 m, *Stainton 3067* (BM!). Mastuj - Baroghil Track 3050 m, *Stainton 2956* (BM!). Golen Gol 1680 m, *S.Bowes Lyon 5* (BM!). Shishi, Madaklasht 2590 m, *S.Bowes Lyon 147* (BM!). Shokor Shal 3300 m, *Wendelbo* s.n. (BM!, *C. pseudphragmites* X *C. stoliczkae* ?). Lateral moraine of lower Tirich Gl., *W.J.Budenberg 11* (K!). Chilas: Darel Vy. 2700 m, *Schickhoff 2199!*. Astor: common 1680-3350 m; Rupal Nullah 2740 m, *R.R.Stewart 22824* (K); *R.R. & I.D.Stewart 18890* (KUH, RAW); Mushkin forest 2580 m, *Schickhoff 1120!*. Lower Astor Vy., below Doyan 1680 m, *Nüsser 722!*. Dras: Dras, 1848-04, *T.Thomson* s.n. (K!). Dras - Matai [Matayan], 1856-10-12/13, *Schlagintweit 6456* (M! [a striking form with utriculiform glumes, GRISEBACH remarked: "status morphologicus, man moechte versucht seyn, sie für einen *Carex* zu halten"]); *Schlagintweit 6456* (BM!, typical). Matai up to the Tsoji P. (NE slopes of the P.), 1856-10-14, *Schlagintweit* s.n. (BM!). Suru: Wakha Vy., SE Mulbekh 3600 m, *H.Hartmann 2545!*. Below Mulbekh 3170 m, *H.Hartmann 2546!*. Zanskar: Abring 3510 m, *Koelz 2975* (K!). Padam 3660 m, *Southampton Univ. 35* (BM!). Ramtasha 3200 m, *Southampton Univ. 102* (BM!). Swat. Hazara. Kashmir: Rembiana Vy. 2130 m, 1875-08-03, *H.C.Levinge* s.n. (BM!). Baltal, *A.P.Young* s.n. (BM!). Himachal Pr.: Lahul, Siser 3050 m, *Koelz 814* (BM!). Keylong, *Bor 15480* (DD; ASWAL & MEHROTRA 1994: *C. garhwalensis*). Sissu, *Aswal 6779* (ASWAL & MEHROTRA 1994). Tandi, *Aswal 6847* (ASWAL & MEHROTRA 1994). W Tibet: S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9660b!*.

D: Temp. Eurasia. *Euras.*

E: 1800-3700 m, coll. - subalp., common. Dry gravels of river-terraces, sandy riversides (*Myricaria bracteata*, *Salix* scrub), scree fans, open scrub and forest (*Juniperus sibirica, J. excelsa, Picea smithiana, Pinus wallichiana*), *Artemisia* scrub-steppe.

N: Plants from the W and S may represent subsp. **pseudophragmites**, whereas most of the plants from the N and C. Karakorum may be placed under subsp. **tartarica** (HOOKER f.) TZVELEV (*Calamagrostis hedinii* PILGER in HEDIN 1922, *Calamagrostis littorea* (SCHRADER) P. BEAUV. var. *tartarica* HOOKER f. 1896, *Calamagrostis turkestanica* auct. non HACKEL), a usually smaller plant (Karakorum, Kashmir, W Himalaya to S Tibet). There are apparently no clear characters to

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distinguish these taxa, and similarly reduced plants occur throughout the area of *C. pseudophragmites*. *C. dubia*, at least from the majority of Afghan specimens, belongs to (the typical subsp. of) *C. pseudophragmites*. The species is often misidentified as *C. emodensis*, and there remain some problems as to its proper morphological delimitation against *C. epigejos* and *C. stoliczkae*.

* **Calamagrostis pulchella** GRISEB. 1868 - **Ic.:** Fl.Xizang.5: fig.111. **A**: Zanskar: Pensi P. 4390 m, *Koelz 2928* (K!); 4330 m, *H.Hartmann 2547* (K!). Kargiakh 4150-4250 m, 1992-08-06; 1992-08-07, *Holzner & Kriechbaum* s.n.!. Kargiakh - Gombo 4200 m, 1992-08-08, *Holzner & Kriechbaum* s.n.!. Kashmir. Himachal Pr.: Lahul, via Kukti P. 4270 m, *Koelz 1214* (BM!). Marrhi 3630 m, 1992-08-16, *Holzner & Kriechbaum* s.n.!. Jispa, *Aswal 10647* (ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 3800 m, *Miehe+9601a!;* 4400 m, *Miehe+9616b!*. **D**: Himalaya (Kashmir, Zanskar - Nepal). **N**: This apparenty was confused with *C. scabrescens*. The plants named cf. **Calamagrostis stoliczkae X C. arundinacea** (HARTMANN 1984: fig.9; pl.7) represent young, but fairly typical specimens of *C. pulchella*, which was previously collected in nearly the same locality by *Koelz*.

* **Calamagrostis scabrescens** GRISEB. 1868 (*Deyeuxia scabrescens* (GRISEB.) MUNRO ex DUTHIE in ATKINSON 1882) - **A**: Swat: Beyond Bishigram 3050-3350 m, *R.R.Stewart & A.Rahman 25010* (BM!, K!). Hazara: Kagan, 1899-07-26, *Inayat* s.n. (K!); Bhurji 3350 m, 1899-07-15, *Inayat* s.n. (K!). Kashmir: Sonamarg 2740 m, *R.R.Stewart 9815* (K!). Liddar Vy., Sonsal Nullah 3960-4270 m, *Duthie 13349* (K!). Pahlgam 3050-3350 m, *R.R.Stewart 21808a* (K!); Mts. opposite Pahlgam 3050-3350 m, *R.R.Stewart 21790* (K!). Himachal Pr.: Patseo, *Bor 15154* (DD; ASWAL & MEHROTRA 1994). **D**: Himalaya: Swat - Sikkim, ?SE Tibet. **N**: Excl. syn. *Calamagrostis filiformis* GRISEB. 1868 (*Deyeuxia filiformis* (GRISEB.) HOOKER f. 1896) which is another distinct species of the C.Himalaya. *C. scabrescens* is apparently confined to more humid situations than *C. pulchella*. Both species are frequently confused and they perhaps intergrade. A record of *C. scabrescens* from Leh: *Meebold* (STEWART 1916) may belong to *C. stoliczkae*.

107. Calamagrostis stoliczkae HOOKER f., Fl. Brit. India 7: 262. 1896 ("*C. stolizkai*")

Calamagrostis pseudophragmites (HALLER f.) KOELER var. *tartarica* auct. non HOOKER f. 1896: WEBSTER & NASIR 1965

CS **Biafo:** Biafo Gl. 4110 m, *R.Scott Russell 1796* (BM!). **Saltoro:** Ghondokhoro Gl. basin 3350 m, *Nasir & Webster 6262* (K!, M!, RAW; WEBSTER & NASIR 1965). Above Hushe 3500 m, *Miehe 2032* (K!). **Nubra:** [Changlung 4270-4660 m] , 1848-08-10, *T.Thomson* s.n. (K!).

W **Ghizar:** Ano Gol 3050 m, *F.Schmid 2381* (K!). **Yasin:** Naz Bar 3610-4300 m, *Miehe 3188* (K!)*; 3443* (K!)*; 3567!*. **Ishkoman:** Mahthantir Gah (3240-4000 m), *F.Schmid 2210* (K!). Imit 3000-3250 m, 1974-08-09, *F.Gartner* s.n. (GZU!). **Gilgit:** Above Jaglot Rv. 3210 m, *Schickhoff 625!*. **Hunza:** Minapin Gl., N facing moraine 3510 m, *Lloyd & Megan 111* (BM!). Daintar, (3200-3900 m), *F.Lobbichler 138* (M!, "*C. emodensis*"). Kutto Darakush, *F.Lobbichler 349* (M!). **Hispar:** Summer grazing 4 miles NW of Hispar Village 4210 m, *O.Polunin 6319* (B!, BM!). Hispar Gl., left bank. Chokutens 3350 m, *R.Scott Russell 1190* (BM!). Hispar Gl., right bank E of Sekambarisi Gl. (3960-4570 m), *R.Scott Russell 1529* (BM!). Barpu Gl., left bank 3810 m, *R.Scott Russell 1122* (BM!). **Batura:** W Khaibar (2500-3000 m), *Klötzli & al. 801.33!*. **Khunjerab:** Dhee Sar Vy., 4150-4420 m. *P.Ebenhöh* s.n. (M!).

S **Shigar:** Sokha Gl. 3960 m, *R.Scott Russell 1668* (BM!). **Skardu:** Indus Vy., P. above Barsho. *J.E.Winterbottom 825* (K!).

A: Chilas: Raikot Gl. W, N Ganalo-Raikot confluence 3900 m, *Nüsser 284!*; Raikot Gl., left lateral moraine 3880 m, *Nüsser 430!; 431!*. Raikot Gl., left lateral moraine, nunatak 3880 m, *Nüsser 430!; 431!*. Astor: Upper Rupal Vy., Rupal Gl. ablation Vy. 3950 m, *Nüsser 1556!*. Suru: 16 km W Zuildo. 2 km N of Suru Rv. 3830 m, *Southampton Univ. 160* (K!). Zanskar: On the Pensi La in Zanskar 3660-4570 m, *Stoliczka* s.n. (K! **type**).

D: Gilgit, Indus Vy., Karakorum, Ladak, Zanskar, ?Kashmir. *Endem.*

E: (2500) 3000-4000 (4300) m, subalp.-alp., locally common. Meadow steppes, *Juniperus turkestanica* scrub, open stony slopes, moraines. "Among boulders near tongue of glacier, an important pioneer plant" (*Nasir & Webster 6262*).

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N: "A very distinctive plant" (Fl.Pak.), but sometimes difficult to distinguish from *C. pseudophragmites* and *C. epigejos*. Usually at higher altitudes than these. The position of the awn and the glumes which usually are rather densely covered with spines suggest a hybrid origin, perhaps *C. pseudophragmites* X *C. pulchella*. Similar plants, which are difficult to distinguish from the *C. pseudophragmites* - *C. epigejos* complex occur at higher altitudes of Nuristan.

108. Calamagrostis tianschanica RUPR. in OSTEN-SACKEN & RUPR., Sertum Tiansch. 34. 1869

Deyeuxia tianschanica (RUPR.) BOR 1949, *Calamagrostis pamirica* LITV. 1921, *Calamagrostis schugnanica* LITV. 1921, ? *Calamagrostis grandiflora* HACKEL ex FEDTSCH. 1924, ? *Deyeuxia holciformis* auct. non (JAUB. & SPACH) BOR: PODLECH 1976, *Calamagrostis holciformis* auct. non JAUB. & SPACH 1851: PODLECH & ANDERS 1977 p.p., DICKORÉ 1991

CN **Braldu:** Pamir P. S, near Shuwart 4650-4750 m, *Miehe 6085!*. **K2-North:** Muztagh Vy., Sughet Jangal 3930-3950 m, *Dickoré 865!*. K2-N Gl. E 4840-4900 m, *Dickoré 804!*. **Shaksgam:** Aghil P. S 4430-4790 m, *Dickoré 604!*. Upper Shaksgam Vy. 4060 m, *Dickoré 912!*.

N **Yarkand:** Raskem, 1898, *Novitzky* (Pl.As.Centr.). N Mazar 3900 m (*Dickoré*). Aghil P. N 4560-4780 m, *Dickoré 523!*. **Karakash:** 15 km E Kirgiz-Dzhangil, road to Karakash Rv. 4500 m, 1959-06-02, *Junatov*; *Li & al.* (Pl.As.Centr.).

Unloc.: Pamir region 3960-4270 m, *Alcock 17785* (K!). Pamir & Tian Shan Journey 1906, *Appleton 862* (K!); *864* (K!).

A: W Kunlun: Upper Tiznaf Vy. 27 km from Saryk P. 3850 m, 1959-06-01, *Junatov* (Pl.As.Centr.). W Kudi 4140 m, *Miehe 8459!*. Upper Kilian Vy. 3500 m, 1928-07-15, *de Terra* s.n. (Z!; SCHMID 1932: "*Deschampsia koelerioides*"). C.Kunlun: Mudzhik-Atas Mts. 4300 m, 1890-08-16; Przhevalsky Mts. 4500-5000 m, 1890-09-22, *Roborovsky* (Pl.As.Centr.). E Pamir: Sassyk-Kul Lake, 1901-07-17, *Fedtschenko* s.n. (K!). Gorno-Badakhshan, W Pshart Vy. 3300 m, *Tzvelev 328* (K!); W Pshart 3300 m, *Tzvelev 273* (K! "*C. schugnanica*"). In valle Murgab prope ostium fl. Pschart Zapadnyi 3350 m, *Lukanenkova*, Gerb.Fl.SSSR *4769* (K!, M!). Takhta-Korum Vy. 3800 m, *Tzvelev 895* "*C. pamirica*" (K!). Wakhan: Upper Baroghil Vy. (3300-3800 m), *Anders 7895* (M!). Langar 3650 m, *Anders 7745* (M!). Darya-e Birgula Jelga Chelab Vy., NW Kol-e Chaqmaqtin 4000-4100 m, *Anders 7541* (M!); (PODLECH & ANDERS 1977); 3300-3800 m (PODLECH & ANDERS 1977: "*C. holciformis*").

D: Tian Shan, Pamir, N Karakorum. *E Pamir*.

E: 3900-4900, (subalp.) - alp., not common in N and C. Karakorum. Dry alpine turf, steppes, and open gravel slopes, mainly colonizing slightly inclined fine gravel (with *Stipa concinna, Carex borii, Potentilla pamirica*); subalpine river-sands and drier margins of fens (*Blysmus compressus, Hordeum brevisubulatum*). On the K2 N slope, there seems to be a wide altitudinal gap between the subalpine and alpine belt, without suitable habitats for the species.

N: More widely distributed in the N; additional records: W Tian Shan, Tschetyrkul, in regione alpina, 1867-07-26, *F.Osten-Sacken* s.n. (LE **type** foto!). Talaskyi Alatau, 1952-07-17, *Tzvelev* s.n. (K!). Usually relatively larger plants with brown glumes, but in the extreme very similar to and perhaps conspecific with *C. holciformis* (see there). According to Fl.Tadzh., *C. pamirica* is synonym of *C. tianschanica*. The only specimen seen differs in the subglabrous panicle branches, but otherwise is identical.

* **Calamagrostis turkestanica** HACKEL 1906 - **A**: Kongur: Sulu-Sakal, 25 km E of Irkeshtam, 1935-07-26, *Olsufev* (Pl.As.Centr.). Alai: In declivi septentrionali jugi Tersagar, montius Trans-Alai, 1878-09-21, *Nevski* (LE **type** foto!). Turkestania, ... [?], 1895-07-23, *S.Korschinky* (K!). **D**: Tian Shan, Pamir-Alai. **N**: Awn subterminal, perhaps *C. pseudophragmites* X *C. tianschanica* ? (see *C. alaica*).

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109. Catabrosa aquatica (L.) P. BEAUV., Ess. Agrost. 97, 157. 1812

Catabrosa aquatica (L.) P. BEAUV. var. *angusta* STAPF in HOOKER f. 1896, *Catabrosa sikkimensis* STAPF in HOOKER f. 1896

Ic.: Fl.Iraq 9: pl. 18. Fl.Xizang.5: fig.70(1-2 "*C. angusta*"; ?3-4 "*C. wallichii*" [non *Colpodium wallichii*]).

S **Leh:** Leh3200 m, *Koelz 2602* (K!, RAW); 3400 m (MEEBOLD 1909). Yangthang, *Holzner & Kriechbaum* s.n.!.

A: E Pamir. Badakhshan. Kurram. Chitral: Khot An N Mastuj 3350 m, *Stainton 2856* (BM!). Rupshu: Ascent to Lanak P. 1847-09-13, *T.Thomson* s.n. (K! **type** *Catabrosa aquatica* var. *angusta*). Tso Kar 4270 m, *Koelz 6581* (K!).

D: Circumarctic: Europe, Medit. - Afgh., Pakistan (Baluch., Kurram, Chitral), Ladakh - E Himalaya (scattered), S & E Tibet, Qinghai; N America. *Holarct.*

E: Wet habitats: "Hanging down from wet rock-wall" (*Koelz 6581*).

* **Chloris virgata** SW. 1797 (? *Chloris barbata* auct. non SW. 1797: HENDERSON & HUME 1873) - **Ic.:** Fl.Xizang.5: fig.39. **A**: W Kashg.: Yarkand City (HENDERSON & HUME 1873). S Kashg.: Chira Oasis, near Hotan 1400 m, 1885-08-02, *Przewalsky* (Pl.As.Centr.). **D**: Caucasus, Middle Asia - C., E & SE Asia, Africa, Australia, N & S America.

110. Chrysopogon gryllus (L.) TRIN. Fund. Agrost. 188. 1820

Andropogon gryllus L. 1756

Ic.: Fl.Iran.70: pl.71.

subsp. **echinulatus** (NEES) T. A. COPE, Kew Bull. 35: 701. 1980

Rhaphis echinulata NEES in ROYLE 1840, *Andropogon royleanus* STEUDEL 1854

S **Shigar:** 2440 m, *R.R.Stewart 20515* (RAW); *A.Ghafoor & Z.L.Butt 644* (KUH). **Skardu:** Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 717* (GOET!). Skardu - Gol 2440 m, *Nasir & Webster 5869* (RAW). Indus Vy. near Katzura 2440-2740 m, *Duthie 12103* (K!).

A: Astor: Gurikot 2380 m, *Giles 56* (K!). Swat. Hazara. Kashmir: Baltal, 1848-09-28, *T.Thomson* s.n. (K!). Tangmarg, near Gulmarg 2290 m, *R.R.Stewart 10656* (K!). Nil Nag, Pir Punjal Range 1830-2130 m, *R.R.Stewart 23081* (K!). Himachal Pr.: *Bhattacharyya 45299*; frequent (DD; ASWAL & MEHROTRA 1994).

D: NE Afgh., Pakistan (NWFP, Punjab), Kashmir, NW India - C. Nepal. *W Himal.* (subsp. *echinulatus*). Species: *Ir.-Tur.*

E: 2100-2440, mont., rare in the S (Indus Vy.). Scrub-steppes and semi-deserts.

N: "Subsp. *gryllus* has a remarkably disjunct distribution: SE Eur., Medit. - N Iraq, Caucasus, and separated by a gap of 3000 miles, Simla region, Nepal - Assam. Along the Himalaya there is a gradual west to east transition from pure *echinulatus* to *gryllus*" (Fl.Pak.); COPE (1980).

* **Chrysopogon serrulatus** TRIN. 1832 - **A**: Swat. Hazara. Kashmir, < 1220 m. **D**: Trop. Africa, Madagascar; Afgh. - Burma.

Colpodium:

The narrow generic concept, employed by TZVELEV 1966 and consequently followed by ALEXEEV 1981 and COPE 1982, which places the W Himalayan species in three different genera (*Catabrosella, Paracolpodium, Hyalopoa*), cannot be followed here. The species are certainly closely interrelated and perhaps intergrade. *C. himalaicum*, however, may be closely related to *Puccinellia minuta* as well. *Colpodium afghanicum* BOR 1970, is a young but typical specimen of *Festuca olgae* (see there).

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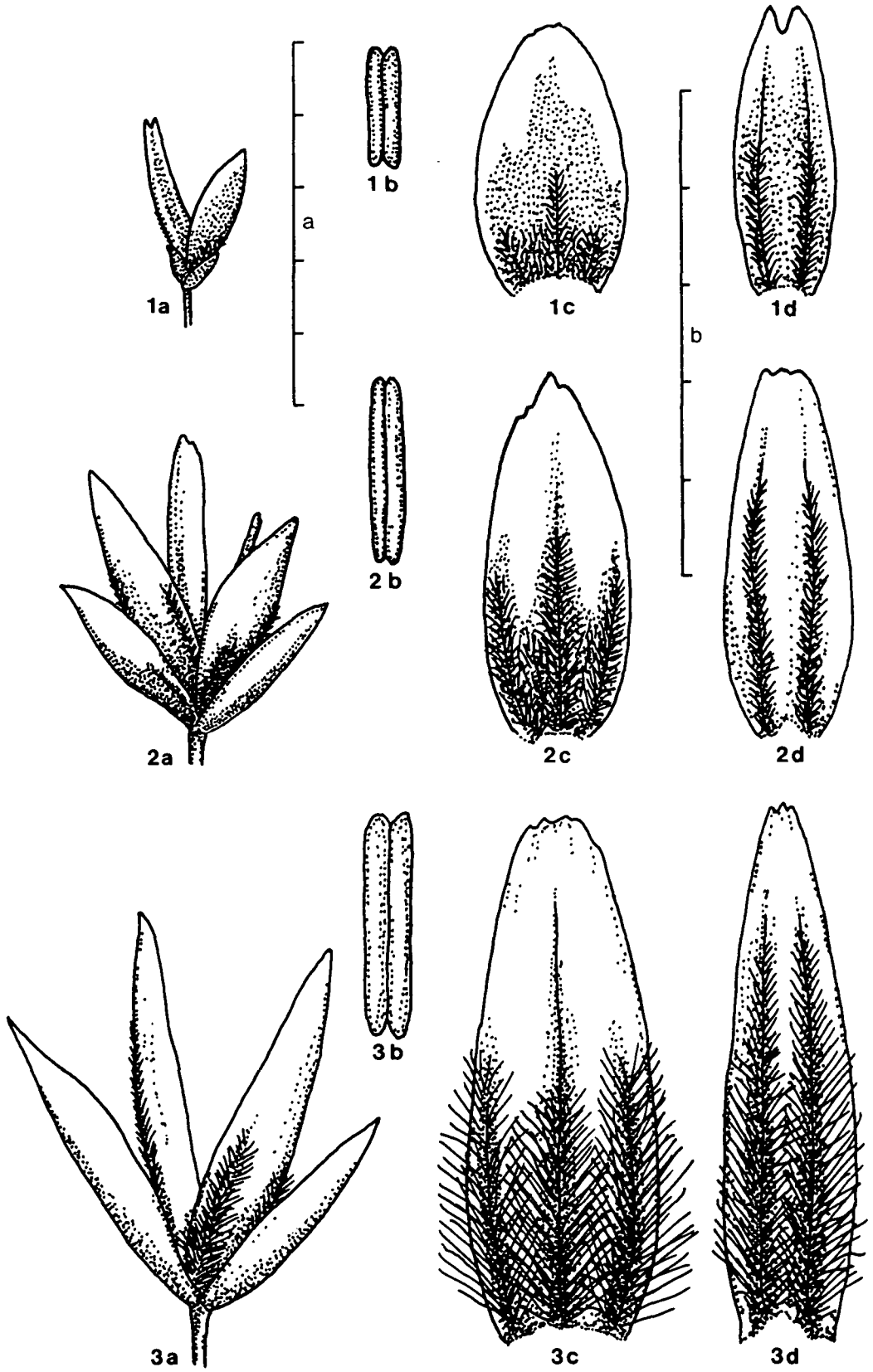

Fig. 6: ***Colpodium***.
Spikelet (a), anther (b), lemma (c), palea (d). Scale a (a,b) = 5 mm, Scale b (c,d) = 5 mm.
1: C. himalaicum (Garhwal, *Schlagintweit 9172*, GOET). **2: C. baltistanicum** sp. nov. (Deosai, *Miehe 5105*). **3: C. leucolepis** (*Klötzli & al. 113.04*).

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Fig. 7: ***Colpodium***.
Habit, inflorescence (a).
1: C. baltistanicum sp. nov. (*H.Hartmann 218*, part of **holotype**, K). **2: C. leucolepis** (*O.Polunin 6120*, K). **3: C. himalaicum** (Kumaon, *Strachey & Winterbottom 2*, **lectotype**, K).

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Key to *Colpodium* and related taxa:

1. Plant with long creeping stolons and succulent stems, ± aquatic. Spikelets usually 2-flowered ..... *Catabrosa aquatica*
+ Plant densely tufted, without stolons, with or without short rhizomes, stems thin, usually in drier habitats. Spikelets 1-10 -flowered **2**
2. Midnerve of the lemma reaching right up to the obtuse or acute tip of the lemma. Lemma glabrous or with short diffuse hairs at the base. Spikelets (2-) 3-10-flowered ..... *Puccinellia*
+ Midnerve of the lemma not reaching the obtuse tip of the lemma. Lemma usually hairy at the base, with long hairs in distinct lines along the nerves. Spikelets 1-4-flowered **3**
3. Spikelets 7-10 mm long, 3-4-flowered; lemma 3.5-4.7 mm long. Panicle effuse, branches long and slender, ± flexuous. Plant rhizomatous ..... **(C. nutans)**
+ Spikelets 3-4.2 mm long, 1-2-flowered; lemma 2.5-4.2 mm long. Panicle ± contracted, with short rigid branches, often spike-like or with a few spreading branches. Rhizomatous or not **4**
4. Lower glume about 2/3, upper glume about 4/5 as long as the lemma. Lemma 5-6 mm long, with hairs 0.7-1 mm on the nerves below, whitish hyaline tinged with purple in upper part. Palea 5.5-6.5 mm. Spikelets 1-flowered. Anthers 2.5-3.5 mm long. Panicle ± contracted, 4-7 X 0.6-1.2 cm, often interrupted or with some longer, spreading branches. Plant robust, laxly tufted, shortly rhizomatous ..... **C. leucolepis**
+ Glumes 1/5 - 2/3 as long as the (lowest) lemma. Lemma 2.5-4.5 mm, with hairs 0.2-0.5 mm on the nerves below, dull greenish or golden-yellow hyaline ± tinged with purple in upper part above. Palea 3-4.5 mm. Spikelets 1-2 flowered. Anthers 1.5-3 mm long. Panicle usually highly contracted, narrowly or broader spike-like. Plants slender, densely tufted..... **5**
5. Spikelets usually 1-flowered. Glumes 1/5-1/3 the length of the lemma. Lemma greenish, hairy only well below of the middle. Anthers 1.5-2 mm long. Panicle narrowly spike-like, 2-4 X 0.2-0,5 cm ..... **C. himalaicum**
+. Spikelets 2-flowered, with the lower floret usually sterile. Glumes 1/2-2/3 the length of the (lower) lemma. Panicle broadly cylindric. Glumes, lemma and palea golden-yellow hyaline in upper parts. Lemma hairy on the nerves up to about the middle. Anthers 2-3 mm long. Panicle cylindric, 1.5-4 X 0.5-0.8 cm ..... **C. baltistanicum**

111. **Colpodium baltistanicum** DICKORÉ sp. nov.

Colpodium himalaicum auct. non (HOOKER f.) BOR 1960: WEBSTER & NASIR 1965, HARTMANN 1966, *Paracolpodium leucolepis* auct. non (NEVSKI) TZVELEV 1968: COPE 1980, ALEXEEV 1981 p.p.

Ic.: Fig. 6 (2), fig. 7 (1).

Species inter *C. leucolepidem* et *C. himalaicum* quasi intermedia.

Gramen perenne valde caespitosum sine rhizomatibus. Culmi fasciculati (5-) 7-15 (-20) cm alti, laeves, basi vaginis emortuis vestiti. Foliorum laminae lineares, plicatae, laeves glabraeque. Panicula densa, cylindrica, 1,5-4 X 0,5-0,8 cm, longe exserta, aurea. Spiculae 2-florae. Glumae subaequales, 2-3 mm longae. Lemma 3,5-4,5 mm longum elliptico-subacutum, praecipue ad nervos ciliatum ad mediam partem lemmatis. Paleae carinae ciliatae ad 3/4 longitudinem. Antherae 2-3 mm longae.

Habitat in graminosis cyperetis alpinis subhumidis (*Carex borii, Kobresia karakorumensis*) ad 3960 m usque ad 5030 m supra mare.

Typus: Karakorum, Biafo Gl., Baintha, NW-exponierte Felsrasen, 4500 m, 1962-07-23, *H.Hartmann 218* (**holotype** K!, **isotype** Z!).

CS **Biafo:** Baintha 4500 m, *H.Hartmann 218* (K!; Z!); 220 (Z!); 4610 m, *H.Hartmann 219!*; Biafo Gl. 4580-4960 m (HARTMANN 1966). **Saltoro:** "Green Island", Ghondokoro Gl. basin 5030 m, *Nasir & Webster 6223* (K!, RAW); Upper Ghondokoro basin, wet flats, 3960-4880 m (WEBSTER & NASIR 1965).

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S **Shigar:** Skoro P. S 4700 m (HARTMANN 1966). **Skardu:** Ascent to Deotso [Deosai, from Skardu], 1847-07-23, *Winterbottom 878* (K! "*Poa laxa*"). Burji P. 4270-4420 m, *C.B.Clarke 29851* (K!); *29861* (K!).

E **Upper Shyok:** [Sassir - Murgai], 1848-08-28, *T.Thomson* s.n. (K!, with *Poa calliopsis*).
A: Deosai: Rd. to Baltistan 3960 m, *R.R.Stewart 19971* p.p. (K!, RAW). Deosai E 4600 m, *Miehe 5105!*. Dras: Rimochagma Nullah 4270 m, *Duthie 12160* (K!).
D: S Karakorum, Deosai Plains. *Endem.*
E: 3960-5030 m, alp. - subniv., rare, but locally frequent in the CS Karakorum. High alpine turf (*Carex borii*, *Kobresia karakorumensis*).

112. **Colpodium himalaicum** (HOOKER f.) BOR, Grasses Burma, Ceyl. Ind. Pak. 529. 1960

Phippsia himalaica HOOKER f. 1896, *Catabrosa himalaica* (HOOKER f.) STAPF in HOOKER f. 1896, *Cata brosella himalaica* (HOOKER f.) TZVELEV 1966

Ic.: Fig. 6 (1), fig. 7 (3).

W **Hispar:** Hispar Gl., above Kanibassar Gl. 4570 m, *R.Scott Russell 1580* (BM!).
A: Chilas: Uppermost Pattaro Vy., Guttum Sagar - Kosto Gali 4860 m, *Nüsser 1409!*. Hazara: Babusar P. 4060 m, *Miehe 308* (K!); 4300 m, *Miehe 528a!*. Kashmir: 3960-4270 m. Sangam Vy. 3960-4270 m, *Duthie 13560* (K!), S of Kolahoi 4270 m, *Duthie 13291* (K!). Upper Lidder Vy., Han Nag 4270 m, *R.R.Stewart 9435* (K!). Apharwat 4270 m, *R.R.Stewart 12507* (K!). Himachal Pr.: Baralacha P., *Bor 190* (DD; ASWAL & MEHROTRA 1994). Lahul. Uttar Pr.: Garhwal, Ghastoli N of Badrinath up the Sarsutti Vy. to Deo Tal on the S foot of the Mana P. (4080-5360 m), *Schlagintweit 9172* (GOET!). Kumaon, Barji Kang P. 4420 m, *Strachey & Winterbottom 2* (K!). Tihri-Garhwal, moraine of Dudu Gl. 3960-4270 m, *Duthie 271* (BM!, K!).
D: W Himalaya: Hazara, Kashmir - Kumaon, C.Nepal. *W Himal.*
E: 4570 m, alp., rare. [?] Relatively humid alpine turf.
N: The plant from **Hispar** is typical on account of the densely tufted habit, with a narrow spike-like inflorescence, spikelets 1-flowered, anthers 1.6 mm, but the glumes are ± half the length of lemmas. The material from Babusar P. is not typical on account of the subglabrous lemma, and is in habit close to *Puccinellia minuta*. The specimen *Schlagintweit 9172* was previously determined as "*Sporobolus diander*" by GRISEBACH.

113. **Colpodium leucolepis** NEVSKI, Bull. Soc. Nat. Moscou **43**: 224. 1934

Colpodium villosum BOR 1970, *Paracolpodium leucolepis* (NEVSKI) TZVELEV 1968, *Paracolpodium altaicum* (TRIN.) TZVELEV subsp. *leucolepis* (NEVSKI) TZVELEV 1966

Ic.: Fig. 6 (3), fig. 7 (2).

CN **Braldu:** Pamir P. S, near Shuwart 4800-4820 m, *Miehe 6093!*.

CS **Shimshal:** Pamir P. 4760-4860 m, *Miehe 6235!; 6270!*.

N **Taxkorgan:** S Taxkorgan, W KKH 4640-4660 m, *Miehe 5636!*. **Mintake:** S Taxkorgan, above Mazar, W KKH 4300 m, *Miehe 5860!*.

W **Hispar:** Gharesa Gl. base camp, 13 miles E of Nagar 4750 m, *O.Polunin 6120* (BM!, K!). **Khunjerab:** P. SW 4600 m, *Miehe 2393!*; 4800 m, *Klötzli & al. 113.04!*.
A: W Kunlun: Tiznap Vy. W Kudi 4380-4500 m, *Miehe 8387!; 8401!; 8438!*. E Pamir: Above Ak-Baital P., 1901-08-08, *Fedtschenko* s.n. (W!). Kizil Kul 4000 m, *Paulsen 625* (W!). Wakhan: Upper Wazit Vy., Kotal-i-Wazit, *Breckle 1303* (hb. Podlech!). Issyk Vy. 5040 m, *H.Huss 458* (hb. Podlech!). Kishnikhan Vy. 4200 m, *R.Senarclens de Grancy 55* (W!). 4200-5040 m (PODLECH & ANDERS 1977).
D: Tian Shan, W Kunlun, Pamir, NW Karakorum, along the Hindukush main ridge to Nuristan and Salang P. area. **Map:** ALEXEEV 1981: map 1. *E Pamir.*
E: 4300-4860 m, alp. - subniv., rare in the NW. High alpine turf spots, dry stony alpine turf, earthy banks by steams, on lateral moraines.

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N: Intermediates with *C. altaicum* are reported from Dzung. Alatau (ALEXEEV 1981). A population of the Karakorum S slope is distinguished here as a separate taxon (*C. baltistanicum*), somewhat intermediate between *C. leucolepis* and *C. himalaicum*.

* **Colpodium nutans** (STAPF) BOR in RECH.f. 1970 (*Catabrosa nutans* STAPF in HOOKER f. 1896, *Hyalopoa nutans* (STAPF) ALEXEEV in T. A. COPE 1982) - **A**: Astor: Near Kalapani 3350-3660 m, *Duthie 12547* (W!). Kamri P. 3350-3660 m, *Duthie 12642* (W!). Rimochagma Vy. 4270 m, *Duthie 12160* (W!). Rama Vy., SW of Astor 3660 m, *Lankester & Pearson 1409* (BM!). Deosai: Deosai, road to Baltistan 3960 m, *R.R.Stewart 19971* p.p. (K!, RAW). Burzil P. 3200-3660 m, *C.B.Clarke 22629* (K!); *29705* (BM!, K!); 3960-4270 m, *R.R.Stewart 22051* (K). Kashmir: Tilail 4110 m, *C.B.Clarke 30790* (BM!). Sonamurg 3350 m, *Levinge* s.n. (BM!). common 3660-4270 m. Baltal, 1848-09-28, *T.Thomson* s.n. (K! **lectotype**). Sind Vy., Yamharu P. 3960-4270 m, *Duthie 13571* (W!). **D**: Kashmir, W Himalaya. **N**: Plants from Astor approach *C. leucolepis* in habit.

114. Crypsis schoenoides (L.) LAM., Tabl. Encycl. Méth. Bot. 1: 166, pl.42 fig.1. 1791

Phleum schoenoides L. 1753, *Heleochloa phleoides* (L.) HOST 1801

Ic.: Fl.Iraq 9: pl.178. Fl.Desert.Sin.1: fig.31(1-4).

S **Shigar:** 2440 m, *C.B.Clarke 30484* (K!). **Skardu:** 1847-11; 1847-12-01, *T.Thomson* s.n. (K!). Floodplain of Indus Rv., c. 1.5 miles from Skardu 2290 m, *Nasir & Webster 6579* (K!, M!, RAW).
A: Kashmir.
D: Medit., N Africa, Sudan (isolated: Senegal, Mozambique, Malawi, Madagascar), W Asia - N India; introduced N America. *Palaeotrop.*
E: 2290-2440 m, coll., rare (Indus Vy.). Moist places, mud-flats subject to seasonal flooding, desert and saline places, "prostrate, forming circular mats on dry sandy soil" (*Nasir & Webster 6579*).

* **Cymbopogon commutatus** (STEUDEL) STAPF 1907 (*Andropogon commutatus* STEUDEL 1854) - **A**: Chitral. **D**: Africa, SW Asia, India.

* **Cymbopogon distans** (NEES ex STEUDEL) W. WATSON in ATKINSON 1882 (*Andropogon distans* NEES ex STEUDEL 1854) - **Ic.:** Fl.Xizang.5: fig.185. **A**: Hazara. Kashmir. **D**: Himalaya, Ceylon.

115. Cymbopogon jwarancusa (JONES) SCHULTES, Mant. 2: 458. 1824

Andropogon jwarancusa JONES 1795, *Andropogon himalayensis* GAND. 1899, non STEUDEL 1854

subsp. **jwarancusa**

Ic.: Fl.Xizang.5: fig.186.

S **Skardu:** Bagicha - Olding on Skardu - Ladakh Road 2590 m, *R.R.Stewart 21001* (RAW).
A: Kashmir.
D: Pakistan (Sind, Baluch., Punjab, NWFP, Gilgit), Kashmir, India (mainly W), Nepal. *W Himal.*

subsp. **olivieri** (BOISS.) SOENARKO, Reinwardtia 9: 307. 1977

Andropogon olivieri BOISS. 1844, *Cymbopogon oliveri* (BOISS.) BOR 1963

Ic.: Fl.Iraq 9: pl.199. Fl.Xizang.5: fig.184(1-3).

W **Gilgit:** Gilgit 1520 m, common, *R.R.Stewart 26646* (K!). Naltar Vy. near Nomal 1520-1830 m, *Duthie 12335* (K!). Above Nomal 2290 m, *R.R.Stewart 26645* (K!, RAW). **Hunza:** Baltit 2600 m, *F.Schmid 1921* (K!, RAW). Karimabad - Khaibar 2700 m, *Klötzli & al. 808.17!.*

S **Skardu:** Near Skardu 2440 m, *Duthie 12045* (K!). **Leh:** Rhizong Rv., Leh - Khalatse 3150 m, *Billiet & Leonard 6892* (K!).
A: Swat. Kashmir: Ramoo 1830 m, *C.B.Clarke 28581* (K!). Himachal Pr.: Kamri, *Bhattacharyya 45377* (BSD; ASWAL & MEHROTRA 1994).
D: Sokotra, Iraq - Pakistan (Sind, Baluch., Punjab, NWFP, Gilgit), NW India, Nepal. *Palaeotrop.*
E: 1520-3150 m, coll. - mont., not common in the SW. (Generally:) Dry grassland.

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N: The delimitation of the subspecies needs further investigation.

* **Cymbopogon martinii** (ROXB.) W. WATSON in ATKINSON 1882 (*Andropogon martinii* ROXB. 1820) - **A**: Swat. Hazara. Kashmir. **D**: Himalaya, SE Asia.

* **Cymbopogon parkeri** STAPF 1929 - **Ic.**: Fl.Iraq 9: pl.198. **A**: Chitral. Swat. **D**: Iraq, Iran, Afgh., Pakistan, NW India.

116. Cymbopogon pospischilii (K. SCHUM.) C. E. HUBBARD, Kew Bull. 4: 175. 1949

Andropogon nardus L. var. *stracheyi* HOOKER f. 1896, *Andropogon pospischilii* K. SCHUM. 1897

W **Ishkoman:** Phakora, *Sh.Ali 84* (K!). **Gilgit:** Jutial Nullah 2130 m, *R.R.Stewart 26647* (K!). Naltar Vy. 1830-2130 m, *Duthie 12328* (K!). Karagh, c.5 miles from Gilgit, *A.Ghafoor & Z.L.Butt 741* (KUH). Shinghai Gah - Pahot Gali 2140-2300 m, *Miehe 707!; 1819!*. Gilgit, *N.McVean* s.n. (K!). **Hunza:** Chalt - Nomal 2000 m, 1955-08-23, *S.Nakao* s.n. (KYO!). Nagar - Minapin 2130-2440 m, *R.R.Stewart 26648* (K!, RAW). ? Chalt 2200 m, 1935-07-13, *Persson 734* (PERSSON 1938: "*Cymbopogon nardus*"). Thunch, 1974-08-17, *F.Gartner* s.n. (GZU!). **Batura:** Gulmit - Atabad 2500 m, *Miehe 3001!*.

A: Chilas: Gor 1850 m, *Schickhoff 1458!*. Below Ranote, Haparing (Gor Region) 1950 m, *Nüsser 1205!*. Tato - Raikot-Bridge 2330 m, *Nüsser 561!*. Buldar Vy., Muthat - Raikot Bridge 1950m , *Nüsser 1065!*. Astor: Astor Vy. 1830 m, *Duthie 12301* (K!, KUH). Doyan 2130 m, *Giles 545* (K!). Swat. Hazara: Kaghan Vy. Kashmir.

D: E Africa (Cape - Ethiopia, Somalia); Pakistan (Sind, Punjab, NWFP, Gilgit), Kashmir, NW Himalaya - Nepal. *Palaeotrop.*

E: 1830-2500 m, coll., not common in the SW. *Artemisia-Juniperus excelsa* forest-steppes.

117. Cynodon dactylon (L.) PERS., Syn. Pl. 1: 85. 1805

Panicum dactylon L. 1753

Ic.: Fl.Iran.70: pl.64. Fl.Xizang.5: fig.40.

W **Gilgit:** Shinghai Gah - Pahot Gali 1780 m, *Miehe 601!*. **Hunza:** Chalt 1950 m, *Klötzli & al. 123.09!*.

S **Lower Shyok:** Near Doghani (WEBSTER & NASIR 1965); Doghani - Sailing 2440 m, *Nasir & Webster 5921* (RAW).

A: W Kashg.: Kashgar 1300 m, *Dickoré 997!*. Yarkand Rv., 1889-06-04, *Roborovsky*; Yangigisar, 1909-05-24, *Divnogorskaya* (Pl.As.Centr.). Chilas: Dassu - Chilas 900-1000 m, *Klötzli & al. 723.10!*. Karakorum Highway, Shangri La, Indus Vy. 1280 m, *Nüsser 1216!*.

D: Trop. - warm temp. *Cosmopol.*

E: 1780-2440 m, coll., rare. S Karakorum: Indus Vy. (N: Kashgaria). Dry to seasonally wet (irrigated) turf, steppes and semi-deserts on sandy or loess soils, resists strong grazing.

118. Dactylis glomerata L., Sp. Pl. 71. 1753

subsp. **glomerata** - **A**: Chitral. Hazara. **D**: Temp. Eurasia, SE to NW Pakistan: Chitral, ?Punjab.

subsp. **himalayensis** DOMIN, Acta Bot. Bohem. 14: 129. 1943

Ic.: Fl.Xizang.5, fig.74 [cf. subsp. *himalayensis*].

W **Gilgit:** Above Naltar 3050-3350 m, *R.R.Stewart 26634* (K!, RAW).

S **Shigar:** Chirka Kalti, 5 miles from Shigar, *A.Ghafoor & Z.L.Butt 665* (KUH). **?Leh:** Ladakh, *Schlagintweit* (GRISEBACH 1868). **Lower Shyok:** Kunes (on the right side of the Shayok) via Kiris to Neru, 1856-08-02/12, *Schlagintweit 5874* (M!).

A: Astor: Rupal Vy., Tarishing - Churit 2830 m, *Nüsser 141!;* Bayals 3160 m, *Nüsser 590!*. Swat: Khawazakhiela - Shangla 1300-1900 m, *K.H.Rechinger 30620* (M!). Hazara: 6 miles from Babusar on

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way to Gilgit, *Sultanul Abedin & M.Qaiser 9146* (KUH). Kaghan Vy. Kashmir. Himachal Pr.: Khoksar, Aswal 6631 (ASWAL & MEHROTRA 1994).
D: Himalaya. *Sino-Him.* Species: *Euro-Sib.*
E: 3050-3350 m, montane, rare in the SW. Habitat not reported, probably on somewhat ruderal water-surplus habitats. (Generally:) meadows, "an excellent fodder grass" (Fl.Pak., for the species).

subsp. **woronowii** (OVCZ.) STEBBINS & ZOHARY 1959 (*Dactylis woronowii* OVCZ. 1934, *Dactylis glomerata* L. subsp. *hispanica* auct. non (ROTH) NYMAN 1882: BOR 1970) - Reported from Nuristan (PODLECH & ANDERS 1976).

N: The distribution of the subspecies of *Dactylis glomerata* in the Himalaya needs a (cytotaxonomic) reexamination with more material. Reported from Pakistan are subsp. **glomerata** (2n=28; throughout the range of the species) and subsp. **himalayensis** DOMIN (2n=14; Himalaya: Afgh. - Yünnan). **Dactylis glomerata** L. subsp. **hispanica** (ROTH) NYMAN (*Dactylis hispanica* ROTH 1797), (2n=28; Medit. - ?Afgh., ?Pakistan) may be substituted by subsp. **woronowii**. Subsp. **himalayensis** is considered "the commonest subsp. in the area; characterized by its looser fascicles of spikelets and shortly awned lemmas" (Fl.Pak.).*Stewart 26634*) has some long hairs on the lemma keels and may represent subsp. **glomerata**. Typical subsp. **himalayensis** seems to be a more easternly taxon, and the specimen from Gilgit (*Stewart 26634*) apparently represents subsp. **glomerata**. Lit.: DOMIN, Acta Bot. Bohem. 14 3-147. 1943.

* **Dactyloctenium aegyptium** (L.) WILLD. 1809 (*Cynosurus aegyptius* L. 1753) - **Ic.**: Fl.Iraq 9: pl.161. **A**: Hazara. Kashmir. **D**: Old world tropics.

119. **Danthonia cachemyriana** JAUB. & SPACH, Ill. Pl. Orient. **4**: 46, pl.331. 1851

Danthonia exilis HOOKER f. 1896, *Avena editissima* PAMPANINI 1915

Ic.: JAUBERT & SPACH 1851: pl.331.

CS **Shimshal:** Shimshal Gorge, Jurjur - Dut 2600-2730 m, *Miehe 5951!.* **Biafo:** Biafo Gl. W terminal moraine 3100 m, *H.Hartmann 79* (K!, RAW; HARTMANN 1966).

N **Upper Yarkand:** Camp Darva Serhot 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930).

W **Gilgit:** Above Naltar 3200 m, 1954-07-23, *R.R.Stewart* s.n. (RAW). **Hunza:** Ulter Nullah 2740-3050 m, *R.R.Stewart 26633* (K!, RAW). **Batura:** W Khaibar (2500-3000 m), *Klötzli & al. 801.45* p.p.*!*.
A: [?] Nuristan. Dras: Matayan 30050-3350 m, *R.R.Stewart 7425* (KUH). Kashmir: 2440-3350 m. Near Gurais 2130-2440 m, *Duthie 12599* (K!); above Gurais 2440-2740 m, *Duthie 12591* (K!). Barzil 2740 m, *C.B.Clarke 29594* (K!). Sonamarg 2440-2740 m, *Duthie 13616* (K!). Tilail 2740-3350 m, *C.B.Clarke 30684* (K!); *30729* (K!). Zoji P. 3050 m, *R.R.Stewart 22362* (K!). In fissuris rupium montium excelsorum Cachemyr, 1831-08, *Jacquemont* (P **type** foto!). ?Himachal Pr..
D: ?NE Afgh. (Nuristan), S Karakorum, W Himalaya (Gilgit, Baltistan, Kashmir - Nepal). *W Himal.*
E: (2500) 2730-3100 (?4900) m, mont., rare. Dry rocks and open moraine sands.
N: The record of PAMPANINI 1930 is from an unusually high altitude far distant from the main area of distribution and needs to be confirmed. If correct, the plant may have been introduced there along the Karakorum trade route (see *Carex cruenta*). The delimitation of *D. cachemyriana* against *D. cumminsii*, a generally more robust plant of the Himalaya S slope, presents some problems.

* **Danthonia cumminsii** HOOKER f. 1896 (*Danthonia cachemyriana* JAUB. & SPACH var. *minor* HOOKER f. 1896, *Danthonia schneideri* PILGER 1921, *Danthonia jacquemontii* BOR 1952) - **Ic.**: Fl.Xizang.5: fig.104. **A**: Nuristan: Kulam Vy., Spuk P., Parigel - Waigelek 2760 m, G.Kerstan 1199 (W!: Fl.Iran.: „*D. cachemyriana*") Swat: Mt.Ilam 2740 m, *R.R.Stewart 24401* (K!). Hazara: Golimusalla, Saran Range, 1899-08-20, *Inayat* s.n. (K!). Murree hills, *R.R.Stewart 29165* (K!). Kashmir: Apharwat above Gulmarg 3660 m, *R.R.Stewart 10474* (K!). Himachal Pr.: Buspa Vy., *Jacquemont 2139* (K!). Lepa - Pangi 3500-3800 m, *Jacquemont 2139* (K!). Khoksar, *Aswal 10126* (ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 3800 m, *Miehe+9601c!.* **D**: Himalaya (Swat - Bhutan), E Tibet, W China (Sichuan, Yunnan) - Malaysia.

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* **Dendrocalamus strictus** (ROXB.) NEES 1834 (*Bambos stricta* ROXB. 1795) - **A**: Kashmir. **D**: Himalaya (Kashmir - Burma), India, Malesia. **N**: The most wide-spread bamboo in SE Asia (Fl.Pak.).

120. Deschampsia cespitosa (L.) P. BEAUV. Ess. Agrost. 91, 149, 160. 1812

Aira cespitosa L. 1753

subsp. **pamirica** (ROSHEV.) TZVELEV, Gram. URSS 285. 1976

Deschampsia pamirica ROSHEV. 1934, *Deschampsia cespitosa* auct. non (L.) P. BEAUV.: BOR 1970 p.p.

W **Batura:** E Morkhoon 3420 m, *Klötzli & al. 90.22!.*

A: E Pamir: Karasu Rv. 3750 m, *S.Ikonnikov, Gerb.Fl.USSR 4952* (M!). Wakhan 2800-4000 m (PODLECH & ANDERS 1977, common!). Kaharac 3000 m, *Roemer 379* (W!). Chitral: Baroghil P. 3810 m, *Stainton 2998* (W!). Astor: Burzil Chowki, Gilgit Road 3350 m, *R.R. & I.D.Stewart 19749* (RAW). Dras: Dras Vy. 3050-3350 m, *Duthie 13710* (K!). Kashmir. Himachal Pr.: Parang Vy., 1847-09-09, *T.Thomson* s.n. (K!, with *Poa calliopsis*). Chotadhara-Batal, *Aswal 6910* (ASWAL & MEHROTRA 1994: *D. cespitosa*).

D: Tian Shan, Pamir-Alai, Wakhan, Karakorum, W Himalaya. *Pamir.* (Species:) Temp. regions of both hemispheres; mountains of trop. Africa. *Cosmopol.*

E: 3420 m, subalp., rare. Damp riverside meadows (?).

N: A critical taxon, morphologically ± intermediate between *D. cespitosa* subsp. *cespitosa* and *D. koelerioides*. The segregation and delimitation of *D. cespitosa* subsp. *pamirica* is somewhat doubtful, and has to be proved on more material. In Fl.Pak., the specimens are cited under *Deschampsia cespitosa* (L.) P. BEAUV. subsp. *cespitosa* (*Aira cespitosa* L. 1753).

121. Deschampsia koelerioides REGEL, Bull. Soc. Nat. Moscou 41(2): 299. 1869

Deschampsia cespitosa (L.) P. BEAUV. subsp. *koelerioides* (REGEL) TZVELEV, Gram. URSS 285. 1976

Ic.: Fl.Pak.143: fig.56(5-6). Fl.Xizang.5: fig.96.

N **Taxkorgan:** S Taxkorgan, 1959-06-13, *Junatov* (Pl.As.Centr.).

S **Shigar/Lower Shyok:** Thalle P. 4570-4880 m, *R.R. & I.D.Stewart 20737; 20740* (RAW).

A: Wakhan: Warm P. leading to the Spadgiz Vy. 4600 m, *Grey-Wilson & Hewer 1588* (W!). Futur Vy. 3600 m, *Roemer 107* (W!). Waldbai Vy. 3800-4050 m, *Anders 8022*; Upper Istmotsh Vy. 4000 m, *Anders 8052*; Upper Tshelab Vy. 4000-4100 m, *Anders 7550* (PODLECH & ANDERS 1977). Chitral: Dorah P., Lutko Vy. NW of Chitral 4110 m, *Stainton 3247* (W!). Agram, Arkari Gol, W of Tirich Mir 3200 m, *Stainton 2642* (W!). Deosai: Shore of Sharsar Lake, Deosai Plains, 3660-3960 m, *Duthie 13861* (K!). Burji P., Deosai Region 4270 m, *R.R.Stewart 20014* (RAW).

D: Mongolia, Altai, Tian Shan, Pamir-Alai, C. & E Afgh. (Hindukush: Salang, Kunar, Wakhan), Pakistan (Chitral, Hazara, Karakorum, Baltistan), Kashmir. *Centr. As.*

E: 4570-4880 m, alp., rare. Humid alpine turf (?).

N: Usually distinct from and at higher altitudes than *D. cespitosa*, though perhaps intergrading.

* **Desmostachya bipinnata** (L.) STAPF in THISELTON-DYER 1900 (*Briza bipinnata* L. 1759) - **A**: Swat. Kashmir. **D**: N & C.Africa, trop. & subtrop. Asia.

* **Digitaria abludens** (ROEMER & SCHULTES) VELDK. 1973 (*Panicum abludens* ROEMER & SCHULTES 1817) - **A**: Swat. Hazara. Kashmir. **D**: S & SE Asia (Pakistan - Thailand, Philippines, New Guinea).

* **Digitaria ciliaris** (RETZ.) KOELER 1802 (*Panicum ciliare* RETZ. 1786) - **Ic.**: Fl.Xizang.5: fig.161(4-7). **A**: Chitral. Swat. Hazara: Kaghan Vy. Kashmir. **D**: Pantrop.

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122. Digitaria ischaemum (SCHREBER) SCHREBER ex MUHL., Descr. Gram. Calam. 131. 1817

Panicum ischaemum SCHREBER in SCHWEIGG. 1804

Ic.: Fl.Xizang.5: fig.162.

W **Yasin:** Sultanabad 2500 m, *G.Stöber 107!*. **Gilgit:** 1520 m, *R.R.Stewart 26652* (K!).

S **Lower Shyok:** Shyok Vy., Blaghar near Doghoni 2440 m, 1940-08-17, *R.R.Stewart* s.n. (KUH).

A: W Kashg.: Kashgar 1330 m, 1934-08-31, *Persson 625*; Yarkand 1350 m, *Persson* 1931-09-05, *Persson 253* (PERSSON 1938). 45 km N Yarkand, Rd. to Maralbashi, 1958-09-30, *Junatov* (Pl.As.Centr.). S Kashg. (Pl.As.Centr.).

D: Temp. N hemisphere. *Holarct.*

E: 1520-2500 m, coll., rare in the S & W. (Generally:) Dry and seasonally moist sandy places, ruderal.

123. Digitaria sanguinalis (L.) SCOP., Fl. Carniol., ed.2, **1**: 52. 1772

Panicum sanguinale L. 1753

Ic.: Fl.Iraq 9: pl.183.

W **Gilgit:** Gilgit, Giles s.n. (K!); 1520 m, *R.R.Stewart 26651* (K!); *26653* (K!); *26654!* (K!). Khomer, 1974-08-22, *F.Gartner* s.n. (GZU!).

S **Skardu:** Skardu [2330 m], 1847-11, *T.Thomson* s.n. (K!). Kiris - Parkutta 2440 m, *R.R.Stewart 20923* (RAW).

A: W Kashg.: 45 km N Yarkand, Rd. to Maralbashi, 1958-09-30, *Junatov* (Pl.As.Centr.). Astor: Nanga Parbat, Ramghat camping Ground 1680 m, *Duthie 12300* (K).

D: Warm temp. (-trop.) regions. *Cosmopol.*

E: 1520-2440 m, coll., rare. (Generally:) Dry to seasonally moist sandy places, somewhat ruderal.

124. Digitaria stewartiana BOR, Kew Bull. **1951**: 166. 1951

S **Shigar:** 2440 m, *R.R.Stewart 20536A* (RAW).

A: Reported from [?]S Kashg.: N Kunlun foothills 2000 m, 1889-09-05, *Roborovsky* (Pl.As.Centr.). Suru: Kargil, 1848-09-23, *T.Thomson* s.n. (K). Chunagund near Kargil, Ladak, 9000' [2740 m], *R.R.Stewart 21047* (K! **type**).

D: "*D. stewartiana* is known only from three collections from Kashmir" [Ladakh: Kargil and S Karakorum: Shigar Vy.; to be expected around the middle Indus Vy. between Skardu and Leh], ? S Kashgaria.

E: 2440 m, mont., rare. Dry open places (?). *Endem.*

N: "This is very similar to *D. ischaemum*, *D. longiflora* and *D. violascens* in having ternate spikelets, but the spikelets are quite glabrous" (Fl.Pak.). Of doubtful status.

* **Digitaria stricta** ROTH ex ROEMER & SCHULTES 1817 - **A**: Hazara. Kashmir. **D**: Trop. Asia.

* **Digitaria violascens** LINK 1827 (*Paspalum fuscum* PRESL 1830) - **Ic.**: Fl.Xizang.5: fig.161(1-3). **A**: Chitral. Swat. Hazara. **D**: Pantropical.

* **Duthiea bromoides** HACKEL 1895 (*Bromus membranaceus* JACQUEM. ex GRISEB. 1868, nomen nudum ?) - **Ic.**: Fl.Pak.143, fig.1(5-6). **A**: Swat. Hazara. Kashmir: "common in Birch woods at high altitude (3300-4400 m)" (Fl.Pak.). Himachal Pr.. **D**: W Himalaya (Swat - Himachal Pradesh).

* **Echinochloa colona** (L.) LINK 1833 (*Panicum colonum* L. 1759) - **Ic.**: Fl.Iraq 9: pl.184. **A**: Swat. Hazara. Kashmir. **D**: Trop. & subtrop. Africa & Asia.

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125. Echinochloa crus-galli (L.) P. BEAUV., Ess. Agrost. 53. 1812

Panicum crus-galli L. 1753

Ic.: Fl.Iraq 9: pl.185. Fl.Iran. 70: pl.67. Fl.Desert.Sin.1: fig.45(1-4: var. *mitis*).

S Skardu: 2440 m, 1940-08-05, *R.R.Stewart* s.n. (RAW). C. 1,5 miles E of Skardu 2290 m, *Nasir & Webster 6580* (K).

A: W Kashg.: Kashgar 1300 m, *Dickoré 998!*. Common about the city of Yarkand (HENDERSON & HUME 1873). Yecheng 1400 m, *Dickoré 125!*. S Kashg. (Pl.As.Centr.). Himachal Pr.: Keylong, *Bor (85186)*; rare (ASWAL & MEHROTRA 1994).

D: Warm temp. - subtrop. (-trop.) *Cosmopol.*

E: 2290-2440 m, coll., rare (S Karakorum). Ruderal, (seasonally) marshy places, irrigation canal sides, roadsides.

* **Echinochloa oryzoides** (ARD.) FRITSCH 1891 (*Panicum oryzoides* ARD. 1764) - **A**: N Kashg.; W Kashg.: Near Kashgar, 1929-07-26, *Popov*; S Kashg.: N Kunlun foothills, 1889-09-13, *Roborovsky* (Pl.As.Centr.). **D**: S Europe - E Asia.

* **Eleusine indica** (L.) GAERTNER 1788 (*Cynosurus indicus* L. 1753) - **A**: Kashmir. Hazara. **D**: Pantrop. - subtrop.

Elymus:

A difficult genus, well represented in the Karakorum. Hybridisation probably obscures the specific limits; several hybrids have been reported, but "none has yet been thoroughly investigated cytologically and experimentally to confirm its origin" (Fl.Pak.). The key and the species delimitation are mainly based upon Fl.Pak., which apparently works well in the Karakorum. Considerable difficulties to make this concept consistent to those of Pl.As.Centr. and Fl.Tadzh., do exist. Presently it seems to be impossible do evaluate many literature records relating to the flora of the Karakorum from these floras.

Key to *Elymus*:

1. Lemma awnless or with a short awn not as long as the body of the lemma 2
\+ Lemma with an awn at least as long as the body of the lemma 6
2. Plant loosely tufted, with long creeping rhizomes. Glumes acute, mucronate or shortly awned. Anthers 3.5-6 mm long. Leaves usually with long and short hairs above ..... **E. repens**
\+ Plant loosely to densely tufted, without rhizomes. Glumes obtuse, acute, acuminate, or toothed at the tip. Anthers 2-5 mm long. Leaves with short hairs above 3
3. Anthers 3-5 mm long. Glumes and lemma obtuse, quite smooth. Leaves narrowly involute ..... **E. cognatus**
\+ Anthers 2-2.5 mm long. Glumes and lemma acute, ± scaberulous or hairy. Leaves usually flat, broader 4
4. Body of the lemma with ± long hairs. Glumes toothed at the tip or acuminate ..... **E. dentatus**
\+ Body of the lemma smooth or scaberulous. Glumes acuminate 5
5. Lemma scaberulous all over the back ..... **E. mutabilis**
\+ Lemma smooth, the nerves thinly scabrid towards the tip ..... **E. stewartii**
6. Spikelets in groups of 2-3 in the middle part of the rhachis 7
\+ Spikelets solitary at all nodes of the rhachis (sometimes 2 spikelets together in *E. schrenkianus*) 8
7. Glumes almost as long as the lowest lemma (awns excluded) ..... **E. dahuricus**
\+ Glumes much shorter than the lowest lemma (awns excluded) ..... **E. nutans**
8. Awn of lemma straight or slightly flexuous 9
\+ Awn of lemma strongly recurved at maturity 12
9. Body of the lemma densely villous ..... **E. thomsonii**
\+ Body of the lemma scabrid or puberulous 10
10. Palea about three-quarters as long as the body of the lemma. Anthers 3-4 mm long .... **E. semicostatus**
\+ Palea about as long as the lemma. Anthers c. 2-3 mm 11

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11. Lemma entirely glabrous or scabrid only near the tip ..... **E. caninus**
\+ Lemma minutely bristly or puberulous ..... **E. russellii**
12. Glumes almost as long as the lowest lemma (awns excluded) ..... **E. fedtschenkoi**
\+ Glumes considerably shorter than the lowest lemma (awns excluded) **13**
13. Rhachilla twisted above the glumes, midrib of lower glume not in line with that of the lowest lemma ..... **E. schrenkianus**
\+ Rhachilla not twisted above the glumes, midrib of lower glume in line with that of the lowest lemma **14**
14. Anthers (2.5-) 3-3.5 mm long ..... **E. canaliculatus**
\+ Anthers 1.5-2.5 mm long **15**
15. Leaves shortly and densely pubescent on both sides; flat or loosely rolled. Glumes short, obtuse, acute or ± emarginate ..... **E. schugnanicus**
\+ Leaves glabrous beneath, pubescent or loosely hairy above; flat, tightly folded or convolute. Glumes longer, acuminate or awned **16**
16. Glumes with an awn (2.5-) 4-10 mm long. Lemma body 11-12.5 mm long; scabrid or loosely villous. Leaves flat ..... **(E. himalayanus)**
\+ Glumes acuminate or with an awn up to 2 mm long. Lemma body 8-9 mm long; smooth or faintly scabrid. Leaves tightly folded, convolute or flat **17**
17. Leaves convolute or tightly folded. Body of the lemma smooth ..... **E. jacquemontii**
\+ Leaves flat to loosely convolute. Body of the lemma somewhat scabrid ..... **(E. tschimganicus)**

* **Elymus abolinii** (DROBOV) TZVELEV 1968 (*Agropyron abolinii* DROBOV 1925) - **N**: Possibly the hybrid *Elymus dentatus* X *E. gmelinii* (TZVELEV 1973).

* **Elymus batalinii** (KRASN.) NEVSKI 1934 (*Triticum batalinii* KRASN. 1887, *Agropyron batalinii* (KRASN.) ROSHEV. 1915, *Elytrigia argentea* NEVSKI 1934) - **N**: This may be the correct name for *Elymus thomsonii* (HOOKER f.) MELDERIS.

126. Elymus canaliculatus (NEVSKI) TZVELEV, Pl. As. Centr. 4: 220: 1968

Agropyron longe-aristatum (BOISS.) BOISS. var. *aitchisonii* BOISS. 1884, *Agropyron canaliculatum* NEVSKI 1932, *Elymus longe-aristatus* (BOISS.) TZVELEV subsp. *canaliculatus* (NEVSKI) TZVELEV 1972

CN **Braldu:** Upper Braldu tributary, above Chikor 4050-4220 m, *Miehe 6198!; 6207!.*

CS **Shimshal:** Upper Shimshal, Zardgar Bin 3300-3800 m, *Miehe 5987!*; Shachmirk P. W 4030-4440 m, *Miehe 6004!; 6027!*; Shachmirk P. - Shujerab, Pamir-tang 4170 m, *Miehe 6381!.* **Biafo:** Snout of Biafo Gl. 3100 m, 1955-07-04, *S.Nakao* s.n. (KYO!). Biafo Gl. 3100-3110 m; 3100 m, *H.Hartmann 53* (K!); 3110 m, *H.Hartmann 51!* [*E. schugnanicus* ?]; Mango 3700-3920 m [*E. schugnanicus* ? cf. HARTMANN 1984]; Baintha 4150-4420 m (HARTMANN 1966).

N **?Upper Yarkand:** Sughet Vy. 4110-4570 m, *Novitsky* (PAMPANINI 1926 [? perhaps *E. schugnanicus*]).

W **Yasin:** NE Yasin, Jud Bar 3900 m, *Miehe 7028!.* **Ishkoman:** Ishkoman P. 3960-4270 m, 1954, *F.Schmid* s.n. (RAW). **Gilgit:** Shinghai Gah - Pahot Gali 3420-3400 m, *Miehe 765!; 1291!; 1389!.* Baghrot Vy. 3570-3680 m, *Miehe 3843!; 4222!.* Above Jaglot Rv. 3210 m, *Schickhoff 629!.* Upper Darchan Vy., above Khaltaro 3230 m, *Schickhoff 731!.* **Hunza:** Rakaposhi N, above Nilt 3780 m, *Miehe* s.n. (with *E. fedtschenkoi, E. russellii, E. mutabilis*). Shispar Vy. 2900 m, *Paffen 264* (M!). **Hispar:** Barpu Gl., Nagir 4330 m, *H.Tyndale 15* (RAW). **Batura:** Chengerab Vy. 3250 m, *Visser-Hooft* (DOLK 1929). Gulmit - Atabad 4130 m, *Miehe 2850!.* Khaibar (2500-) 3820-4000 m, *Miehe 2611!; 2629!; Klötzli & al. 30.01!; 802.45!.* E Morkhoon (3600-) 3900-3910 m, *Klötzli & al. 44.04!; 804.55!.*

S **Leh:** Likir Gompa 4020 m, *H.Hartmann 4097!.* Kardong P. (STEWART 1916). Hemis Gompa - Gotssangdubhe 4000 m, *Billiet & Leonard 6842* (K!). Above Götsang Gompa 4300 m, *H.Hartmann 4098!.* Yangthang 4020 m, 1993-07-16, *Holzner & Kriechbaum* s.n.!.

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A: Kurram (var. *aitchisonii*). Chitral. Chilas: Gor 3230 m, *Schickhoff 1543!; 1555!*. Raikot Gl., left lateral moraine 3880 m, *Nüsser 429!*. Deosai: Deosai 4050 m, *Miehe 2134!*. Dras: Yasghum, c. 18 km E Dras 3520 m, *H.Hartmann 2333!*. Suru: Sanmodangsa 3940 m, *H.Hartmann 2335!*. 2.5 km S Namika P. 3880 m, *H.Hartmann 2334!* [*E. schugnanicus* ?]. Zanskar: Sarchu 4600 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Chumik Marpo 4600 m, 1992-08-04, *Holzner & Kriechbaum* s.n.!. W Chumik Marpo 4550 m, 1993-07-25, *Holzner & Kriechbaum* s.n.!. Kurgiakh 4250 m, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Gumburanjon 4350 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Swat. Hazara: Kaghan Vy. 3500-3600 m, *Miehe 70!*. Kashmir: Zoji P., *Bimal Misri 301* (BM!). Himachal Pr.: Ramjak - Darcha 3750 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Sissu - Gondhla, *Aswal 6732* (ASWAL & MEHROTRA 1994).

D: Pamir-Alai, S Karakorum - Himalaya (Chitral, Kashmir - Nepal). *W Himal.*

E: (2500-) 3100-4460 (4570) m, subalp. - alp., frequent in the W & S. Meadow steppes (*Festuca olgae*) and dwarf scrub (*Juniperus sibirica, J. turkestanica, Artemisia santolinifolia, Artemisia compacta*) in the subalpine - alpine transition zone.

N: Difficult to distinguish from *E. schugnanicus*. Records may partly refer to *E. schugnanicus* or *E. jacquemontii*. A record from Mustagh Ata (OSTENFELD 1922) probably belongs to *E. jacquemontii*.

? 127. **Elymus caninus** (L.) L., Fl. Suec., ed. 2, 39. 1755

Triticum caninum L. 1753, *Agropyron caninum* (L.) P. BEAUV. 1812, *Roegneria canina* (L.) NEVSKI 1934

W **Hunza:** Baltit 2440 m, *F.Schmid* s.n. (RAW).

A: ?Kashmir.

D: Temp. Eurasia, E to S Siberia, ?C. Mongolia, Pamir-Alai, ?W Karakorum (Pakistan: Gilgit), ?W Himalaya (Kashmir); introduced into N America. *Euro-Sib.*

N: Records from C. Asia including that from the Karakorum are somewhat doubtful; the record has to be confirmed.

128. **Elymus cognatus** (HACKEL) T. A. COPE, Fl. Pakistan **143**: 628. 1982

Agropyron cognatum HACKEL 1905, *Elytrigia cognata* (HACKEL) ANDERS & PODLECH 1976, *Agropyron ferganense* DROBOV 1916, ? *Agropyron dshungaricum* NEVSKI 1934, *Agropyron repens* auct. non (L.) P. BEAUV. 1812: HOOKER f. 1896, WEBSTER & NASIR 1965, HARTMANN 1966

CS **Biafo:** Biafo Gl., NW terminal moraine 3100 m, *H.Hartmann 60* (K!); E Korofon 3180 m, *H.Hartmann 61* (Z!). Karakorum [? near Askole] 4270 m, 1876-08-13, *C.B.Clarke* s.n. (BM!, K!). **Baltoro:** along Biafo Lungma 3200 m, 1955-07-05, *S.Nakao* s.n. (KYO!). **Saltoro:** Shahircho 3660-3810 m (WEBSTER & NASIR 1965); Hushe Vy. 3660 m, *Nasir & Webster 6096* (RAW). Above Hushe 3400-3450 m, *Miehe 1913!*.

W **Ghizar:** Ghizar 3000 m, 1957-07-29, *K.Ogino 283* (KYO!). ? Diwangal - Ghizar 3200 m, *K.Ogino 251* (KITAMURA 1964: "*Agropyron repens*"). Chumarkhan P. 3050 m, *J.D.A.Stainton 2892* (BM). Sunji Vy. 3050-3660 m, 1957-07-27, *M.S.Zahur* s.n. (K!). **Yasin:** Naz Bar 3300-3660 (-3850) m, *Miehe 3019!, 3308a!, 3401!; 3410!; 3499!; 3534!; 3596!; 3645!*. Panji P. N 3530 m, *Miehe 7017!*. **Ishkoman:** Panji Bar 3200 m, 1957-08-09, *K.Ogino 488* (KYO!). Talas near Ishkoman P. 3700 m, *F.Schmid 2227* (RAW). Upper Baru Gah 3260-3590 m, *Miehe 6805a!; 6903!*. Imit 3000-3250 m, 1974-08-09, *F.Gartner* s.n. (GZU!). **Gilgit:** Nomal - Naltar, *R.R.Stewart 26611* (BM!, K!); Jagot 3100-3300 m, 1974-08-03, *F.Gartner* s.n. (GZU!). Naltar Lakes 3660 m, *R.R.Stewart 26608* (BM!, K!, RAW). Shinghai Gah - Pahot Gali 2430-3360 m, *Miehe 644!; 706a!; 738!; 1471!; 1707!, 1755!*. Sai Vy. 2350-3100 m, *Schickhoff 1961!; 2022!*. Baghrot Vy. 2860-3500 m, *Miehe 4317!; 4353!; 4528!; 4599!; 4640!*; above Sat 3010-3050 m, *Schickhoff 441!; 473!*; above Gutumi Nullah 2980 m, *Schickhoff 524!*. Upper Dainyor Vy. 2960 m, *Schickhoff 388!*. **Hunza:** Daintar 3000 m, *F.Lobbichler 365* (M!). Mouchohar 3200 m, *G.Braun 582!*. Chaprot 3000 m, *G.Braun 602!*. N Chaprot 2600-3300 m, *Klötzli & al. 50/51.13!; 71.06c!; 725.30; 726.24!; 727.01!*. Chaprot Vy. 3130 m, *Schickhoff 2132!*. Minapin 2900 m, 1974-07-22, *F.Gartner* s.n. (GZU!). Minapin, above Hapakund 2970-3030 m, *Schickhoff 295!; 351!*. Pisan 3000-3300 m, 1974-07-24, *F.Gartner* s.n. (GZU!). **Hispar:** Nagar -

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Hopar Gl. 2440-2740 m, *R.R.Stewart 26606* (BM!, K!). Hispar Village area 3230 m, *O.Polunin 6346* (BM!). **Batura:** Gulmit - Atabad 3500-3560 m, *Miehe 2694!*. Khaibar 2940-3820 m, *Miehe 2654!; 2661!*. W Khaibar (2500-) 3000-3300 m, *Klötzli & al. 801.23,41!; 802.05!*.

S **Shigar:** Karakorum 3350 m [? probably Shigar - Skoro P.], 1876-08-06, *C.B.Clarke 30113* (BM!). Kero Lungma Gl., left bank 3050-3350 m, *R.Scott Russell 1328* (BM!); *1339* (BM!). Upper Basna Vy., Doko - Gon 2680 m, *Miehe 4953!*; 2650-2750 m, 1991-07-08, *J.Poelt* s.n.!. Basna Vy., Matsumdus - Doko 3300-3400 m, 1991-07-07, *J.Poelt* s.n.!. **Skardu:** Above Bashu 3210-3230 m, *Schickhoff 915!; 945!; 947!*. **Leh:** Fotu P., *Bimal Misri 308* (K!).

A: Wakhan 2850-4250 m (PODLECH & ANDERS 1977). Chitral. Astor: Chugam 2530 m, *Giles* s.n. (K!). Above Rattu 2740 m, *R.R.Stewart 21791a* (K!). Upper Astor Vy., Above Shankargarh 3350 m, *R.R.Stewart 22751* (K!). Mushkin forest 2740-3050 m, *Duthie 12276* (K!); 2580 m, *Schickhoff 1147!* (cf.); 2900-3000 m, *Schickhoff 1386!; 1422!*. Deosai: 3700 m, *Miehe 2076!*. Shingo Vy. 3050-3350 m, 1892-07-07, *Duthie 11895* (K! **type**). Dras: Dras 2440-2740 m, 1848-09-24, *T.Thomson* s.n. (K!). SW above Dras 3450 m, *H.Hartmann 2332!* p.p. (with *E. cognatus* X *E. repens* ?). ?Dras "Yarkand Exp.", 1870-06-23, *Henderson 486* (K!; HENDERSON & HUME 1873: "*Agropyron repens*"). Suru: Panikhar 3350 m, *H.Hartmann 2331!*. Zanskar: [Tongde - Zangla], 1848-06-28, *T.Thomson* s.n. (K!). [Nira - Yulchung], 1848-07-02, *T.Thomson* s.n. (K!). Tungri 3640 m, *H.Hartmann 2550!*; SW above Tungri 3870 m, *H.Hartmann 2549!*. Himachal Pr.: Spiti, Pin Vy. junction 3500 m, 1993-08-06, *Holzner & Kriechbaum* s.n.! (cf.: anthers 4.4 mm).

D: Iran, Afgh., Pakistan (Chitral, Gilgit, Baltistan; Ladakh). *W Himal.*

E: 2350-3810 (4270) m, mont. - subalp., common in the W and S. A highly characteristic component of the *Artemisia brevifolia-Juniperus excelsa* forest-steppes of the lower subalpine belt, less common in *Juniperus sibirica* dwarf-scrub and in open *Pinus wallichiana* forests.

N: 2n = 14 (HUSS 1980, material from Wakhan). "According to BOR (1970) this is conspecific with *Agropyron ferganense* DROBOV 1916, but TZVELEV (1976) is not certain of this." (Fl.Pak.). *Agropyron cognatum* HACKEL var. *shingoense* MELDERIS was based on the same sheets (*Duthie 11895*) quoted by HACKEL as the type of *A. cognatum*, and is therefore invalid. These three type sheets, however, consist of specimens with ± shortly awned lemmas, which are not characteristic of the majority of the specimens of *E. cognatus* as understood later, but more of its putative hybrid with *E. repens*. *E. repens* is much rarer in the Karakorum, and most literature records of this, especially in the phytosociological literature (HARTMANN 1972, f.f.), probably belong to *E. cognatus*.

129. **Elymus dahuricus** TURCZ. ex GRISEB. in LEDEB., Fl. Ross. 4: 331. 1852

Clinelymus dahuricus (TURCZ. ex GRISEB.) NEVSKI 1932, *Elymus dahuricus* TURCZ. ex GRISEB. var. *micranthus* MELDERIS in BOR 1960

Ic.: Fl.Xizang.5: fig.87.

CS **Nubra:** [Lower] Nubra Vy. 3660-3960 m, 1848-08-04, *T.Thomson* s.n. (K!).

W **Ghizar:** Sunji Vy. 3660 m, 1957-07-26, *M.S.Zahur* s.n. (K!). **Yasin:** *Sh.Ali 86* (K!); 2440-2590 m, 1957-08-09, *M.S.Zahur* s.n. (K!). Naz Bar 3350-3400 m, *Miehe 3601!*. Sultanabad 2500 m, *G.Stöber 39!; 74!; 82a!*. **Gilgit:** Naltar 3050 m, *R.R.Stewart 26678* (K!); Naltar Lakes 3660 m, 1954-07-20, *R.R.Stewart* s.n. (K!). Bursar Nullah, 1954-08-04, *R.R.Stewart* s.n. (K!). Shinghai Gah - Pahot Gali 2880 m, *Miehe 738a!*. Baghrot Vy. 2860-3340 m, *Miehe 4320!*; above Sat 3010 m, *Schickhoff 484!*. **Hunza:** Minapin 1930 m, *O.Polunin 6068* (BM). Baltit 2300 m, *Lobbichler 8* (M!). Chalt - Chaprot 2080-2120 m, *Klötzli & al. 120.14!; 121.07!*. N Chaprot 2380-3150 (?-4000) m, *Klötzli & al. 77.16!; 727.97!*. **Batura:** Khaibar 2760 m, *Klötzli & al. 118.02!*; W Khaibar 3020 m, *27.45!*.

S **Shigar:** Karakorum [? probably Shigar - Skoro P.] 3660 m, 1876-08-07, *C.B.Clarke 30144* (K!). Chirka Khalti, c.5 miles from Shigar towards Thandro, *A.Ghafoor & Z.L.Butt 667* (KUH). Skardu - Shigar 2440 m, *R.R.Stewart 20487* (RAW). **Skardu:** 2330 m, *C.B.Clarke 29939* (K!). **Leh:** [Wandla] 3050-3350 m, 1848-07-06, *T.Thomson* s.n. (K!). Ladakh, common (STEWART 1916). **Shyok:** Shyok Vy., 1847-10/11, *T.Thomson* s.n. (K!). [Calzar] (3660-4270 m), 1848-07-23, *T.Thomson* s.n. (K!).

Unloc.: Karakorum, Bulhan 1956-09-19, *Sh.Ali 291* (K!).

A: N Kashg., E Pamir. Wakhan 2790-3800 m (PODLECH & ANDERS 1977). Chitral: Bumbrait, 1956-07-22, *?Norris/R.R.Stewart 25184* (K! **type** var. *micranthus* MELDERIS); 1956-07-24, *25181*

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(K!). Astor: Rama - Gurikot 2440-2740 m, *R.R.Stewart 22948a* (K!). Kashmir. Himachal Pr.: Baralacha P., *Bor's coll. 326* (DD; ASWAL & MEHROTRA 1994).
D: Siberia, Mongolia - C. Asia; Afgh., N Pakistan, Kashmir, Himalaya, S & E Tibet, China, Japan. *E Asiat.*
E: 1930-3660 (4270) m, mont., frequent in the W & S. *Artemisia brevifolia-Juniperus excelsa* forest-steppes and disturbed habitats, usually with ground-water or under irrigation.
N: *E. dahuricus* generally grows at relatively low elevations. Where, at higher altitudes, it comes into contact with *E. nutans*, there are specimens (hybrids ?), which are difficult to assign to one or the other species.

130. Elymus dentatus (HOOKER f.) TZVELEV, Spisok rast. Gerb. Fl. SSSR **18**: 29. 1970
Agropyron dentatum HOOKER f. 1896

CN **Braldu:** Upper Braldu tributary above Chikor 4050-4100 m, *Miehe 6223!*.

CS **?Biafo/Shigar:** Karakorum [? probably Skoro P.] 4270 m, 1876-08-08, *C.B.Clarke 30186a* (K!).

N **Yarkand:** Surukwat Vy. 3720 m, *Dickoré 428!*. Aghil Gorge 3820-3850 m, *Dickoré 432!; 933!*.

W **Yasin:** Yasin Vy. 2590 m, 1957-08-09, *M.S.Zahur* s.n. (K!). **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12423* (K! **type** var. *scabrum* NEVSKI). **Hunza:** Minapin Gl. (LLOYD & LLOYD 1968). **Hispar:** Hispar Gl., *R.Scott Russell 1869* (BM).

S **Skardu:** Burji P. above Skardu 4570 m, *R.R. & I.D.Stewart 20154* (RAW).
A: Kongur: Upper Oytag Vy. 2900-3080 m, *Miehe 8790!*. Upper Gez Gorge (3000-) 3300-3500 m, *Miehe 5289!; 5327!; 5418!*. W Kunlun: Akaz P. N 2630 m, *Miehe 8628!*; Akaz P. 3200-3600 m, *Miehe 8648!*. Tiznap Vy. N Kudi 2900 m, *Miehe 7535!*. Chilas: Raikot Gl., left lateral moraine, nunatak 3880-4000 m, *Nüsser 411!; 432!*. Deosai: 3780 m, *R.R.Stewart 22111* (K!); 4050 m, *Miehe 2145!*. Shingo Vy., near Gulteri 3350 m, *R.R.Stewart 22230* (K!). Dras: 3350-3660 m, 1848-09-27, *T.Thomson* s.n. (K!); hb. *Munro* (K! **type** var. *kashmiricum* MELDERIS). Above Dras 3350-3660 m, *Duthie 13757* (K!). Zanskar: Pensi P. 4370 m, *H.Hartmann 2612* (K!). Rangdum 3050 m, *Koelz 2855* (BM!). Swat: Beyond Ushu, 2740-3050 m, *R.R.Stewart & A.Rahman 25277; 25373a* (K!). Kashmir: *Jacquemont 1020* (K! **type**?). Baltal, 1848-09-28, *T.Thomson* s.n. (K! **type** var. *elatum* HOOKER f.). Near Baltal, 3050-3350 m, *Duthie 11601* (K!). Ascent Burzil P. 3660 m, *R.R. & I.D.Stewart 19105* (K!). Burzil P. 3660-3960 m., *R.R.Stewart 22050b; 22090* (K!).
D: S Siberia, Altai, W C. Asia to Pamir Alai, W Kunlun, Karakorum, N Pakistan, Kashmir. *W Centr.As.* (subsp. *dentatus: ?Endem.*)
E: (2590) 3050-4100 (4570) m, subalp. (-alp.), rare. Open scrub-steppes (*Artemisia compacta, Festuca olgae*), on rocks and gravel fans. Apparently more common on loess slopes of the W Kunlun.
N: Probably intergrading with *E. thomsonii*, where coming into contact. The Karakorum plants are considered belonging to the typical subsp., while **Elymus dentatus** (HOOKER f.) TZVELEV subsp. **ugamicus** (DROBOV) TZVELEV 1973 (*Agropyron ugamicum* DROBOV 1923, non *Elymus ugamicus* DROBOV 1925) is wide-spread in C. Asia. **Elymus dentatus** (HOOKER f.) TZVELEV subsp. **lachnophyllus** (OVCZ. & SIDOR.) TZVELEV 1973 (*Roegneria lachnophylla* OVCZ. & SIDOR. 1957) was described from Hissar-Darvaz.

131. Elymus fedtschenkoi TZVELEV, Nov. Syst. Pl. Vasc. **10**: 21. 1973
Agropyron curvatum NEVSKI 1932, *Roegneria curvata* (NEVSKI) NEVSKI 1934, non *Elymus curvatus* PIPER 1903, *Agropyron macrolepis* auct. non DROBOV 1925, *Elymus macrolepis* auct. non (DROBOV) TZVELEV 1968

W **Yasin:** Yasin Vy. 2590 m, 1957-08-09, *M.S.Zahur* s.n. (K!); Moshbar Nala 3960 m, 1957-08-11, *M.S.Zahur* s.n. (K!). Andarb 3050 m, 1957-07-28, *M.S.Zahur* s.n. (K!). Naz Bar 3610-3660 m, *Miehe 3437!* (cf.). Jud Bar 4290 m, *Miehe 7030!* (sheaths without long retrorse hairs). **Gilgit:** Naltar Lakes 3960 m, *R.R.Stewart 26607* (K!). Shinghai Gah - Pahot Gali 4000-4150 m, *Miehe 942!; 1023!; 1388!*. **Hunza:** Rakaposhi N, above Nilt 3730-3780 m, *Miehe 6525a!; 6643!*. **Hispar:** Makerum, Hispar Gl. 3810 m, *R.Scott Russell 1387* (BM!). Gharesa Gl., 12 miles E of Nagar 3890 m, *O.Polunin 6259* (BM).

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S **Shigar:** Sokha Gl., left bank 3960 m, *R.Scott Russell 1669* (BM!).

A: E Tadzh. Wakhan: Upper Boroghil Vy. 3300-3800 m, *Anders 7893* (PODLECH & ANDERS 1977). Chilas: Raikot Gl., left lateral moraine, nunatak, base camp area 4030 m, *Nüsser 520!*. Astor: Above Doyan 3050-3350 m, *Duthie 12657* (K!). Kalapani P. 3660 m, 1952-08-12, *I.A.Siddiqi* s.n. (K!). Dras: S above Matayan 3550 m, *H.Hartmann 2336!*. Swat: beyond Ushu, near Batain 2740-3050 m, *R.R.Stewart & A.Rahman 25042a; 25342* (K!).

D: C. Asia - W Siberia; N Pakistan (Swat, Gilgit, Astor), Ladakh. *W Pamir.*

E: (2590) 3050-4150 m, subalp. - alp., not common in W and S Karakorum. Relatively humid scrub (*Salix karelinii, Juniperus sibirica*), meadows (*Kobresia schoenoides*) and open tall-forb communities on screes in the subalpine - alpine transition zone. A tall, stout grass, not very xeromorphic and in the Karakorum apparently preferring the monsoon-influenced regions. In drier habitats and in the extreme W it is ± substituted by *E. russellii* (see there).

N: The characteristic indument of the lower sheaths and leaves varies apparently with the hygric conditions. Plants from humid outer Gilgit (*Miehe 942*) have many long and short retrorse hairs, which are sparser on plants from Hunza (*Miehe 6643*) and the long hairs may diminish completely on specimens from Yasin (*Miehe 7030*).

* **Elymus himalayanus** (NEVSKI) TZVELEV 1972 (*Roegneria himalayana* NEVSKI 1934, *Agropyron himalayanum* (NEVSKI) MELDERIS in BOR 1960) - **A**: Wakhan: Tolibai Vy. 4000-4200 m, *Anders 8061!* (PODLECH & ANDERS 1977). Swat 2740-3050 m. Hazara: Kaghan Vy. 3830 m, *Miehe 143!*. Kashmir 3050-3660 m.

* **Elymus hispidus** (OPIZ) MELDERIS 1978 (*Triticum intermedium* HOST 1805, non *Elymus intermedius* M. BIEB., *Elytrigia intermedia* (HOST) NEVSKI 1933, *Agropyron hispidum* OPIZ in BERCHT. & OPIZ 1836) - **A**: ?Deosai 3700 m, *Miehe 2085!. Artemisia brevifolia-Juniperus excelsa* steppe-forest. **N**: Perhaps misidentification of *E. cognatus* X *E. repens*; *E. hispidus* subsp. *hispidus* and subsp. *barbatulus* (SCHUR) MELDERIS are only reported from Baluchistan in Fl.Pak.

132. Elymus jacquemontii (HOOKER f.) TZVELEV, Pl. As. Centr. 4: 221. 1968

Agropyron jacquemontii HOOKER f. 1896, *Anthosachne jacquemontii* (HOOKER f.) NEVSKI in KOMAROV 1934, ? *Agropyron jacquemontii* HOOKER f. var. *pubescens* PAMPANINI 1926, *Elymus tschimganicus* auct. non (DROBOV) TZVELEV („*E. czimganicus*") 1968: ?TZVELEV 1968 p.p., PODLECH & ANDERS 1977, *Elymus canaliculatus* auct. non (NEVSKI) TZVELEV 1968: ?TZVELEV 1968 p.p.

CS **Saltoro:** Above Hushe 3660 m, *Miehe 1890!*. **Nubra:** Nubra Vy. 5180 m, *T.Thomson* s.n. (K!; HOOKER 1896).

N **Mustagh Ata:** ? Mustagh Ata, 1909-07-20, *Divnogorskaya*; ? Mustagh Ata - Sarykol Mts., Kashgar - Taxkorgan Rd., Ulug-Rabat 1959-06-12; ? 10-12 km S Ulug-Rabat 4100 m, 1959-06-14, *Junatov* (Pl.As.Centr.: "*E. czimganicus*"). Mustagh Ata N 3900 m, *Miehe 5441!*; SW 4000-4080 m, *Miehe 5897!*. Hills W [Little] Karakul 4050-4350 m, *Miehe 5343!; 5355!, 5384!*. P. between Tagama basin and [Little] Karakul [Ulug-Rabat] 4100 m, *Miehe 5264!*. ? Jam-Bulak-Bashi Gl. 4440 m, 1894-07-29, *S.Hedin* (OSTENFELD 1922: "*E. longe-aristatus*"). **Taxkorgan:** S Taxkorgan, above Dafda, 4110 m, *Miehe 5579!*.

W **Yasin:** Naz Bar 3920-4200 m, *Miehe 3444!; 3461!; 3472!; 3549! 3558!; 3570!*. **Gilgit:** Baghrot Vy. 3180-4350 m, *Miehe 3822!; 4330!; 4540!*; 3600 m, *Nüsser 1259!* (cf.). **Hunza:** NE Chalt 2880-3390 m, *Klötzli & al. 24/25/26.08!*. **Batura:** Gulmit - Atabad 4000-4270 m, *Miehe 2754!; 2817!; 2979!*. **Khunjerab:** P. SW 4150-4620 m, *Miehe 2471!; 2505!; 2514!; 2525!; 2528!*.

S **Leh:** Taglang P. NW 4950 m, *H.Hartmann 4096!*.

E **Depsang:** Camp Piccolo Cumdan 4930 m, *Dainelli & Marinelli* (PAMPANINI 1930: *Agropyron jacquemontii* var. *pubescens* PAMPANINI). **Aksai Chin:** Beyond Lanak P. 5300 m, 1927-08-16, *Bosshard* (Z! "*E. longe-aristatus*").

A: Kongur: Upper Gez Gorge 3500 m, *Miehe 5329!*. E Pamir. Wakhan 4000-4400 m ! (PODLECH & ANDERS 1977: "*E. tschimganicus*"). Zanskar: E Markha Vy., Nimaling 4960 m, *H.Hartmann 3019!*.

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S above Tchatchutse 4530 m, *H.Hartmann 3020!*. Debring, Rd. to Taglang P. 4820 m, *H.Hartmann 4095!*. Pogmar P. SE 4750 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. Sumdo 4800 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. Nakli P. 4500 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. Chumik Marpo 4700 m, 1993-07-26, *Holzner & Kriechbaum* s.n.!. Rupshu: Tso Morari, *G.Stoliczka* s.n. (K!). Nuruchan 4750-4830 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. W Tibet: Gnari Khorsum, left side of the Satlej, from the surface of the lacustrine plain only 14800-15300' [4510-4660 m], 1855-07-23, *Schlagintweit 7372* (GOET!). W Gar (N 32°10' E 79°57') 4330 m, *Miehe+9663a!*. SE Garyarsa, Upper Gar Vy. (N 31°32' E 80°24') 4650 m, *Miehe+9657!*. Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4680 m, *Miehe+9610b!* (cf.).

D: E Pamir, Kongur, Wakhan, Karakorum, SW Tibet. *W Tibet.*

E: (2880) 3180-5180 (5300) m, subalp.-alp., *Juniperus turkestanica* dwarf-scrub, meadow steppes, alpine steppes and *Kobresia*-turf.

N: *Elymus tschimganicus* (DROBOV) TZVELEV 1968 apparently has been mixed up with *A. jacquemontii*.

133. Elymus mutabilis (DROBOV) TZVELEV, Pl. As. Centr. 4: 217. 1968

Agropyron mutabile DROBOV 1916, *Roegneria mutabilis* (DROBOV) HYL. 1945

CS **Saltoro:** Above Hushe 3600 m, *Miehe 1879!*.

W **Yasin:** Naz Bar 3930-4200 m, *Miehe 3211!; 3274!; 3375!; 3560!*. **Ishkoman:** Panji P. S, above Holojut 3850-3870 m, *Miehe 6916!*. **Hunza:** Rakaposhi N, above Nilt 3670-3900 m, *Miehe 6485!; 6526b!; 6589!*. **Hispar:** Hispar Gl. 3350 m, *R.Scott Russell 1200* (BM!).

D: Boreal & arctic N Hemisphere; S to ?Caucasus, Mongolia, Tian Shan, ?Pamir-Alai, Karakorum (Gilgit, C. Karakorum), ?W Himalaya, ?S Tibet. *Holarct.*

E: 3350-4200 m, subalp. - alp., rare in the W & S. Relatively humid meadow steppes (*Festuca olgae*), open scree slopes, tall forb communities and *Betula jacquemontii* forests in the subalpine - alpine transition zone.

N: The leaf sheaths are completely glabrous and often ± glaucous.

134. Elymus nutans GRISEB., Nachr. Ges. Wiss. Göttingen 3: 72. 1868

Clinelymus nutans (GRISEB.) NEVSKI 1932, *Elymus sibiricus* auct. non L.: HOOKER f. 1896 p.p.; PAMPANINI 1930 p.p., SULTAN & STEWART 1959 (non *Agropyron nutans* KENG 1941, non *Roegneria nutans* (KENG) KENG 1957)

Ic.: Fl.Xizang.5: fig.86. Fl.Desert.Sin.1: fig.23(1-6).

CN **K2-North:** Muztagh Vy., Sughet Jangal 3930 m, *Dickoré 618!*; Muztagh Vy. E 4220-4420 m. Skyang Vy. 4300 m, *Dickoré 763!*.

CS **Biafo:** Karakorum [near Askole] 3660 m, 1876-08-10, *C.B.Clarke 30373* (K!). Biafo Gl. 4110 m, *R.Scott Russell 1818* (BM). Ste Ste; Askole 3080 m; Mango 3700-4030 m; 3730 m, *H.Hartmann 94* (K!); *95!* [*schrenkianus* ?]. Baintha 4020-4420 m; Skoro P. N 4170 m (HARTMANN 1966). **Saltoro:** Above Hushe 3300 m, *Miehe 1847!*. **Nubra:** Tsarasa to Aranu (right side of the Nubra Vy.), 1856-08-03/04, *Schlagintweit 2095* (K!). [Lower] Nubra Vy., 1848-08-04, *T.Thomson* s.n. (K!); Nubra Vy. 3170 m, *F.Ludlow 413* (BM).

N **Taxkorgan:** Pirali - Taxkorgan 3800-3900 m, *Miehe 5236; 5241!*. **Mintake:** S Taxkorgan, above Mazar 4260 m, *Miehe 5663!*. **Yarkand:** Kunlun S slope 5 km N Mazar 4000 m, *Dickoré 263!*; 3 km W Mazar 3870 m; 10 km SW Mazar 4160 m, *Dickoré 371!*; Ilyk 3520 m (*Dickoré*). Surukwat Vy.; Aghil Vy.; Aghil P. N 3590-4200 m *Dickoré 437!; 488!*. **Karakash:** Xaidulla 3750 m, *Miehe 8330!*.

W **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26679* (K!). Naltar 3660 m, *R.R.Stewart 26500a* (K!); *26681* (K!). Naltar, Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). **Hunza:** Ulter Nullah 2740 m, *R.R.Stewart* (K!). Daintar, *Lobbichler 399* (M!). Minapin 2900 m, 1974-07-22, *F.Gartner* s.n. (GZU!). **Hispar:** Gharesa Gl., 12 miles E of Nagar 3870 m, *O.Polunin 6257* (BM). **Batura:** Khaibar 2500 m, *Klötzli & al. 801.67,76!*. W Khaibar 3920 m, *Klötzli & al. 29.08,13!*. E Morkhoon 3490-3560 m, *Klötzli & al. 87/88.09!*.

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S **Skardu:** Skardu, *Webster 5828* (K!*). Satpura Lake 3050 m, *Nasir & Webster 5828* (K!, RAW). **Leh** Leh 3660-3960 m, 1848-07, *T.Thomson* s.n. (K!); 1856-07-01/15, *Schlagintweit 1410* (K!*); 3450 m (MEEBOLD 1909). Ladakh, common, *Schlagintweit* (GRISEBACH 1868); > 4270 m (HENDERSON & HUME 1873). N Leh 3600-3650 m, *Hartmann 2560!; 3015!*. Bodh Kharbu, *Bimal Misri 326* (K!). Mathu, *Bimal Misri 343* (K!*). Rhizong Vy. (Indus tributary), Leh - Kalatse 3150 m, *Billiet & Leonard 6887* (K!). **Lower Shyok:** Poen, opposite Tsorbat, left side of Shyok, 1856-07-10, *Schlagintweit 6142* (GOET!). Khapalu, left side of Shyok, 1856-07-12, *Schlagintweit 5701* (M!). **Shyok:** [Calzar], 1848-07-22, *T.Thomson* s.n. (K!). **Pangong:** Shushal 4330 m, *Koelz 2443e* (K!).

E **Upper Shyok:** Sassar, 1848-08, *T.Thomson* s.n. (K!).

Unloc.: Tibet occ., temp., 10000-14000', *T.Thomson* s.n. (GOET! **type**). ? Ladakh and Yarkand (HENDERSON & HUME 1873: "*E. sibiricus*", may belong here).

A: Kongur: Bostan-Terek 2400 m, 1934-08-04, *Persson 521* (PERSSON 1938). Jerzil 2800 m, 1930-07-01, *Persson 14* (PERSSON 1938). W Kunlun: Tiznap Vy., Kudi 3000 m, *Dickoré 186!*; W Kudi (3000-3500 m), *Miehe 8514!*. Wakhan: 2790-4250 m (PODLECH & ANDERS 1977). Astor: Descent from Deotso to Das Kirim 1847-07-25, *Winterbottom 703* (K!). Rupal - Gurikot 2440 m, *R.R.Stewart 22863a* (K! *). Burzil P. N 3660 m, *R.R.Stewart 22032* (K!). Rupal Vy. Bayals 3160 m, *Nüsser 589!*. Dras: Chokyal, *Bimal Misri 315* (K!). Himachal Pr.: Khoksar, *Aswal 6551* (ASWAL & MEHROTRA 1994). Uttar Pr.: Garhwal, Badrinath 10000-10600', 1855-08-01/31, *Schlagintweit 10094* (GOET!). Rupshu: Da - Hanle 4570 m, *Koelz 2298a* (K!). ? Rupshu 4570-5490 m, *Stoliczka* s.n. (K!, ? to *E. schrenkianus*). W Tibet: Gnari Khorsum, Lomorti - Poling, 1855-09-05/15, *Schlagintweit 7113* (GOET!, **type** of var. *condensatus* GRISEB.).

D: C. Asia, Pakistan (Chitral, Gilgit, Karakorum; Kashmir), Himalaya. *Centr. As.*

E: (2500) 2730-4420 (4520) m, subalp., frequent. Usually in water-surplus and ground-water habitats: screes, open riverside gravel, *Myricaria bracteata*-scrub, moist turf by springs and flushes.

N: Specimens marked with an asterisk (*) may represent hybrids with *E. dahuricus*, which is sometimes difficult to distinguish from and perhaps intergrades with *E. nutans* in the montane belt. *E. nutans* is a continental subalpine species, common in the central ranges, apparently rare in the S outer ranges (Swat, Hazara, Kashmir). On the fringe of the alpine belt, there are specimens difficult to distinguish from *E. schrenkianus*. "Very similar to *E. sibiricus* L., which differs only in having sessile spikelets and glumes with an awn as long as the body of the glume."

135. Elymus repens (L.) GOULD, Madroño 9: 127. 1947

Triticum repens L. 1753, *Elytrigia repens* (L.) DESV. 1810, *Agropyron repens* (L.) P. BEAUV. 1812

Ic.: Fl.Iraq 9: pl.74. Fl.Pak.143: fig.73. Fl.Xizang.5: fig.79. Fl.Desert.Sin.1: fig.21(4-10).

CS **Biafo:** Biafo Gl. 3100 m, *H.Hartmann 60* (K!).

W **Ishkoman:** Upper Baru Gah 3260 m, *Miehe 6805b!* (with *E. cognatus 6805a*). **Gilgit:** Shinghai Gah - Pahot Gali 3200 m, *Miehe 1503!*. **Hunza:** Rakaposhi NW & W opposite Chalt 3280 m, *Miehe 6689!*.

S **Shigar:** 2350 m, *C.B.Clarke 30490* (K!); 2380 m, *C.B.Clarke 30080* (K!, ? with *E. cognatus*). **Skardu:** Satpura Nullah, above Skardu, *R.R. & I.D.Stewart 20371* (KUH). **Leh:** Shey, *Bimal Misri 333* (K!).

A: [?]Kongur: Jerzil 2800 m, 1930-07-23, *Persson 153* (PERSSON 1938). [?]W Kunlun: Kentalek 2700 m, 1931-07-13, *Persson 210* (PERSSON 1938). Wakhan 2790-3600 m (PODLECH & ANDERS 1977); Khandud 2800 m, *Roemer 280* (M!).

D: Temp. Eurasia (Pakistan: Baluch., Chitral, Baltistan; Ladakh); introduced into many temperate countries. *Euras.*

E: 2350-3280 m, mont., rare in S and W. *Juniperus excelsa* groves and forests, *Juniperus sibirica* dwarf-scrub, *Picea smithiana* and *Pinus wallichiana* forests; in the Karakorum apparently confined to a narrow altitudinal zone and humid and shady situations.

N: The Karakorum plants can be distinguished from other species by the stolons, relatively broad, flat leaves with long and very short hairs above, and the acuminate to shortly awned glumes and lemmas, which are ± densely covered with short spines. *E. repens* probably hybridizes with *E. cognatus* and *E. dahuricus* (see under *E. stewartii*).

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136. Elymus russellii (MELDERIS) T. A. COPE, Fl. Pakistan **143**: 618. 1982
Agropyron russellii MELDERIS in BOR 1960

CS **Biafo:** Biafo Gl. 4110 m, *R.Scott Russell 1800, 1809* (BM).

W **Yasin:** Naz Bar 3840 m, *Miehe 3348!* (sheaths subglabrous); 4100-4200 m, *Miehe 3462!; 3471!; 3575!; 3587!; 3588!*. **Hunza:** Rakaposhi N, above Nilt 3780 m, *Miehe 6526a!* (with *E. fedtschenkoi* and *E. mutabilis*). Above Chaprot 2500 m, *Schickhoff 168!*. **Hispar:** Hispar Gl. 3960 m, *R.Scott Russell 1553* (BM). Makerum, Hispar Gl. 3810 m, *R.Scott Russell 1388* (BM **type**).

D: W & S Karakorum. *Endem.*

E: (2500) 3810-4200 m, subalp.-alp., not common. Dry W-, S- & E-facing meadow steppes in the subalpine - alpine transition zone (Yasin), rarely reported from [rather dry ?] alpine turf (Hunza).

N: *E. russellii* probably arose from the hybrid *E. fedtschenkoi* X *E. mutabilis*. It grows under similar ecological conditions and often together with the putative parents. As regards the length of the arista and the indument of the sheaths (mostly only dense, very short retrorse hairs) it seems to be intermediate between and sometimes grading into one of the putative parent species. On the other hand, *E. russellii* probably merits specific recognition, since it may breed independently, probably developed a special ecological preference and distribution area, and has a characteristic habit.

137. Elymus schrenkianus (FISCHER & MEYER) TZVELEV, Not. Syst. (Leningrad) **20**: 428. 1960
Triticum schrenkianum FISCHER & MEYER 1845, *Agropyron schrenkianum* (FISCHER & MEYER) DROBOV 1916, *Roegneria schrenkiana* (FISCHER & MEYER) NEVSKI 1934, *Elymus sibiricus* auct. non L. 1753: ? PAMPANINI 1930 p.p.

CN **Braldu:** Pamir P. S, near Shuwart 4650-4680 m, *Miehe 6156!*. **K2-North:** K2-N Gl. W 4290-4550 m; K2-N Gl. E 4610 m, *Dickoré 696!*; 4730-5030 m, *Dickoré 663!*. **Shaksgam:** Aghil P. S 4310-4790 m (*Dickoré*).

CS **Shimshal:** Pamir P. 4720-4790 m, *Miehe 6298!*.

N **Mustagh Ata:** W 4340-4380 m, *Miehe 5503!*. SW 4280-4360 m, *Miehe 5929!*. **Yarkand:** 10 km SW Mazar 4160m, *Dickoré 371!*. Aghil P. N 3850-4520 m, *Dickoré 437!; 488!*. **?Upper Yarkand:** Zug-Shaksgam Vy., Kalmuk Lungpa 4500 m, *Clifford* (MASON 1928). **Karakash:** Sughet Davan Vy. 5000 m, *de Terra* (Z!). W Xaidulla 4380 m, *Miehe 7855!*.

W **Yasin:** Naz Bar 3620-4440 m, *Miehe 3060!; 3291!*. **Gilgit:** Shinghai Gah - Pahot Gali 4040-4470 m, *Miehe 965!; 1151!; 1578!*. **Hispar:** Yengutsa Gl., S of Hispar village 3960 m, *O.Polunin 6384* (BM). **Batura:** Gulmit - Atabad 4150-4260 m, *Miehe 2801!*. **Khunjerab:** P. SW 3900-4720 m, *Miehe 2342!; 2497!; 2556!*.

E **Changchenmo:** Kiam 5100 m, 1927-08-11, *Bosshard* (Z!). Lacarpo, Lanak P., 1927-08-13, *Bosshard* (Z!). **?Depsang:** Akash Gl. 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930: "*E. sibiricus*"). **Aksai Chin:** N Tibetan Mts. 5100-5160 m, *Miehe 8037!; 8232!*. ? Lingzi Tang & Aksai Chin 5180 m, *Picot* (HEMSLEY 1895: *E. sibiricus*).

A: W Kunlun: Tiznap Vy. N Kudi 4100 m, *Miehe 7452!*. Upper Tiznap Vy. 3840-3950 m, *Miehe 7554!; 7555!; 8557!*. Mazar P. NE 4380 m, *Dickoré 288!*; 4470-4480 m, *Miehe 7756!* (cf.); *7774!* (cf.). E Pamir. Wakhan: 2930-4400 m (PODLECH & ANDERS: subsp. *pamiricus*). Zanskar: S above Nimaling 5170 m, *H.Hartmann 3017!*. Laju P. 4700 m, 1992-07-29, *Holzner & Kriechbaum* s.n.!. Sarchu 4400 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. Sumdo 4800 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. ?Hazara. ?Kashmir. ?Himachal Pr.. Rupshu: Nuruchan 4650 m, 1992-07-24, *Holzner & Kriechbaum* s.n.!. Starsa Puk Tso 4550 m, 1992-07-25, *Holzner & Kriechbaum* s.n.!. W Tibet: Gnari Khorsum, Northern foot of Uta Dhura Pass across the Kiungar Pass to its northern foot 16200-17600' [4940-5360 m], 1855-07-09/12, *Schlagintweit 7342* (GOET!). Upper Domar Chu 5130-5240 m, *Miehe 7910; 7913!; 7952!; 8067!* (cf.). Shiquanhe - Aong Co (N 32°28' E 81°20') 4900 m, *Miehe+9672b!*. W Wuma (N 32°23' E 83°08') 5180 m, *Miehe+9677b!*. E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680c!*. Garyarsa - Moincer, Indus-Sutlej divide (N 31°23' E 80°32') 4750 m, *Miehe+9655a!*. N Moincer (N 31°15' E 80°15') 5250 m, *Miehe+9641b!*; 5050-5280 m,

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Miehe+9642b!; 5280-5550 m, *Miehe+9643a!.* Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4570 m, *Miehe+9619b!.* Changtang: Lungmu Co 5170 m, *Miehe 8129!* (cf.).

D: C. Asia, Karakorum, Pakistan (Gilgit, Hazara), Kashmir, Himalaya. *Centr. As.*

E: (3620) 3850-5180 m, (subalp.-) alp. - subniv., frequent in N and C. Karakorum. Alpine turf, steppes (*Festuca olgae, Stipa purpurea*) and open scree slopes, up to the highest vegetation patches of the free gelifluction belt (*Sibbaldia tetrandra, Saussurea gnaphalodes*).

N: On the K2-N slope, *E. schrenkianus* probably reaches the highest altitude among the grasses. *E. schrenkianus* acts as the alpine vicariant of *E. nutans* which is mainly distributed in groudwater-influenced habitats of the subalpine belt. Some specimens of the subalpine-alpine transition zone are difficult to assign to one or the other species, when the characteristic twisting of the spikelet above of the glumes of *E. schrenkianus* is not clearly expressed. Reduced forms of *E. nutans* sometimes do not have more than one spikelet on the joints of the inflorescence. The indument of the lemmas is also variable; *E. schrenkianus* seems to have a tendency towards short, somewhat curved trichomes, while the lemmas of *E. nutans* mostly carry stiff spines. **Elymus schrenkianus** (FISCHER & MEYER) TZVELEV subsp. **pamiricus** (TZVELEV) TZVELEV, Nov. Syst. Pl. Vasc. 9: 62. 1972 (*Elymus pamiricus* TZVELEV 1960), **type** from E Pamir: W Pshart Vy.; also recorded from NW Tibet and Mongolia, is doubtfully distinct.

138. **Elymus schugnanicus** (NEVSKI) TZVELEV, Nov. Syst. Pl. Vasc. 9: 62. 1972

Agropyron schugnanicum NEVSKI 1932, *Roegneria schugnanica* (NEVSKI) NEVSKI 1934, *Agropyron canaliculatum* auct. non NEVSKI 1932: BOR 1970 p.p.

CS **Biafo:** Mango 3780 m, *H.Hartmann 100* (RAW).

N **Yarkand:** Aghil P. N 4520 m, *B.Dickoré 516!*

W **Ghizar:** Yarkhun, Chumarkhan P. E of Mastuj 3660 m, *J.D.A.Stainton 2902* (BM). Sunji Vy. 3050-3350 m, *M.S.Zahur* (K!). **Hispar:** Barpu Gl. 3050-3350 m, *R.Scott Russell 1094* (BM).

S **?Shigar:** Karakorum [? probably Shigar - Skoro P.] 3810 m, 1876-08-07, *C.B.Clarke 30164* (K!). **Skardu:** Ascent to Deotso [Deosai] from Skardo, 1847-07-23, *Winterbottom 879* (K!). **Leh:** Kanda P. N 4570 m, *H.Hartmann 2551!.*

E **Upper Shyok:** Sassar, 1848-08, *T.Thomson* s.n. (K).

A: Wakhan 3200-4600 m (PODLECH & ANDERS 1977). Mt.Noshaq, Qasideh Vy. 3200 m, 1960-08-01, *R.Yoshii 555* (KYO!); 4000 m, 1960-08-21, *R.Yoshii 727* (KYO!). Chilas: Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1346!.* Swat. [?]Himachal Pr..

D: C. Asia, Pakistan (Chitral, Gilgit, Karakorum). *W Pamir.*

E: 3050-4570 m, subalp. - alp., rare and scattered. Dry stony slopes.

139. **Elymus semicostatus** (NEES ex STEUDEL) MELDERIS in HARA, STEARN & WILLIAMS, Enum. Fl. Pl. Nepal 1: 132. 1978

Triticum semicostatum NEES ex STEUDEL 1854, *Triticum striatum* NEES ex STEUDEL 1854, *Roegneria striata* (NEES ex STEUDEL) NEVSKI 1934

CS **Shimshal:** 3000 m, *Visser-Hooft* (DOLK 1929).

W **Yasin:** Yasin Vy. near Moshbar 3660 m, 1957-08-10, *M.S.Zahur* s.n. (K!). **Gilgit:** Gilgit, field borders 1520 m, *R.R.Stewart 26610* (BM!, K!). Naltar 3050 m, *R.R.Stewart 26609* (K!*, RAW). Shinghai Gah - Pahot Gali (2150-) 2300-2430 m, *Miehe 706!; 1791!.* **Hunza:** Chalt - Chaprot 2120 m, *Klötzli & al. 120.08!.*

A: Chitral: Brir 1520 m, *M.A.Siddiqui & A.Rahman 26758* (BM!). Chilas: Gor 2690 m, *Schickhoff 1590!.* Astor: Astor - Rama 2440-2740 m, *R.R.Stewart 22882* (K!). Rama - Gurikot 2440-2740 m, *R.R.Stewart 22948* (K!). Gudhai Vy. 3350-3660 m, *Duthie 12186* (BM!*). Swat. Hazara: Kaghan Vy. Kashmir: Srinuggur [Srinagar] 7800' [2380 m], 1876-07-16, *C.B.Clarke 29116* (BM!, **type** var. *validus*). Tilail 2740 m, *C.B.Clarke 30719* (BM!*). Pir Panjal, in herbosis excelsis, *Jacquemont 1192* (K!*). Pir Panjal, Yusi Marg 2440 m, *R.R.Stewart 23260* (BM!*). Gojipatri near Nil Nag 2130 m, *R.R.Stewart 23075* (BM!*). Kishtwar 2130-2440 m, 1848-06-16, *T.Thomson* s.n. (K!*); 1848-06-18, *T.Thomson* s.n. (K!*). Lidder Vy., Pahlgam 2190 m, *R.R.Stewart 21471* (BM!*); Pornspul above

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Pahlgam, *R.R.Stewart 21802* (K!, BM!*). Himachal Pr.: Keylong - Jispa, *Aswal 10250* (ASWAL & MEHROTRA 1994).

D: Afgh., Pakistan (Kurram, Chitral, Hazara, Gilgit), Kashmir, Himalaya - Sikkim. *W Himal.*

E: (2150-) 2300-3050 (-3660) m, mont. *Artemisia brevifolia-Juniperus excelsa* forest-steppes.

N: Very variable, the above cited material probably being not homogenous. Specimens determined as *E.* [*semicostatus* var.] *validus* are marked with an asterisk (*). This plant is very robust and resembles *E. fedtschenkoi* or *E. russellii*, it may merit specific recognition.

140. Elymus stewartii (MELDERIS) T. A. COPE, Fl. Pakistan **143**: 627. 1982

Agropyron stewartii MELDERIS in BOR 1960

W **Yasin:** Naz Bar 4100 m, *Miehe 3480!*. **Ishkoman:** Baru Gah 3450-3600 m, *Miehe 6779!*. Upper Baru Gah 3850 m, *Miehe 6863!*.

S **Leh:** N Leh 3650 m, *H.Hartmann 3014!*. **Lower Shyok:** Near Kasurmik, Shyok watershed 9-10000' [2740-3050 m], 1940-08-15, *R.R. & I.D.Stewart 20704* (K! **type**). Blaghar 3050 m, *R.R.Stewart 20844A* (K).

D: SW Karakorum (Gilgit, Baltistan). *Endem.*

E: 2740-4100 m, mont.-subalp., rare. *Juniperus sibirica* dwarf-scrub, tall forb communities in avalanche lines and meadow steppes.

N: *E. stewartii* probably arose from the hybrid between *E. mutabilis* and *E. repens*. The culms and sheaths of *E. stewartii* are glabrous and pruinose (*E. mutabilis*) but the leaf surfaces are sometimes covered with long and short hairs (*E. repens*). Regarding the ± stoloniferous to tufted habit, ± dense spikes, glumes which are spiny on the nerves and glabrous lemmas, *E. stewartii* is ± intermediate between the putative parents.

141. Elymus thomsonii (HOOKER f.) MELDERIS in HARA, STEARN & WILLIAMS, Enum. Fl. Pl. Nepal **1**: 132. 1978

Elymus thomsonii HOOKER f. 1896

CS **Shimshal:** Shachmirk P. W 4000-4200 m, *Miehe 6068!*.

N **Mustagh Ata:** SW 4000-4080 m, *Miehe 5895!*. **Taxkorgan:** Pirali - Taxkorgan 3800-3900 m, *Miehe 5230!*. S Taxkorgan, above Dafda 4110 m, *Miehe 5578!*. **Karakash:** SE Dahongliutan 4800-4850 m, *Miehe 7872!*.

W **Khunjerab:** P. SW 4150-4350 m, *Miehe 2530!*.

A: Kongur: Upper Oytag Vy. 3120 m, *Miehe 8671!*. W Kunlun: Tiznap Vy., W Kudi 3500-3700 m, *Miehe 8503!*. Himachal Pr.: Kunawur, above Lippa, 1847-08-20, *T.Thomson* s.n. (BM!). Uttar Pr.: Ganges Vy. below Rhudughara, 3050-3350 m, 1883-07-21, *Duthie* s.n. (BM!).

D: E Pamir, W Kunlun, N Karakorum; W Himalaya (Kunawur, Garhwal, Kumaon - Nepal). *Endem.*

E: 3800-4350 (-4850) m, subalp. - alp., rare / locally frequent in the NW. Steppes (*Festuca olgae*, *Artemisia compacta*, *Oxytropis* spp.), on open gravel and loess slopes, ± confined to the (lower) alpine belt and an altitudinal vicariant of *E. dentatus*.

N: The species is morphologically very distinct by its long awned, densely hairy lemmas, but hybrids are formed with very different species (*E. dahuricus, E. longe-aristatus*), probably also with the closely related *E. dentatus*. The distribution of *E. thomsonii* seems to be highly disjunct NW and SE of the Karakorum. There seems to be a considerable nomenclatural confusion around the species. "*Elymus thomsonii*" HOOKER f. in sched. (ined.?), is a different plant; a [?]**type** cover of this contains a sheet from Himachal Pr.: Piti, Dankar, 1847-09-02, *T.Thomson* s.n. (K!). This represents a strange, unidentified plant, actually inserted under *Leymus secalinus* (and perhaps a hybrid between this and another genus ?). *Agropyron alaicum* DROBOV 1916 (*Elytrigia alaica* (DROBOV) NEVSKI 1934) - **A**: Wakhan 3150 m, *Roemer 121* (M!; PODLECH & ANDERS 1977) and *Agropyron batalinii* (KRASN.) ROSHEV. 1915 (*Elytrigia batalinii* (KRASN.) NEVSKI 1934) - **A**: Wakhan 4000-4100 m, *Anders 7934* (M!; PODLECH & ANDERS 1977) probably belong here. **Elymus batalinii** (KRASN.) NEVSKI 1934 (*Triticum batalinii* KRASN. 1887, *Agropyron batalinii* (KRASN.) ROSHEV. 1915, *Elytrigia argentea* NEVSKI 1934) may be the correct name for the above taxon.

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* **Elymus tschimganicus** (DROBOV) TZVELEV 1968 ("*Elymus czimganicus*", *Agropyron tschimganicum* DROBOV 1925, *Roegneria tschimganica* (DROBOV) NEVSKI 1934) - **A**: Kongur: Upper Oytag Vy. 3570-3900 m, *Miehe 8813; 9152!*. **D**: Dzungaria, Tian Shan, Alai, Kongu, ?E Pamir. **N**: Records of *A. tschimganicus* from **Mustagh Ata** (Pl.As.Centr.) and Wakhan (PODLECH & ANDERS 1977) probably belong to *A. jacquemontii*. Both species apparently have been mixed up occasionally. *E. tschimganicus* is a taller plant with ± flat leaves, and occurs in *Picea schrenkiana* forests of the N Tian Shan and the Kongur N slopes.

Possible Hybrids:

Elymus canaliculatus X E. cognatus (? *Elymus* X *incertus* H. HARTMANN 1984)
Ic.: HARTMANN 1984: fig.8; pl.6
W **Gilgit:** Above Phuparash 2860 m, *Schickhoff 783!*.
A: Zanskar: Doda Vy., S above Tungri 4000 m (HARTMANN 1984: **type** *E.* X *incertus*).
N: Rather *E. cognatus* than *E. repens* probably is the second parent of *E.* X *incertus*.

Elymus canaliculatus X E. fedtschenkoi ? (*Agropyron* X *interjacens* MELDERIS)
CS **Biafo:** Baintha 4150 m, *H.Hartmann 56!*.
W **Ishkoman:** Deux versants de l'Ishkoman Aghost 4210-4540 m, paturages et endroits humides, *F.Schmid 2430* (K! **type**).

Elymus canaliculatus X E. schrenkianus ?
W **Gilgit:** Baghrot Vy. 3830-3930 m, *Miehe 4243!; 4265!*.

Elymus canaliculatus X E. thomsonii ?
N **Taxkorgan:** S Taxkorgan, above Dafda 4110 m, *Miehe 5578!*.
N: ± intermediate between and growing together with its putative parents.

* **Elymus cognatus X E. nutans ?** (X *Agroelymus koelzii* MELDERIS) - **A**: Zanskar: Mune 12000'[3660 m], 1933-07-17/18, *Koelz 5741* (MICH **type**, foto !).

Elymus cognatus X E. repens ?
W **Gilgit:** Naltar Vy., Jagot 3100-33000 m, 1974-08-03, *F.Gartner* s.n. (GZU!). **Hunza:** Rakaposhi NW & W opposite Chalt 3360 m, *Miehe 5072!* (with *E. repens*: *Miehe 6697*). Minapin 2900 m, 1974-07-22, *F.Gartner* s.n. (GZU!).
S **Skardu:** Deosai N - Satpara 3760 m, *Miehe 5072!*.
N: Rather stout plants with flat leaves and with slightly spiny glumes and lemmas may represent this hybrid, which may be confused with *Elymus hispidus* (OPIZ) MELDERIS.

Elymus dahuricus X E. nutans ?
W **Batura:** Khaibar 2700-2760 m, *Klötzli & al. 118.03!; 801.72,108,112!*. E Morkhoon 3070 m, *Klötzli & al. 94.09!*.
N: ± intermediate and growing together with its putative parents by flushes of the lower subalpine belt.

Elymus dahuricus X E. thomsonii ?
W **Batura:** E Morkhoon 3590 m, *Klötzli & al. 89.18!*.
N: An incomplete specimen determined by Scholz as "*E.* cf. *dahuricus*", has the lemmas long ang densely hairy and long-awned as in *E. thomsonii*, but is a otherwise subglabrous plant like *E. dahuricus*.

Elymus dentatus X E. russellii ? (*Agropyron* X *spurium* MELDERIS)
S **Shigar:** Sokha Gl., right bank 4570 m, *R.Scott Russell 1627* (BM! **type**).

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Elymus nutans X E. repens ?
CS **Biafo:** Biafo Basecamp, *H.Hartmann 57!.*

* **Elymus repens X E. schrenkianus** *?* - **A**: Wakhan: Deh Ghulaman 3100 m, *Anders 7934* (PODLECH & ANDERS 1977; M!). **N**: The specimen probably is *E. dahuricus.*

Elymus schrenkianus X E. thomsonii ?
N **Taxkorgan:** S Taxkorgan, above Dafda 4270 m, *Miehe 5613!.*

142. Enneapogon persicus BOISS., Diagn. Pl. Or. Nov. 1(5): 71. 1844

Pappophorum persicum (BOISS.) STEUDEL 1854, *Pappophorum aucheri* JAUB. & SPACH 1851

Ic.: Fl.Iraq 9: pl.158. Fl.Pak.143: fig.8.

W **Yasin:** Sultanabad 2500 m, *G.Stöber 115!.* **Gilgit:** 1520 m, *R.R.Stewart 26667* (K!). Gilgit Vy. 1220-1520 m, *Duthie 12316* (K!). Deserts near Gilgit 1520-1830 m, *M.W.Khan 26685* (K, RAW). Naltar Vy., near Nomal 1520-1830 m, *Duthie 12635* (K!). Bunji 1100 m, *Klötzli & al. 810.12!.* **Hunza:** Baltit 2600 m, *F.Schmid 1917* (K!, RAW). E Chaprot 2400-2700 m, *Klötzli & al. 730.16!.* Karimabad - Khaibar 2700 m, *Klötzli & al. 808.19!.* **Batura:** Gulmit - Atabad 2500-2930 m, *Miehe 2674!* (very dwarf); *3005!.*

S **Shigar:** Shigar 2440 m, *R.R.Stewart 20580* (RAW). **Skardu:** 2330 m, *C.B.Clarke 30046* (K!). Along S Bank of Indus Rv., 8-9 miles E of Skardu 2290 m, *Nasir & Webster 5866* (K!, RAW).

A: Chitral. Swat. Chilas: Indus Vy., Astor Vy. - Raikot Bridge 1470 m, *Nüsser 907!.* Below Ranote, Haparing (Gor Region) 1950 m, *Nüsser 1204!.* Indus Rv. terrace, KKH - Old Bunji Bridge 1380 m, *Nüsser 706!.*

D: SE Spain; NE Africa, SW & C.Asia: Egypt, Arabia - Turkmenistan, India. *Sud.-Sind.*

E: 1100-2700 (2930) m, subtrop. - coll., occasional in the SW. Deserts, *Artemisia* scrub-steppes, on rocks and gravel-fans.

N: "A desert species, useful pasture and fodder plant in parts of Iraq" (Fl.Pak. 143). **Enneapogon borealis** (GRISEB.) HONDA 1936 (*Pappophorum boreale* GRISEB. in LEDEB. 1852, *Enneapogon brachystachyus* (JAUB. & SPACH) STAPF in DYER 1900) occurs from Dzungaria & E Kashgaria north- and eastwards.

143. Eragrostis minor HOST, Gram. Austr. 4: 15. 1809

Poa eragrostis L. 1753, *Eragrostis poaeoides* P. BEAUV. 1812

Ic.: Fl.Desert.Sin.1: fig.11(3-5).

CS **Nubra:** [Lower] Nubra Vy., 1848-08-04, *T.Thomson* s.n. (K!).

W **Ishkoman:** Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** 1520 m, *R.R.Stewart 26683* (K!). Kargah, 5 miles from Gilgit, *A.Ghafoor & Z.L.Butt 726, 745* (K?).

S **Skardu:** Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 716* (K!); Skardu 2330 m, *C.B.Clarke 29970* (K!); 2130-2440 m, *Duthie 12067* (K!); 2440 m, *Nasir & Webster 5787* (RAW). **Leh:** (STEWART 1916). S Leh 3450 m, *H.Hartmann 2578!.* **Shyok:** Shayuk Vy. [Liakzun - Hundar], 1847-10-22, *T.Thomson* s.n. (K!).

Unloc.: Ladakh 3660-3960, *Thomson* (HOOKER 1896).

A: Wakhan (PODLECH & ANDERS 1977). Chitral. Astor: Ascent to Deotso, *Winterbottom 862* (K!).

D: N, W & C. Europe, Medit., SW, C. & E Asia, trop. Africa; introduced in Australia and America. *Euras.*

E: 1520-3450 m, coll.-mont., scattered in the S & W. (Generally:) Dry to seasonally moist sandy open places, ruderal; "garden weed" (*R.R.Stewart 26683*).

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144. Eragrostis pilosa (L.) P. BEAUV., Ess. Agrost. 162. 1812
Poa pilosa L. 1753

Ic.: Fl.Iraq 9: pl.171. Fl.Xizang.5: fig.34.

W **?Ghizar:** Gilgit Rv. Vy., [?]Ishkoman 1520 m, 1885-07-28, *Giles 247* (K!). **Gilgit:** 1520 m, *R.R.Stewart 26684* (K!). **Hunza:** SE Chalt 1900 m, *Klötzli & al. 124.01!*.

A: Swat. Hazara.

D: C. & S Europe, SW, Middle, C., E and trop. Asia; introduced in S Africa and America. *Euras.*

E: 1520-1900 m, coll., rare. Dry and seasonally moist, ± ruderal habitats, "irrigated ground" (*Giles 247*).

145. Eremopoa altaica (TRIN.) ROSHEV. in KOMAROV, Fl. URSS **2**: 431. 1934
Aira altaica TRIN. 1835
subsp. **songarica** (SCHRENK) TZVELEV, Bot. Zhurn. **51**: 1104. 1966
Glyceria songarica SCHRENK 1841, *Eremopoa songarica* (SCHRENK) ROSHEV. in KOMAROV 1934, *Eremopoa persica* (TRIN.) ROSHEV. var. *songarica* (SCHRENK) BOR 1960

N **Yarkand:** Mazar Dala 3600 m, *Dickoré 388!*).

W **Ghizar:** Shandur P., edge 1 lake 3720 m, *Bowes Lyon 86* (BM!). **Yasin:** Darkot 3350 m, *Bowes Lyon 8071* (K).

S **Skardu:** 2440 m, 1940-08-05, *R.R.Stewart* s.n. (KUH). **Leh:** Leh 3500 m, 1992-07-11, *Holzner & Kriechbaum* s.n.!.

E **Aksai Chin:** Lingzi Tang Plains (4570-5490 m) (HENDERSON & HUME 1873).

A: Wakhan 2750-4000 m (PODLECH & ANDERS 1977). Chitral: Above Shokor Shal 3600 m, 1950-06-18, *Wendelbo* s.n. (BM!). Shishi 1680 m, *Bowes Lyon 630* (BM!). Lowari P. 3050 m, *Harriss 16821* (BM!). Chitral - Mastuj Track, Kuragh 2740 m, *Stainton 2515* (BM!). Astor: Gudai Vy. 3350-3660 m, *Duthie 12663* (K, RAW). Zanskar: Below Dzongkul Gompa 3800 m, *H.Hartmann 2579!*. Sarchu 4400 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Doda Chu, Ramtasha 3200 m, *Southampton Univ. 105* (BM!). Kashmir: Burzil 2820 m, *C.B.Clarke 29603* (BM!). Burzil Chauki 2680 m, *Meinertzhagen* s.n. (BM!). Himachal Pr.: Lahol, left shore of the Bhaga (later Tsinab) at Kardong, 1856-06-14, *Schlagintweit 4063* (BM!). Kyelang, *Jäschcke* (Z!); 3200 m, *Koelz 371* (BM!). Khoksar, *Bor 14586* (DD; ASWAL & MEHROTRA 1994).

D: Turkey, Caucasus - Afgh. (Nuristan), N Pakistan, Kashmir, Himalaya - W China; S Ural - Altai. *Centr.As.*

E: 2440-3600 (?5490) m, mont., rare in the outer valleys (Yarkand, Gilgit-Indus). Open sandy, eutrophic, water-surplus habitats.

N: According to Fl.Pak., subsp. **songarica** (SCHRENK) TZVELEV is the most common taxon in the area; subsp. **altaica** perhaps occurs in Astor: ? Shankargarh 2900 m, *G.M.J.Giles 25* (K), and subsp. **oxyglumis** (BOISS.) TZVELEV 1966 may also be found.

* **Eremopoa bellula** (REGEL) ROSHEV. 1934 (*Festuca bellula* REGEL 1880) - **A**: E Pamir: Sasyk-Kul; Chechekty (Fl.Tadzh.). **D**: W Tian Shan, Pamir. **N**: Perhaps not different from *E. altaica*.

* **Eremopoa persica** (TRIN.) ROSHEV. 1934 (*Poa persica* TRIN. 1830) - **A**: W Pamir, E Pamir (Fl.Tadzh.). **D**: SW Asia: Turkey - Afgh., Pakistan (Baluch.). **N**: Records from Pamir may (partly ?) refer to *E. altaica*.

* **Eremopyrum distans** (C.KOCH) NEVSKI 1934 (*Agropyron distans* C.KOCH 1848) - **Ic.**: Fl.Iraq 9: pl.80. **A**: Wakhan: Eshkashem 2600 m, *Giles* s.n. (PODLECH & ANDERS 1977). **D**: SW & Middle Asia (Turkey - W Pakistan).

* **Eulaliopsis binata** (RETZ.) C. E. HUBBARD in HOOKER 1935 (*Andropogon binatus* RETZ. 1789) - **A**: Swat. Hazara. Kashmir. **D**: SE Asia: Himalaya - N India, Burma, Indo-China, Philippines.

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Festuca:

The genus, apparently, presents relatively few problems in the area. The species of the Karakorum usually are rather well defined, however, mostly on leaf anatomy. *Festuca* provides excellent geoecological monitor species with very characteristic distribution figures. For key and species descriptions see Fl.Pak. and ALEXEEV (1980).

Key to *Festuca* (adapted from Fl.Pak.):

1. Junction of leaf-blade and sheath auricled **2**
\+ Junction of leaf-blade and sheath not auricled **3**
2 Lemmas with an awn 10-18 mm long. Upper surface of leaves without ribs ..... **(F. gigantea)**
\+ Lemmas awnless or with a short awn up to 3 mm long. Upper surface of leaf-blade with prominent ribs. Auricles ciliate on the edge. Lower lemmas often awned ..... **(F. arundinacea)**
(Auricles glabrous. Lower lemmas awnless: **F. pratensis)**
3. Glumes entirely hyaline (except along the nerves), different in texture from the herbaceous lemmas .. **4**
\+ Glumes herbaceous, similar in texture to the lemmas **6**
4. Spikelets greenish-yellow ..... **F. karatavica**
\+ Spikelets whitish, tinged with purple or brown **5**
5. Leaf blades flat or loosely rolled. Ovary densely hairy at the tip. Plants dioecious ..... **F. olgae**
\+ Leaf blades folded. Ovary sparsely hairy at the tip. All spikelets bisexual ..... **F. alatavica**
6. Blades of all leaves flat, without ribs above. Ligule 3-8 mm long **7**
\+ Blades of leaves of vegetative shoots folded-setaceous, ribbed above. Ligule usually less than 1 mm long **8**
7. Lemma 5-nerved, 8-10 mm long ..... **(F. modesta)**
\+ Lemma 3-nerved, 5.5-7 mm long ..... **(F. asthenica)**
8. Lemma awnless or rarely with an awn-point or awn up to 0.8 mm long, glabrous **9**
\+ Lemma with an awn usually over 1 mm long, rarely awnless but then hairy **10**
9. Spikelets loosely disposed in an open panicle. Lemmas with a short awn-point or awn up to 0.8 mm long. Anthers 1.5-1.75 mm long (Kurram) ..... **(F. afghanica)**
\+ Spikelets densely crowded in a narrow panicle. Lemmas quite awnless. Anthers 0.8-1 mm long (Kashmir) ..... **(F. levingei)**
10. Leaf-blade scabrid on the lower (outer) surface for its whole length **11**
\+ Leaf-blade smooth on the lower surface or sometimes scabrid towards the tip **13**
11. Leaf-blade 6-sided in section with 7 approximately equal sclerenchyma strands ..... **F. kashmiriana**
\+ Leaf-blade flattened-cylindrical in section with 3 sclerenchyma strands, 1 on the keel and 2 marginal **12**
12. Leaf-blade 5-nerved, glaucous-pruinose ..... **F. valesiaca**
\+ Leaf-blade 7-nerved, usually green ..... **F. alaica**
13. Leaf-blade with 3 sclerenchyma strands, 1 on the keel and 2 marginal **14**
\+ Leaf-blade with 5-9(-11) sclerenchyma strands, these sometimes united into a continuous or interrupted cover **17**
14. Anthers 1.7-2.5 mm long. Sclerenchyma strands very prominent ..... **F. alaica**
\+ Anthers 0.7-1.4 mm long. Sclerenchyma strands usually less prominent **15**
15. Leaf-blade 5-nerved (rarely 7-nerved but then the outermost pair of nerves much smaller than the innermost pair) ..... **F. coelestis**
\+ Leaf-blade 7-nerved, the outermost pair being equal in size to the innermost pair **16**
16. Spikelets brown ..... **F. pamirica**
\+ Spikelets green, variegated with purple ..... **F. tibetica**
17. Anthers 0.5-0.8(-0.9) mm long ..... **F. nitidula**
\+ Anthers more than 1 mm long **18**
18. Leaf-blades flatted-cylindrical in section. Sclerenchyma in the form of a continuous or interrupted cover, in the latter case forming 3 broad strands or 5-7 narrower ones of which that on the keel is the most extensive ..... **F. hartmannii**

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\+ Leaf-blades flattish or folded, in the latter case being angular and 4-many-sided in section. Sclerenchyma in (5-) 7-9 (-11) sparate strands of which that on the keel does not exceed any of the others in width **19**

19. Ovary densely hairy at the tip **20**

\+ Ovary glabrous or with just a few hairs at the tip (if rather more hairy then distinguished from *F. debilis* by the presence of sclerenchyma on the upper epidermis) ..... **F. rubra**

20. Leaf-blades of fertile culms flat. Spikelets 9-11 mm long. Anthers 1.7-2.2 mm long ..... **(F. debilis)**

\+ Leaf-blades of fertile culms folded-setaceous. Spikelets 14 -17 mm long. Anthers 2.5-3.5 mm long ..... **(F. simlensis)**

146. **Festuca alaica** DROBOV, Trav. Mus. Bot. Acad. Pétersb. **16**: 134, pl.17/5. 1916

Festuca ovina L. subsp. *kotschyi* HACKEL ex BOISS. 1884, *Festuca ovina* L. subsp. *bornmuelleri* HACKEL 1908, *Festuca sulcata* auct. non (HACKEL) NYMAN 1882: BOR in RECH. f. 1970 p.p., *Festuca rubra* auct. non L. 1753: BOR in RECH. f. 1970 p.p.

Ic.: ALEXEEV 1980: fig.5(11-13).

CS **Saltoro:** Ghondokoro Gl., upper end of Hushe Vy., *Nasir & Webster 6125* (RAW, W).

W **Yasin:** Naz Bar 3530-3850 m, *Miehe 3597!*. **Ishkoman:** Imit 3600-3800 m, 1974-07-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Shinghai Gah - Pahot Gali 4000 m, *Miehe 1392A* (K!). Rakaposhi W, above Barti 3020-3050 m, *Miehe 6737!*. Naltar Vy. 3150 m, *G.Braun 233!*. **Hunza:** N Chaprot 3750 m, *Klötzli & al. 7.01!*. Chaprot 3500 m, *G.Braun 627!*.

S **Skardu:** Above Bashu 3230 m, *Schickhoff 916!*. Talu Brok 3330 m, *Schickhoff 1856!*. Ganji Forest 3300 m, *Schickhoff 1914!*. **Leh:** Above Lardo 4460 m, *H.Hartmann 2882!*. SW above Matho 4470 m, *H.Hartmann 2881!*.

A: ?Wakhan: Kishnikhan Vy. 3600-4000 m, *H.Gamerith 77* (W!, cf.). Chitral: Tirich Mir, Zapotili 3600 m, 1950-07-09, *P.Wendelbo* s.n. (K!). Och Anzog 3600 m, 1950-07-19, *P.Wendelbo* s.n. (K!). Golen (Krui Uts), *Bowes Lyon 120* (BM!). Jingeret Gol, W Drosh 3660 m, *Stainton 3201* (BM!). Chilas: Babusar Vy. 2750 m, *Schickhoff 1758!*. Raikot Gl., left lateral moraine 3900 m, *Nüsser 418b!*. S Bezar Gali ("Fulu") 4180 m, *Nüsser 541!*. Astor: Upper Rupal Vy., ascent to Mazeno High Camp 4600 m, *Nüsser 1497!*. Deosai: Burzil P. N 3960 m, *R.R. & I.D.Stewart 22058a* (K!). Deosai plains, Road to Baltistan 3960 m, *R.R.Stewart 19922* (RAW). Dras: SW above Dras 3450 m, *H.Hartmann 2878!*. S above Yasghum 3520-3540 m, *H.Hartmann 2879!; 2880!*. Suru: Kartse Vy. 4160 m, *H.Hartmann 2883!*. Zanskar: Pensi P. 4360 m, *H.Hartmann 2618!*. S above Tungri 4000 m, *H.Hartmann 2516!*. Swat: Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25311* (K!). Sho Nala, *A.Rahman 228* (K!). Hazara: [Kaghan Vy.], "alpage au-dessus de" Gittidas 4300 m, *F.Schmid 482* (K!). Kashmir: Burzil P. 3960-4270 m, *R.R. & I.D.Stewart 22102* (K!). Rajdani P. top 3660 m, *R.R. & I.D.Stewart 22561* (K!). Pir Panjal, Fras Nag 2740 m, *R.R. & I.D.Stewart 23149a* (K!). 2740-4270 m. Himachal Pr.: Lahul.

D: Turkey, N Iran, Pamir-Alai, Tian Shan, Afgh., W Himalaya (N Pakistan, Kashmir, NW India).
Map: ALEXEEV 1980: map 8. *Ir.-Tur.*

E: 3020-4470 m, (mont.) subalp. (-alp.), scattered in the S. Relatively humid turf, meadows (*Kobresia schoenoides*), steppes, scrub and relatively dry open forests (*Juniperus excelsa*, *Pinus wallichiana*).

N: *F. alaica* is also common in Afghanistan E of Kurram and Nuristan. It is easily confused with *F. coelestis*, but differs by the often scabrid leaves with more extensive sclerenchyma strands, the narrow panicle, and the large anthers.

147. **Festuca alatavica** (ST.-YVES) ROSHEV. in KOMAROV, Fl. URSS **2**: 528. 1934

Festuca rubra L. subsp. *alatavica* ST.-YVES 1928, ? *Festuca duthiei* HACKEL ex STAPF in HOOKER f. 1896, *Festuca tianschanica* ROSHEV. in KOMAROV 1934, *Festuca altaica* auct. non TRIN. in LEDEB. 1829: STAPF in HOOKER f. 1896, ?PAMPANINI 1930, SULTAN & STEWART 1959, BOR 1960, WEBSTER & NASIR 1965, BOR 1970

Ic.: ALEXEEV 1980: fig.2(10,11).

CN **Braldu:** Pamir P. S, near Shuwart 4420-4520 m, *Miehe 6177!*.

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CS **Biafo:** Gense 3700-4510 m; 3730 m, *H.Hartmann 141* (Z!); 4090 m, *H.Hartmann 139* (K!); 4300 m, *H.Hartmann 140* (Z!: habit similar *F. olgae*); Mango 3730-4220 m; 3750 m, *H.Hartmann 138!*; Baintha 4100-4610 m; Skoro P. N 4130-4450 m; 4200 m, *H.Hartmann 144* (Z!); (HARTMANN 1966). Karakorum [? probably Skoro P. - Askole] 4270 m, 1876-08-09, *C.B.Clarke 36252* (K!). **?Biafo/Shigar:** Karakorum [? probably Skoro P.] 4420 m, 1876-08-08, *C.B.Clarke 30215* (K!); *C.B.Clarke 30197* (BM!). **Saltoro:** Ghondokoro and Chogolisa basins, "apparently common at high altitudes", (4270-4880) m (WEBSTER & NASIR 1965); Hushe Vy., Chogolisa Gl. basin 4270 m, *Nasir & Webster 6246* (K!, RAW). Above Hushe 4150 m, *Miehe 1961!; 1984!.*

W **Gilgit:** Jutial Nullah, *R.R.Stewart 26688* (K!, RAW). Shinghai Gah - Pahot Gali 3840-4250 m, *Miehe 1075* (K!); *1116!; 1196!; 1315!.* Baghrot Vy. 3520-3730 m, *Miehe 4037!.* **Hunza:** Rakaposhi N, above Nilt 3850 m, *Miehe 6492!*; 4230-4300 m, *Miehe 6639!.* Rakaposhi NW & W, opposite Chalt 3570 m, *Miehe 6655!.* **Hispar:** Gharesa Gl., 12 miles E of Nagar 3960 m, *O.Polunin 6291* (BM!). Makerum, Hispar Gl. 3810 m, *R.Scott Russell 1395* (BM!); 3810-4110 m, *R.Scott Russell 1422* (BM!).

S **Shigar:** Skoro P. S 4600 m (HARTMANN 1966). **Shigar/Lower Shyok:** Thalle P., *R.R.Stewart 20739* (WEBSTER & NASIR 1965). **Skardu:** Near top of Satpura Nullah 4270 m, *R.R.Stewart 20180* (KUH, RAW). Ganto P. W 3700-3900 m, *Miehe 4880!*; 3970 m, *Miehe 4810!.* Above Bashu 3230 m, *Schickhoff 922!.*

A: Kongur: Billuli Rv., Chumbus Rv., 1909-06-12, *Divnogorskaya*; Yashilkan - Gunyt 4000 m, 1941-07-21, *Serphukov* (Pl.As.Centr.). Upper Oytag Vy. 3620-3780 m, *Miehe 8733!; 8744!; 8747!; 8847!.* Astor: Rama Vy., SW of Astor 3660 m, *Lankester & Pearson 1471* (BM!). Deosai: Deosai E 4300 m, *Miehe 5177!.* Dras: above Dras 3350-3660 m, *Duthie 13790* (K!); Rimochagma Vy. 4270 m, *Duthie 12640* (K!); Karpuchu Vy. 3960-4270 m, *Duthie 11968* (K!). Hazara: Kaghan Vy., Gittidas, *Mutz 214* (K!). Himachal Pr.: Chotadara - Batal, *Sethi & Negi 505* (DD; ASWAL & MEHROTRA 1994).

D: Dzung. Alatau, Tian Shan, Alai, Kongur; S & W Karakorum, NW Himalaya (disjunct). **Map:** ALEXEEV 1980: map. 5. *W Centr.As.*

E: (3230) 3520-4600 (4880) m, subalp. - alp., locally common in the S & W Karakorum. *Betula utilis* forests, scrub (*Rhododendron anthopogon, Salix karelinii*) and relatively humid turf (*Kobresia nitens*); on scree slopes and wet rocks; occasionally in alpine steppes. (Kongur: *Juniperus pseudosabina* scrub and *Kobresia* mats.)

N: *F. alatavica* is closely related to *F. olgae*, and though usually of a very different habit, intermediates may occur. *F. alatavica* generally prefers more humid situations than *F. olgae*.

* **Festuca asthenica** HOOKER f. 1896 (*Festuca modesta* auct. non NEES ex STEUDEL 1854) - **A**: Kashmir 1830-3350 m. **D**: Kashmir (endemic). **Map:** ALEXEEV 1980: map 1.

* **Festuca arundinacea** SCHREBER 1771 - **Ic.**: Fl.Iraq 9: pl.29. **A**: Wakhan 3640-4000 m (PODLECH & ANDERS 1977: **Festuca arundinacea** SCHREBER subsp. **orientalis** (HACKEL) TZVELEV 1970). **D**: (of species:) temp. Eurasia.

* **Festuca brachyphylla** SCHULTES & SCHULTES f. 1827 - **A**: ? Kongur: Upper Oytag Vy. 3900 m, *Miehe 9167!* (cf.). E Pamir. **D**: Arct. Eurasia, S to E Pamir; N America.

148. Festuca coelestis (ST.-YVES) V. KRECZ. & BOBROV in KOMAROV, Fl. URSS 2: 514, 770. 1934

Festuca ovina L. subsp. *coelestis* ST.-YVES 1928, *Festuca valesiaca* auct. non SCHLEICHER ex GAUDIN 1811: ? WEBSTER & NASIR 1965

Ic.: ALEXEEV 1980: fig.6(1).

CS **Shimshal:** Pamir P. 4760-4860 m, *Miehe 6234!; 6273!; 6327!.* **Biafo:** Cho Blok 4100-4180 m; 4100 m, *H.Hartmann 109!; 120* (Z!); 4130 m, *H.Hartmann 111* (Z!); 4180 m, *H.Hartmann 120* (K!, RAW); Ste Ste - Gense 3520 m; Gense 3780-4510 m (HARTMANN 1966). Skoro P. N 4700 m, *E.Reiser 166* (Z!). **?Saltoro:** Hushe Vy., 3350-4270 m, *G.L.Webster 6067; 6080; 6125* (WEBSTER & NASIR 1965: *F. valesiaca*; *6080 = F. hartmannii !*).

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N **Taxkorgan:** Above Dafda 4400 m, *Miehe 5587!*. S Taxkorgan, W KKH (37°03'N 75°27'E) 4400-4660 m, *Miehe 5816!; 5871!*. **Mintake:** Above Mazar 4110-4170 m, *Miehe 5682!*; 4300-4500 m, *Miehe 5638!; 5652!; 5777!; 5784!*. **Yarkand:** 1-4 km S Saryk P. 5000 m, 1959-06, *Junatov* (Pl.As.Centr.).

W **Yasin:** Naz Bar 3620-4500 m, *Miehe 3053!; 3083!; 3096!; 3164!; 3295!; 3450!; 3574!*. Panji P. N 4170-4180 m, *Miehe 6987!*. **Ishkoman:** Ishkoman P. 3960-4270 m, 1954-08, *F.Schmid* s.n. (RAW). **Gilgit:** Shinghai Gah - Pahot Gali 3950-4250 m, *Miehe 1013!; 1057!; 1199!; 1629!; 1663!*. Baghrot Vy. 4060-4350 m, *Miehe 3786!; 3823!*. Naltar Vy., Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). **Hunza:** N Chaprot (3150-) 3590 (-4000) m, *Klötzli & al. 5.03!; 727.52!*. NE Chaprot 4020-4100 m, *Klötzli & al. 17.03!; 18.04!*. **Batura:** Gulmit - Atabad 3600-4370 m, *Miehe 2711!; 2783!; 2821!; 2871!; 2937!*. **Khunjerab:** P. SW 4600-4740 m, *Miehe 2288!; 2324!; 2362!; 2405!; 2444!; 2472a!*.

A: Kongur: Kingtau Mts., 3-4 km SE Kosh-Kulak, 1959-06-10, *Junatov*; Mia Rv. 4000 m, 1941-07-21, *Serphukov* (Pl.As.Centr.). W Kunlun: Tiznap Vy., W Kudi 4340-4410 m, *Miehe 8406!; 8412!; 8431!*. Upper Tiznap Vy. 3950 m, *Miehe 8555!*; 4400-4410 m, *Miehe 7658!; 7698!*; Mazar P. NE 4380 m, *Dickoré 273-2!*; N 4540 m, *Miehe 7781!*. 3-4 km E Saryk P. 4800 m, 1959-06-04, *Junatov* (Pl.As.Centr.). Wakhan: Wazit P. 4600 m, *Breckle 1299* (PODLECH & ANDERS 1977). Chilas: Raikot Gl., left lateral moraine, Base camp area 3970 m, *Nüsser 475!*. Ganalo Gl. right lateral moraine, Base camp area 4200 m, *Nüsser 509!*. Astor: Kamri Vy., 1897-08-25, *Duthie* s.n. (W). Deosai: 3860-4050 m, *Miehe 2098!; 2127!; 2192!*; 3900 m, *Schickhoff 1949!*. Deosai E 4290-4600 m, *Miehe 5127!; 5156!*. Hazara: Kaghan Vy., Babusar P., *Miehe 349!; 462!*. Babusar P., 1954-08-15, *Metz* s.n. (RAW). Kashmir: Pahlgam 4110 m, *C.B.Clarke 31070* (K!). Pir Panjal, Fras Nag 2740 m, *R.R. & I.D.Stewart* s.n. (K!).

D: Dzung. Alatau, Tian Shan, Pamir-Alai, W Kunlun, W & S Karakorum, W Himalaya (Kurram - Kashmir); *3000-4500 m. **Map**:ALEXEEV 1980: map 7. *W Centr.As.*

E: (3210) 3590-4860 (5000) m, (subalp.-) alp. (-subniv.), frequent in the W and S. Meadow steppes, alpine turf and on open screes of the free gelifluction belt, less frequent and ± azonal in water-surplus habitats in subalpine scrub (*Juniperus turkestanica, Salix karelinii, Artemisia* spp.).

N: *F. coelestis* seems to be perfectly allopatric to *F. tibetica*, by which it is substituted S of the Kunlun main ridge, E of Shimshal P., and N of the Karakorum main ridge. *F. hartmannii* is an altitudinal vicariant of the forest-belt in the SW and of the outer ranges.

* **Festuca debilis** (STAPF) ALEXEEV 1978 (*Festuca kashmiriana* STAPF var. *debilis* STAPF in HOOKER f. 1896) - **A**: Kashmir 2440-3660 m. **D**: Kashmir (endemic).

* **Festuca gigantea** (L.) VILL. 1787 (*Bromus giganteus* L. 1753) - **A**: Chitral. Swat: 1520-2400 m. Kalam 2130 m, *A.Rahman 226* (BM!). Hazara. Kashmir: 1980-3050 m. Alibad 3350 m, *C.B.Clarke 29002* (BM!). Himachal Pr.. **D**: Temp. Eurasia (S to Himalaya - Nepal - E India; E to E Siberia), introduced in N America. **Map:** ALEXEEV 1980: map 3.

149. Festuca hartmannii (MARKGR.-DANNENB.) ALEXEEV, Bull. Soc. Nat. Moscou **83**(4): 121. 1978

Festuca ovina L. subsp. *coelestis* ST.-YVES var. *hartmannii* MARKGR.-DANNENB. in HARTMANN 1966, *Festuca valesiaca* auct. non SCHLEICHER ex GAUDIN 1811: WEBSTER & NASIR 1965 ?p.p.

Ic.: ALEXEEV 1980: fig. 6(10-14).

CS **Biafo:** Baintha 4000 m, 1962-07, *Hartmann 114* (K!, RAW **type**); 4000-4100 m: 4100 m, *H.Hartmann 121!*; Mango 3730 m; 3850 m, *H.Hartmann 112* (Z!); (HARTMANN 1966). Skoro P. N 4200 m, *H.Hartmann 115!*. **Saltoro:** Ghondokoro Gl., *Nasir & Webster 6080* (RAW). Above Hushe 3660 m, *Miehe 1903!*.

W **Yasin:** Naz Bar 3620-4180 m, *Miehe 3224!; 3296!; 3360!; 3399!*. **Ishkoman:** Upper Ishkoman, Baru Gah 3450-3600 m, *Miehe 6776!*. Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!); 4000 m, 1974-07-19, *F.Gartner* s.n. (GZU!). **Gilgit:** Shinghai Gah - Pahot Gali (3030-) 3200-4580 m. *Miehe 752!; 795!; 824!; 861!; 889!; 924!; 1080!; 1099!; 1157!; 1214!; 1278!; 1286!; 1309!; 1375!; 1433!; 1532!; 1544!; 1554!; 1687!*. Kar Gah 3190 m, *Schickhoff 2063!*. Baghrot Vy. 3180 m, *Miehe 4329!*; 3820 m, *Miehe 3736!*; above Gutumi Nullah 2980 m, *Schickhoff 560!*. Rakaposhi W, above Barti

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3200-3250 m, *Miehe 6753!*. Above Jaglot Rv. 3210 m, *Schickhoff 624!*. Upper Darchan Vy., above Khaltaro 3210 m, *Schickhoff 696!*. Upper Haramosh Vy., above Iskere 2970 m, *Schickhoff 845!*. **Hunza:** Rakaposhi N, above Nilt 3470-3780 m, *Miehe 6430!; 6521!; 6565!*; above Nilt, Masot Gl. 3170 m, *Schickhoff 267!*. Rakaposhi NW & W, opposite Chalt 3570 m, *Miehe 6654!*. Batura S flank 3500 m, *Paffen 330* (M!). NE Chalt 3720 m, *Klötzli & al. 21.07!*. Pisan 2600 m, *G.Braun 513!*. Chaprot Vy. 3310 m, *Schickhoff 2153!*. **Batura:** Gulmit - Atabad 3900-4000 m, *Miehe 2825!*.

S **Shigar:** Ganto P. E 3600 m, *Miehe 4902!*. Upper Basna Vy., above Gon 3360 m, *Miehe 5009!*. **Skardu:** Burji P. 4270 m, *C.B.Clarke 29017* (K!). Upper Stak Nala, Above Khotia Lungma Gl. 3360 m, *Schickhoff 870!*. Ganto P. W 4050 m, *Miehe 5127!* (cf.). Talu Brok 3330 m, *Schickhoff 1843!*.

A: Chilas: Gor 3520 m, *Schickhoff 1495!*. Rakhiot Vy. 3560 m, *Schickhoff 1644!*. Raikot Gl. left moraine 3820 m, *Nüsser 1310!*. Astor: Near Kalapani, *Duthie 12556* (K!). Above Zaipur 3120-3140 m, *Schickhoff 1077!*; *1093!*. Below Sachen Gl. 3380 m, *Schickhoff 1000!*. Deosai: 4050 m, *Miehe 2157!*; Deosai E 4200-4300 m, *Miehe 5153!* (cf.). Dras: Near Kargeh P. 3960-4270 m, *Duthie 13917* (K!). Marpo P. 4270-4570 m, *R.R. & I.D.Stewart 22299A* (K!). Swat: Beyond Bishigram, *R.R.Stewart & A.Rahman 24924* (K!). Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25311* (K!). Sho Nala 3350 m, *A.Rahman 228* (K!). Hazara: Kaghan Vy., Babusar P. (3200-) 3500-4300 m [very common], *Miehe 37!; 100!; 129!; 161!; 183!; 231!; 249!; 290!; 335!; 511!; 569!*. Saiful Maluk, *Shaukat Ali 22* (K!). Kashmir: Kamri P. 3660-3960 m, *Duthie 12657* (K!). Burzil P. 3660 m, *R.R. & I.D.Stewart 19062* (KUH); *19071* (RAW). Sonamarg 3660 m, *R.R.Stewart 9904* (K!). Sind Vy., *Duthie 11582* (W). Tragbol 3350 m, *C.B.Clarke 29261* (K!). Poonch & Azad Kashmir, Kuthnar, *R.R.Stewart & E.Nasir 23900* (K!). Aliabad 3350 m, *C.B.Clarke 28973* (K!). Apharwat, 1891-07-19, *J.Gamble* (K!). Liddar Vy., Kolahoi, *Duthie 13515* (K!). Musjid Vy., *Duthie 13295* (K!). Songnam Vy. 3960-4270 m, *Duthie 13562* (K!). Bedori (3050-3660 m), 1952-07-02, *R.R.Stewart & E.Nasir* s.n. (KUH). Badrawar, *C.B.Clarke 31516* (LE). Himachal Pr.: Lahul, Jispa, *W.Koelz 2046* (K!, LE, W). Billing Lumpa, *Bor 12669* (K!). Jaunsar, *J.Gamble 24809* (K!). Marhi, 1992, *Holzner & Kriechbaum* s.n.!. Uttar Pr.: Kumaon, Roghas up to the Milum Gl. to Bitterguar, 1855-06-18/19, *Schlagintweit* (LE; ALEXEEV 1980). Near Lebung P. *Duthie 6154* (LE; ALEXEEV 1980). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4000-4300 m, *Miehe+9629b!*.

D: SW Karakorum, W Himalaya (Swat - Kumaon). **Map:** ALEXEEV 1980: map 9. *W Himal.*

E: (2400) 2600-4580 m, subalp. - alp., common in the SW, rare in the C. Karakorum. Forests (*Picea smithiana, Pinus wallichiana, Betula jacquemontii*), relatively humid subalpine scrub (*Rhododendron anthopogon, Salix karelinii*) and alpine turf, up to the highest turf spots in the humid areas; more rarely in forest-steppes (*Juniperus excelsa, Artemisia* spp.), where in rock crevices, screes and other water-surplus habitats.

150. **Festuca karatavica** (BUNGE) B. FEDTSCH., Izv. Petersb. Bot. Sada 14, suppl. 2: 86. 1915

Poa karatavica BUNGE 1854, *Leucopoa karatavica* (BUNGE) V. KRECZ. & BOBROV in KOMAROV

W **Yasin:** Naz Bar 4330 m, *Miehe 3192!*.

A: Badakhshan: Anjuman P. E 4150 m. W Nuristan, Pirdum P. N (2300-3700 m), common, *G.Kerstan 1094* (W!).

D: W Tian Shan, W Pamir-Alai, Iran, C. & E Afgh. (Kabul, Parvan, Wardak, Bamian, Ghazni, Badakhshan, Nuristan), NW Pakistan (Yasin). *Ir.-Tur.*

E: 4330 m, alp., rare in the extreme W. Meadow steppe.

N: A large tufted grass, very common in C. Afgh.; avoided by grazing animals, probably because it is an aluminium-accumulator (BOR & MELDERIS in KÖIE & RECHINGER 1965). The locality of *F. karatavica* in **Yasin** is probably an isolated outpost of its distribution area. *F. karatavica* substitutes the C. Asiatic *F. olgae*; a similar case may be *Tricholepis toppinii* which in the extreme W Karakorum replaces *T. tibeticum*.

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151. Festuca kashmiriana STAPF in HOOKER f., Fl. Brit. India 7: 351. 1896
(excl. var. *debilis* et var. *simlensis*); *Festuca kashmiriana* STAPF var. *ligulata* STAPF in HOOKER f. 1896, *Festuca rubra* L. subsp. *kashmiriana* (STAPF) ST.-YVES 1928

Ic.: ALEXEEV 1980: fig.4(11,12).

W **Hunza:** N Chaprot, *Klötzli & al.* s.n.!.

S **Shigar:** Sokha Gl., right bank 4570 m, *R.Scott Russell 1646* (BM!). Skoro P. S 4500 m, *H.Hartmann* (s.n.?)*!* (HARTMANN 1966). **Skardu:** Burji P. above Skardu 4270 m, *R.R.Stewart 20169* (RAW). Ganto P. W 3990 m, *Miehe 4770!*.

A: Deosai: Deotso, *Winterbottom 880* (K!). Deosai 3860-4050 m, *Miehe 2099!; 2110!; 2135!; 2159!; 2170!; 2177!; 2180!*; 3900 m, *Schickhoff 1944!; 1946!; 1953!*. Deosai E 4100 m, *Miehe 5179!; 5185!*. Shores of Shersan Lake 3960 m, *Duthie 14049* (K!). Dras: Dras Vy. 3350-3660 m, *Duthie 11664* (K!). Rimochagma Nala 3960-4270 m, *Duthie 12641* (K! **isosyntype**). Suru: W Sanmodangsa 4190 m, *H.Hartmann 2876!; 2877!*. Zanskar: Pensi P. 4360 m, *H.Hartmann 2617!*; 4180 m, *Southampton Univ. 158* (BM!); *Koelz 2935* (LE; ALEXEEV 1980). Above Tungri, *H.Hartmann 2615!*. Rangdum 3660 m, *Koelz 5951* (BM!). Debni 4400 m, 1992-08-03, *Holzner & Kriechbaum* s.n.!. Gumburanjon 4600 m, 1993-07-30, *Holzner & Kriechbaum* s.n.!. Above Lakong, 1992, *Holzner & Kriechbaum* s.n.!. Hazara: Kaghan Vy. 2900 m, *Inayat 20237* (K!). Saiful Maluk, *Shaukat Ali 215* (K!). Kashmir: Khillanmarg 3050 m, *R.R.Stewart 10405* (K!). Liddar Vy., Shisha Nag 3660-3960 m, *Duthie 13331* (K!); above Jansu 3350-3660 m, *Duthie 13314* (K!). Musjid Vy. 3960-4270 m, *Duthie 13264* (K!). Sonsal Nala 3960 m, *Duthie 13361* (K!). Tulion above Pahlgam 3660 m, *R.R.Stewart 7849* (K!). Butna Vy., Chenab to Zanskar, 1848-06-20, *T.Thomson* s.n. (K! **syntype**). Himachal Pr.: Lahul, Billing Lumpa, *Bor 12662* (K!); *14757* (K!); *15373* (K!). Spiti, Ki-Chu, *H.Gill 1963* (K!); Punjab, Kulu - Lahaul, *Drummond 23359* (K!). Kunawar, Runang P. 1847-07-21, *T.Thomson* s.n. (K!). Bashahr, Harang P. 3960 m, *J.H.Lace* s.n. (K!). Khoksar, *Bor 12295* (DD; ASWAL & MEHROTRA 1994). Uttar Pr.: Tihri-Garhwal, below Srikanta, *Duthie 262* (LE; ALEXEEV 1980).

D: ?SW Dzungaria-Kashgaria; W Himalaya: N Pakistan, Kashmir, NW India (- Lahul, Kunawur, W Nepal); 3100-4700 m. **Map**:ALEXEEV 1980: map 5. *W Himal.*

E: 3990-4500, alp., rare in the S. Alpine steppes and turf (*Kobresia schoenoides*, *Carex melanantha*).

* **Festuca levingei** STAPF in HOOKER f. 1896 - **A**: Kashmir: 1875-08, *Levinge* (K! **type**). **D**: Kashmir: endemic, "known only from the type which is without precise locality" (Fl.Pak.).

* **Festuca modesta** NEES ex STEUDEL 1854 - **A**: Kashmir 1830-2130 m. **D**: Himalaya (Kashmir, Uttar Pradesh - W Nepal), SE Tibet, SW China (Sichuan, Yunnan, Hubei). **Map:** ALEXEEV 1980: map 1.

152. Festuca nitidula STAPF in HOOKER f., Fl. Brit. India 7: 350. 1896

Ic.: Fl.Xizang.5: fig.44(5-7). ALEXEEV 1980: fig.2(12,13).

S **Leh:** Nima Mud, *Koelz 2342* (LE). Valley above Pugha, 1847-09-23 [>4720 m, above hot borax-springs], *T.Thomson* s.n. (K! **syntype**). **Shyok:** [Calzar] (3660-4270 m), 1848-07-23, *T.Thomson* s.n. (K! **lectotype**).

Unloc.: Valleys of Tibet 4570 m, *Strachey & Winterbottom 1* (BM!, K! **syntype**).

A: Kashmir: Kamri Vy., *Duthie 12566* (W; ALEXEEV 1980). Himachal Pr.: Punjab, Dharamsala, *C.B.Clarke 23979* (K; ALEXEEV 1980).

D: Tian Shan; S Tibet, Inner Himalaya (SE Karakorum, E Ladakh, Kashmir, Himachal Pradesh, Nepal - SE Tibet); 4000-5000 m (disjunct). **Map:** ALEXEEV 1980: map 3. *S Tibet.*

E: (3660) 4270-4720 m, alp., rare in the SE. (Generally:) Humid alpine turf.

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153. Festuca olgae (REGEL) KRIVOT., Not. Syst. (Leningrad) **20**: 56. 1960

Molinia olgae REGEL 1881, *Leucopoa olgae* (REGEL) V. KRECZ. & BOBROV in KOMAROV 1934, *Festuca sibirica* HACKEL ex BOISS. 1884, *Festuca deasyi* RENDLE 1900, *Colpodium afghanicum* BOR 1970 syn. nov., *Leucopoa sibirica* auct. non GRISEB. 1852: HOOKER f. 1896, "*Schoenodorus transparens*" HOOKER & THOMSON in sched., *Leucopoa albida* auct. non (TURCZ. ex TRIN.) V. KRECZ. & BOBROV 1934, *Festuca alatavica* auct. non (ST.-YVES) ROSHEV. in KOMAROV 1934: WEBSTER & NASIR 1965

Ic.: ALEXEEV 1980: fig. 2(5-9).

CN **Braldu:** Pamir P. S, near Shuwart 4650-4680 m, *Miehe 6155!*. **K2-North:** Muztagh Vy. E 4250-4420 m, *Dickoré 892!*. K2-N Gl. W 4360-4460 m. K2-N Gl. E 4590-4620 m, *Dickoré 718!*. **Shaksgam:** Aghil P. S 4580-4630 m (*Dickoré*).

CS **Shimshal:** Shachmirk P. W 4030-4440 m, *Miehe 6019!*. **Biafo:** Mango 3700 m, *H.Hartmann 123!; 127* (K!, Z!); 3730 m; Cho Blok 4180-4240 m; 4180 m, *H.Hartmann 125* (Z!). Gense 4350-4510 m; Laskam 4430-4700 m. Karakorum [? near Askole] 4270 m, 1876-08-12, *C.B.Clarke 30455* (K!). **Biafo/Shigar:** Karakorum [Skoro P.] 4270 m, 1876-08-08, *C.B.Clarke 30183* (BM!, K!); 4570 m, 1876-08-08, *C.B.Clarke 30205* (K!); 4420 m, 1876-08-08, *C.B.Clarke 30222* (BM!). **Saltoro:** Tsogosbang above Barol Brok (right side of Sospor Gl.), 1856-07-17, *Schlagintweit 6094* (M!). Upper Hushe Vy., abundant, 3350-4570 m (WEBSTER & NASIR 1965); Hushe Vy., Daltsangpa 4270 m, *Nasir & Webster 6197* (K!, RAW); c. 1 mile S Shahircho 3510 m, *Nasir & Webster 6062* (K!); opposite Shahircho 3660-3960 m, *Nasir & Webster 6141* (K!); Atosar Vy. 3810 m, *Nasir & Webster 6150* (K!; M!). Above Hushe 4150 m, *Miehe 1941!;* 4350 m, *Miehe 2015!*. Kondus Gl. 1961-06, *W.Axt* s.n. (W!). **Nubra:** Nubra [Sassir P. W] 3660-4570 m, 1848-08-12, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** Hills W [Little] Karakul 3900-4200 m, *Miehe 5336!; 5394!*. **Taxkorgan:** S Taxkorgan, above Dafda 4110 m, *Miehe 5575!*. **Yarkand:** Aghil Vy., Aghil P. N 3990-4250 m (*Dickoré*).

W **Ghizar:** Ghutbar 4270 m, *Bowes Lyon 49* (BM!); *51* (BM!, W!); *53* (BM!). Chumarkhan P. E Mastuj 3960 m, *Stainton 2896* (BM!, W!). **Ishkoman:** Chhantir Gah, 1954-08, *F.Schmid* s.n. (RAW). Pekova 3900 m ("abundant 3810-4420 m"), *Bowes Lyon 8233* (K!). Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Baghrot Vy. 3180 m, *Miehe 4331!*; 3720 m, *Miehe 4189!*; 3830-3930 m, *Miehe 4237!;* 3480 m, *Nüsser 1234!*. **Hunza:** NE Chaprot (3600-4400 m), *Klötzli & al. 728.79!*. Rakaposhi N, above Nilt 3620-3900 m, *Miehe 6503!; 6575!*. **Hispar:** 4 miles W of Hispar Village 3960 m, *O.Polunin 6327* (B!, BM!). **Batura:** Khaibar 3780 m, *Miehe 2643!*; 4000 m, *Miehe 2602!*. W Khaibar 3920 m, *Klötzli & al. 29.26!*. E Morkhoon 3860 m, *Klötzli & al. 36.22!*; *38.21!*.

S **Skardu:** Ronishikar 3960 m, *Duthie 11979* (K!). Satpura Nullah above Skardu 3960 m, *R.R.Stewart 20340* (RAW). Ganto P. W 3300-3920 m, *Miehe 4662!; 4694!; 4823!*. Pakora, Ganto P. W 3500 m, 1991-07-04, *J.Poelt* s.n.!. **Leh:** Timti P. via Timti to Kharbu Koma, 1856-07-02/03, *Schlagintweit 6536* (K!). Kharbu Koma to Shaksi (SW of Dah), 1856-07-03, *Schlagintweit 5348* (GOET!). Alchi Brok 4460 m, *H.Hartmann 2355!*. Stok Phu Vy., 4550 m, *H.Hartmann 2566!*. Taglang P. N 4800 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. **Shyok:** Above Chortren Chen 5180 m, *Koelz 2659* (BM!, K!).

Unloc.: Plains of Tibet 4570 m, *Strachey & Winterbottom 2* (K!).

A: Kongur: Upper Oytag Vy. 3450-3770 m, *Miehe 8692!; 8804!; 9200!*. Upper Gez Gorge 3500 m, *Miehe 5320!*. W Kunlun: Ak-kez P., 1959-07-05, *Junatov & Yuan I-Fen 354* (K!). 35-38 km S Kudi, Rd. to Saryk P. 4180 m, 1959-06-01, *Junatov* (Pl.As.Centr.). Upper Tiznap Vy. 4100-4300 m, *Dickoré 954!*. C.Kunlun: Keria Mts., near Han-yut 4000 m, 1885-07-13, *Przewalsky*; Cherchen 4190 m, *Li & al. 9420* (Pl.As.Centr.). Wakhan 3600-4200 m (PODLECH & ANDERS 1977). Futur Vy. 3900 m, *Roemer 90* (M!, W! **type** *Colpodium afghanicum*; PODLECH & ANDERS 1977). Kishnikhan Vy. 3600-4000 m, *H.Gamerith 88* (W!); 4200 m, *R.Senarclens de Grancy 50* (W!). Upper Istmotsh Vy. 3900-4000 m, *Anders 8120* (M!). Chitral: Tirich Mir, Camp 2 by S Barum Gl. 4500 m, 1950-07-27, *Wendelbo* s.n. (BM!, K!). Owir (Nichagh) 3660 m, *Bowes Lyon 889* (BM!). Chilas: Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1338!*. Suru: Kartse 4140 m, *H.Hartmann 2354!*. Zanskar: [Phutaksha P. - Hanupata] 3960-4570 m, 1848-07-04, *T.Thomson* s.n. (K!). Pensi P. 4380 m, *H.Hartmann 2567!*; 5030 m, *Koelz 5922* (BM!). Kargiag, *Bor 14890* (K!). Pogmar P. SE 4900 m, 1992-07-27, *Holzner & Kriechbaum* s.n.!. Sarchu 4500 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Kenlung, *Bor 15135* (K!); *16452* (K!). Himachal Pr.: Spiti, N foot of Tari P. via Mud to S foot of Parang P., 1856-06-12/17,

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Schlagintweit 6947 (BM!, GOET!). Baralacha P., *Bor 14890* (K!). Zinzinglur, *Bor 15275* (K!). Patabo, *Bor 15169* (K!). Kyelang, *Bor 15091* (K!). Rancha Galli, *Bor 15169* (K!). Kulu - Lahaul, *Drummond 23367* (K!). Hangarang P. 3800 m, *Jacquemont 1647* (K! "*Festuca muticum* JACQUEM."). Uttar Pr.: Jumna Vy., Barlavan, *Jacquemont 709* (K! "*Poa pallida* JACQUEM. mss."). Rupshu: Spiti, N foot of Parang P. 1856-06-17, *Schlagintweit* s.n. (BM!).

D: Tian Shan, E Pamir, NE Iran, E Hindukush, Kunlun, Karakorum, NW Himalaya (Chitral - Lahul, Kunawar). **Map:** ALEXEEV 1980: map 4. *W Centr.As.*

E: (2400) 3180-4630 (5180) m, subalp. - alp., locally common. Dry, but in the inner ranges usually N-facing, relatively stable scree and rocky slopes (granite, moraines), cliffs, steppes and scrub-steppes (*Juniperus turkestanica*, *J. sibirica*) and dry meadows. *Festuca olgae* forms a very characteristic and distinctive tussock-steppe belt on the subalpine-alpine border, especially in the N and C. ranges. "One of the most abundant and conspicuous grasses in the Upper Hushe Vy." (WEBSTER & NASIR 1965).

N: "*Colpodium afghanicum* BOR", from the type and only collection is a young and rather dwarf, but otherwise typical specimen of *Festuca olgae*. In the W (Afghanistan), *F. olgae* is substituted by *F. karatavica*; *Festuca nepalica* ALEXEEV 1977 is a closely related endemic of Nepal.

154. **Festuca pamirica** TZVELEV, Not. Syst. (Leningrad) 422. 1960

Festuca rubra L. subsp. *schlagintweitii* ST.-YVES 1928 p.p., *Festuca alaica* subsp. *pamirica* (TZVELEV) TZVELEV 1971,

Ic.: ALEXEEV 1980: fig.5(18-20).

W **Ghizar:** Ghutbar Gol 4270 m, *Bowes Lyon 46* (W!). **Yasin:** NE Yasin, Jud Bar 3820-3900 m, *Miehe 7024!; 7027!; 7050!*. **Ishkoman:** Ishkoman P. 3960-4270 m, *F.Schmid 18* (K!, RAW); "deux versantes de l'Ishkoman Aghost" 4210-4540 m, *F.Schmid 2433* (K!).

S **Shigar:** Thale La - Bagmaharal (northeast of Skardo & Shigar), 1856-08-30, *Schlagintweit 5914* (K!, **syntype** *F. rubra* subsp. *schlagintweitii*). **Leh:** *Schlagintweit* (ST.-YVES 1929: *F. rubra* subsp. *schlagintweitii*).

A: E Pamir: Bilyand-Kiik Vy., near Takhta-Korum P. 4450 m, *Tzvelev 1008* (LE **type**; ALEXEEV 1980). Wakhan: Issyk Vy. 4150 m, *Huss 338*; 4400 m, *Huss 405*; *434* (PODLECH & ANDERS 1977). Pamir region 3960-4270 m, *Alcock 17778* (K!). Chitral: Madaglast, *Toppin 543* (K!). Siru Gol, S of Shah Jinali P. 4420 m, *Stainton 3056* (K!, W!).

D: E Iran, Pamir-Alai - SW Karakorum. **Map:** ALEXEEV 1980: map 8(2). *W Pamir.*

E: 3820-4550 m, alp., rare in the SW. Steppes, dwarf scrub (*Astragalus*, *Juniperus turkestanica*), dry rocks.

155. **Festuca rubra** L., Sp. Pl. 74. 1753

Ic.: Fl.Xizang.5: fig.47 (subsp.?).

subsp. **arctica** (HACKEL) GOVOR., Fl. Ural. 127. 1937

Festuca rubra L. subsp. *rubra* var. *genuina* subvar. *arenaria* f. *arctica* HACKEL 1882, *Festuca cryophila* V. KRECZ. & BOBROV 1934, *Festuca richardsonii* HOOKER 1840, *Festuca kirilovii* STEUDEL 1854, *Festuca rubra* L. var. *alaica* DROBOV 1916

CS **Biafo:** Karakorum [near Askole] 4110 m, 1876-08-10, *C.B.Clarke 30335* (BM!; K!). Baintha 4000 m, *H.Hartmann 133* (K!). Ste Ste - Gense 3450 m, *H.Hartmann 129!*; 3450-3520 m; Skoro P. N 4130 m (HARTMANN 1966: *F. rubra* subsp. *rubra* f. *barbata*). Biafo Gl., left bank 4110 m, *R.Scott Russell 1819* (BM!).

N **?Mintake:** Mintaka 4150 m, 1935-07-03, *Persson 694* (PERSSON 1938: *F. kirilovii*).

W **Hunza:** Nilt, *S.M.A.Kazmi 6160* (M!). N Chaprot 3730 m, *Klötzli & al. 8.01!*; (3100-4000 m), *Klötzli & al. 727.37, 47!*. **Hispar:** Makerum, Hispar Gl. 3810 m, *R.Scott Russell 1389a* (BM!). **Batura:** E Morkhoon 4050 m, *Klötzli & al. 102.08!*.

S **Skardu:** Satpura Nullah, above Skardu, *R.R.Stewart 20293* (RAW). Bilamik Nullah 3550 m, *Schickhoff 1886!*. **Leh:** Leh 3500 m, 1992-07-13, *Holzner & Kriechbaum* s.n.!. Near Kangi P. 4880 m, *Koelz* 2835 (BM!).

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A: Wakhan: Futur Vy. 3600 m, *Roemer 105* (W!). Chitral: Rosh Gol NE Tirich Mir 3350 m, *Stainton 2792* (BM!). Owir SE Tirich Mir 2740 m, *Stainton 2770* (BM!, W!). Oihor Gol 3350 m, *Bowes Lyon 827* (BM!). Showar Shun E of Baroghil P. 3960 m, *Stainton 3007* (BM!, W!). Baroghil P. 3810 m, *Stainton 2997* (BM!, W!). Yarkhun (N 36°30'-48' E 72°40-73°05) 3660 m, *Bowes Lyon 1002* (BM!). Yarkhun Vy., Rawark 3250 m, *Stamm & Wöhrl 216* (W!). Chilas: Rakhiot Vy. 3220 m, *Schickhoff 1678!*. Astor: Gudai Vy. 3350-3660 m, *Duthie 12211* (K!). Above Doyan 3350-3660 m, *Duthie 12471* (K!). Above Zaipur 3120 m, *Schickhoff 1049!; 1078!*. Rupal Vy., Nagachakali, 3500 m, *Nüsser 635!*. Upper Rupal Vy., Rupal Gl. ablation Vy. 3950 m, *Nüsser 1551!;* Upper Mazeno Base Camp 4320 m, *Nüsser 1473!*. Mushkin Forest 3000 m, *Schickhoff 1434!; 1447!*. Deosai: Deosai E 4260 m, *Miehe 5091!*. Dras: Marpu Nala 3350-3660 m, *Duthie 11828* (K!). Suru: Kartse Vy. 4160 m, *H.Hartmann 2875!*. W above Sanku 3880 m, *H.Hartmann 2874!*. 16 km W Zuildo, 2 km N of Suru 3830 m, *Southampton Univ. 159* (K!). Zanskar: Seni 3660 m, *Koelz 5764* (BM!). Chumik Marpo 4600 m, 1992-08-04, *Holzner & Kriechbaum* s.n.!. Kurgiakh 4150 m, 1992-08-07, *Holzner & Kriechbaum* s.n.!. Gumburanjon 4300 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Below Lakong, 1992, *Holzner & Kriechbaum* s.n.!. Shingo P. 4800 m, 1993-07-30, *Holzner & Kriechbaum* s.n.!. Sarchu 4400 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. Hazara: Babusar P. 4050-4100 m, *Miehe 468!*. Kashmir: Pir Patsaski or Kishtvar P. to Islamabad, 1856-08-05/10, *Schlagintweit 5139* (GOET!). Himachal Pr.: Tsanskar Sumdo to Ramchak (S foot of the Shinku La P.), 1856-06-18, *Schlagintweit 11008* (BM!). Lahul, Kyelang, *Bor 14915* (K!).

D: Arctic N hemisphere, on high mountains S to Afgh. (Nuristan), Pakistan (Chitral, Baltistan, Kashmir), Himalaya. *Holarct.*

E: Moist alpine turf, *Kobresia schoenoides* flushes and *Salix* scrub by streams.

N: The plants differ in the long-hairy lemmas from typical *F. rubra*, but the treatment in Fl.Pak. is not conform with that of ALEXEEV (1980), who determined most of the material at K as subsp. *rubra*. The plants cited above are quite distinct, but the exact delimitation of subsp. *arctica* against subsp. *clarkei* and subsp. *rubra* needs to be reexamined.

subsp. **clarkei** (STAPF) ST.-YVES 1928 - **A**: Swat: Mt.Ilam 2440-2740 m, *R.R.Stewart 24367* (K!). Hazara: Shadal, 1899-08-16, *Inayat* s.n. (K!). Murree hills, Dunga Gali 2440 m, *R.R.Stewart 23307* (K!). Thandiani 2440 m, *R.R.Stewart 27763* (K!). Kashmir: Gurais 2440 m, C.B.Clarke 29505 (K!). Gulmarg 2440-2740 m, *Duthie 13020* (K!). Alibad 3350 m, *C.B.Clarke 29002* (K!). Himachal Pr.: Dalhousie 7000' [2130 m], 1874-09-17, *C.B.Clarke 22613* (BM!, K! **type**); 1830 m, *C.B.Clarke 23236* (BM!). Lahul, Manali, *Bor 16644* (K!). **D**: Himalaya (Swat - Assam), SE Tibet, Yünnan.

subsp. **rubra**

W **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12394* (K!); 3660 m, *R.R.Stewart 26689* (BM!). Naltar 3050 m, 1954-07-20, *R.R.Stewart* s.n. (K!). Upper Darchan Vy., above Khaltaro 3210 m, *Schickhoff 682!*. **Hunza:** Ulter Nullah 3050 m, *R.R.Stewart 26690* (K!, RAW). Baltit, *Lobbichler 42* (M!). Minapin, above Hapakund 2970 m, *Schickhoff 309!*.

S **Shigar:** Thalle P. - Bagmaharal, *Schlagintweit 1856* (LE). **Skardu:** Shagarthang Vy. 3050-3350 m, *Duthie 12111* (K!). Satpura Lake 3050 m, *Nasir & Webster 5825* (RAW). **Leh:** Wandla, 1848-07-06, *T.Thomson* s.n. (K!). Ladakh [Indus Vy., W Leh], 1848-09-16, *T.Thomson* s.n. (K!). Leh - Kalte, *Schlagintweit 1512* (LE). Fotu P. Base, *Bimal Misri 306* (K!). Yangthang 3700-3750 m, 1993-07-16, *Holzner & Kriechbaum* s.n.!. Kartse 4100 m, 1992-07-20, *Holzner & Kriechbaum* s.n.!.

S **Pangong:** Shushal, *Koelz 2446* (LE; ALEXEEV 1980).

E **Upper Shyok:** Sassar, 1848-08-28, *T.Thomson* s.n. (K!).

A: Wakhan 2750-4350 m (PODLECH & ANDERS 1977). Chilas: Martal 2970 m, *Nüsser 1132!; 1144!*. Buldar Vy, Fary 2860 m, *Nüsser 1030!*. Astor: Gudai Vy. 3350-3660 m, *Duthie 12213* (K!). Above Doyan 3350-3660 m, *Duthie 12654* (K!). Rupal Nullah near Nanga Parbat 2440-2740 m, *R.R. & I.D.Stewart 22851* (K!). Middle Rupal Vy., Village Lower Rupal 3100 m, *Nüsser 1578!*. Deosai: Shingo Vy. - Marpo P. 3350-3660 m, *R.R. & I.D.Stewart 22248* (K!); *22253* (K!). Dras: 3050 m, *Duthie 11766* (K!); *13742* (K!). Marpu Nullah 3350-3660 m, *Duthie 11828* (K!). ? Dras Vy. (HENDERSON & HUME 1873: *F. duriuscula*). Suru: Mulbekh, *Bimal Misri 325* (K!). Zanskar: [Nira - Yulchung], 1848-07-02, *T.Thomson* s.n. (K!). [Phutaksha P. - Hanupata 3990-4880 m)], 1848-07-04, *T.Thomson* s.n. (K!). Kashmir: Muzzafarabad, 1899-07-14, *Inayat* s.n. (K!). Kishenganga, Bagwan

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2440 m, *R.R. & I.D.Stewart 21602* (K!). Burzil P. 3960 m, *R.R. & I.D.Stewart 22039a* (K!). Zoji P., 1848-09-27, *T.Thomson* s.n. (K!). "Goumbour in valle Sind" [Gumbur, Zoji P.], *Jacquemont 1022* (K!). Sind Vy., below Baltal 2740-3050 m, *Duthie 11581* (K!). Pahlgam 2740 m, *R.R. & I.D.Stewart 21527* (K!). Kolahoi Vy. 4330 m, *O.Polunin 56/549* (BM!). Chenab to Zanskar [Butna Vy., Chishot (2500-3200 m)], 1848-06-19, *T.Thomson* s.n. (K!). Himachal Pr.: Heights above Kibar, 1847-09-06, *T.Thomson* s.n. (K!). Parang Vy., 1847-09-11, *T.Thomson* s.n. (K!). Lahul, Rotang P. to Koksar (N slopes of the P.), 1856-06-09, *Schlagintweit 3992* (K!). Chotadara, *Aswal 6867* (ASWAL & MEHROTRA 1994). Rupshu: Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!).

D: Temp. N hemispere, S to W Himalaya; Sikkim. **Map:** ALEXEEV 1980: map 6. *Holarct.*

E: 2740-4100 m, mont. - subalp., locally common in the W & S. Humid meadows (*Blysmus compressus*) by streams and irrigation canals, scrub (*Caragana versicolor*) and forests (*Pinus wallichiana*).

N: No subsp. is reported in the following records: Kongur: Ulug-Tuz, Charlym Vy., 1909-06-20, *Divnogorskaya*; W Kunlun: Kaplyk Rv. 3200 m, 1942-07-12, *Serphukov*; E Pamir: Pistan 4500 m, 1901-07-15, *Alexeenko*; Tagdumbash-Pamir, Kara-Chukur Rv. - Ilyksu Rv., 1901-07-16, *Alexeenko* (Pl.As.Centr.). A number of records of subsp. *rubra* from the Himalaya, from Himachal Pr. eastwards remain uncertain.

* **Festuca rupicola** HEUFFEL 1858 (*Festuca sulcata* (HACKEL) NYMAN 1882 - **A**: Reported from Wakhan 4000-4350 m (PODLECH & ANDERS 1977). **N**: Probably to *F. alaica* ? - **Festuca valesiaca** SCHLEICHER ex GAUDIN subsp. **sulcata** (HACKEL) SCHINZ & KELLER 1905 (*F. rupicola* HEUFFEL) is reported to occur from C. & E Europe, Medit., SW & Middle Asia, E to Tian Shan, Siberia.

* **Festuca simlensis** (STAPF) ALEXEEV 1978 (*Festuca kashmiriana* STAPF var. *simlensis* STAPF in HOOKER f. 1897) - **A**: Kashmir. **D**: W Himalaya (Kashmir - Nepal).

156. **Festuca tibetica** (STAPF) ALEXEEV, Bull. Soc. Nat. Moscou **83**(4): 118. 1978

Festuca valesiaca SCHLEICHER ex GAUDIN var. *tibetica* STAPF in HOOKER f. 1896, *Festuca ovina* L. var. *alpina* GRISEB. 1868 p.p.

Ic.: ALEXEEV 1980: fig.6(2-4).

CN **Braldu:** Pamir P. S 4760-4770 m, *Miehe 6111!*. **K2-North:** K2-N Gl. W 4340-4550 m, *Dickoré 733!*. K2-N Gl. E 4740-5020 m, *Dickoré 668!; 775!*. **Shaksgam:** Aghil P. S 4400-4460 m; 4630-4820 m (*Dickoré*).

N **Yarkand:** Aghil P. N 4800 m, *Dickoré 581!*. **Upper Yarkand:** Camp Rimu North 5280 m, *Dainelli & Marinelli* (PAMPANINI 1930).

E **Upper Shyok:** Sassar, 1848-08, *T.Thomson* s.n. (K! **syntype**). **Depsang:** Camp Piccolo Cumdan 4930 m; Chipchak Camp 4900 m, *Dainelli & Marinelli* (PAMPANINI 1930). **Aksai Chin:** N Tibetan Mts. 5150 m, *Miehe 8211!*.

A: Zanskar: Nimaling - Kongmaru P. W 4860 m, *H.Hartmann 3023!*; 4960 m, *H.Hartmann 3022!*. Debring - Taglang P. 5050 m, *H.Hartmann 4100!*. Uttar Pr.: Garhwal, Chorhoti P., *Strachey & Winterbottom* (K, LE; ALEXEEV 1980). Kumaon, Lebury Gl., *Duthie 6154* (K; ALEXEEV 1980). W Tibet: Upper Domar Chu 5190-5300 m, *Miehe 7912!; 7927!; 7933!; 8064!*. N Moincer (N 31°15' E 80°15') 5050-5500 m, *Miehe+9639b!; +9640b!; +9641c!; +9643b!*. Changtang: Lungmu Co 5280 m, *Miehe 8161!*.

D: N Karakorum, E Ladakh (Zanskar-Rupshu), Inner Himalaya (Garhwal, Kumaon, Nepal, Sikkim), W, C. & S Tibet. **Map:** ALEXEEV 1980: map 6. *Tibet.*

E: 4340-5150 (5280) m, alp. - subniv., scattered to frequent in the N. Turf, open gravel slopes.

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157. Festuca valesiaca SCHLEICHER ex GAUDIN, Agrost. Helv. **1**: 242. 1811
subsp. **hypsophila** (ST.-YVES) TZVELEV, Bot. Zhurn. 56(9): 1255. 1971
Festuca ovina L. subsp. *sulcata* var. *hypsophila* St.-YVES 1932

N **Taxkorgan:** Above Dafda 4400 m, *Miehe 5590!; 5603!*. **Mintake:** 3960-4110 m, *Miehe 5699!; 5723!*.

W **Ghizar:** Chumarkhan P. 3660 m, *Stainton 2899* (W!).

A: Kongur: Upper Oytag Vy. 3120 m, *Miehe 8673!*. Ulug-Tuz, Charym Vy., 1909-06-20, *Divnogorskaya* (Pl.As.Centr. "*F. valesiaca*"). W Kunlun: Arpalyk Vy., Kizyl-Bazar 3500 m, 1941-06-13, *Serphukov* (Pl.As.Centr. "*F. valesiaca*"). Akaz P. 3600-3710 m, *Miehe 8586!; 8609!*. ?W Pamir, ?E Pamir: "*F. sulcata*" (Fl.Tadzh.).

D: Turkey, Caucasus, Iran - NW Pakistan; Kashgaria, Dzungaria, Mongolia, Altai. *Ir.-Tur.*

E: 3960-4400 m, (subalp.) - alp., rare in the NW. Meadow steppes, open turf (*Festuca olgae, Kobresia capillifolia*).

? subsp. **valesiaca** (*Festuca ovina* L. var. *valesiaca* (SCHLEICHER ex GAUDIN) LINK 1833

W **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26687* (K, RAW).

D: Eur., Temp. Asia: Turkey, Caucasus - ?NW Pakistan (Gilgit) - Siberia, Mongolia, NW China. *Euras.*

E: 3660 m, subalp., rare in the SW. Habitat unknown in the Karakorum.

N: The specimen is not cited by ALEXEEV (1980), and may prove to be *F. alaica*.

* **Glyceria notata** CHEVALL. 1827 (*Glyceria fluitans* var. *plicata* FRIES 1839, *Glyceria plicata* (FRIES) FRIES 1842, *Glyceria fluitans* (L.) R. BR. subsp. *plicata* (FRIES) ST.-LAGER in CARIOT 1889 - **Ic.**: Fl.Iraq 9: pl.43. Fl.Pak.143: fig.48. Fl.Iran.70: pl.15. **A**: Wakhan (PODLECH & ANDERS 1977). **D**: Europe, N Africa, SW Asia. **N**: Widespread in Afgh.; easternmost localities in Wakhan and Pakistan (Sind): Karachi.

* **Glyceria tongolensis** C. B. CLARKE 1876 (*Glyceria kashmiriensis* KELSO 1935) - **A**: Kashmir 2130-2740 m. **D**: Himalaya (Kashmir - Assam), S China, Japan.

158. Helictotrichon desertorum (LESS.) NEVSKI, Sov. Bot. 4: 41. 1937
Avena desertorum LESS. 1834

N **Mintake:** S Taxkorgan, above Mazar 3960 m, *Miehe 5701!*.

D: SE Europe - E Asia, S to NW Pamir, NW Karakorum. *Euro-Sib.*

E: 3960 m, alp., rare in the NW. Alpine steppe with *Festuca valesiaca* subsp. *hypsophila*.

N: The single specimen from the area is too scant for a more accurate determination. It may belong to **Helictrotrichon desertorum** subsp. **altaicum** (TZVELEV) HOLUB, Folia Geobot. Phytotax. (Praha) 5: 436. 1970 (*Helictotrichon altaicum* TZVELEV 1968), but it has the leaves somewhat hairy below.

* **Helictotrichon fedtschenkoi** (HACKEL) HENRARD 1940 (*Avena fedtschenkoi* HACKEL 1906) - **A**: W Pamir. **D**: Endemic.

159. Helictotrichon hookeri (SCRIBNER) HENRARD, Blumea 3: 429. 1940
Avena hookeri SCRIBNER 1890, *Avenastrum asiaticum* ROSHEV. 1932, *Helictotrichon pratense* auct. non (L.) BESSER 1828: HARTMANN 1966, COPE 1980

CS **Biafo:** Mango 3730-3850 m; 3730 m, *H.Hartmann 215* (K!, RAW); 3750 m, *H.Hartmann 213!*; (HARTMANN 1966).

W **Gilgit:** Shinghai Gah - Pahot Gali 3880 m, *Miehe 1359!*. Naltar Lakes 3660 m, 1954-07-20, *R.R.Stewart* s.n. (RAW). **Hunza:** N Chaprot 3580 m, *Klötzli & al. 6.21!*.

S **Skardu:** Satpura Nullah, above Skardu, *R.R.Stewart 20359* (KUH).

Unloc.: Below Sochar P. 3660 m, *Nasir & Webster 6529* (RAW).

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A: Astor: Gudhai Vy. 3660 m, *Duthie 12181* (K!). Dras: Marpo P. 3660-3960 m, *R.R.Stewart & E.Nasir 22320* (K!, RAW). S above Matayan 3550 m, *H.Hartmann 2330!*. Suru: Kartse 4060 m, *H.Hartmann 2329!*. Kashmir: Apharwat above Gulmarg 3960 m, *R.R.Stewart 8895* (K!). Banihal P. 2440 m, *R.R.Stewart 12112* (K!, KUH). Himachal Pr.: W Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!.

D: Siberia, Altai, Dzungaria, Tian Shan, Pamir-Alai, SW Karakorum - Ladakh; N America (W). *E Asiat.*

E: 3580-3880, subalp. - alp., not common. Relatively humid pastures.

N: **Helictotrichon pratense** (L.) BESSER 1828 (*Avena pratensis* L. 1753, *Avenastrum pratense* (L.) OPIZ 1852, *Avenula pratensis* (L.) DUMORT. 1868) is restricted to Europe, though it may have been "introduced into parts of India in grass-seed mixtures" (Fl.Pak.).

* **Helictotrichon virescens** (NEES ex STEUDEL) HENRARD 1940 (*Trisetum virescens* NEES ex STEUDEL 1854, *Avena aspera* MUNRO ex THWAITES 1864) - **Ic:** Fl.Xizang.5: fig.101. **A**: Chitral. Swat. Hazara: Kaghan Vy. Kashmir. **D**: Himalaya (Chitral - W China), India, Ceylon, Burma.

160. Heteropogon contortus (L.) P. BEAUV. ex ROEMER & SCHULTES, Syst. Veg. 2: 836. 1817

Andropogon contortus L. 1753

Ic.: Fl.Iraq 9: pl.203. Fl.Xizang.5: fig.187.

S **Leh:** Leh 3500 m, *Holzner & Kriechbaum* s.n. !.

A: Swat. Hazara: Karman, 1974-08-24, *F.Gartner* s.n. (GZU!). Kashmir.

D: Trop. - warm temp. *Pantrop.*

E: 3500 m, coll. - mont., rare in the S. Roadside. Usually at much lower altitudes, up to c. 1500 m in W Himalaya, 1800-2300 m in S Tibet (Fl.Xizang.). Perhaps a recent and episodic introduction in Ladakh.

N: Reported to be a good fodder grass before it reaches the flowering stage, but later animals can be seriously injured by the sharp callus ("speargrass"; Fl.Pak.).

* **Hierochloe laxa** R. BR. ex HOOKER f. 1896 - **Ic.**: Fl.Pak 143: fig.55(1-2). **Unloc.**: Sochar P. 3960 m, *Nasir & Webster 6528* (RAW). **A**: Astor: Rama Vy. 4020 m, *Nüsser 171!*. Dras: Dras Vy., 3350-3660 m, *Duthie 11646* (K). Swat. Hazara: Kaghan Vy. Kashmir. Himachal Pr.: Above Lakong, 1992, *Holzner & Kriechbaum* s.n.!. Billing Nala, *Bor 15226* (DD; ASWAL & MEHROTRA 1994). **D**: W Himalaya (Swat - Nepal). **E**: "A common grass of alpine meadows and rock ledges." (Fl.Pak.).

* **Hierochloe wendelboi** WEIMARCK 1977 - **A**: Swat: Sho Nala 3350 m, *A.Rahman 224* (K!). **D**: Endemic: NE Afgh., NW Pakistan (Swat).

• **Hordeum aegiceras** NEES ex ROYLE, Ill. Bot. Himal. 418. 1839

Hordeum coeleste var. *trifurcatum* SCHLECHTER 1837, *Hordeum vulgare* L. var. *trifurcatum* (SCHLECHTER) KOERN. 1885

A: Cultivated in Kashmir at over 3000 m (Fl.Pak.). Himachal Pr.: Upper Kunawar, Hango, cult., 1847-08-24, *T.Thomson* s.n. (K!). Chamba.

161. Hordeum bogdanii WILENSKY, Izv. Saratovsk. Opyt. Stan. 1 (2): 13. 1918

Hordeum nodosum auct. non L. 1762: SULTAN & STEWART 1959, *Hordeum secalinum* auct. non SCHREBER 1771: HOOKER f. 1896 p.p.

Ic.: Fl.Desert.Sin.1: fig.22(1-3).

W **Ishkoman:** Imit 2400 m, *F.Gartner* s.n. (GZU!). **Gilgit:** Gilgit - Imit 1520-2440 m, 1954-07, *F.Schmid* s.n. (RAW). **Hunza:** Minapin - Chalt 1830 m, *R.R.Stewart 26682* (K!, RAW).

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S **Shigar:** Shigar 2350 m, 1876-08-05, *C.B.Clarke 30073* (K!). Karakorum 3080 m [? probably Shigar - Skoro P.], 1876-08-06, *C.B.Clarke 30110* (K). Alkali plain below Shigar 2440 m, *R.R.Stewart 20495* (RAW). **Skardu:** Indus Vy. near Skardu 2130-2440 m, *Duthie 12102* (K!). **Leh:** Namika P. [Indus Vy.] 3660 m, [?]1848-09-04, *T.Thomson* s.n. (K!).

A: Wakhan (PODLECH & ANDERS 1977).

D: ?SE Eur. - S USSR, Mongolia, China; Afgh., Pakistan (Baluch., Gilgit, Baltistan); Ladakh, Kashmir. *Centr. As.*

E: 1520-3600 m, coll.-mont., rare in the SW. ?Dry to seasonally moist open, moderately saline habitats.

162. **Hordeum brevisubulatum** (TRIN.) LINK, Linnaea **17**: 391. 1843

Hordeum secalinum SCHREBER var. *brevisubulatum* TRIN. 1828, *Hordeum secalinum* auct. non SCHREBER 1771: HOOKER f. 1896 p.p.

Ic.: Fl.Xizang.5: fig.88.

subsp. **nevskianum** (BOWDEN) TZVELEV, Nov. Syst. Pl. Vasc. 1971: 66. 1971

Hordeum nevskianum BOWDEN 1965

W **Ghizar:** Sunji Vy. 3050-3660, 1957-07-27, *M.S.Zahur* s.n. (K!). **Yasin:** Panji P. N 3530 m, *Miehe 7013!*. **Ishkoman:** "deux versantes de l'Ishkoman Aghost" 4210-4540 m, *F.Schmid 2431* (K!).

S **Leh:** Spituk, *Bimal Misri 335* (K!).

A: Badakhshan. Wakhan: Qazi-Deh Vy. 3200 m, *Roemer 143* (M!). Chitral. Dras: Chokyal, *Bimal Misri 321* (K!). Suru: Mulbekh 3250 m, *H.Hartmann 2576!*.

D: W Siberia, Afgh., Pakistan (Chitral, Gilgit), Kashmir - Nepal, W China. *Centr. As.*

E: 3000-4250 m, mont.-subalp., rare in the S & W. Irrigated meadows.

subsp. **turkestanicum** (NEVSKI) TZVELEV, Nov. Syst. Pl. Vasc. 1971: 66. 1971

Hordeum turkestanicum NEVSKI 1934, *Hordeum secalinum* SCHREBER var. *brevisubulatum* TRIN. f. *puberulum* KRYLOV 1914, *Hordeum brevisubulatum* (TRIN.) LINK. var. *puberulum* (KRYL.) MELDERIS in NORLINDH 1949

CN **Braldu:** Swamps of Chikor 3800 m, *Miehe 6187!*. **K2-North:** Muztagh Vy. 3930 m, *Dickoré 622!*. **Shaksgam:** Upper Shaksgam Vy. 4060 m (*Dickoré*).

CS **Nubra:** [Lower] Nubra Vy., 1848-08-02, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** Mustagh Ata N 3650 m, *Miehe 5472!*. **Taxkorgan:** Pirali - Taxkorgan (N 37°05'-45' E 75°15'-25') 3800-3900 m, *Miehe 5237!*. **Mintake:** S Taxkorgan, above Mazar 3960 m, *Miehe 5714!*. **Yarkand:** Mazar Dala 3600-3620 m. 3 km W Mazar 3850 m, *Dickoré 324!*. **Karakash:** W Xaidulla 4150 m, *Miehe 8321!*.

W **Batura:** E Morkhoon 3000 m, *Klötzli & al. 803.12!*.

E **Upper Shyok:** [Murgai 4880 m], 1848-08-22, *T.Thomson* s.n. (K!).

Unloc.: Ladakh & Karakash Vy. 3960 m (HENDERSON & HUME 1873: "*Hordeum pratense* L.") probably belongs to here.

A: Kongur: Jerzil 2800 m, 1930-07-01; 1930-07-11, *Persson 13; 90* (PERSSON 1938). W Kunlun: Upper Kudi Vy. 3740 m, *Dickoré 233!*. W Pamir. E Pamir. Nuristan. Wakhan 2750-4250 m (PODLECH & ANDERS 1977 [typical 4050-4250 m!, plants from lower altitudes may partly represent subsp. *nevskianum* or transitional forms]). Chitral. Kashmir: [Badarwah, to Chatargarh on the Chenab], 1848-07-06, *T.Thomson* s.n. (K!). Rupshu: Chimerara lake, Rukshu, *Lance* s.n. (K!). Head of Salt Lake [Tso Kar] 4720 m, 1847-09-25, *T.Thomson* s.n. (K!). Grassy plain [Parang Rv. to Lanak P. 4510-4820 m], 1847-09-12, *T.Thomson* s.n. (K!). W Tibet: S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9659a!*.

D: Dzungaria, Kashgaria, Tian Shan, Pamir-Alai, NE Afgh. (Wakhan), Pakistan (Baltistan; Kashmir) - Nepal. *Centr. As.*

E: 3600-4880, subalp. (alp.), rare, locally frequent in the N. Moist turf on river-sands, fens and flushes (*Blysmus compressus, Carex pseudofoetida, Kobresia royleana, Kobresia schoenoides*).

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N: The lateral spikelets are often reduced to bristles in high altitude plants. These plants are very similar to species of the genus *Psathyrostachys* NEVSKI (see *Psathyrostachys juncea* (FISCH.) NEVSKI: Fl.Iran.70: pl.35).

- **Hordeum distichon** L., Sp. Pl. 85. 1753 - **A**: Cultivated in Sind, Baluch., NWFP and the Punjab (Fl.Pak.).

* **Hordeum murinum** L. 1753 subsp. **glaucum** (STEUDEL) TZVELEV 1971 (*Hordeum glaucum* STEUDEL 1854) - **A**: Kurram: Parachinar 1830 m, *R.R.Stewart 28245* (K!). Nishat Bagh, main Vy. 1740 m, *R.R.Stewart 23071* (K!). Chitral 1490 m, *Harriss 16830* (K!). Hazara. Kashmir Ramoo 1830 m, *C.B.Clarke 28549* (K!). Srinagar, Sambal Nalla 1620 m, 1891-07-10, *G.A.Gammie* s.n. (K!). Jhelum Vy. 1520 m, 1891-07-14, *G.A.Gammie* s.n. (K!). **D** Medit. - SW Asia, Pakistan (Baluch., Kurram, Chitral, Hazara), Kashmir; introduced in Australia and N America. **Hordeum murinum** L. subsp. **leporinum** (LINK) ARCANG. 1882 (*Hordeum leporinum* LINK 1834) - **A**: Chitral: Drosh 1370 m, 1908-04, *Toppin 179* (K!). **D**: Medit. - SW & C. Asia, China. **Hordeum murinum** L. subsp. **murinum** - **A**: Swat. Hazara. Kashmir. **D**: Temp. Eurasia.

- **Hordeum vulgare** L., Sp. Pl. 84: 1753
  subsp. **vulgare**

Ic.: Fl.Iraq 9: pl.88. Fl.Xizang.5: fig.89

CS **Nubra:** Liagtsung to Panamik (left side of the Nubra Vy.), 1856-07-24/31, *Schlagintweit 2064* (K!).

S **Leh:** Kharbu Koma - Shaksi (SW of Dah), 1856-07-03, *Schlagintweit 5347* (M!). **Pangong:** Panamik on the lake Tsomognalari to Durguk, 1856-07-01/04, *Schlagintweit 2548* (K!).

Unloc.: 1847-08-26, *T.Thomson* s.n. (K!). 1848-07-05, *T. Thomson* s.n. (K!).

A: Wakhan 2800-3180 m (PODLECH & ANDERS 1977). Astor: Naugam Hasora, 1847-07-03, *Winterbottom 701* (K!). Hazara. Himachal Pr.: Lahul, Jespa, Kyelang 3140 m, *N.L.Bor 16405* (K!). Rupshu: Vy. below Hanle, 1847-09-17, *T.Thomson* s.n. (K!).

N: "Barley is cultivated in Ladakh up to 15000 feet [4570 m], and in Yarkand to 9000 feet [2740 m]" (HENDERSON & HUME 1873). "It is grown in the plains and up to 4700 m in Ladakh." (Fl.Pak.) [probably a mistake, 14000 feet ≈ 4300 m (4270 m) seems to be realistic nowadays. In S Tibet (Tsangpo Vy., vicinity of Lhasa) the upper limit of barley-cultivation locally reaches 4700 m].

163. **Imperata cylindrica** (L.) RAEUSCHEL, Nomencl. Bot., ed. 3: 10. 1797

Lagurus cylindricus L. 1759

Ic.: Fl.Iraq 9: pl.205. Fl.Iran.70: pl.68. Fl.Xizang.5: fig.175 (var. *major*). Fl.Desert.Sin.1: fig.45(5-7: var. *major*).

W **Gilgit:** Jaglot, 1974-08-22, *F.Gartner* s.n. (GZU!). **Hunza:** Nomal - Chalt 1750-2130 m, *F.Schmid 1821* (K!). Chalt - Chaprot 2080 m, *Klötzli & al. 121.12!*.

A: Chitral. Hazara: Karman, 1974-08-24, *F.Gartner* s.n. (GZU!). Kashmir.

D: Medit., SW Asia - Middle Asia, Himalaya, Old World trop.; Chile (var. *cylindrica*); Africa (var. *africana* (ANDERSSON) C. E. HUBBARD); trop. Asia, Australia, ?E Africa (var. *major* (NEES) C. E. HUBBARD). *Palaeotrop.*

E: 1750-2130 m, coll., rare in the SW. Dry open habitats, steppes and semideserts; "champs, bords de chemins" (*F.Schmid 1821*).

* **Isachne himalaica** HOOKER f. 1896 - **A**: Hazara, Kashmir < 600 m. **D**: Himalaya (Afgh. - Sikkim).

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164. Koeleria argentea GRISEB., Nachr. Ges. Wiss. Univ. Goett. **3**: 77. 1868

Trisetum litvinowii (DOMIN) NEVSKI subsp. *argentea* (GRISEB.) TZVELEV 1970 (non *Trisetum argenteum* (WILLD.) ROEMER & SCHULTES)

CS **Nubra:** Nubra, *Schlagintweit 2116* (M!). Tsarasa to Aranu (right side of the Nubra Vy., 1856-08-03/04, *Schlagintweit* s.n. (BM!). Panamik to Tsanglung (left side of the Nubra Vy.), 1856-08-09, *Schlagintweit 2239* (BM!).

S **Leh:** Leh, 1856-07-15/08-05, *Schlagintweit 951* (GOET! **holotype**; K! **isotype**). Indus Vy., Upshi - Leh (3660-4270 m), *F.Stoliczka* s.n. (K!). **Shyok:** [Calzar], 1848-07-22, *T.Thomson* s.n. (K!); 1848-07-23, *T.Thomson* s.n. (K!).

A: Wakhan: [?]3180-4900 m (PODLECH & ANDERS 1977, [localities and collection numbers partly the same as those cited under subsp. *litvinowii*, which is *Trisetum clarkei* !]). Kaharac 3000 m, *H.Roemer 381* (M!, W! [sub *K. cristata* det. BOR]). Zanskar: Kurgiakh 4150 m, 1992-08-07, *Holzner & Kriechbaum* s.n.!. [?] Himachal Pr..

D: Afgh. (Wakhan), ?Pakistan: Baluch.; E Ladakh, Inner Himalaya (Nepal), S & E Tibet, Kansu. "A rather rare species" (Fl.Pak.). *S Tibet.*

E: (3660-4270 m), subalp., rare in the E. Humid turf, moist open alluvial gravel by rivers and mountain streams.

N: A record from Baluchistan: Quetta hillside "only specimen from a front officer Quetta", 1956-05-07, *J.J.Norris 114* (K!), is doubtful regarding its identity and provenance. *K. argentea* occurs with certainty in the Wakhan, apparently very disjunct. The main area of distribution seems to comprise the interior dry valleys of S and E Tibet to Kansu. The distribution in the Upper Indus and Tsangpo valleys probably is not continuous, as are the localities in E Tibet separated by high mountain ridges. *K. argentea* and *K. litvinowii* are closely related and, although habitually different, there are no clear-cut differential characters separating them. They may merge one into another along the Kunlun Shan, but at present there is no evidence that they do so, and they probably are separated by a wide gap comprising the whole of the Karakorum range in the W. Both species are somewhat intermediate between *Koeleria* and *Trisetum*, intergeneric hybrid origin was suggested by TZVELEV in Pl.As.Centr.4. The putative parents probably are: *Koeleria cristata* X *Trisetum clarkei* = *Koeleria argentea*; *Koeleria cristata* X *Trisetum spicatum* = *Koeleria litvinowii*.

165. Koeleria cristata (L.) PERS., Syn. Pl. 1: 97. 1805

Aira cristata L. 1753, *Koeleria gracilis* PERS. 1805, *Koeleria macrantha* (LEDEB.) SCHULTES & SCHULTES f. 1824

Ic.: KENG 1959: fig.408. Fl.Iraq 9: pl.131. Fl.Xizang.5: fig.91.

CS **Shimshal:** Upper Shimshal, Zardgar Bin 3900-4050 m, *Miehe 5981!; 5998!*. **Biafo:** Ste Ste 3440 m, *H.Hartmann 152* (RAW); E Ste Ste 3200 m; Ste Ste - Gense 3380 m; 3440 m; Gense 3780 m; Munjung 3230 m; Drinsang 3780 m, *H.Hartmann 148* (K!); Cho Blok 4110-4240 m; Laskam 3980-4220 m; Mango 3700-4030 m; 3750 m, *H.Hartmann 150!*; Baintha 4020-4420 m (HARTMANN 1966). Biafo Gl., left bank 4420-4570 m, *R.Scott Russell 1830* (BM!). **Saltoro:** Above Shahircho, dry cliffs, apparently not common, 3810 m, *Nasir & Webster 6097* (K!; WEBSTER & NASIR 1965). Hushe Vy., 1970-08-07, *A.Gilli* s.n. (K!). Above Hushe 4150 m, *Miehe 1948!*.

W **Yasin:** Naz Bar 3370-3850 m, *Miehe 3028!; 3300!; 3330!; 3407!; 3411!; 3438!; 3508!; 3595* (K!). **Ishkoman:** Imit (rivulet) 2400 m, 1974-08-10; 3600-3800 m, 1974-07-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Above Naltar 3350 m, *R.R.Stewart 26691* (K!), Naltar Vy., Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). Shinghai Gah - Pahot Gali 2430-4000 m, *Miehe 670!; 725!; 761!; 1296!*; *1339* (K!)*; 1391!; 1418!; 1729!; 1770!*. Sai Vy. 3100 m, *Schickhoff 2024!*. Baghrot Vy. 2890-3240 m, *Miehe 4461!; 4607!*; 3510 m, *Nüsser 1261!;* above Sat 3010 m, *Schickhoff 497!*. Rakaposhi W, above Barti and Jaglot 3200 m, Miehe *6748!*. **Hunza:** Baltit 1954-06-10/15, *F.Schmid* s.n. (RAW). Baltar 3650 m, *Paffen 110* (M!). Minapin Gl. below Hapakund 2800 m, *Paffen 430* (M!). Upper Shispar Vy. 3700 m, *Paffen 249* (M!). Upper Batura 3900 m, *Paffen 350* (M!). **Hispar:** Hispar Gl., Makerum 3810 m, *R.Scott Russell 1390* (BM!). Hispar Gl., right bank 3960 m, *R.Scott Russell 1552* (BM!); *1555b* (BM!); E of Sekambarisi (3960-4420 m), *R.Scott Russell 1500* (BM!). Barpu Gl., right bank 3050-3350 m, *R.Scott Russell 1098* (BM!); 3810 m, *R.Scott Russell 1376* (BM!). **Batura:** Gulmit - Atabad

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3300-4050 m, *Miehe 2819!; 2932!; 2978!; 2990!*. Khaibar 3820-4000 m, *Miehe 2614!; 2632!*. W Khaibar 3300 m, *Klötzli & al. 802.15!*. E Morkhoon 3600-3900, *Klötzli & al. 36.18, 19!; 804.56!*. **Khunjerab:** Dhee Sar Vy., 4150-4420 m, *P.Ebenhöh* s.n. (M!).

S **Shigar:** Kero Lungma Gl., right bank 3960 m, *R.Scott Russell 1376* (BM!). **Skardu:** Turkt-i-Sulaiman, 1847-05-29, *Winterbottom 285* (K!). Above Bashu 3210 m, *Schickhoff 942!*.

A: Kongur: Bostan-Terek 1929-07-10, *Popov*; Sulu-Sakal Vy., 25 km from Irkeshtam, 1935-07-26, *Olsufev*; Kingtau N, 1 km N Kosh-Kulak, 1959-06-10, *Junatov* (Pl.As.Centr.). Wakhan 2930-4550 m (PODLECH & ANDERS 1977); *Anders 7902* (M!). Chitral. Chilas: Darel Vy. 2700 m, *Schickhoff 2193!*. Gor 3520 m, *Schickhoff 1484!*. Gor Region, below Martal 2650-2680 m, *Nüsser 1166!; 1167!; 1171!;* Martal 2930-2970m, *Nüsser 1076!; 1142!;* Kahlimay, 3610m, *Nüsser 1091!* (cf.); above Kahlimay, 3770m, *Nüsser 1107!* (cf.). Muthat, Buldar Vy. 2960m, *Nüsser 1039!*. Raikot Gl., left lateral moraine, nunatak, Base camp area 4000 m, *Nüsser 526!*. Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1341!*. Astor: Tibet, Hasora, Pattere or Nahake P. (Gue - Pattere), 1856-09-14, *Schlagintweit 6753* (M!). Kalapani - Shankargarh 3050 m, *R.R.Stewart 22755* (K!). Kalapani 3050 m, *Schickhoff 1282!*. Faqirkot 2980 m, *Schickhoff 1314!*. Rupal Vy., Nagachakali, "nunatak" 3550-3710 m, *Nüsser 620!; 650!*. Upper Rupal Vy., Latobo, Tap Gl., left lateral moraine 3710 m, *Nüsser 45!;* Rupal Gl. ablation Vy. 3950 m, *Nüsser 1540!.;* Upper Mazeno Base Camp 4320 m, *Nüsser 1474!*. Upper Harchu Vy. 3500 m, *Nüsser 847!* (cf.). Deosai: 3780 m, *Meinertzhagen 79* (BM!); 3800-4050 m, *Miehe 2158!; 2178* (K!); *2197* (K!). Dras: Dras Vy. (HENDERSON & HUME 1873). Matayan - Dras 3350 m, 1891-07-31, *Gammie* s.n. (K!). Marpu Nullah, above Dras 3660-3960 m, *Duthie 11779* (K!). Marpo P. towards Dras 3660 m, *R.R.Stewart 23331a* (K!). SW above Dras 3450 m, *H.Hartmann 2357!*. SE above Matayan 3450 m, *H.Hartmann 2356!*; common 3350-3960 m. Suru: Sanmodangsa 3950 m, *H.Hartmann 2358!*. Swat. Hazara: Kaghan Vy., common 2440-3960 m; above Battakundi 3350 m, *Schickhoff 90/856!*. Kashmir: Zoji P., *Bimal Misri 302* (K!); common. Himachal Pr.: Kishtwar 1848-06-13, *T.Thomson* s.n. (K!). Hills above Changas, 1847-08-28, *T.Thomson* s.n. (K!). Khoksar, *Aswal 10246* (ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4450 m, *Miehe+9611!;* 4680 m, *Miehe+9610c!*.

D: Temp. N hemispere, S to Himalaya (E Afgh.: Nuristan, Pakistan: Baluch., Punjab). *Holarct.*

E: (2430-) 2890-4150 (-4400), mont.-subalp., common in SW. Very characteristic of *Artemisia brevifolia-Juniperus excelsa* forest steppes, and subalpine meadows, also in open forests and dwarf-scrub (*Picea smithiana, Pinus wallichiana, Juniperus turkestanica, J. sibirica, Artemisia santolinifolia, Acantholimon* spp.).

* **Koeleria litvinowii** DOMIN 1907 (*Koeleria hosseana* DOMIN 1912, *Trisetum litvinowii* (DOMIN) NEVSKI 1934) - **A**: W Kunlun: Akaz P. 3710 m, *Miehe 8596!*. Tiznap Vy. W Kudi 3300-3930 m, *Miehe 7506!; 8480!*. Upper Tiznap Vy. 3080-3950 m, *Miehe 7803!; 8556!*. Mazar P. NE 4380 m, *Dickoré 272A!*. C.Kunlun: S Cherchen 4190 m, 1959-06-04, *Li & al. 9417* (Pl.As.Centr.). E Pamir: Gorno-Badakhshan, W Pshart Vy. 4000 m, *Tzvelev 616* (K!). **D**: E Pamir, W Kunlun (endemic). **E**: A characteristic species of (subalp.-) alp. loess steppes, turf and open gravel slopes of the Kunlun N slope. **N**: Specimens reported from Wakhan (PODLECH & ANDERS 1977) are *Trisetum clarkei*.

Possible hybrid:

Koeleria argentea X K. cristata ?

W **Hispar:** Hispar Gl., Makerum 3810 m, *R.Scott Russell 1391* (BM!).

Habit like *K. cristata*, but lemma with a very short terminal awn; together with typical *K. cristata*.

* **Leersia oryzoides** (L.) SWARTZ 1788 (*Phalaris oryzoides* L. 1753) - **A**: Hazara. Kashmir < 1600 m. **D**: Temp. N hemisphere (S to W Himalaya).

* **Leymus lanatus** (KORSH.) TZVELEV 1969 (*Elymus lanatus* KORSH. 1896, *Malacurus lanatus* (KORSH.) NEVSKI 1934) - **Ic.**: Fl.Iran.70: pl.36. **A**: W Pamir. E Pamir. Wakhan 2750-4020 m (PODLECH & ANDERS 1977); 3400-3900 m!. **D**: Pamir-Alai, Wakhan (endem.). **N**: 2n = 28 (HUSS 1980, material from Wakhan).

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166. Leymus secalinus (GEORGI) TZVELEV, Pl. As. Centr. **4**: 209. 1968

Triticum secalinum GEORGI 1775, *Elymus dasystachys* TRIN. in LEDEB. 1829, *Aneurolepidium dasystachys* (TRIN.) NEVSKI in KOMAROV 1934, *Elymus secalinus* (GEORGI) BOBROV 1960, *Aneurolepidium secalinum* (GEORGI) KITAG. 1965

Ic.: Fl.Desert.Sin.1: fig.25(9-12).

CN **Braldu:** Upper Braldu tributary, above Chikor 4250-4400 m, *Miehe 6184!*. **K2-North:** Muztagh Vy. 3900-4140 m, *Dickoré 623!; 624!; 625!; 871!*. E Muztagh Vy. 4400 m, *Dickoré 894!*. Skyang Vy. 4140 m, *Dickoré 828!*. **Shaksgam:** Aghil P. S 4480-4560 m, *Dickoré 595!*. Upper Shaksgam Vy. 3960-4060 m, *Dickoré 607!; 910!*.

CS **Shimshal:** Upper Shimshal, Shachmirk P. W 3600-3800 m, *Miehe 6053!*. **Biafo:** Ashkoley 3200 m, 1876-08-10, *C.B.Clarke 30378* (K!). Ste Ste 3080 m, *H.Hartmann 92!* (HARTMANN 1966). **Baltoro:** Paiju 3450 m, *H.Hartmann 90* (K!); 3450-3480 m (HARTMANN 1966). **Nubra:** Nubra (3660-4270 m) [Lowermost Nubra Vy.], 1848-07-27, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** N 3930 m, *Miehe 5435!*; W 3800 m, *Miehe 5564!*. S of P. between Tagama basin and [Little] Karakul lake 3650 m, *Miehe 5256!*. **Taxkorgan:** Taxkorgan - Tagama basin 3000 m, *Miehe 5249!*. S Taxkorgan, above Dafda 3620 m, *Miehe 5629!*. Pirali - Taxkorgan 3800-3900 m, *Miehe 5238!*. **Yarkand:** Ilyk - Mazar (common) 3520-3800 m, *Dickoré 361!; 406!; 941!*. Aghil Vy. 3870-3930 m. **Karakash:** Khotan, Sumgal (on the S foot of Bushia P.) to Gulbagashen (large Yashem quarries), 1856-08-23/30, *Schlagintweit 12759* (GOET!). Upper Karakash Vy. 4880 m (HENDERSON & HUME 1873); 1870-07-12, *Henderson 102* (K!).

W **Ghizar:** Bahushtar Nala 3350 m, 1957-08-13, *M.S.Zahur* s.n. (K!). **Gilgit:** Naltar Vy., 2440-2740 m, *Duthie 12358* (K!). Naltar 3660 m, *R.R.Stewart 26674* (K!); above Naltar 3050-3350 m, *R.R.Stewart 26675*. **Hunza:** N Chaprot 3200 m, *Klötzli & al. 50/51.09!*. NE Chaprot 3400-3550 m, *Klötzli & al. 730.08!*. **Hispar:** Holshal near Nagar 3100-3250 m, *F.Schmid 1951* (K!). **Batura:** Gulmit - Atabad 3600 m, *Miehe 2714!*. **Khunjerab:** Khunjerab P. SW 4150-4350 m, *Miehe 2508!*; 4460 m, *Miehe 2498!*; 4500 m, *Klötzli & al. 807.12!*. Dhee Sar Vy. 4150-4420 m, *P.Ebenhöh* s.n. (M!).

S **Shigar:** Shigar 2350 m, 1876-08-05, *C.B.Clarke 30063* (K!); *30087* (K!). Shigar, near forest nursery, *A.Ghafoor & Z.L.Butt 682* (KUH). **Skardu:** Satpur above Skardu 2740-3050 m, *Duthie 12033* (K!). **Leh:** 10 km W Leh 3400 m, *H.Hartmann 2563!*. N Leh 3600 m, *H.Hartmann 3013!*. Vy. S Matho 3790 m, *H.Hartmann 2337!*. Mathu, *Bimal Misri 337* (K!). Spituk, *Bimal Misri 336* (K!). Likir - Himis Shukpa 3560 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!. Kartse 4100 m, 1992-07-20, *Holzner & Kriechbaum* s.n.!. Near Rumtse 4300 m, *H.Hartmann 4094!*. **Lower Shyok:** Kasurmik 2740 m, *R.R. & I.D.Stewart 20715* (RAW). **Shyok:** Shyok Vy. (3660-4270 m), 1847-10-30, *T.Thomson* s.n. (K!).

E **?Aksai Chin:** Kuenlun plains (3510-5180 m), *H.P.Picot* s.n. (K!).

Unloc.: Pamir Region 3960-4270 m, *Alcock 17795* (K!). W Tibet, 1922, *Kashyap* s.n. (K!).

A: Kongur: Jerzil 2800 m, 1930-07-11, *Persson 87* (PERSSON 1938). W Kunlun: Kentalek 2700 m, 1931-07-21, *Persson 241* (PERSSON 1938). Akaz P. 3300 m, *Dickoré 158!*. Tiznap Vy. Kudi 3000 m, *Dickoré 190!*. Upper Tiznap Vy. 3880-4210 m, *Miehe 7651!*; *7684!*. E Pamir. Wakhan 2650-4550 m (PODLECH & ANDERS 1977: subsp. *pubescens*). Astor: Chugam 2530 m, *Giles 108* (K!). Gudhai Vy. 3350-3660 m, *Duthie 12185* (K!). Rupal Nullah 2590-2740 m, *R.R. & I.D.Stewart 18869* (KUH, RAW). Upper Rupal Vy., Latobo 3600 m, *Nüsser 28!* (veg.). Deosai: Shingo Vy. 3050-3350 m, *Duthie 11891* (K!). Dras: Dras, Bimal Misri 363 (K!). Chokyal, near Dras, *Bimal Misri 311* (K!). Suru: Lower Wakha Vy., S Gompa 3420 m, *H.Hartmann 2564!*. Zanskar: [Tongde - Zangla], 3660 m, 1848-06-28, *T.Thomson* s.n. (K!); [NW Zangla] 3660-3960 m, 1848-06-29, *T.Thomson* s.n. (K!). Hemeling 3510 m, *Southampton Univ. 136* (BM!, K!). Tungri 3600 m, *H.Hartmann 2565!*. Nakli P. - Sarchu, 1993-07-23, *Holzner & Kriechbaum* s.n.!. Sarchu 4400 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. Kurgiakh 4200 m 1992-08-07; N Kurgiakh 4250 m, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Lahul, Kenlung 4880 m, *Bor 16468* (K!). Himachal Pr.: Jispa 3140-3200 m, *Bor 16577* (DD, K!; ASWAL & MEHROTRA 1994); *16911* (K!). Rupshu: Da - Hanle 4570 m, *Koelz 2298* (K!). N Tso Kar 4600 m, 1992-07-22, *Holzner & Kriechbaum* s.n.!. Startsa Puk Tso 4550 m, 1993-07-22, *Holzner & Kriechbaum* s.n.!. W Tibet: Laptel 4420 m, *Strachey & Winterbottom 3* (K!). Tibet, Takhlakot, *Koelz 21175* (K!).

D: Siberia, C. Asia, N Pakistan, Ladakh, Kashmir, NW India, Inner Himalaya. *Centr. As.*

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E: (3000-) 3350-4560 (-4880 m), (mont.-) subalp. (-alp.), frequent. Common on riverside sands, gravel, by saline springs in the subalpine belt of the inner ranges, occasionally in dry steppes of the lower alpine belt; loess slopes of the outer ranges.
N: 2n = 28 (HUSS 1980, material from Wakhan). **Leymus secalinus** (GEORGI) TZVELEV subsp. **secalinus**, with lamina glabrous on the lower surface and subsp. **pubescens** (O. FEDTSCH.) TZVELEV, Nov. Syst. Pl. Vasc. **9**: 59. 1972 (*Elymus dasystachys* TRIN. var. *pubescens* O. FEDTSCH. 1903) with lamina densely short-pilose on both surfaces, may both occur in the area. Their taxonomic rank, based on a single character of unknown variability, may be overestimated.

* **Lolium multiflorum** LAM. 1779 - **A**: Wakhan 2800 m (PODLECH & ANDERS 1977). Hazara. **D**: Europe, Medit.; widely introduced elsewhere.

* **Lolium perenne** L. 1753 - **A**: Kashmir. **D**: Temp. Eurasia, N Africa; introduced in other temp. regions.

* **Lolium persicum** BOISS. & HOHEN. ex BOISS. 1853 - **Ic.**: Fl.Iraq 9: pl.32. **A**: Reported from W Kunlun: Kentalek 2700 m, 1931-07-13, *Persson 209* (PERSSON 1938). **D**: SW Asia, widely introduced elsewhere.

* **Lolium rigidum** GAUDIN 1811 - **Ic.**: Fl.Iraq 9: pl.33. Fl.Iran.70: pl.10. **A**: Wakhan 2800 m (PODLECH & ANDERS 1977). Kashmir. **D**: Medit., SW Asia; widely introduced elsewhere.

* **Lolium temulentum** L. 1753 - **A**: Chitral. Hazara. Kashmir. **D**: Temp. Europe, SW Asia; introduced elsewhere. **N**: A weed of grain crops.

* **Lygeum spartum** LOEFL. ex L. 1754 - **A**: Kashmir (? introduced). **D**: Medit.

* **Melica nutans** L. 1753 - **A**: Kashmir: Keran 1520-1830 m, *R.R. & I.D.Stewart 1752* (KUH, RAW). Near Gulmarg 2440-2740 m, *Duthie 11394* (K!). Pahlgam 2290 m, *R.R.Stewart 7981* (K!, KUH). **D**: Temperate Eurasia, S to Kashmir.

* **Melica onoei** FRANCHET & SAVAT. 1876 (*Melica scaberrima* (NEES ex STEUDEL) HOOKER f. var. *micrantha* HOOKER f. 1896) - **Ic.**: Fl.Xizang.5: fig.71. Hazara: Nuri, Kagan, 1899-08-04, *Inayat* s.n. (K!). Kashmir: Kishtwar 1830 m, *C.B.Clarke 31381* (K! **type** *M. scaberrima* var. *micrantha* ?). **D**: Pakistan (Hazara), Kashmir; China, Japan.

167. Melica persica KUNTH, Revis. Gram. 1: 122, 351, pl.89. 1830

Melica jacquemontii DECNE. in JACQUEM. 1844, *Melica hohenackeri* BOISS. 1853, *Melica canescens* (REGEL) LAVRENKO in KOMAROV 1934, *Melica ciliata* auct. non L.: HENDERSON & HUME 1873

Ic.: Fl.Iraq 9: pl.95 (*M. jacquemontii*); pl.96 (*M. persica*). Fl.Iran.70: pl.38 (subsp. *persica*). Fl.Pak.143: fig.47.

CS **Biafo:** Biafo Gl., terminal moraine, not common 3000-3090 m, *H.Hartmann 55* (K!); *153!; 154* (K!, RAW); 3070-3120 m; Korofon 3110 m (HARTMANN 1966). **Saltoro:** Shahircho, between boulders, rare 3350 m, *Nasir & Webster 6044* (K!; WEBSTER & NASIR 1965); Hushe Vy. 3660 m, *Nasir & Webster 6044* (RAW).

W **Yasin:** Yasin - Darkot, N side 3200 m, abundant, *Bowes Lyon 8118* (K!). Naz Bar 3300 m, *Miehe 3634!*. **Ishkoman:** Ishkoman P. 3960-4270 m, 1954-08, *F.Schmid* s.n. (RAW). **Hunza:** Pisan 2600 m, 1974-07-25, *F.Gartner* s.n. (GZU!). Rakaposhi NW & W opposite Chalt 3500-3700 m, *Miehe 6715!*.

S **Shigar:** Ganto P. - Basna Vy. 3300-3400 m, *Miehe 4929!*; *Poelt* s.n.!. **Shigar/Lower Shyok:** Thalle P., *R.R.Stewart 20657* (WEBSTER & NASIR 1965). **Skardu:** Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 811* (K!). Skardu 2300 m *C.B.Clarke 29953* (K!); 2440 m, *C.B.Clarke 29979* (K); *R.R.Stewart 20466* (RAW). Dry rocky areas above Satpura Lake, c. 4 miles S Skardu, not common, *Nasir & Webster 5823* (K!); Satpara Nullah (WEBSTER & NASIR 1965). **Leh:** Leh 3500 m, 1992-07-14, *Holzner & Kriechbaum* s.n.!. Khalatse 2950 m, *F.Billiet & J.Leonard 6806*

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(K!). Hemis Gompa - Gotssangdubhe 3900-4000 m, *F.Billiet & J.Leonard 6833* (K!). Kanda P. - Rumbak Vy., Yurutse 4180 m, *H.Hartmann 2555!*. Likir - Yangthang 3750 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!. E Yangthang 3650 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!.
A: Kurram. Nuristan. Wakhan: Qazi-Deh 3900 m, *Roemer 135* (M!); (*M. jacquemontii*); 4580 m (*M. hohenackeri*) (PODLECH & ANDERS 1977). Chitral: Oihor Gol 3200 m, *Bowes Lyon 834* (BM!). Tirich Mir 3100-3500 m, *G.Kerstan 1566* (K!). Barum Gol, Zapotili 3600 m, 1950-07-09, *Wendelbo* s.n. (K!, RAW). Agram, Arkari Gol 3050 m, *Stainton 2618* (RAW). Drosh 1370 m, *Toppin 228* (K!). Mirkhani 1370 m, *Stainton* 2282 (RAW). Astor: Chugam 2530 m, *Giles 79* (K!). Shankargarh, *Inayat 25775* (K!). Rama above Astor 3050 m, *R.R.Stewart 22926* (K!). Deosai: Shingo Vy. 3050-3350 m, 1892-07-08, *Duthie* s.n. (K!). Dras: Dras (HENDERSON & HUME 1873); "Yarkand Exp." 1870, *Henderson* (K!). Matayan 3050-3350 m, *Duthie 11726* (K!). Marpo P. above Dras, hot rocks 3350 m, *R.R.Stewart 22230* (K!). Tasgam, *Bimal Misri 347* (K!). Suru: Wakha Vy., SE Mulbekh 3600 m, *H.Hartmann 2556!*. W above Sankoo 3820 m, *H.Hartmann 2340!*. Zanskar: Tungri 3680 m, *H.Hartmann 2557!*. Swat: Bahrein 1520 m, *R.R.Stewart & A.Rahman 25047* (K!, RAW). Kashmir: Lohan Gali near Tilel 3350 m, *R.R.Stewart 18548* (RAW). Himachal Pr.: Spiti, Ki 3950 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!. Poh 3350 m, 1993-08-04, *Holzner & Kriechbaum* s.n.!.
D: Medit., SW & Middle Asia: Turkey - Afgh., Pakistan (Kurram, Baluch., Chitral, Gilgit); Kashmir, NW India. *Ir.-Tur.*
E: (2100) 2300-3900 (4270) m, coll. - mont., not common in the S & W. Steep rocky and scree slopes, meadows and forest-steppes (*Artemisia brevifolia, Juniperus excelsa*). "The economic value is not known for certain; it is reported to be poisonous, but, on the other hand, that it is heavily grazed." (Fl.Pak.).
N: A very polymorphic species, variously split up into numerous taxa. For full synonomy under the adopted wide species-concept see Fl.Pak. "Virtually nothing is known about the causes of the puzzling variation within *M. persica* sensu lato" (Fl.Turkey).

* **Melica scaberrima** (NEES ex STEUDEL) HOOKER f. 1896 (*Glyceria scaberrima* NEES ex STEUDEL 1854) - **A**: Astor: Kalapani 2130 m, 1956-08-20, *R.R.Stewart* s.n. (RAW). Hazara: Thandiani 2590 m, *E.W.Trotter 104* (K!, KUH); 2740 m, *E.Nasir 24842* (RAW); Panther Hill 2290 m, *E.Nasir & R.R.Stewart 27632* (RAW). ?Kashmir. **D**: Himalaya (Hazara - Nepal).

* **Melica secunda** REGEL 1880 (*Melica gracilis* AITCH. & HEMSLEY 1882) - **A**: Kashmir: Zoji P. 3050 m, *R.R.Stewart 22372* (K!). **D**: Tian Shan, Pamir-Alai, Afgh. (Kurram), Kashmir (only once collected).

* **Milium effusum** L. 1753 - **Ic.**: Fl.Xizang.5: fig.127. **A**: Astor: N slope of Chillam, Burzil P. 3350 m, *R.R.Stewart 22017* (K!). Swat. Hazara: Kaghan Vy. Kashmir: Hispoor 2440 m, *C.B.Clarke 28672* (K!). Gulmarg 2590 m, *C.R.Lancaster 224* (BM!). 1830-3050 m, [?]common in mesophytic forests. **D**: Temp. N hemisphere, S to Caucasus, Tian Shan; Himalaya. **N**: Reported from Ladakh (STEWART 1916); probably erroneous.

* **Miscanthus nepalensis** (TRIN.) HACKEL in DC. 1889 (*Eulalia nepalensis* TRIN. 1832, *Diandranthus nepalensis* (TRIN.) L. LIOU 1987) - **A**: Hazara, Kashmir < 1700 m. **D**: Himalaya (Pakistan - W China), N India, Burma.

* **Muhlenbergia duthieana** HACKEL 1902 (*Muhlenbergia sylvatica* auct. non TORREY & GRAY 1834: HOOKER f. 1896) - **A**: Swat. Hazara. Kashmir. 1520-2740 m. **D**: W Himalaya (Swat - Nepal).

* **Muhlenbergia himalayensis** HACKEL ex HOOKER f. 1896 - **A**: Kashmir. Himachal Pr.. **D**: W Himalaya: Kashmir - Nepal.

168. Muhlenbergia huegelii TRIN., Mém. Acad. Sci. Pétersb., ser.6, 6(2): 293. 1841

Muhlenbergia viridissima NEES ex STEUDEL 1854, *Muhlenbergia geniculata* NEES ex STEUDEL 1854

W **Hunza:** Chalt 1830 m, 1954-08-17, *R.R.Stewart* s.n. (RAW).
S **Skardu:** Baltistan - Kargil Road, Tolti - Bagicha 2440 m, *R.R.Stewart 20973* (RAW).

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A: Swat. Hazara. Kashmir.
D: Himalaya (E Afgh. - Bhutan), N & NE India, China, Korea, Japan, Philippines. *Sino-Himal.*
E: 1830-2440 m, coll., rare in the SW. Habitat unknown in the Karakorum, probably water-surplus habitats.

* **Neyraudia arundinacea** (L.) HENR. 1929 (*Aristida arundinacea* L. 1771, *Arundo madagascarensis* KUNTH 1830, *Neyraudia madagascariensis* (KUNTH) HOOKER f. 1896 - **A**: [?]W Kashg.: "Yarkand Plains, wherever there is water" (HENDERSON & HUME 1873). Hazara. Kashmir. **D**: Trop. Africa, trop. Asia (E to ?Nepal).

* **Oplismenus undulatifolius** (ARD.) ROEMER & SCHULTES 1817 (*Panicum undulatifolium* ARD. 1764) - **Ic.**: Fl.Pak.143: fig.20. **A**: Swat. Hazara: Kaghan Vy. Kashmir. 1520-2130 m. **D**: S Europe, Anatolia, Caucasus - Pakistan; E Asia. Asia.

169. Orinus thoroldii (STAPF ex HEMSLEY) BOR, Kew. Bull. 6: 454. 1951

Diplachne thoroldii STAPF ex HEMSLEY 1894, *Orinus arenicola* HITCHC. 1933
Ic.: HITCHCOCK 1933: fig.2. KENG 1959: fig.229. Fl.Xizang.5: fig.36.
S **Pangong:** Tsaka, Ladakh, Kashmir. In bare sand, 15500' [4720 m], 1931-07-18, *Koelz 2365* (K! **type** *Orinus arenicola*).
A: W Tibet: S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9659b!.* W Gar (N 32°10' E 79°57') 4330 m, *Miehe+9663b!.*
D: E Ladakh, S Tibet, C. Himalaya. *S Tibet.*
E: 4720 m, alp., rare (extreme SE). (Generally:) Subalp. (- alp.), superficially dry fluvioglacial sands and gravels, sand-dunes.
N: A characteristic psammophyte of S Tibet; apparently the westernmost localities, more wide-spread in S Tibet.

• **Oryza sativa** L. Sp. Pl. 333. 1753 - **Ic.**: Fl.Iraq 9: pl. 14.
W **Gilgit:** Khomer, 1974-08-22, *F.Gartner* s.n. (GZU!).
A: W Kashg.: Commonly cultivated about Yarkand (HENDERSON & HUME 1873). Kashgar 1330 m, 1925-08-10, *Persson 70a*, cult. (PERSSON 1938). Yangishar, 1913-07-03, *Knorring* (Pl.As.Centr.). S Kashg.: Khotan oasis 1600 m, 1889-09-23, *Roborovsky* (Pl.As.Centr.). Kashmir: extensively cultivated up to c. 2000 m (Fl.Pak. 143).
N: Rice demands a sufficiency of heat and abundant water. Nowadays its cultivation in Kashgaria may be restricted, since "a limited water-supply can be employed more economically on other crops" (cotton e.g.; cf. Fl.Iraq). "Apparently not cultivated in Ladakh" (HENDERSON & HUME 1873).

* **Panicum antidotale** RETZ. 1786 - **A**: Swat. Hazara, Kashmir < 1000 m. **D**: Iran, Afgh. - Kashmir. **D**: Trop. Africa, SW Asia - India.

• **Panicum miliaceum** L., Sp. Pl. 58. 1753
W **Yasin:** Thui Vy., Harp 2800 m, cult., *G.Stöber 86!.* E of Dharkot (2600-3150 m), *Miehe 7062!.* **Gilgit:** Naltar - Nomal 2290 m, 1954-07-24, *?F.Schmid* s.n. (RAW).
S **Skardu:** 2100-2290 m, *Schlagintweit 675* (K).
A: W Kashg.: Cultivated near Yarkand (HENDERSON & HUME 1873). S Kashg.: Kunlun N 1600 m, 1889-09-13, *Roborovsky*; E Kashg. (Pl.As.Centr.). Wakhan: 2800-3300 m, cult. (PODLECH & ANDERS 1977). Astor: Gudai - Gorikot 2440 m, *Nasir & Webster 6423* (RAW). Suru: Kargil, 1848-09-23, *T.Thomson* s.n. (K).
E: Cultivated 2100-2800 m, sometimes as a casual escape on ruderal places.
N: Widely cultivated, wild unknown, probably originated as a crop plant in N India (Fl.Pak.).

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170. Pennisetum flaccidum GRISEB., Nachr. Ges. Wiss. Göttingen **1868**: 86. 1868
Gymnothrix flaccida (GRISEB.) MUNRO ex AITCH. 1869, *Pennisetum centrasiaticum* TZVELEV 1968

Ic.: Fl.Xizang.5: fig.168.

CS **Biafo:** Ashkoley 3060 m, 1876-08-11, *C.B.Clarke 30409* (K!: diseased). Ste Ste 3080 m, *H.Hartmann 165!*; *167* (K!, HARTMANN 1966). **Nubra:** Nubra Vy., *Schlagintweit* (GRISEBACH 1868); Tsarasa - Aranu (right side of the Nubra Vy., 1856-08-03/04, *Schlagintweit 2141* (GOET! **holotype**).

W **Yasin:** Sultanabad 2500 m, *G.Stöber 40A!*. **Gilgit:** Naltar Vy. 1830-2130 m, *Duthie 12341* (K!). Nomal 1680 m, *R.R.Stewart 26656* (K!, RAW). Shinghai Gah - Pahot Gali 1800-2300 m, *Miehe 694!; 1818!*. **Hunza:** Chalt - Chaprot 2120 m, *Klötzli & al. 120.02!*. Karimabad - Khaibar 2400 m, *Klötzli & al. 808.01!*. **Hispar:** Nagar - Hopar Gl. 2440-2740 m, *R.R.Stewart 26655* (K!: diseased. RAW). **Batura:** Gulmit - Atabad 2500 m, *Miehe 3004!*.

S **Skardu:** Satpura nala 2740-3050 m, *Duthie 12666* (K!). **Leh:** Ladakh, *Schlagintweit* (GRISEBACH 1868); 3960 m (HENDERSON & HUME 1873); "common" (STEWART 1916). Dah (right side of the Indus Vy.), 1856-07-04/15, *Schlagintweit 1194* (GOET! **isotype**). Environs of Gia, 1856-07-30/31, *Schlagintweit 1653* (GOET! **type** var. *interruptum*). Lama Yuru, Fotu P., *Bimal Misri 344* (K!). N above Leh 3620-3650 m, *H.Hartmann 2574!*; *3026!*.

A: W Kashg.: ? Yarkand Plains (HENDERSON & HUME 1873: *Gymnothrix* sp.). Yarkand 1350 m, 1931-08-14, *Persson 247*; Yarkand Kardong 1800 m, 1931-07-25, *Persson 77b* (PERSSON 1938). Yarkand oasis 1000 m, 1889-06-04, *Roborovsky* (Pl.As.Centr.). S Kashg.: Russian Mts. N, 1885-06-06, *Przhevalsky*; Keria oasis, 1885-06-10, *Przhevalsky*; Budiya, SW Khotan, 1958-09-27, *Junatov* (Pl.As.Centr.). W Pamir: Ishkashim pr. pag. Schitcharj ad fl. Pjandzh, *C.Afanasjev & P.Ovczinnikov 1653* (LE **type** *P. centralasiaticum*; Pl.As.Centr.); to be expected in the Afghan Wakhan (PODLECH & ANDERS 1977). Chitral: Drosh 1370 m, *Toppin 389* (K!). Brumbret 1520 m, *M.A.Siddiqui & A.Rahman 26733* (K!). Astor: [?]Gurikot 2380 m, *Giles 74* (K!). Deosai: Shingo Vy. 3050-3350 m, *Duthie 11905* (K!). Dras: Dras 3050 m, *Duthie 13746* (K!). Chokyal, *Bimal Misri 322* (K!). Swat: *J.J.Norris 85* (K!). Hazara: Kagan Vy. 2440 m, *Inayat 20343* (K!). Kashmir: Banahal, 1848-05-11, *T.Thomson* s.n. (K!). Kishtwar, 1848-06-15, *T.Thomson* s.n. (K!). Himachal Pr.: Vy. below Hango, 1847-08-24, *T.Thomson* s.n. (K!). Kyelang 3050-3350 m, *Bor 8735* (K!); *14670* (K!); *14910* (K!); *16933* (K!). Billing Nala, *Aswal 10450* (ASWAL & MEHROTRA 1994). Rupshu: Vy. below Hanle, 1847-09-17, *T.Thomson* s.n. (K!).

D: Kashgaria, Tadzh., Afgh., S Karakorum, N Pakistan, Kashmir, Himalaya - S Tibet, S China. *Centr. As.*

E: 1680-3960, (coll.-) mont. - subalp., locally common. Desert-steppes, steppes, forest-steppes, (*Artemisia, Juniperus*); on open sandy, gravelly and rocky places; roadsides and other ruderal localities. "Common in the higher alpine slopes, it is grazed by sheep and goats. Some collectors say it is a useful fodder grass [*Giles 74*]." (Fl.Pak.). The **type** of var. *interruptum* is a diseased plant, infected by a smut which seems to be common in some areas.

171. Pennisetum lanatum KLOTZSCH, Bot. Erg. Reise Pr. Waldemar 65, pl.99. 1862

Ic.: Fl.Pak.143: fig.21(3-4).

W **Gilgit:** Naltar, *A.Ghafoor & Z.L.Butt 808* (KUH). Naltar Vy., Jagot 3100-3300 m, 1974-07-03, *F.Gartner* s.n. (GZU!); 3210 m, 1973-07-19, *F.Gartner* s.n. (GZU!). Baghrot Vy. 3280-3340 m, *Miehe 4520!*; above Sat 3050 m, *Schickhoff 445!*; above Gutumi Nullah 2980 m, *Schickhoff 533!*. Above Phuparash 2870 m, *Schickhoff 752!*. **Hunza:** N Chaprot 2380-3150 (-3500 m), *Klötzli & al. 1.17!; 4.66!; 52.05!*; 77.13!**. Upper Rashumaling Vy. 2680-2700 m, *Schickhoff 118!*; *158!*.

S **Skardu:** Satpura Nullah 3050-3350 m, *Duthie 11997* (K!); *A.Ghafoor 562* (KUH). Upper Stak Nala, Above Khotia Lungma Gl. 3360 m, *Schickhoff 895!*. **?Leh:** Ladakh (STEWART 1916).

Unloc.: Karakorum [Skardu: ?] 2440 m, *C.B.Clarke 30094* (K!).

A: Chitral. Chilas: Gor 2690 m, *Schickhoff 1592!*. Gor Region, Martal 2930m, *Nüsser 1072!; 1073!*. Astor: Tibet, Hasora, Gue - Pattere Brok, 1856-09-13, *Schlagintweit 6206* (GOET!). Nanga Parbat, NE slopes below Rama 2900-3050 m, *Nasir & Webster 6491* (K!, RAW). Upper Astor Vy., Kalapani - Shankargah 2740-3050 m, *R.R.Stewart 22745* (K!). Lower Rupal Vy. 3140 m, *Nüsser 128!*. Middle

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Rupal Vy., Village Lower Rupal 3100 m, *Nüsser 1581!*. Swat. Hazara: Kaghan Vy.: 2840-3030 m, common. Kashmir. Himachal Pr.: Lahol, Bhaga Vy., Kardong - Dartse, 1856-06-15/18, *Schlagintweit 2828* (GOET!). Kishtwar, Triloknath - Kali P. (SW Triloknath), 1856-06-24/27, *Schlagintweit 3830* (GOET!). Khoksar, *Aswal 6602* (ASWAL & MEHROTRA 1994).

D: W Himalaya (E Afgh. - Uttar Pradesh). *W Himal.*

E: 2440-3340 m, mont., locally common in the SW. *Artemisia-Juniperus* forest-steppes and forests (*Pinus gerardiana, Pinus wallichiana, Picea smithiana*). "Reported to be abundant and valuable fodder grass above 2000 m" (Fl.Pak.).

N: The usually very long and dense indumentum of culm and leaves is reduced in some specimens (marked *). The subglabrous form apparently does not deserve taxonomic recognition.

172. **Pennisetum orientale** L. C. M. RICHARD in PERS., Syn. Pl. 1: 72. 1805

Pennisetum fasciculatum TRIN. 1834, *Pennisetum triflorum* NEES ex STEUDEL 1854

W **Gilgit:** Gilgit Vy. 1220 m, *Duthie 12313* (K!). Gilgit 1520 m, *R.R.Stewart 26658* (K!). Karagh, c.5 miles from Gilgit, *A.Ghafoor & Z.L.Butt 744* (KUH). Shinghai Gah - Pahot Gali 2140 m, *Miehe 634!*.

S **Skardu:** 2440 m, *Nasir & Webster 6563* (RAW). **Lower Shyok:** Above Shyok Rv., c.7 miles E of Kiris 2440 m, *Nasir & Webster 5893* (K!).

A: Chitral: Drosh 1370 m, *Toppin 229* (K!). Chilas: Gor 1850 m, *Schickhoff 1459!*. Lower Indus Vy., below Dassu 900 m, *Klötzli & al. 723.35!*. Muthat - Raikot Bridge, Buldar Vy. left slope 2000m, *Nüsser 1059!*. Hazara: Pani Galli, overlooking Indus Vy. 2100 m, *Duthie 7606* (K!). Siran Vy. *Inayat 20342a* (K!). Kaghan Vy., opposite Paras 1410 m, *Schickhoff 90/437!*. Kashmir: [SE Srinagar]1848-05-02, *T.Thomson* s.n. (K!). Srinagar 1900 m, *H.Hartmann 2610* (K!).

D: N Africa, Arabia, SW Asia - Middle Asia, Himalaya - Nepal, Bhutan, India, Ceylon. *Sud.-Sind.*

E: 2140-2440 m, coll., not common in the SW. *Artemisia-Juniperus* scrub and forest-steppes.

173. **Phacelurus speciosus** (STEUDEL) C. E. HUBBARD, Kew Bull. 1928: 25. 1928

Andropogon speciosus STEUDEL 1854, *Rottboellia glauca* HACKEL 1891

Ic.: Fl.Pak.143: fig.37.

W **Ghizar:** Ghutbar 4110 m, *Bowes Lyon 60* (BM!).

A: Chitral: Golen Gol 2130 m, *Bowes Lyon 27* (BM!). Moch Gol 3200 m, *Bowes Lyon 172* (BM!). Bumburet Vy. 2500-2530 m, *Miehe 7077!*. Swat. Hazara: Kaghan Vy. 3010 m, *Schickhoff 90/1200!*. Kashmir: Jhelum Vy. 910-1220 m, *C.B.Clarke 27385* (K!). Pahlgam 2190 m, *R.R.Stewart 21639* (K!). Ganderbal 1680 m, 1891-07-25, *Gammie* s.n. (K!). Sonamarg 2590 m, *C.B.Clarke 30878* (K!); 2740-3050 m, *R.R.Stewart 6766* (K!). Kishtwar, 1848-06-18, *T.Thomson* s.n. (K!). Himachal Pr.: Billing Nala, *Aswal 10448* (ASWAL & MEHROTRA 1994).

D: Afgh., Baluch., - NW India, Nepal. *W Himal.*

E: 4110 m, subalp., rare in the extreme W. Dry slopes. (Chitral:) Humid mont. forests (*Cedrus deodara, Pinus gerardiana*). Usually at lower altitudes.

N: "A highly polymorphic species" (Fl.Pak.).

* **Phalaris arundinacea** L. 1753 (*Typhoides arundinacea* (L.) MOENCH 1794) - **A**: Dras: Kargah Vy. W of Dras 3050-3350 m, *Duthie 13933* (K). Kashmir. **D**: Temp. N hemisphere (Pakistan: Punjab; Kashmir); introduced to most parts of the world.

174. **Phleum alpinum** L., Sp. Pl. 59. 1753

Phleum commutatum GAUDIN 1808

Ic.: Fl.Iraq 9: pl.111. Fl.Xizang.5: fig.122.

CS **Biafo:** Skoro P. N 4170-4250 m, *H.Hartmann 169* (K!); *170!* (HARTMANN 1966).

W **Gilgit:** Shinghai Gah - Pahot Gali 3950 m, *Miehe 1060!*. Baghrot Vy. 3820-4060 m, *Miehe 3741!; 3748!*. Naltar Vy., Jagot 2950-3300 m, 1974-08-03, *F.Gartner* s.n. (GZU!). **Hunza:** N Chaprot 3530

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m, *Klötzli & al. 728.15!*. Rakaposhi N, above Nilt 3950-3970 m, *Miehe 6544!*. Pisan 2900 m, *G.Braun 556!*.

A: Chitral. Chilas: Gor 3520 m, *Schickhoff 1506!*. Astor: Rupal Vy., Bayals 3160 m, *Nüsser 588!; 592!*. Lower Rupal Vy. 3300 m, *Nüsser 102!;* Middle Rupal Vy., Village Lower Rupal 3100 m, *Nüsser 1577!*. Kalapani 3260 m, *Schickhoff 1228!*. Swat. Hazara: Kaghan Vy. 3940 m, *Miehe 339!*; 3200-4060 m. Kashmir: common. Himachal Pr.: Khoksar, *Aswal 6552* (ASWAL & MEHROTRA 1994).

D: Mountains of N hemisphere S to N Africa; Pakistan (Swat, Hazara), Kashmir, Himalaya; N America; Chile. **Map:** HEGI 1 (3): fig. 80. *Holarct.*

E: 3530-4250 m, subalp. - alp., rare. Humid alpine turf with long snow-cover, flushes, *Rhododendron anthopogon-Salix karelinii* scrub.

175. **Phleum himalaicum** MEZ, Feddes Repert. **17**: 293. 1921

Phleum arenarium L. var. *thomsonii* GRISEB. 1868, *Phleum arenarium* auct. non L. 1753: HOOKER f. 1896

W **Gilgit:** Jutial Nullah 2130 m, *R.R.Stewart 26698* (K!, RAW). Shinghai Gah - Pahot Gali 2140-2430 m, *Miehe 630; 641a!*; *648!*.

S **Skardu:** Takht-i-Sulaiman, 1847-05-29, *Winterbottom 283* (K!); 1830 m, 1889-09-09, *E.W.Trotter 141G* (K!).

A: Chitral. Chilas: Muthat - Raikot Bridge, Buldar Vy. left slope 2350m, *Nüsser 1045!*. Swat. Hazara: Kaghan Vy., 1510-1830 m; opposite Malkandi 1510 m, *Schickhoff 90/259!*. Kashmir: 2130-2440 m.

D: Afgh., Pakistan (Chitral, Swat, Hazara, Gilgit); Kashmir, W Himalaya. *W Himal.*

E: 2130-2430 m, mont., rare in the SW. *Artemisia-Juniperus* forest-steppe. A small, short living therophyte, easily overlooked and apparently restricted to a narrow altitudinal belt with sufficient winter-rain and summer-heat in the SW.

* **Phleum paniculatum** HUDSON 1762 (*Phleum asperum* JACQIN 1786) - **A**: Chitral. Swat. Hazara. Kashmir. **D**: Medit. - NW India.

* **Phleum pratense** L. 1753 - **A**: Chitral: Brumboret Vy. SW Chitral 2740 m, *J.D.A.Stainton 3212* (BM, K!). **D**: Temp. Europe, introduced into most countries. **N**: Introduced in Chitral, "at edge of irrigation channel".

176. **Phragmites australis** (CAV.) TRIN. ex STEUDEL, Nomencl. Bot., ed.2, **2**: 324. 1841

Arundo phragmites L. 1753, *Arundo australis* CAV. 1799, *Phragmites communis* TRIN. 1820

Ic.: Fl.Iraq 9: pl.143. Fl.Iran.70: pl.53. Fl.Xizang.5: fig.30. Fl.Desert.Sin.1: fig.9(4-6).

CS **Shimshal:** Shimshal Gorge, Jurjur - Dut 2600-2730 m, *Miehe 5959!*. **Biafo:** Braldo Rv. S Biafo-BC 3060 m (HARTMANN 1966).

N **Taxkorgan:** Taxkorgan - Tagama basin 3000-3100 m, *Miehe 5570!*. **Yarkand:** Ilyk to Mazar 3550-3820 m, common; Kunlun S slope 15 km E Mazar 3900 m, *Dickoré 307!* (veg.).

W **Yasin:** Sultanabad 2000 m, *G.Stöber 105!* (veg.). **Batura:** Gulmit - Atabad 2500 m, *Miehe 3003!*. Karimabad - Khaibar 2800 m, *Klötzli & al. 808.16!*. E Morkhoon 3300 m, *Klötzli & al. 803.30!*.

S **Leh:** Shey Gompa 3300 m, *H.Hartmann 4121!*.

A: W Kashg.: Kashgar - Yecheng, common in oases. Yecheng - Kokyar 1700 m, *Dickoré 140!*. S Kashg.. W Pamir. E Pamir. Wakhan 2800-3800 m (PODLECH & ANDERS 1977). Chilas: Karakorum Highway, Indus Vy.1240 m, *Nüsser 1214!*. Suru: Below Mulbekh 3200, *H.Hartmann 2575!*. Himachal Pr.: Trilokinath, *Bhattacharyya 45937* (BSD; ASWAL & MEHROTRA 1994).

D: Temp. regions. *Cosmopol.*

E: 2000-3820 m, coll. - mont., not common (but locally dominant; in the N only Yarkand Vy., frequent). Sandy river-sides (*Myricaria bracteata*, *Lactuca tatarica*) and as a groundwater-indicator in deserts and steppes on gravel slopes and fans (where mostly dwarf and sterile). Very common on superficially dry to wet (irrigated) sands and alluvial loess of the Kashgarian oases. Its distribution in the large valleys of the S Karakorum apparently is insuffiently matched by the few herbarium

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specimens. According to HARTMANN (pers.comm. 1993), *Ph. communis*, occurs here and there along the Indus Rv. in Ladakh, and is reported to be common in **Nubra**. The delimitation of *Ph. australis* against *Ph. karka* and, possibly other taxa, remains somewhat doubtful. A low growing plant of quite different habit, constant in culture, perhaps ? *Phragmites humilis* DE NOT. 1846, occurs in W Kashg.: Kashgar 1280 m, *Dickoré 988!*.

177. Phragmites karka (RETZ.) TRIN. ex STEUDEL, Nomencl. Bot., ed. 2, **2**: 324. 1841
Arundo karka RETZ. 1786, *Phragmites roxburghii* (KUNTH) STEUDEL 1841, *Phragmites nepalensis* NEES ex STEUDEL 1854

W **Yasin:** Along Mir Wali Canal, *M.Qaiser & A.Ghafoor 3634* (KUH). **Gilgit:** 1520 m, *R.R.Stewart 26632* (RAW).

S **Skardu:** 2440 m, *Nasir & Webster 6590* (RAW).
A: Chilas: Indus Vy. below Dassu 900 m, *Klötzli & al. 723.29,36,37!*. Astor: Rupal - Gurikot 2440-2590 m *R.R & I.D.Stewart 18927* (RAW).
D: Trop. Africa, trop. & warm temp. Asia, Polynesia, N Australia. *Palaeotrop.*
E: 1520-2440 m, subtrop. - coll., rare in the SW.

Piptatherum:
A characteristic Irano-Turanian genus, with its species number quickly diminishing E of Wakhan and N of the Himalaya main range. No species has been reported from the Karakorum N slopes (except for one record of *P. gracile* close to the Shimshal P.) and Kashgaria so far. Species delimitation, synonymy and distribution features are mainly based on FREITAG (1975); see also for key; many specimens are actually determined by *Freitag*.

178. Piptatherum aequiglume (DUTHIE ex HOOKER f.) ROSHEV., Not. Syst. (Leningrad): 113. 1951
Oryzopsis aequiglumis DUTHIE ex HOOKER f. 1896, *Oryzopsis fasciculata* HACKEL 1902

Ic.: Fl.Xizang.5: fig.131

S **Skardu:** Iskardo [Skardu], 1847-11, *T.Thomson* s.n. (K!).
A: Nuristan. Astor: Kamri Vy., W Kalapani 2740-3050 m, *Duthie 12644* (K! **isotype** var. *fasciculatum* (HACKEL) FREITAG); 3050-3350 (W). Thandiani - Kalapani 2130-2440 m, *R.R.Stewart 27789* (K!). Dras: Kargeh Vy., W of Dras 3350-3660 m, *Duthie 13936* (K!). Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1797!*. Kashmir: Changla - Dunga, 1880-08, *A.P.Young* s.n. (BM!). Himachal Pr.
D: Himalaya: E Afgh. (Nuristan), N Pakistan, Kashmir - China. **Map:** FREITAG 1975: fig.6. *Sino-Himal.*
E: c. 2400 m, coll., rare. Habitat in the Karakorum unknown: ? water-surplus habitat in semidesert. (Generally:) "*Quercus*, *Abies* and *Picea* forests and clearings, more rarely in *Juniperus* forests" (FREITAG 1975), *Cedrus deodara* forests.
N: The Nuristan locality seems to be less isolated than it may be suspected from the map of FREITAG 1975.

* **Piptatherum baluchistanicum** FREITAG 1975 - **A**: Reported from Chitral. **D**: SE Afgh., W Pakistan (Baluchistan). **Map:** FREITAG 1975: fig.7.

179. Piptatherum gracile MEZ, Feddes Repert. **17**: 211. 1921
Oryzopsis gracilis (MEZ) PILGER 1939, *Oryzopsis lateralis* STAPF in HOOKER f. 1896 (non *Milium laterale* MUNRO ex REGEL 1880), *Piptatherum laterale* auct. non (MUNRO ex REGEL) ROSHEV. 1951

Ic.: Fl.Xizang.5: fig.129.

CN **Braldu:** Upper Braldu tributary, above Chikor 4050-4100 m, *Miehe 6224!*.

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CS **Biafo:** Ashkoley [Askole] 3060 m, 1876-08-10, *C.B.Clarke 30380* (K!). Biafo Gl., terminal moraine 3070-3120 m; NW Biafo BC 3180 m; Korofon 3110-3280 m; E Askole 3200 m; Drinsang 3600-3920 m; Cho Blok 4000 m; 4110 m; Ste Ste - Gense, *H.Hartmann 158* (RAW); 3450 m; 3510 m; 3440 m, *H.Hartmann 157!; 160* (K!); Baintha 4000 m (HARTMANN 1966). **Saltoro:** Upper Hushe Vy. 3050-3350 m, common (WEBSTER & NASIR 1965); 3350 m, *Nasir & Webster 6275* (RAW). Above Hushe 3250-3660 m, *Miehe 1830!; 1846!; 1899!; 1914!; 2059!*. **?Nubra:** [Lower] Nubra Vy. 3050-3950 m (HOOKER 1896: "*Oryzopsis munroi*": see there).

W **Yasin:** Naz Bar 3280-4180 m, *Miehe 3018!; 3031!; 3223!; 3468!; 3548!; 3651!;* 4440 m, *Miehe 3074!*. Jud Bar 3820-3900 m, *Miehe 7040!*. **Ishkoman:** Baru Gar 3510 m, *Bowes Lyon 8167* (K!). Panji P. S, above Holojut 4040 m, *Miehe 7040!*. **Gilgit:** Jutial Nullah 2130 m, *R.R.Stewart 26696* (K!, RAW). Naltar - Nomal, *A.Ghafoor & Z.L.Butt 857* (KUH); 2440 m *R.R.Stewart 26695* (RAW). Naltar Vy., Jagot 3100-3300 m, 1974-08-03, *F.Gartner* s.n. (GZU!). Upper Dainyor Vy. 2960 m, *Schickhoff 385!*. Baghrot Vy. 2960-3340 m, *Miehe 4298!; 4376!; 4419!; 4529!*. Shinghai Gah - Pahot Gali 2550-3220 m, *Miehe 723!; 1474!; 1757!*. **Hunza:** Ulter Nullah 2440-3050 m, 1954-08-12, *R.R.Stewart* s.n. (K!). N Chaprot 2600-3150 (-4000) m, *Klötzli & al. 71.08!; 725.18!; 727.85!; 730.42!*. Pisan 2250 m, 1974-07-23, *F.Gartner* s.n. (GZU!); 2800-3000 m, 1974-07-24, *F.Gartner* s.n. (GZU!). **Batura:** Gulmit - Atabad 2500-2930 m, *Miehe 2679!*. Khaibar 3820 m, *Miehe 2630!*. W Khaibar 2500-3000 m, *Klötzli & al. 801.27!*. E Morkhoon 3470-3910 m, *Klötzli & al. 44.01!; 106.05!*.

S **Shigar:** Karakorum [? probably Shigar - Skoro P.] 3050 m, 1876-08-06, *C.B.Clarke 30105* (K!; HOOKER 1896: var. *effusa* HOOKER f.). **Skardu:** Burji P. 3350 m, 1876-08-01, *C.B.Clarke 29898* (K!). Satpura nala 3050-3350 m, *Duthie 12031* (K!). Above Satpura Lake, c. 4 miles S of Skardu 3050 m, *Nasir & Webster 5827* (K!, RAW). **Leh:** Le, 1848-07, *T.Thomson* s.n. (K! **neotype**). Fotu P. base, *Bimal Misri 309* (K!). Ang (N of Indus) 3550 m, *H.Hartmann 3030!*. NE Yangtang 3720 m, *H.Hartmann 3029!*. Likir Gompa 4020 m, *H.Hartmann 4101!*. Götsang Gompa (S of Indus) 4300 m, *H.Hartmann 4102!*. Near Shanti Stupa 3500 m, *Holzner & Kriechbaum* s.n.!. Yangthang 3700 m, 1993-07-16, *Holzner & Kriechbaum* s.n.!. **Pangong:** [?]Shushal Rv. 4270 m, *Strachey & Winterbottom* s.n. (K!).

Unloc.: Ladakh, Stag 3350 m, *Koelz 2612* (K!).

A: Wakhan 2700-4550 m (PODLECH & ANDERS 1977). Chitral: Laspur Gol SE of Mastuj 3350 m, *Stainton 3103* (BM!). Chilas: 3 miles from Babusar on way to Gilgit, *Sultanul Abedin & M.Qaiser 9041* (KUH). Gor Region, below Martal 2650 m, *Nüsser 1169!*. Astor: Nanga Parbat range, vicinity of Rama 3350 m, *Nasir & Webster 6459* (K!). Rama Vy. 3290 m, *Lankester & Pearson 1481* (BM!). Deosai: 3700 m, *Miehe 2066!*. Shingo Vy. 3050-3350 m, *Duthie 11919* (K!). Dras: Dras Vy., below Matayan 3050-3350, *Duthie 11745* (K!). Descent Marpo P. above Dras 3960 m, *R.R.Stewart 22313* (K!). Dras, *Bimal Misri 365* (K!). Tasgam, *Bimal Misri 354* (K!). Suru: Suru Vy., above Sanku 3320 m, *H.Hartmann 2342* (K! "*O. lateralis*"). Zanskar: [NW Zangla], 1848-06-29, *T.Thomson* s.n. (K!). Dzongkul 3800-3830 m, *H.Hartmann 2583a!; 2584!*. Sarchu 4500 m, 1992-08-02, *Holzner & Kriechbaum* s.n.!. Thoyor 4450 m, 1992-08-03,, *Holzner & Kriechbaum* s.n.!. Kurgiakh, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Swat. Hazara. Kashmir. Himachal Pr.: Ramjak - Darcha 3720 m, 1993-08-01, *Holzner & Kriechbaum* s.n.!. Poh 3850 m, 1993-08-04, *Holzner & Kriechbaum* s.n.!. Sissu - Gondhla, *Aswal 6733* (ASWAL & MEHROTRA 1994).

D: Pamir-Alai (apparently rare), S Karakorum, W Himalaya (Chitral - Nepal), S Tibet. **Map:** FREITAG 1975: fig.8. *W Himal.*

E: 2130-3500 (-4000) m, mont. - subalp., common in the S. Dry slopes, meadows, forests; most common in *Artemisia brevifolia - Juniperus excelsa* forest-steppes.

180. Piptatherum hilariae PAZIJ, Bot. Mater. Gerb. Bot. Akad. Nauk Uzbeksk. SSR **10**: 20. 1948

Oryzopsis wendelboi BOR in WENDELBO 1952, *Oryzopsis humilis* BOR; 1952

Ic.: Fl.Xizang.5: fig.133 (*O. wendelboi*).

W **Yasin:** Darkot 3290 m, *Bowes Lyon 8105* (K!).

A: Chitral: Barum Gol, Shokor Shal 3300 m, very common, 1950-07-14, *P.Wendelbo* s.n. (BM!, K! **isotypes** *O. wendelboi*). Astor: Below Sachen Gl. 3080 m, *Schickhoff 1037!*. Swat. Hazara. Kashmir. Himachal Pr.: Patseo, *Aswal 10329* (ASWAL & MEHROTRA 1994).

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D: W Pamir, E Afgh., N Pakistan, Kashmir. **Map:** FREITAG 1975: fig.9. *W Himal.*
E: 3290 m, mont., rare in the W. Dry hillside (*Bowes Lyon 8105*). "A widespread but uncommon species in moist upland forests between 1300 and 3500 m." (Fl.Pak.).

* **Piptatherum laterale** (MUNRO ex REGEL) ROSHEV. 1951 (*Milium laterale* MUNRO ex REGEL 1880, *Oryzopsis pubiflora* HACKEL in STAPF 1885) - **Ic.**: Fl.Xizang.5: fig.128. **A**: Wakhan 3200-4250 m (PODLECH & ANDERS 1977). Chitral: Baroghil P. 3810 m, *J.D.A.Stainton 2986* (RAW). Swat. Dras: SW Dras 3450 m, *H.Hartmann 2343!*. Suru: Sanmodangsa 3950 m, *H.Hartmann 2341!*. Rungoum, 1.5 km W Zuildo 4000 m, *Southampton Univ. 84* (K!). Zanskar: Pensi P. (Rangdun - Zanskar) 4360 m, *H.Hartmann 2585!*; (K! "*O. gracilis*"). Tungri 4000 m, *H.Hartmann 2582!*; (K!). Drontichon 4700 m, 1992-07-29, *Holzner & Kriechbaum* s.n.!. Thoyor 4450 m, 1992-08-02, *Holzner & Kriechbaum* s.n.!. Nakli P. 4500 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. **D**: SW Asia: E Turkey - Iran, Afgh., Tadzh., Pamir-Alai, Tian Shan; W Himalaya (E Afgh. - Nepal). **Map:** FREITAG 1975: fig.14. **E**: Alp. steppes (*Artemisia*, *Poa*). **N**: The Zanskar localities are an extension to the range given by FREITAG 1975.

181. Piptatherum munroi (STAPF) MEZ, Feddes Repert. 17: 212. 1921

Oryzopsis munroi STAPF in HOOKER f. 1896, *Oryzopsis stewartiana* BOR 1953, *Oryzopsis geminiramula* OHWI 1957

Ic.: Fl.Xizang.5: fig.134.

W **Gilgit:** Naltar Vy., 2130-2440 m, *Duthie 12344* (K!). Naltar - Nomal 2440 m, 1954-07-24, *R.R.Stewart* s.n. (K!). Shinghai Gah - Pahot Gali 2880 m, *Miehe 629!; 633!; 737!*. **Hunza:** N Chaprot 2600-3000 m, *Klötzli & al. 729.43!*. Upper Rashumaling Vy. 2630-2680 m, *Schickhoff 65!*; *135!*.

S **Shigar:** Upper Basna Vy., Doko - Gon 2650-2750 m, *Miehe 4972a!*.
A: Chitral: Beorai Gol - Drosh 1520 m, *Stainton 3271* (BM!). Chilas: Gor 2690 m, *Schickhoff 1572!; 1585!*. Astor: Gudai Vy. 2740-3050 m, *Duthie 12228* (K!); 3350-3660 m, *Duthie 12192* (K!). Rama - Gurikot (2440-3050 m), *R.R.Stewart 22947* (K!). Pine forest c.4 miles SE of Tarshing at foot of Nanga Parbat 2440 m, *Nasir & Webster 6498* (K!). Rupal Nullah 2440-2740 m, *R.R.Stewart 22854* (K!). Kalapani - Shankargarh 3350-3660 m, *R.R.Stewart 22746* (K!). Mushkin forest 2580 m, *Schickhoff 1137!*. Dras: Kargeh Vy. [W of Dras] 2740-3050, *Duthie 13958* (K!). Zanskar: [Nira - Yulchung], 1848-07-02, *T.Thomson* s.n. (K! "*P. soongaricum*"). Swat: Bahrein 1520 m, *A.Rahman* s.n. (BM!). Madian 1370-1520 m, *R.R.Stewart 24423* (BM!). Hazara: Kaghan Vy. 3390-3600 m, *Miehe 59!; 387!*. Kashmir: Srinagar, *C.B.Clarke 29023* (BM!). Tangmarg 1830 m, *O.Polunin* s.n. (BM!). Himachal Pr.: Khoksar, *Aswal 6601* (ASWAL & MEHROTRA 1994). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4250 m, *Miehe+9613a!;* 4680 m, *Miehe+9610d!*.
D: Himalaya: E Afgh., N Pakistan, Kashmir - Nepal, S Tibet - W China. **Map:** FREITAG 1975: fig.10. *Sino-Himal.*
E: (2130-) 2440-2880 (-3000 m), mont., not common in the SW. Relatively humid *Artemisia brevifolia - Juniperus excelsa* forest-steppes, *Pinus wallichiana* forests; *Salix-Fraxinus* scrub (*Miehe 6972a*).
N: *Piptatherum songaricum* (TRIN. & RUPR.) ROSHEV. 1950, occurs in the Tian Shan.

* **Piptatherum pamiralaicum** (GRIG.) ROSHEV. 1951 (*Oryzopsis pamiralaica* GRIG. 1940) - **A**: Wakhan 2800-3800 m (PODLECH & ANDERS 1977). **D**: E Afgh., W Pamir. **Map:** FREITAG 1975: fig.11.

* **Piptatherum platyanthum** NEVSKI 1937 - **A**: Wakhan 2930-4550 m (PODLECH & ANDERS 1977). **D**: N Iran (Elburs), Afgh., Tadzh. **Map:** FREITAG 1975: fig.18.

* **Piptatherum purpurascens** (HACKEL) ROSHEV. 1951 (*Oryzopsis purpurascens* HACKEL ex PAULSEN 1903) - **A**: Wakhan 3500-4350 m (PODLECH & ANDERS 1977). **D**: C. & E Afgh. (Hindukush, Wakhan), W Pamir. **Map:** FREITAG 1975: fig.12.

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182. Piptatherum vicarium (GRIG.) ROSHEV. in SHISHKIN, Fl. Kirgiz. SSR **2**: 64. 1950
Oryzopsis vicaria GRIG. 1938, *Oryzopsis microcarpa* PILGER 1939

W **Gilgit:** Kargah, *A.Ghafoor & Z.L.Butt 727* (KUH). Shinghai Gah - Pahot Gali 2150-2300 m, *Miehe 1811!*. **Hunza:** Baltit 2440 m, *F.Schmid 10* (K!, RAW). Pisan 2250 m, 1974-07-23, *F.Gartner* s.n. (GZU!).

A: W Pamir. Chitral: Mirkandi 1770 m, *Harris 16789* (K!). Ziarat, Lowari P. 2130 m, *Stainton 2549* (BM!). Bumboret 2070 m, *Bowes Lyon 639* (BM!). Buni 1980 m, *Bowes Lyon 902* (BM!). Chitral - Mastuj track, Barenis 1830 m, *Stainton 2435* (BM!). Chilas: Gor 1850 m, *Schickhoff 1456!*. Buldar Vy. left slope, Muthat - Raikot Bridge 2480m, *Nüsser 1042!*. Swat: Dir 1220 m, *R.R.Stewart, E.Nasir & M.A.Siddiqi 1275* (K!, RAW). Hazara Changla Gali, Murree Hills 2440 m, *R.R.Stewart 23331* (K!). Kashmir: Kamri Vy. 2740-3050 m, *Duthie 12644* (K!). Liddar Vy., above Pahlgam 2440-2740 m, *Duthie 13473* (K!). Banihal P., *Jacquemont 785* (K!).

D: NE Iran, Afgh., Pamir-Alai, Tian Shan, NW Pakistan (E to Chitral, Swat, Gilgit). **Map:** FREITAG 1975: fig.15. *W Pamir*.

E: 2150-2440 m, coll., rare in the SW. Dry cliffs and hillsides, in *Artemisia brevifolia - Juniperus excelsa* forest-steppes.

Poa:

This is one of the most complex and difficult genera of the Karakorum. Numerous taxa have been described from adjacent areas. The species concepts of different floras are largely inconsistent. The genus is known for its intraspecific variation of chromosome numbers and high morphological plasticity. Numerous taxa are, apparently, poorly defined morphologically, although some of them may represent fairly stabilized and apomictic micro-species. Herbarium material, however, often is misidentified, and sometimes even not correctly allocated to species groups or sections. The most difficult group seems to be § *Stenopoa* (*P. nemoralis* group), which is distributed over all altitudinal belts of the whole mountain system and which includes some of the most common plants of the Karakorum (*Poa sterilis* and *Poa attenuata* or a number of ill-defined alpine taxa, *P. attenuata* group). The following treatment of this group is very provisional. Similarly problematic is § *Poa* (*P. pratensis* group), but here the intergrading complex is almost confined to the S Karakorum, whereas other related species seem to be fairly well defined. § *Bolbophorum* (*Poa bulbosa* group) apparently is absent from the C. Asiatic Karakorum N slope and entirely confined to the outer ranges of the S Karakorum. *Poa ladakhensis* H. HARTMANN 1984 proved to belong to *Puccinellia*.

Synopsis of *Poa* (Pl.As.Centr.4, TZVELEV 1976, Fl.Eur.5)

Sect. *Arctopoa* (GRISEB.) TZVELEV
P. tibetica

Sect. *Poa*
(*P. afghanica*), (*P. aitchisonii*), *P. calliopsis*, (*P. falconeri*), *P. gilgitica*, *P. lipskyi*, (*P. pagophila*), (*P. polycolea*), *P. pratensis*, (*P. setulosa*), (*P. stapfiana*), *P. suruana*

Sect. *Stenopoa* DUM.
P. attenuata, (*P. contracta*), (*P. glauciculmis*), (*P. himalayensis*), *P. nemoralis*, (*P. marginata*), (*P. palustris*), (*P. pseudodisjecta*), (*P. relaxa*), *P. sterilis*, (*P. stewartiana*)

Sect. *Bolbophorum* ASCHERSON & GRAEBNER
P. alpina, *P. bactriana*, (*P. bulbosa*), (*P. glabriflora*)

Sect. *Coenopoa* HYL. (*Triviales* NANNF.)
P. sikkimensis, (*P. trivialis*)

Sect. *Ochlopoa* ASCHERSON & GRAEBNER
P. annua, (*P. nepalensis*), *P. supina*

Key to *Poa*:

1. Keels of palea with flexuous, curved or crispate hairs along almost the whole of their length. Annual or sometimes perennial (§ *Ochlopoa*) **2**
\+ Keels of palea scabrid or ciliate, if hairy then only in the lower half. Perennial, rarely annual **4**

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2. Anthers (1.0) 1.3 - 2 mm long. Lemma elliptic, usually dark coloured towards the tip. Spikelets ± clustered towards the end of the panicle branches ..... **P. supina**
+ Anthers 0.6 - 0.8 (1.0) mm long. Lemma lanceolate, green or variously tinged with purple. Spikelets ± evenly spaced in the panicle **3**
3. Lemma without any wool at the base ..... **P. annua**
+ Lemma with copious wool at the base ..... **(P. nepalensis)**
4. Short living, vividly green or ± purplish tinged, flaccid perennials. Ligules long and acute. Lemma with copious callus wool. Palea keels spiny. Anthers 0.5 - 2 mm (§ *Coenopoa*) **5**
+ Perennials, usually long living, mid-green or glaucous, often more rigid. Ligules short and truncate or long and acute. Lemma with or without callus wool. Palea keels scabrid or ciliate. Anthers 0.5 - 3.5 mm **6**
5. Anthers 0.5 - 0.8 mm ..... **P. sikkimensis**
+ Anthers 1.5 - 2 mm ..... **(P. trivialis)**
6. Stem distinctly bulbous or thickened with the hardened or scarious remains of old leaf sheaths; plants densely tufted, not rhizomatous. Spikelets often viviparous, lemmas of the sexual spikelets broadly ovate (§ *Bolbophorum*) **7**
+ Base of stem not or only slightly bulbous. Rhizomatous or tufted plants. Plants rarely viviparous, lemmas lanceolate or sometimes ovate **9**
7. Base of stem enclosed into scarious remains of dead sheaths. Leaves broad, flaccid to ± coriaceous ..... **P. alpina**
+ Base of stem with a distinct hardened bulbous swelling. Leaves usually narrower, thin, ± ephemeric . **8**
8. Lemma (of sexual spikelets) with copious callus-wool and long hairs on the nerves below. Spikelets mostly viviparous ..... **P. bulbosa**
+ Lemma (of sexual spikelets) subglabrous, with only a few short hairs on the nerves below. Spikelets mostly sexual, sometimes viviparous ..... **P. bactriana**
9. Plants ± rhizomatous or loosely tufted with long or short ascending stolons, innovations extravaginal. Lemma with ± copious, sparse or rarely absent callus wool **10**
+ Plants densely tufted, without rhizomes or stolons, innovations usually intravaginal. Lemma without or with sparse callus wool (§ *Stenopoa*) **17**
10. Callus wool copious, consisting of a tuft of crispate hairs usually as long as or longer than the spikelet **11**
+ Callus wool absent, inconspicuous or consisting of a small tuft of crispate or ± straight hairs usually much shorter than the spikelet **13**
11. Lemma ovate, usually distinctly variegated with purple and with a broad yellow scarious margin. Keels of palea with very few short spines. Panicle effuse, panicle branches few, long and slender, the lower often reflexed, smooth or scabrid. Tiny plant (5-15 cm) with thin, long creeping rhizomes, high alpine ..... **P. calliopsis**
+ Lemma lanceolate, ± concolorous or usually less distinctly variegated, with narrow margin. Palea ± densely spiny on the keels. Panicle effuse to densly contracted, panicle branches usually many, rarely deflexed, scabrid or glabrous. Usually robust plants (15-50 cm) with thick rhizomes, various habitats **12**
12. Panicle highly contracted, spike-like with most branches not longer than the spikelets, smooth. Margin of lower glume often ciliate. Lemma lanceolate, pale-greenish. Stout and robust, very glaucous plant. Rhizomes long, thick (E Pamir, Ladakh, W Tibet) ..... **P. tibetica**
+ Panicle usually less contracted, most branches much longer than the spikelets, smooth or scabrid. Margin of lower glume smooth. Lemma lanceolate, green or variously tinged with purple. Plant slender, less robust, glaucous or green. Rhizomes short ascending or long, usually thin (S Karakorum, Himalaya and elsewhere) ..... **P. pratensis**
12a Pedicels and panicle branches smooth or very slightly scabrid, panicle usually contracted. Plants stout and rigid, with thick ± long rhizomes. Leaves tightly folded, usually short and rigid, very glaucous. Lemma ovate-lanceolate ..... **P. pratensis** subsp. **pruinosa**
12b Pedicels and panicle branches usually scabrid, panicle effuse to ± contracted. Plants ± slender and flaccid, with thin or short stolons. Leaves flat or folded, ± long ± flexuous, green to ± glaucous. Lemma lanceolate or lanceolate-ovate **12c**

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12c Basal leaves tightly folded, 1-2 mm broad, usually mid-green, often nearly as long as the culms. Plants ± densely tufted, with short ascending stolons. Lemma ovate-lanceolate, 2-3 mm long ..... **P. pratensis** subsp. **angustifolia**

12d Basal leaves flat or loosely folded, 2-4 mm broad, green or glaucous. Lemma ovate to lanceolate, 2-5 mm long **12e**

12e Plants usually 15-70 cm, culms and leaves flaccid to ± robust. Panicle branches variously scabrid. Lemma greenish or variously tinged with purple, with ± distinct scarious margins ..... **P. pratensis** subsp. **pratensis**

12f Plants 5-15 cm, stout and rigid. Panicle branches densely scabrid with short spines. Lemma variegated, deeply suffused with purple and with prominent scarious margins ..... (**P. pratensis** subsp. **staintonii**)

13. Plant loosely tufted **14**

\+ Plant densely tufted **18**

14. Anthers small 1.8 - 2.5 mm ..... (**P. pagophila**)

\+ Anthers 2.5 - 3.5 mm **15**

15. Stout, rigid, glaucous plants ..... **P. lipskyi**

\+ Slender and lax plants, usually not glaucous **16**

16. Lemma entirely glabrous ..... **P. suruana**

\+ Lemma densely hairy below **17**

17. Lemma 5-nerved, hairy in the lower third. Sheaths and leaf-blades smooth ..... (**P. falconeri**)

\+ Lemma 7-nerved, hairy on the faces up to about the middle. Sheaths and leaf blades scabrid ..... **P. gilgitica**

18. All culm nodes usually included into leaf-sheaths, leaves almost all basal. Panicle ± contracted with relatively few and large spikelets, these usually variegated with purple. Glumes ovate to lanceolate. Lemma variously hairy or glabrous between the nerves. Plants (2-) 5-20 (-50) cm, ± dwarf or stout, growing on alpine to subnival turf and screes ..... **P. attenuata**

\+ Culm usually well exserted from the leaf-sheaths, with distinct, often black nodes visible at least in the basal part, with leaves usually up to the middle or higher. Panicle effuse to ± contracted, with relatively small spikelets. Spikelets usually ± concolorous greenish, sometimes suffused with purple. Glumes ± lanceolate. Lemma usually glabrous between the nerves, with long hairs on lateral nerves. Plants (10-) 20-50 (-80) cm high, ± slender, growing in colline to subalpine steppes, meadows and forests **19**

19. Ligule 0.5 - 0.8 mm. Glumes very unequal, the lower one-nerved, narrowly lanceolate with green midrib and broad scarious margin. Usually green, slender and flaccid plants. Panicle usually effuse (in full flowering), panicle branches slender. Anthers 1.2-1.5 mm. Rare in the SW Karakorum, in moist shady places of the colline and lower montane belt ..... **P. nemoralis**

\+ Ligule 1 - 3 (-5) mm. Glumes subequal or ± unequal, 3-nerved. Usually glaucous, ± stout or rigid plants. Panicle usually ± contracted, with few, short rigid branches. Anthers 1.4-2.0 mm. Common in the W & S Karakorum, dry to moderately moist colline to subalpine steppes, meadows and forests ..... **P. sterilis**

* **Poa afghanica** BOR 1954 - **Ic.:** BOR & MELDERIS in KÖIE & RECHINGER 1965: pl.5, 6. Fl.Iran.70: pl.12. **A**: [?]Wakhan 2700-3180 m (PODLECH & ANDERS 1977) [? to *P. pratensis*]. **D**: E Afgh. (Nuristan, ?Wakhan). **N**: Poorly understood, probably close to *P. aitchisonii*.

* **Poa aitchisonii** BOISS. 1884 - **A**: Chitral. **D**: Iran, Afgh., Pakistan.

183. Poa alpina L., Sp. Pl. 67. 1753

Ic.: RAJBHANDARI 1991: pl.81b, fig.9d-f.

CS **Biafo:** Biafo Gl. 4110 m, *Scott Russell 1801* (BM!, RAJBHANDARI 1991). Laskam 4430-4540 m; Cho Blok 4130-4180 m; Ste Ste - Gense 3520-3600 m; 3520 m, *H.Hartmann 171* (Z!); 4000 m (K!, RAW); Gense 3700-4510 m; Mango 3700-4220 m; Baintha 4000-4780 m; 4000 m, *H.Hartmann 175!*;

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176 (Z!); 1962-07-24, *E.Reiser* s.n. (Z!); Skoro P. N 4130-4380 m (HARTMANN 1966). **Saltoro:** Saling (on the right side of the Shayok opposite Khapalu) to Hushe (on the Tsetanga Rv.), 1856-07-13/15, *Schlagintweit 5483* (GOET! "*P. annua*" det. *Grisebach*). Ghondokoro and Chogolisa basins, 4270-4880 m, *Nasir & Webster 6221; Francis 38* (WEBSTER & NASIR 1965). Above Hushe 4350 m, *Miehe 1997!*.

N **Mintake:** S Taxkorgan, W KKH (37°03'N 75°27'E) 4500 m, *Miehe 5819!*.

W **Yasin:** Naz Bar 3900-4120 m, *Miehe 3263!; 3279!; 3368!*. **Ishkoman:** Ishkoman Chhantir 3350 m, *Bowes Lyon 8199* (K!, RAJBHANDARI 1991). **Gilgit:** Naltar Vy. 3350-3660 m, 1892-08-04, *Duthie* s.n. (K!); 3350-3960 m, *R.R.Stewart 26619* (K!); *26622* (K!, RAW). Baghrot Vy. 3730-4280 m, *Miehe 3740!; 3749!; 3981!; 4109* (K!); *4560!*. Shinghai Gah - Pahot Gali 3750-4190 m, *Miehe 1003!; 1063!; 1110!; 1367* (K!); *1670a!*. **Hunza:** Minapin Gl. 3510-3660 m, *Lloyd & Megan 45* (BM!); *74* (BM!); *89* (BM!, LLOYD & LLOYD 1968). Rakaposhi N, above Nilt 3670-3780 m, *Miehe 6550!*. Above Masot Gl. 3630 m, *Schickhoff 185!*. N Chaprot 3530 m, *Klötzli & al. 728.13!*. NE Chaprot 3910-4250 m, *Klötzli & al. 11.06, 17, 24!; 13.05, 14!; 14.05!; 17.01, 05!*. Batura S flanks 3500 m, *Paffen 331* (M!). Upper Batura 3900 m, *Paffen 350* p.p. (M!, with *Koeleria cristata*). Zangia Harar 3960 m, *R.Scott Russell 1029* (BM!). **Hispar:** Hispar Gl., N lateral moraine 4000 m, *Koncza* (CALCIATI & KONCZA 1909); right bank 4110-4270 m, *R.Scott Russell 1562* (BM!). Makerum 3810 m, *R.Scott Russell 1396* (BM!). Gharesa Gl., 12 miles E Nagar 3890 m, *Polunin 6264* (BM!, E, RAJBHANDARI 1991). **Batura:** Gulmit - Atabad 4000-4050 m, *Miehe 2938!; 2963!*. E Morkhoon 3990-4100 m, *Klötzli & al. 38.13!; 103.03!*. **Khunjerab:** Buksel Vy. 3500 m, *Visser-Hooft* (DOLK 1929).

S **Shigar:** Kero Lungma Gl., right bank 3960 m, *R.Scott Russell 1377* (BM!); left bank 4420 m, *R.Scott Russell 1260* (BM!). Sokha Gl., left bank 3960-4110 m, *R.Scott Russell 1658* (BM!); *1693* (BM!). Thale La to Bagmaharal, 1856-08-30, *Schlagintweit 5940* (M!). **Shigar/Lower Shyok:** Thalle P., *R.R.Stewart 20649* (RAW); *20738* (KUH). **Skardu:** Burji P. 3960 m, *C.B.Clarke 29927* (BM!); Bari La [Burji P.] 4270-4570 m, *Duthie 12667* (K!). Ganto P. W 4200 m, *Miehe 4869!*.

E **Upper Shyok:** [Murgai 4880 m] 1848-08-22, *T.Thomson* s.n. (K!). [Sassir - Murgai], 1848-08-28, *T.Thomson* s.n. (K!, with *Poa calliopsis*).

Unloc.: Ladakh and Yarkand 2740-3660 m (HENDERSON & HUME 1873); "Yarkand Exp.", 1870-06-28, *Henderson 576* (K!). Karakorum 3810 m, *C.B.Clarke 30428* (K!); 4880 m, *C.B.Clarke 30246* (K!).

A: Kongur: Upper Oytag Vy., 3750-3900 m, *Miehe 8727!; 8839!; 9162!*. Wakhan 3300-4600 m (PODLECH & ANDERS 1977); *Anders 7521* (M!); *7872* (M!); Upper Istmotsh Vy. 3900-4000 m, *Anders 8135* (M!). Kurram. Nuristan. Chitral: Barum Gol, Zapotili 3600 m, 1950-07-09, *Wendelbo* s.n. (BM!). Rosh Gol NE Tirich Mir 3350 m, *Stainton 2795* (BM!). Oihor Gol 3350 m, *Bowes Lyon 819* (BM!). Sha Jinali P. N Mastuj 4420 m, *Stainton 3044* (BM!). Chilas: Raikot Vy., near Fairy Meadows 3350 m, *Nüsser 955!* (cf.). Raikot Gl., left lateral moraine, nunatak 4050 m, *Nüsser 415!*. Kosto Vy. 4150 m, *Nüsser 1446!*. Ganalo Gl. right lateral moraine, nunatak, Base camp area 4200 m, *Nüsser 511!*. Astor: Sati Su - Das Kirim, *Winterbottom 661* (K!). Deosai: Upper Shingo Vy., Deosai Plains 3960 m, *R.R.Stewart 22239a* (KUH). Dras: Marpo P. above Dras 4720 m, *R.R.Stewart 22306* (K!, RAW). Matayan 3350 m, 1891-07-31, *G.A.Gammie* s.n. (K!). Baltal - Matayan, 1880-09, *A.P.Young* s.n. (BM!). Suru: Dras, Kargil via Suru to Tsringmat, 1856-10-10/11, *Schlagintweit 7200* (M!). Swat: Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25331* (BM!). Hazara: Kaghan Vy., Babusar P., common 3700-4100 m, *Miehe 155!; 196!; 233!; 461!; Schickhoff 90/659!; 90/710!; 90/720!; 90/747!; 90/1371!*. Kashmir: Common !. [Baltal] 1848-09-28, *T.Thomson* s.n. (K!). Himachal Pr.: Lahol, Rotang P. - Koksar (N slopes of the P.), 1856-06-09, *Schlagintweit 3987* (Z!). Spiti, Chota Dara 3800 m, 1993-08-07, *Holzner & Kriechbaum* s.n.!. W Tibet: Gnari Khorsum, N foot of Uta Dhura P. across the Kiungar P. to its N foot (4940-5360 m), 1855-07-09/12, *Schlagintweit 7321* (GOET!).

D: Circumarctic: Eurasia, S to Medit., Caucasus, Tian Shan, Pamir-Alai, W Kunlun, W & S Karakorum, Himalaya: Afgh. (Wakhan, Nuristan) - N Pakistan, Kashmir - W Nepal; N America. *Holarct.* **Map**: RAJBHANDARI 1991: fig.30 (Himalaya).

E: 3340-4890 m, alp., locally common in the S & W Karakorum. Moist alpine turf with long snow cover (*Kobresia nitens, Carex stenocarpa*), in "snow-valleys" and subalpine scrub (*Betula utilis, Salix karelinii, Rhododendron anthopogon*), rare and confined to meadow steppes of the subalpine-alpine transition zone in the arid regions.

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N: Usually a very distinct species in the area, though vegetatively plastic. Nevertheless, *P. alpina* has been confused and mixed up with various other species (e.g. *P. calliopsis*, *P. pratensis*, *P. supina*) in literature records, which obscures the northern and eastern limits of its distribution. The species is frequently viviparous in Europe, but apparently always sexual in Central Asia.

184. Poa annua L., Sp. Pl. 68. 1753
Poa royleana STEUDEL 1854

Ic.: Fl.Xizang.5: fig.63. Fl.Desert.Sin.1: fig.15(3-8). RAJBHANDARI 1991: pl.82a, fig.10e-g.

CS **Nubra:** [Lower] Nubra Vy. (3050-3350 m), 1848-08-04, *T.Thomson* s.n. (K!).

S **Leh:** 1856-07-15/08-05, *Schlagintweit 989* (K!).

A: Wakhan (PODLECH & ANDERS 1977). Hazara: Kaghan Vy. 1450 m, *Schickhoff 90/183!*.

D: Almost cosmopolic (avoiding deserts and hot climates). **Map**: RAJBHANDARI 1991: fig.30 (Himalaya). *Cosmopol.*

E: c. 3000-3500 m, mont., rare. Cultivated and ruderal moist open places, perhaps undercollected. "A common weedy species found in a variety of habitats. 1400-4300 m." (Fl.Pak.).

* **Poa araratica** TRAUTV. 1873 (*Poa versicolor* BESSER subsp. *araratica* (TRAUTV.) TZVELEV 1974). - **D**: Turkey - Turkmenistan. **N**: Specimens often assigned to this are fairly frequent in the mont. - subalp. (alp.) belt of the SW Karakorum on meadows, relatively humid meadow steppes, rocks, in scrub and forest (*Salix karelinii*, *Betula jacquemontii*, *Juniperus turkestanica*). "Very similar to *P. sterilis*, but has a short, thick rhizome and the uppermost node is near the base of the culm. It is also rather similar to *P. attenuata*, but has longer spikelets and lemmas." (Fl.Pak.). The specimens are more or less intermediate between *P. sterilis* (subalp.) and *P. attenuata* (alp.) and are perhaps of hybridogenous origin. The *Poa attenuata* - *P. sterilis* complex appears to be almost continuous, but whereas the extremes are usually quite distinct, the intermediates do not seem to deserve specific status. They are highly variable, but probably best placed under the respective ill-defined species or regarded as transitional forms.

185. Poa attenuata TRIN., Mém. Acad. Sci. Pétersb. Sav. Étr. **2**: 327. 1835
Poa albertii REGEL 1880, *Poa litwinowiana* OVCZ. 1933, *Poa glauciculmis* OVCZ. 1932, *Poa marginata* OVCZ. 1932, *Poa densissima* ROSHEV. ex OVCZ. 1932, *Poa lahulensis* BOR 1948, *Poa koelzii* BOR 1948, *Poa poophagorum* BOR 1948, *Poa rangkulensis* OVCZ. & CZUK. 1956, *Poa roemeri* BOR 1970, *Poa glauca* VAHL subsp. *litwinowiana* (OVCZ.) TZVELEV 1974, ? *Poa dahurica* TRIN. 1836, ? *Poa attenuata* TRIN. var. *dahurica* (TRIN.) GRISEB. in LEDEB. 1852, ? *Poa serotina* EHRH. ex HOFFM. var. *botryoides* TRIN. ex GRISEB. 1852, ? *Poa botryoides* (GRISEB.) ROSHEV. 1929, ? *Poa sinoglauca* OHWI 1943, ? *Poa sinattenuata* KENG 1959, ? *Poa versicolor* BESSER subsp. *araratica* auct. non (TRAUTV.) TZVELEV 1974, ? *Poa araratica* auct. non TRAUTV. 1873, ? *Poa nemoralis* auct. non L. 1753

Ic.: Fl.URSS 2: tab. 30:8-9. Fl.Iran.70: pl.13 (*P. roemeri*). Fl.Xizang.5: fig.54(4-6) (*P. lahulensis*), fig.59 (*P. litwinowiana*). RAJBHANDARI 1991: pl.93b, fig.20a-c (*P. lahulensis*), pl.87b, fig.17a-c (*P. litwinowiana*), pl.92b, fig.19a-c (*P. koelzii*).

CN **Braldu:** Pamir P. S, near Shuwart 4550-4770 m, *Miehe 6115!; 6129!; 6139!; 6161!; 6165!*. Upper Braldu tributary, above Chikor 4100-4200 m, *Miehe 6225!; 6227!;* 4410 m, *Miehe 6212!; 6216!* (*P. attenuata* X *P. sterilis* ?); *6218!*. **K2-North:** Muztagh Vy. SE 4090 m, *Dickoré 864!;* E 4370-4420 m (*Dickoré*). K2-N Gl. W 4420-4460 m, *Dickoré 656!*. K2-N Gl. E 4580-4620 m, *Dickoré 713!; 714!; 723!; 815!*; 4750-5020 m, *Dickoré 671!; 798!*. **Shaksgam:** Aghil P. S 4480 m, *Dickoré 590!*; 4580-4630 m; 4790 m (*Dickoré*).

CS **Shimshal:** Shachmirk P. W 4030-4440 m, *Miehe 6016!*. Pamir-tang, Shachmirk P. - Shujerab 4500-4650 m, *Miehe 6385!*. Pamir P. 4720-4860 m, *Miehe 6244!; 6289!; 6297!; 6301!; 6329!;* N 4600 m, *Miehe 6044!*. **Biafo:** Cho Blok 4130 m, *H.Hartmann 173* (Z!); 4180 m, *H.Hartmann 172* (K!), 4200 m, *H.Hartmann 185!* (K!); *192!*. Laskam 4450 m, *H.Hartmann 194!*; 4700 m, *H.Hartmann 193* (RAW, Z!). Skoro P. N 4600 m, *H.Hartmann 198* (Z!). Biafo Gl. 4420-4570 m, *R.Scott Russell 1831* (BM!). **Saltoro:** Near tongue of Ghondokoro Gl. 3350 m, *Nasir & Webster 6263* (K, RAW). Above

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Hushe 4150-4330 m, *Miehe 1972!; 2026!*. **Nubra:** (K). Nubra [Taksha - Changlung] 3660-3960 m, 1848-08-09, *T.Thomson* s.n. (K!). Nubra [Sassir P. W] 4270 m, 1848-08-12, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** Hills W Karakul 4050-4280 m, *Miehe 5339!; 5350!; 5374!*. Mustagh Ata N 3930 m, *Miehe 5436!*; W 4190-4520 m, *Miehe 5488!; 5498!; 5500!; 5543!; 5558!*; SW 4280-4360 m, *Miehe 5924!*; SW 4000-4180 m, *Miehe 5894!; 5898!; 5940!*. **Taxkorgan:** S Taxkorgan (N 37°03' E 75°27') 4400-4460 m, *Miehe 5886!;* 4640-4660 m, *Miehe 5862!*.; above Dafda 4110-4400 m, *Miehe 5584!; 5604!*. **Mintake:** S Taxkorgan, above Mazar 4110-4170 m, *Miehe 5677!* (*P. attenuata* X *P. sterilis* ?); 4110-4500 m, *Miehe 5727!; 5732!; 5749!; 5783!*. **Yarkand:** Mazar P S 4910 m, *Miehe 8349!*. Aghil Gorge 3850 m, *Dickoré 433!*. Aghil Vy. 4150 m, *Dickoré 463!*; Aghil P. N 4520-4800 m, *Dickoré 505!; 577!*. **Karakash:** W Xaidulla 4600-4840 m, *Miehe 8283!*. SE Dahongliutan 4800-4850 m, *Miehe 7883!*.

W **Ghizar:** Ghutbar 4270 m, *Bowes Lyon 55* (BM!). **Yasin:** Naz Bar 4140-4390 m, *Miehe 3102!; 3210!*. Panji P. N 4170-4180 m, *Miehe 6978!*. **Ishkoman:** Panji P. S, above Holojut 4270-4290 m, *Miehe 6944!*. Ishkoman P. 3960-4270 m, 1954-08, *F.Schmid* s.n (K!). **Gilgit:** Shinghai Gah - Pahot Gali 4150-4580 m, *Miehe 949!; 972!; 1221!; 1231!; 1271!; 1277!; 1579!; 1594!; 1624!*. Baghrot Vy. 4300-4350 m, *Miehe 3834!*. **Hunza:** Zangia Harar 4270 m, *R.Scott Russell 1530* (BM!). **Hispar:** Hispar Gl., Makerum 4420 m, *R.Scott Russell 1460* (BM!); right bank, 3960 m, *R.Scott Russell 1551* (BM!); *1554* (BM!); E of Sekanbarisi Gl. (3960-4570 m), *R.Scott Russell 1517* (BM!); left bank, Turmun Makerum 3350-3510 m, *R.Scott Russell 1231* (BM!); Makerum 3810-4110 m; *R.Scott Russell 1392* (BM!); *1389b* (BM!); *1446* (BM!); *1454* (BM!). Gharesa Gl. 12 miles E Nagar 3960 m, *O.Polunin 6299* (BM!); basecamp 13 miles E Nagar 4740 m, *O.Polunin 6142* (BM!); junction with Gl. from Momhil Sar 4820 m, *O.Polunin 6185* (BM!). **Batura:** Gulmit - Atabad 4040 m, *Miehe 2740* (cf.); 4150-4370 m, *Miehe 2755!; 2768!; 2790!; 2805!; 2869!; 2920!*. E Morkhoon 4100 m, *Klötzli & al. 38.18!;* 4300 m, *Klötzli & al. 39.04!*. **Khunjerab:** P. SW 4150-4800 m, *Miehe 2253!; 2265!; 2275!; 2325!; 2338!; 2365!; 2406!; 2426!; 2455!; 2472!; 2493!; 2496!; 2504!; 2515!; 2527!; 5216!*; 4250-4600 m, *Klötzli & al. 109.02,05; 111.01!; 130/131.09!*.

S **Shigar:** Kero Lugma Gl. left bank 3960-4720 m, *R.Scott Russell 1240* (BM!); *1277* (BM!); *1359* (BM!). **Skardu:** Burji P. 4420 m, *C.B.Clarke 29858* (K!); Burji P., above Skardu 4570 m, *R.R.Stewart 20112* p.p. (KUH, RAW, US; RAJBHANDARI 1991 „*P. araratica*"). **Leh:** Zingrul, 1927-07-16, *Bosshard* (Z!: "*P. bulbosa*"). Khardong P. 5060 m, 1912-07, *R.R. & I.D.Stewart* s.n. (RAW). SE Leh, Matho 4470 m, *H.Hartmann 2378!;* 4550 m, *H.Hartmann 2378!*. Kanda P. N 4850 m, *H.Hartmann 2568!*. Taglang P. 4790-5200 m, 1992-07-21; 1993-07-21, *Holzner & Kriechbaum* s.n.!. Taglang P. NW 4950 m, *H.Hartmann 4109!*; Taglang P. 5300 m, *H.Hartmann 4103!*. Tirdik, upper Bedashisa Vy., near Sabu 4800 m, *Billiet & Leonard 6865* (K!). **Lower Shyok:** Tsorbat P. to Tsumgaks on the N foot of the P., 1856-07-08, *Schlagintweit 5293* (GOET!); *5302* (GOET!). **Pangong:** Keptung P., 1927-09-29, *Bosshard* (Z!, SCHMID 1932: "*P. bulbosa*"). Chacagma, 1927-08-05, *Bosshard* (Z!).

E **Upper Shyok:** [Sassir P. E] 4880-5180 m, 1848-08-13, *T.Thomson* s.n. (K!). Sassar 1848-08, *T.Thomson* s.n. (K!). [Sassir - Murgai] 4570 m, 1848-08-15, *T.Thomson* s.n. (K!). **Aksai Chin:** Sirigh Jilga Lake 5300 m, 1927-08-31, *Bosshard* (Z!).N Tibetan Mts. 5160 m, *Miehe 8035!*; *8046!*; 5100-5300 m, *Miehe 8236!* (cf.).

Unloc.: Balti, *Schlagintweit 6087* (GOET!). „Pamir Boundary Commision", *Alcock 17775* (K!). Tibet, 1896/1897, *Deasy & Pike* (K!). Rocks above Niskik P. 5180 m, *R.Scott Russell 1530* (BM!).

A: Kongur: Upper Oytag Vy. 3280 m, *Miehe 8769!*; Upper Oytag Vy. 3700-3900 m, *Miehe 9045!; 9151!*.; Upper Gez Gorge 3000-3300 m, *Miehe 5427!*. W Kunlun: Akaz P. 3580-3710 m, *Miehe 8587!; 8601!; 8649!*. Kudi 3050 m, *Dickoré 225!*; Upper Tiznap Vy. 4200 m; NE Mazar P. 4380 m, *Dickoré 273A!*; 4570 m, *Dickoré 301!*. Tiznap Vy., N Kudi 3480 m, *Miehe 7464!*. W Kudi 3930-4100 m, *Miehe 7495!; 8490!*. Upper Tiznap Vy. SE Kudi 3080-4000 m, *Miehe 7620!; 7631!; 7641!; 7801!; 8529!*. Mazar P. N 4470-4510 m, *Miehe 7759* (cf.); *7764!*. Mazar P. N 4890 m, *Miehe 8519!*. W Pamir. E Pamir. Wakhan: ?2700-4600 m (*P. litwinowiana*), ?2930-4450 m (*P. roemeri*), ?2800-4250 m (*P. glauciculmis*) (PODLECH & ANDERS 1977) [very common in the Wakhan, but apparently not elsewhere in Afgh.; typical ± above of 4000 m, whereas much of the material from lower altitudes (in hb. Podlech!) may represent *P. sterilis*]. Bahrak - Dalez P. 3300-4250 m, *Anders 7291* (PODLECH & ANDERS 1977: *P. marginata*);. N side of Lake Caqmaqtin 4050 m, *Grey-Wilson & Hewer 1547* (W!). Tergan Qurun Vy. leading to the Tosma P., S of Lake Bishutik 4500 m, *Grey-Wilson & Hewer 1522*

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(W!). Chitral: Barum Gol, South Barum Gl. 4500 m, 1950-07-27, *P.Wendelbo* s.n. (K!). Chilas: Raikot Gl., left lateral moraine, nunatak 3880-3900 m, *Nüsser 418!; 434!.* Pattaro Vy., above Gutum Sagar 4450 m, *Nüsser 1347!.* Astor: Rupal Vy., Nagachakali, nunatak 3500-3620 m, *Nüsser 605!; 633!.* Upper Rupal Vy., ascent to Mazeno High Camp 4650 m, *Nüsser 1508!.* Above Rama, near lake 3380 m, *Nasir & Webster 6457* (RAW). Gudai Vy. 3660 m, *Duthie 12182* (K!). Deosai: Deosai 3860-4050 m, *Miehe 2104!; 2146!; 2172!.* Deosai E 4260-4600 m, *Miehe 5092!; 5123!.* Dras: Kargil via Suru to Tsringmat, 1856-10-10/11, *Schlagintweit 7196* (GOET!). Marpo P. 4570-4720 m, *R.R.Stewart 22302* (K!). Zanskar: Takti P., 1848-07-01, *T.Thomson* s.n. (K!). [Nira - Yulchung], 1848-07-02, *T.Thomson* s.n. (K!). Phutaksha P., 1848-07-04, *T.Thomson* s.n. (K!). Rangdum 3050 m, *Koelz 2905* (BM!). Kangi P. - Rangdum 3660 m, *Koelz 2859* (BM!). Zingchen 4700 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Shingo P., 1981, *Holzner* s.n.!. Nimaling 4800 m, *H.Hartmann 3040!;* 4860 m, *H.Hartmann 3041!.* S above Nimaling, foot of Kang Yaze 5170 m, *H.Hartmann 3039!* Kanda P. S 4880 m, *H.Hartmann 2573* (K!). Debring 4820 m, *H.Hartmann 4104!.* W Chumik Marpo 4650 m, 1993-07-25, *Holzner & Kriechbaum* s.n.!. Surichun P. - Kargiakh 4900 m, 1993-07-27, *Holzner & Kriechbaum* s.n.!. Sumdo 4800 m, 1992-07-28, *Holzner & Kriechbaum* s.n.!. Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. Sarchu 4450 m, 1992-08-02, *Holzner & Kriechbaum* s.n.!. Gamburanjon 4600 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Lahul, Lingti 12000' [3660 m], *Bor 15024* (K! **type** *P. lahulensis*). Lingti Chu 4500 m, 1993-07-25, *Holzner & Kriechbaum* s.n.!. Hazara: Kaghan Vy., Saiful Muluk - Babusar P. 3860-4300 m, *Miehe 187!; 491!; 512!; 564!.* Himachal Pr.: Parang Vy., 1847-09-10, *T.Thomson* s.n. (K!). Dartse to Tsanskar Sumdo, 1856-06-17, *Schlagintweit* s.n. (Z!). Tsanskar Sumdo to Ramchak (S foot of Shinku La P.), 1856-06-18, *Schlagintweit 11000* (GOET!), s.n. (Z!). Ascent Shingo P., above Lakong 4700 m, *Holzner & Kriechbaum* s.n.!. Rupshu: Ascent to Lanak P., 1847-08-13, *T.Thomson* s.n. (K!). Hanle Rv. 4210-4270 m, 1847-09-10, *T.Thomson* s.n. (K!). Rupshu, Vy. SE of Ladakh [Tso Kar], 1847-09-24, *T.Thomson* s.n. (K!). Rupshu, „limestone & micaceous rocks" (4570-5490 m), 1865-06, *Stoliczka* s.n. (K!). Environs of the Salt Lake Tsomoriri, 1856-06-21/22, *Schlagintweit 6805* (GOET!). Tsakzhun Tso 4570 m, Ladakh, Kashmir, in dry sand plain, 15000' [4570 m], 1931-07-20, *Koelz 2385* (K! **holotype**, BM **isotype** *P. koelzii*); *Koelz 2389* (K!). Nuruchan 5100 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. Nuruchan 4650-5050 m, 1992-07-23; 1992-07-24, *Holzner & Kriechbaum* s.n.!. W Tibet: Gnari Khorsum, Poti via Lomorti to Poling, 1855-09-05/15, *Schlagintweit 7103* (GOET!); *7112* (GOET!). Laptel to Selchell and Hoti (S of the Satlej), 1855-07-16/19, *Schlagintweit 7062* (K!). Left side of the Satlej, from the surface of the lacustrine plain only 4510-4660 m, *Schlagintweit 7376* (K!). Upper Domar Chu 5100-5300 m, *Miehe 7909!; 7911!; 7917!; 7928!; 7950!; 8015!; 8083!; 8111!.* Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670c!;* (N 32°28' E 81°20') 4900 m, *Miehe+9672d!.* W Wuma (N 32°23' E 83°08') 5180 m, *Miehe+9677c!.* E Wuma (N 32°34' E 83°22') 4800-5200 m, *Miehe+9679b!.* N Moincer (N 31°15' E 80°15') 5050-5550 m, *Miehe+9640d!; +9645c!; +9641d!; +9643c!* (cf.); *+9644c!* (cf.). Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4680 m, *Miehe+9610e!; +9608!.* Manasarovar Lakes, S Langa Co (30°34' E 81°14') 4700 m, *Miehe+9638b!* (cf.). Changtang: Lungmu Co 5170 m, *Miehe 8122!.*

D: Central Asia: Siberia, Altai, Mongolia, Tian Shan, Pamir-Alai, Kunlun, Karakorum, Himalaya, Tibet. *Centr.As.*. **Map**: RAJBHANDARI 1991: fig.33 (*P. lahulensis*).

E: (3350) 3930-5300 m, alp.-subniv., common. Dry alpine turf (*Kobresia capillifolia*), steppe (*Oxytropis densa, O. chiliophylla, Stipa purpurea, St. subsessiliflora, Festuca olgae*) and semi-desert, screes slopes, rock-fissures, permafrost gravel.

N: *Poa attenuata* is one of the most common components of the alpine flora of Pamir, Karakorum and the Tibetan Plateau. It is close to and perhaps conspecific with the circumarctic-alpine **Poa glauca** VAHL, Fl. Danica **6** (17): 3. 1790. The *Poa attenuata* group is highly polymorphic and represents one of the most problematic complexes in the flora of High Asia. Much more work has to be done to reexamine its variation. Numerous taxa have been described (more recently CUI & CUI 1987). Some of them may represent discrete (apomictic ?) populations, but their morphological characters are often very indistinct and certainly highly plastic. The indumentum of the spikelets, often employed for distinguishing *P. lahulensis* (lemma hairy between nerves), *P. koelzii* (callus-wool), and other micro-species does not seem to be a reliable character and is often variable in one panicle. The delimitation of the alpine *P. attenuata* group against the montane-subalpine *P. sterilis* group (*P. nemoralis, P. sterilis*) presents further problems. However, the over-all variation does not seem to be quite

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continuous, but there are many specimens, mainly from middle altitudes and often assigned to *P. araratica* (*P. versicolor* subsp. *araratica*), see there, which seem to be more or less intermediate between what is here called *P. attenata* and *P. sterilis*. There is no positive (morphological or ecological) indication that these intermediates, which are also extremely variable, do represent another distinct species, nor about the identity of the C. Asiatic plants and *P. araratica*.

186. Poa bactriana ROSHEV., Not. Syst. (Leningrad) **4**: 93. 1923

? *Poa zaprjagajevii* OVCZ. 1933, ? *Poa nevskii* ROSHEV. 1936, ? *Poa dsilgensis* ROSHEV. 1936, ? *Poa bactriana* ROSHEV. subsp. *drobovii* TZVELEV 1973, *Poa bulbosa* auct. non L. 1753

Ic.: RAJBHANDARI 1991: pl.83b, fig.11d-f.

CS **Saltoro:** Above Shahircho, upper end of Hushe Vy. 3660 m, *Nasir & Webster 6095* (K!, RAW; WEBSTER & NASIR 1965).

W **Yasin:** Darkot 3260 m, *Bowes Lyon 8096* (K!: sexual); 3290 m, *Bowes Lyon 8102* (K!: viviparous & sexual).

S **Shigar:** Tandoro 2400 m, *H.Hartmann 197* (K!, Z!: sexual); *198* (K!, Z!: viviparous). Ganto P. - Basna Vy. 3300-3400 m, *Miehe 4931!* (viviparous); 1991-07-07, *J.Poelt* s.n.! (viviparous). S Gon 3000-3100 m, 1991-07-09, *J.Poelt* s.n.! (viviparous).

A: Wakhan: Tolibai Vy. 4000-4200 m, *Anders 8063* (PODLECH & ANDERS 1977: *P. dsilgensis*). Chitral. Zanskar: [Umasi P.], 1848-2.6 [1848-06-20/23], *T.Thomson* s.n. (K!; GOET!). Himachal Pr.: Lahul, Gondla - Kyelang 3110 m, *N.L.Bor 14659* (K!); Serchu - Kyelang, *N.L.Bor 15129* (K!).

D: SW & Middle Asia; Turkey - Afgh., Pakistan, NW India (insuffiently known). *Ir.-Tur.*

E: 2400-3660 m, mont. - subalp., rare. Dry hillsides, cliffs, limestone screes, *Artemisia brevifolia* scrub-steppes; "abundant on dry slopes, associated with *Artemisia*" (WEBSTER & NASIR 1965).

N: It seems to be rather unlikely that the sexual and viviparous specimens from the few localities in the Karakorum represent different species. *Poa bactriana* probably includes several other taxa (as listed above). See under *P. bulbosa*.

* **Poa bulbosa** L. 1753 - **Ic.**: RAJBHANDARI 1991: pl.84a, fig.12a-d. Fl.Desert.Sin.1: fig.15(1-2). **A**: Chitral. Astor: Lower Rupal Vy., Churit - Bulashbar, 2480 m, *Nüsser 806!;* Nahake - Gageh, 3000 m, *Nüsser 773!*. Dras: Matayan 3350 m, 1891-07-31, *G.A.Gammie* s.n. (K!). Swat. Kashmir. **D**: Europe, SW Asia, C. Asia, W Himalaya. **Map**: RAJBHANDARI 1991: fig. 31. **E**: [?] "High alpine meadows 1000-3700 m". Apparenty under more humid conditions than *P. bactriana*. **N**: Viviparous specimens are hardly to be distinguished from *P. bactriana*. The *Poa bulbosa*-complex (§ *Bolbophorum*) needs a thorough reexamination. The taxonomy of the complex is very confused, and many herbarium specimens are even not correctly allocated to § *Bolbophorum*. Part of the (strictly viviparous) specimens from NW Himalaya may belong to *P. bactriana*.

187. Poa calliopsis LITV. ex OVCZ., Izv. Tadzhik. Bazy Bot. **1**: 18. 1933

Poa flexuosa auct. non SM. 1800: HOOKER f. 1896 p.p., ? *Poa phariana* BOR 1948, *Poa pratensis* L. var. *alpigena* auct. non BLYTT 1861: ? PAMPANINI 1934

Ic.: Fl.URSS 2: fig. 21(11). Fl.Tadzh.1: fig.19. Fl.Xizang.5: fig.54(1-3). RAJBHANDARI 1991: pl.85a, fig.13d-f.

CS **Shimshal:** Pamir P. 4790-4880 m, *Miehe 6311!; 6323!.* **?Nubra:** Siachen Gl., base camp 4850-4950 m, *Dainelli* (PAMPANINI 1934: "*P. pratensis* var. *alpigena*").

N **Mustagh Ata:** N 3650 m, *Miehe 5465!.* **Taxkorgan:** Dafdar 3500 m, 1935-06-29, *Persson 660* (PERSSON 1938). **Yarkand:** Aghil P. N 4560-4660 m, *Dickoré 532!.* **?Upper Yarkand:** Rimu Gl. camp 5210 m, *Dainelli* (PAMPANINI 1934: "*P. pratensis* var. *alpigena*").

S **Leh:** Wandla Vy., 1848-09-04, *T.Thomson* s.n. (K!). Kartse 4130 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. **Pangong:** Environs of the salt lake Tsomognalari, 1856-06-25/29, *Schlagintweit 7007* (M!).

E **Upper Shyok:** [Sassir - Murgai], 1848-08-28, *T.Thomson* s.n. (K!). ?Upper Sassir Vy. 4850 m, *Dainelli* (PAMPANINI 1934: "*P. pratensis* var. *alpigena*"). **Aksai Chin:** Beyond Lanak P. 5300 m, 1927-08-16, *Bosshard* (Z!).

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A: ?Kongur: Kashgaria, in angustis Ulug-Tuz, 1909-06-29, *Divnogorskaya* s.n. (K!). W Kunlun: Upper Tiznap Vy., 3-4 km E Saryk P. 4800 m, 1959-06-04, *Junatov* (Pl.As.Centr.). Upper Tiznap Vy., S Kudi 3950-4210 m, *Dickoré 957!*; *Miehe 7732!; 8554!*. C.Kunlun: Kyuk-Egil Rv., S Keria 4300 m, 1885-06-28, *Przhevalsky*; Russian Mts. N 4600-5000 m, 1890-08-20, *Roborovsky* (Pl.As.Centr.). E Pamir. Wakhan: Upper Tshelab Vy. 4000-4100 m, *Anders 7560* (M!; PODLECH & ANDERS 1977). Zanskar: [Nira - Yulchung 3930-4180 m], 1848-07-02, *T.Thomson* s.n. (K!, with *P. pratensis*). Shingo P. 4800 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Himachal Pr.: Parang Vy., 1847-09-09, *T.Thomson* s.n. (K!). Rupshu: Kyung Tso 5030 m, *Koelz 2246a* (K!). Starsa Puk Tso 4550 m, 1992, *Holzner & Kriechbaum* s.n.!. Nuruchan 4680 m, 1993-07-22, *Holzner & Kriechbaum* s.n.!. W Tibet: Ad rupes altissimas Transkinbrong NW Tibet, *Jacquemont 1804* p.p. (K!: "*P. variegata*", with *P. pratensis*). Gnari Khorsum, 1855-09, *Schlagintweit 7125* (M!). Upper Domar Chu 5170 m, *Miehe 7958!*. E Wuma (N 32°34' E 83°22') 4790 m, *Miehe+9681b!*. N Moincer (N 31°15' E 80°15') 5030 m, *Miehe+9647c!*.

D: C. Tian Shan, Pamir-Alai, Wakhan, Kunlun, Karakorum, Himalaya (Kashmir-Bhutan), Tibet, SW China. *Tibet*.

E: 3500-5300, alp.-subniv., scattered. By flushes and periodical water-courses, in humid alpine turf, on fens (*Kobresia schoenoides*), on fine permafrost gravel.

N: A usually distinct, small rhizomatous species with broad variegated lemmas of high alpine water-surplus habitats. It has a characteristic Pamiro-Tibetan distribution, with only scattered connecting localities along the Karakorum main ridge. Young specimens with unfolded lemmas may be confused with *P. pratensis*. Possibly there are intermediates where both species come into contact at relatively low altitudes (Wakhan, Indus Vy. of Ladakh ?). Single culms without the bases may be difficult to distinguish from *P. alpina*.

* **Poa falconeri** STAPF in HOOKER f. 1896 - **Ic.: Fig. 8(1). A**: Swat: Beyond Bishigram, *R.R.Stewart 24996* (K!). Kashmir: Above Pahlgam 3660 m, 1925-08-14, *R.R.Stewart 8789* (K!). Musjid Vy. 3960-4270 m, *Duthie 13262* (K!). Himachal Pr.: Lahul. W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4000-4300 m, *Miehe+9629c!;* 4530 m, *Miehe+9617c!;* 4570 m, *Miehe+9619c!* (cf.). **D**: Himalaya (Swat - Nepal), S & SE Tibet. *?Sino-Him.* **N**: A very variable species and apparently insufficiently understood. Two local derivates N of the Himalaya main ridge, *P. gilgitica* and *P. suruana* are recognized here as distinct taxa.

188. Poa gilgitica DICKORÉ sp. nov.

Ic.: Fig. 8 (2).

P. falconeri primo aspectu maxime similis, sed lemmate 7-nervi (nec 5-nervi), inter nervis piloso ad 1/2 (nec 1/3).

Gramen perenne. Culmi basi decumbentes, demum erecti, teretes, glabri, 40-70 cm alti, basi vaginis scaberrimis circumdati. Foliorum laminae ± complicatae, scaberrimae. Ligula acuta, 3-4,5 mm longa. Panicula laxa, anguste-pyramidalis, nutans, 12-16 cm longa, 4-7 cm lata, rami scabri, inferiores 2-nati, reflexi. Spiculae lanceolato-acutae, 3-5-florae, 5,5-7 mm longae. Gluma inferior 2,2-2,7 mm longa, oblongo-acuta, 1-nervis, superior 2,8-3,3 mm longa, 3-nervis, ovata, late hyalino-marginata. Lemma inferius 4,2-5 mm longum, 7-nerve, acutum, inter nervos pubescens ad dimidium, carina ciliata, lana nulla. Paleae carinae semipilosae. Antherae 2,5-3 mm longae.

Habitat in Piceetis (*Picea smithiana*, *Pinus wallichiana*, *Carex oligocarya*, *Allium gilgiticum*) humidis montium ad 2910 m usque ad 3600 m supra mare.

Typus: [Gilgit] Shinghai Gah - Pahot Gali (N 35°48'-55' E 74°10'-17'), *Picea smithiana* forest on NW-facing slope, vegetation record no. 37, 3100 m, 1990-07-26, *G. & S. Miehe 796* (**holotype** K!, **isotype** GOET!).

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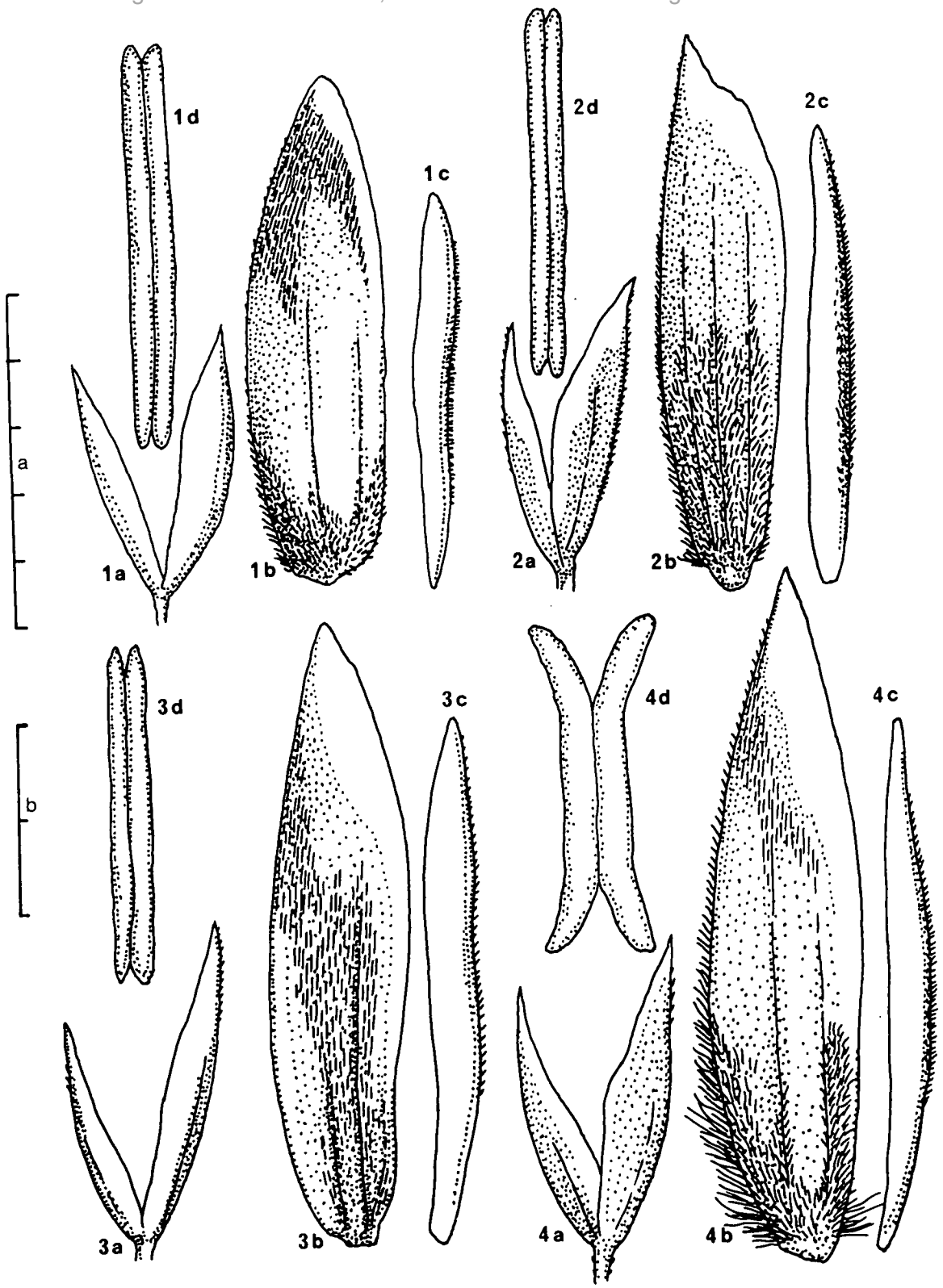

Fig. 8: ***Poa***.
Glumes (a), lemma (b), palea (c), anther (d). Scale a (a) = 5 mm, Scale b (b - d) = 2 mm.
1: P. falconeri (Kashmir, *R.R.Stewart 8789*, K). **2: P. gilgitica** sp. nov. (*Miehe 1461*, type locality). **3: P. suruana** (*H.Hartmann 2873*, **type**, hb.Hartmann). **4:** *P. lipskyi* (Kunlun, *Dickoré 285*).

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W **Gilgit:** Shinghai Gah - Pahot Gali 2910-3460 m, *Miehe 718!; 796!* **(type)**; *805!; 1438!; 1461!; 1514!.* Above Jaglot Rv. 3210 m, *Schickhoff 608!.* Rakaposhi W above Barti 3200-3250 m, *Miehe 6749!; 6754!.* **Hunza:** Rakaposhi NW & W opposite Chalt 3200 m, *Miehe 6671!.*

S **Shigar:** Ganto P. E 3600 m, *Miehe 4915!.*

A: Chilas: Gor 3230 m, *Schickhoff 1520!.*

D: SW Karakorum, Indus Gorge: Upper Chilas, Gilgit, Lower Hunza, W Baltistan. *Endem.*

E: 2910-3600 m, mont.-subalp., rare in the SW Karakorum. Moist shady, usually N-facing *Picea smithiana* forests, somewhat ruderal (grazing places), more rarely in *Pinus wallichiana*, *Betula jacquemontii* forest and *Juniperus* scrub.

N: This seems to be, like *Poa suruana*, another local derivate of the *P. falconeri* group; *P. stapfiana* is apparently also closely related. *P. gilgitica* is characterized by its very scabrous leaf-blades and sheaths, and 7-nerved pubescent lemmas. It appears to be ecologically isolated and ± confined to *Picea smithiana* (and potential *Abies webbiana* ?) forests of the Indus Gorge (see *Allium gilgiticum*, *Carex oligocarya*).

* **Poa glabriflora** ROSHEV. 1936 (*Poa bactriana* ROSHEV. subsp. *glabriflora* (ROSHEV. ex OVCZ.) TZVELEV 1973 - **A**: Zanskar: Chumik Marpo 4800 m, 1992-08-04, *Holzner & Kriechbaum* s.n.!. Sarchu 4400 m, 1993-07-23, *Holzner & Kriechbaum* s.n.!. **D**: Pamir, Hindukush, W Himalaya (insuffiently known).

* **Poa himalayensis** NEES ex STEUDEL 1854 - **A**: Kashmir. Himachal Pr.: Rohtang P. 3600 m, 1992-08-17, *Holzner & Kriechbaum* s.n.!. **D**: Himalaya (Kashmir - Bhutan), SE Tibet, Assam.

189. Poa lipskyi ROSHEV., Bull. Jard. Bot. Pétersb. **30**: 303. 1932

Poa dschungarica ROSHEV. 1932, *Poa taldyksuensis* ROSHEV. 1950 (diagn.ross.), *Poa kungeica* GOLOSK. 1955, *Poa litwinowiana* auct. non OVCZ. 1933: DICKORÉ 1991

Ic.: Fl.URSS 2: fig.31(12). **Fig. 8 (4).**

CN **K2-North:** K2-N Gl. W 4370-4420 m, *Dickoré 654!; 747!.*

N **Mustagh Ata:** Hills W [Little] Karakul 4300-4350 m, *Miehe 5361* (K!); *5390!.* **Mintake:** S Taxkorgan, above Mazar, W KKH 4110-4300 m, *Miehe 5637!; 5665!; 5683!.*

A: W Kunlun: Akaz P. 3260-3300 m, *Miehe 7377!; 7421!.* Mazar P. NE 4380 m, *Dickoré 285!.* E Pamir.

D: Dzung. Alatau, Tian Shan, Pamir-Alai, W Kunlun, N Karakorum. *E Pamir.*

E: 4110-4420 m, (subalp.-) alp., rare in the NW. Steppes (*Festuca olgae*), turf, tall forb communities (*Carex nivalis, Delphinium brunonianum*) on stabilized moraine gravels; *Caragana*- scrub. Apparently more common and characteristic on alpine loess slopes of the Kunlun Shan.

N: **Type** from Dzung. Alatau (LE). The plants from **Mintake** (*Caragana* scrub) are relatively large and less glaucous. They may represent a separated population somewhat transitional to *P. pratensis* subsp. *pruinosa*, which grows in the same locality. *Poa hissarica* ROSHEV. 1941 (? *Poa laudanensis* ROSHEV. 1934) is close to *P. lipskyi*, but has a subglabrous lemma.

190. Poa nemoralis L., Sp. Pl. 69. 1753

W **Ghizar:** Gupis 1980 m, *Bowes Lyon 8031* (K!). Kargah Vy. 2500 m, *Bowes Lyon 8021* (K!). **Hunza:** Pisan 3100 m, *G.Braun 558!; 561!.*

A: Kongur: Upper Oytag Vy. 3060 m, *Miehe 9184!.* Chilas: Raikot Vy., right slope above Fary 3300 m, *Nüsser 1024!.* Swat: Madyan - Kolalai, *Rechinger 30689* (W!). Hazara: Kaghan Vy. 2250 m (*Cedrus*-forest), *Schickhoff 90/395!.*

D: Temp. Eurasia, N America (Pakistan: Swat, Gilgit, Hazara, Kashmir). *Holarct.*

E: 1930-3730 m, coll. - mont., rare in the S & W. Humid forests, among boulders, wet rock-walls.

N: Most of the cited specimens are not quite certain and may also refer to reduced specimens of *P. sterilis*. *P. nemoralis* seems to be at least rare N of the Himalaya main range. Many literature records

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may refer to *P. sterilis* or to hybrids with this and to the alpine complex, here included under *P. attenuata* .

* **Poa nepalensis** WALL. ex DUTHIE 1883 (*Poa annua* L. var. *nepalensis* GRISEB. 1868) - **A**: Kashmir. **D**: Himalaya (Kashmir - Nepal), Assam.

* **Poa pagophila** BOR 1949 (*Poa flexuosa* auct. non SM. 1800 nec WAHLENB. 1814: STAPF in HOOKER f. 1896 p.p.) - **Ic.**: Fl.Xizang.5: fig.57. **A**: Chitral. Swat. Kashmir. **D**: Himalaya (?Swat - Bhutan), ?S Tibet.

* **Poa palustris** L. 1759 - **A**: Kashmir: Pir Punjal, Fras Nag 2740 m, *R.R.Stewart 23152* (K!). **D**: N hemispere. **N**: Apparently the only collection from Kashmir, difficult to distinguish from *P. sterilis*.

* **Poa polycolea** STAPF in HOOKER f. 1896 - **Ic.**: Fl.Xizang.5: fig.56. **A**: Kashmir: Sharda, Kiran, 1964-09-24, *J.Mohd* (K!). [?] Liddar Vy., above Kanimal 3660 m, *Duthie 13128* (K!). Himachal Pr.: Vy. N of Chamba, 1848-06-11, *T.Thomson* s.n. (K! **type**). **D**: W Himalaya (E Afgh. - Bhutan).

191. Poa pratensis L., Sp. Pl. 67. 1753

subsp. angustifolia (L.) GAUDIN, Agrost. Helv. 1: 214. 1811

Poa angustifolia L. 1753, *Poa pratensis* L. var. *angustifolia* (L.) SMITH 1800

Ic.: Fl.URSS 2: fig. 29(2-3); KENG, l.c.: fig.102. Fl.Desert.Sin.1: fig.16(11-14).

W **Yasin:** Naz Bar 3370-3470 m, *Miehe 3334!; 3507!*. **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26618** (K). Baghrot Vy. 3130-3850 m, *Miehe 3767!; 4363!; 4493!; 4552!; 4579!*. Shinghai Gah - Pahot Gali 3450 m, *Miehe 825!*. Rakaposhi W above Barti 3020-3050 m, *Miehe !*. **Hunza:** Daintar 3000 m, *Lobbichler 405* (M!). Above Nilt, Masot Gl. 3170 m, *Schickhoff 248!*. Rakaposhi N above Nilt 3600-3970 m, *Miehe 6470!; 6486!; 6531!; 6568!*. N Chaprot, *Klötzli & al. 727.49, 62!* (subsp. *angustifolia* X subsp. *pruinosa* ?).

S **?Skardu:** Satpura Lake 3050 m, *Nasir & Webster 5815* (RAW).

A: Swat. Hazara. Kashmir.

D: Temp. N hemispere.

E: 3000-3970 m, mont. - subalp., scattered in the SW. Relatively humid forests (*Picea smithiana, Pinus wallichiana, Juniperus excelsa, Betula utilis*), scrub (*Juniperus sibirica, Salix karelinii*) and meadows.

N: It apparently grades freely into subsp. *pratensis* and subsp. *pruinosa*.

subsp. pratensis

Ic.: Fl.URSS 2: fig.29(1); KENG 1959: fig.101. Fl.Xizang.5: fig.52. Fl.Desert.Sin.1: fig.16(7-10).

CS **Biafo:** Ste Ste - Gense 3530 m, *H.Hartmann 170* (K!); 3520 m, *H.Hartmann 181* (Z!). Mango 3780 m, *H.Hartmann 180* (Z!). **Saltoro:** Ghondokoro Gl. basin, flat along lateral moraine, 3960-4270 m, *Nasir & Webster 6183* (K!, RAW; WEBSTER & NASIR 1965).

W **Yasin:** Darkot 3200 m, *Bowes Lyon 8080* (K!). Naz Bar 3350-3400 m, *Miehe 3610!*. Panji P. N 4170-4180 m, *Miehe 6975!*. **Ishkoman:** Ishkoman Chantir 3350 m, *Bowes Lyon 8199* (K!). Talas near Ishkoman 3700 m, 1954-08-12, *F.Schmid* s.n. (RAW). Upper Baru Gah 3320-3450 m, *Miehe 6789!; 6812!*; Panji P. S above Holojut 4040-4100 m, *Miehe 6928; 6931!*. Imit 3600-3800 m, 1974-07-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Naltar 2740-3050 m, *R.R.Stewart 26709* (K!). Naltar Lakes 3350 m, *R.R.Stewart 26621* (K!); Naltar Vy. 3050-3350 m, *Duthie 12392* (K!); above Bichgari 3120 m, *Schickhoff 37!*. Baghrot Vy. 3800-4300 m, *Miehe 3813* (K!*); (3400-3700 m), *Miehe 4198!*. Shinghai Gah - Pahot Gali 3240-4150 m, *Miehe 1030* (K!); *1461!; 1644* (K!). Kar Gah 3190 m, *Schickhoff 2055a!*. **Hunza:** Banidas, *Lobbichler 229* (M!). Rakaposhi N above Nilt 3900 m, *Miehe 6582a!*; (alt.?) *Miehe 6520!*. Rakaposhi NW & W opposite Chalt 3500-3570 m, *Miehe 6663!; 6703!*. N Chaprot 3200 m, *Klötzli & al. 50/51.04!; ?*6.15!;*(2880-3390 m), *24/25/26.06!* (subsp. *pratensis* X subsp. *pruinosa* ?); (3600-4400 m), *728.77!*. Chaprot Vy. 3130 m, *Schickhoff 2109!*. Upper Rashumaling Vy. 2700 m, *Schickhoff 137!*. Nagar - Minapin 2130-2440 m, *R.R.Stewart 26620* (K!). Minapin, above Hapakund

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3030 m, *Schickhoff 358!*. Above Nilt, Masot Gl. 3210 m, *Schickhoff 214!*. **Batura:** Gulmit - Atabad 4000-4050 m, *Miehe 2969* (K!).

S **Skardu:** Ganto P. W 3990 m, *Miehe 4773!*. **Leh:** 1848-07, *T.Thomson* s.n. (K!); 3500 m, 1992-07-13, *Holzner & Kriechbaum* s.n.!. Ladakh 3350 m (HENDERSON & HUME 1873). Wandla [3350 m], 1848-07-06, *T.Thomson* s.n. (K!). Nurla, 1848-07-08, *T.Thomson* s.n. (K!). N Leh 3600 m, *H.Hartmann 3037!***. NE above Sankar 3600 m, *H.Hartmann 4108!***. SE Leh, Matho 4550 m, *H.Hartmann 2350*** (K!). Kanda P. N 4550 m, *H.Hartmann 2572!***. **Shyok:** [Calzar], 1848-07-22, *T.Thomson* s.n. (K!). [Kardong P. N], 1848-09-10, *T.Thomson* s.n. (K!).

A: Kongur: Aj-bulong 3400 m, 1930-07-20, *Persson 227**; Jerzil 2800 m, 1930-07-16, *Persson 122** (PERSSON 1938). Upper Oytag Vy. 3150 m, *Miehe 8687!*. Wakhan. Chitral. Chilas: Gor Region, Martal 2930m, *Nüsser 1081!*. Rakhiot Vy. 3230 m, *Schickhoff 1627!*. Raikot Vy. , Fairy meadows 3310 m, *Nüsser 365!* (cf.), *1009!* (cf.); Funtory 3290 m, *Nüsser 341!* (cf.). Lake Funtory 3300 m, *Nüsser 315!* (cf.); Jut 3310 m, *Nüsser 940!* (cf.); Nirril Batharet 3410 m, *Nüsser 997!* (cf.). Astor: Above Doyan 3050-3350 m, *Duthie 12460* (K!). Astor Vy. 2440 m, *Nüsser 901!*. Harchu Vy., right slope above Baro-Nirril 3120 m, *Nüsser 890!* (cf.). Upper Rupal Vy., Latobo 3600 m, *Nüsser 25!* (cf.); Tap Plain 3460 m, *Nüsser 744!* (cf.). Deosai: 4110 m, 1876-08-19, *C.B.Clarke 300557* (K!). Shores of Shorsar Lake 3960 m, *Duthie 14048* (K!). Dras: Marpo P. beyond Dras 3350 m, *R.R.&I.D.Stewart 22260* (K!). S above Matayan 3550 m, *H.Hartmann 2352!*. Yasghum E Dras 3540 m, *H.Hartmann 2353!*. Suru: E of Suroo, *Stoliczka* s.n. (K!). Zanskar: [Nira - Yulchung 3930-4180 m], 1848-07-02, *T.Thomson* s.n. (K!, with *P. calliopsis*). Swat. Hazara: Kaghan Vy., above Naddi RH 2410 m, *Schickhoff 90/363A* (K!). Kashmir common. Himachal Pr.: [Chenab Vy., Asdhari - Shol (2100-2680 m)], 1848-06-16, *T.Thomson* s.n. (K!). Lahol, Bhaga Vy., Kardong - Dartse, 1856-06-15/18, *Schlagintweit 2772* (K!). Rupshu: Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!). Vy. below Hanle 1847-09-17, *T.Thomson* s.n. (K!).

D: Temp. Eurasia, S to Pakistan: Baluch., Punjab, NWFP, Gilgit; Kashmir, Ladakh. *Euro-Sib.* Species: *Holarct.*

E: (2880-) 3150-4350 (-4440) m, subalp., common in the SW. Various mesophytic and semi-arid habitats: forests and scrub (*Pinus, Juniperus, Betula, Salix*), meadows and dry alpine turf. With its creeping rhizomes, *Poa pratensis* prefers stable, but not too hard soils on moraines or fine gravel, where it also occurs as a pioneer; not in bedrock fissures and hard, saline alluvial soils. "A very common species of old meadows and pastures where it affords excellent grazing and makes good hay." (Fl.Pak.).

N: Specimens marked with an asterisk (*) are reported as *P. angustifolia*, but may refer to the typical subsp. Specimens from rather high altitudes around Leh (*Caragana versicolor* dwarf scrub) and possibly other localities, marked (**), somewhat approach *P. calliopsis*. They may represent results of hybridization and introgression, but further studies are needed.

Poa pratensis L. subsp. **pruinosa** (KOROTKY) DICKORÉ comb. nov.

Basionym: *Poa pruinosa* KOROTKY, Feddes Repert. **13**: 291. 1914.

? *Poa sajanensis* ROSHEV. 1932, *Poa pamirica* ROSHEV.1934, *Poa markgrafii* H. HARTMANN 1984, *Poa alpigena* auct. non (BLYTT) LINDM. 1918: KENG 1959, BOR 1960

Ic.: Fl.URSS 2: fig.31(10); KENG 1959: fig.104. HARTMANN 1984: pl.4, fig.5 (*P. markgrafii*). Fl.Xizang.5: fig.53.

CS **Biafo:** Baintha 4000 m, *H.Hartmann 178!*; *182* (Z!).

N **Mintake:** S Taxkorgan, above Mazar 4300 m, *Miehe 5767!*. 37°03'N 75°27'E 4350 m, *Miehe 5811!*.

W **Yasin:** Naz Bar 4330-4440, *Miehe 3062* (K!); *3143!; 3178!*. **Gilgit:** Naltar Vy., Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). Naltar Lakes 3170 m, *Schickhoff 47!*. **Hunza:** N Chaprot 3150 m, *Klötzli & al. 1.09!*; 3590-3750 m, *Klötzli & al. 3.10!; 7.04A!; 10.07!*. Chaprot 3650 m, *G.Braun 616!* (X subsp. *angustifolia* ?). **Hispar:** Gharesa Gl. N-facing slope 12 miles E of Nagar, *O.Polunin 6256* (B!). **Batura:** W Khaibar 3920 m, *Klötzli & al. 29.01!*. E Morkhoon 3970 m, *Klötzli & al. 46.09!*.

S **Leh:** Stok Phu c. 30 km SE Leh 4600 m, *H.Hartmann 2571* (K!).

A: Kongur: Upper Oytag Vy. 3280 m, *Miehe 8767!*. E Pamir: Pamir, ad prov. Wachan versus, in valle fl. Pamir, ad rivulum Chargosh supra Mazartepe, 1901-07-26, *Alexeenko 2139* (K! **isotype** *P. pamirica*). Wakhan: (3300-) 3600-4000 (-4100) m, common. Futur Vy. 3600 m, *Roemer 106* (M!).

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Kotal-e Qara Qabchal - Zemestan-e Baharak (3300-4050) m, *Anders 7297* (M!). Darya-e Birgula-e Jelga Chelab Vy. NW Kol-e Chaqmaqtin 4000-4100 m, *Anders 7540* (M!). Dowansu Vy., Upper Darya-e Waghjir 4100-4250 m, *Anders 7656* (M!). E upper Darya-e Istmoch, Toli Bay Vy. 4000 m, *Anders 8041* (M!); *8044* (M!); 3900-4000 m, *Anders 8123* (M!). Futur Vy. 3600 m, *Roemer 106* (M!). [A record of *P. pamirica* (PODLECH & ANDERS 1977) refers to subsp. *pratensis*]. Chilas: Raikot Vy., Funtory 3240 m, *Nüsser 915!;* Nirril Batharet 3410 m, *Nüsser 1000!;* Bayal 3600 m, *Nüsser 1269!; 1272!.* Middle Pattaro Vy. 3570 m, *Nüsser 1352!.* Dras: Dras, *Bimal Misri 356* (K!). Suru: Chellong Nallah W Panikhar 3640 m, *H.Hartmann 2380!* (G **holotype** *P. markgrafii*, hb. Hartmann **isotype**!). Sanmodangsa Plain, Parkutze - Julidok 3880 m, *H.Hartmann 2351!.* Zanskar: Sulle - Padum 1856-06-22/24, *Schlagintweit 6692* (GOET!). Pensi P. 4350 m, *H.Hartmann 2570!.* Himachal Pr.: Bara Lacha P. 4880 m, *N.L.Bor 227* (K!). W Tibet: Gnari Khorsum, Laptel to Selchell and Hoti (S of the Satlej), 1855-07-16/19, *Schlagintweit* s.n. (GOET!).

D: Tian Shan, Pamir-Alai, S Karakorum, W Himalaya. *?E Pamir.*

E: 3170-4150 m, subalp. - alp., scattered. Open alluvial sands, by glaciers, alpine turf and free gelifuction gravel with relatively long snow cover.

N: This, under the name *P. tianschanica* (which probably is a synonym of *P. tibetica*), has been considered of hybrid origin of *P. pratensis* X *P. tibetica* by TZVELEV 1976. It is somewhat intermediate between them and fills the gap between Pamir and Tibet, where *P. tibetica* apparently is absent today. It is usually distinct by the characters given in the key, but apparently freely grading into subsp. *pratensis* and perhaps subsp. *angustifolia* as well. *Poa tibetica* seems to be set off a little better, while there apparently are also hybrids between *P. pratensis* subsp. *pruinosa* and *P. lipskyi*. The Central Asiatic plant seems to be reasonably different from the circumarctic **Poa pratensis** L. subsp. **alpigena** (BLYTT) HIIT. 1933 (*Poa pratensis* L. var. *alpigena* BLYTT 1861). *Poa bucharica* ROSHEV. 1923 from W Pamir and *Poa jaunsarensis* BOR 1948 from C. Himalaya apparently are also closely related.

Poa pratensis L. subsp. **staintonii** (MELDERIS) DICKORÉ comb. nov.
Basionym: *Poa alpigena* (BLYTT) LINDM. subsp. *staintonii* MELDERIS in HARA, STEARN & WILLIAMS, Enum. Fl. Pl. Nepal **1**: 142. 1978

A: Rupshu: Nuruchan 4680 m, 1993-07-21, *Holzner & Kriechbaum* s.n.!. W Tibet: N Moincer (N 31°15' E 80°15') 5050 m, *Miehe+9639f!.*

D: S Tibet (Rupshu - Nyainqentanglha Shan), Inner Himalaya (Nepal).

* **Poa pseudodisjecta** OVCZ. 1957 - **A**: E Pamir. Wakhan: Dowansu Vy. 4100-4250 m, *Anders 7677* (PODLECH & ANDERS 1977). **N**: Considered a synonym of *P. lipskyi* by TZVELEV 1976; the specimen from Wakhan to be confirmed.

* **Poa relaxa** OVCZ. 1933 (*Poa versicolor* BESSER subsp. *relaxa* (OVCZ.) TZVELEV 1974) - **A**: Kongur: Jerzil 2800 m, 1930-07-01, *Persson 20* (PERSSON 1938). W Pamir, E Pamir. **D**: W Tian Shan, Pamir-Alai. **N**: Close to *P. sterilis* and possibly falling into the wide variation range of this.

* **Poa setulosa** BOR, Kew Bull. **3**: 142. 1948 - **A**: Swat. **D**: NW Himalaya.

192. Poa sikkimensis (STAPF) BOR, Kew Bull. 7: 130. 1952

Poa annua L. var. *sikkimensis* STAPF in HOOKER f. 1896

Ic.: Fl.Xizang.5: fig.62.

S **Leh:** Leh, 1856-07-15/08-05, *Schlagintweit 980* (K!, Z!); 1848-07, *T.Thomson* s.n. (K!). Leh. above Sankar 3600 m, *H.Hartmann 4107!.*

D: Ladakh; C. Himalaya, S Tibet. *S Tibet.*

E: Wet turf by irrigation, moist somewhat ruderal habitats.

N: Apparently an outlying station of the mainly S Tibetan / C. Himalayan species.

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* **Poa stapfiana** BOR 1949 (*Poa tremula* auct. non LAM. 1791: STAPF in HOOKER f. 1896) - **A**: Swat: Beyond Bishigram 3050 m, *R.R.Stewart 25643* (K!). Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25332* (K!). Hazara: Kaghan Vy., Makra 3730 m, *Schickhoff 90/1355* (K!). Kashmir: Pahlgam, in snow nullah 2440-2740 m, *R.R.Stewart 21505* (K!). Himachal Pr.: Lahul. **D**: W Himalaya: Swat - Nepal.

193. **Poa sterilis** M. BIEB., Fl. Taur.-Cauc. **1**: 62. 1808

Poa versicolor BESSER subsp. *araratica* auct. non (TRAUTV.) TZVELEV 1974, *Poa araratica* auct. non TRAUTV. 1873, *Poa nemoralis* auct. non L. 1753

CS **Biafo:** Mango 3650 m, *E.Reiser* (Z!); 3700-3750 m, *H.Hartmann 184!; 186!; 187* (Z!); *190* (Z!). Mango 3730 m, *H.Hartmann 188* (K!; Z!)[*P. nemoralis* X *P. sterilis* ?]. Cho Blok 4200 m, *H.Hartmann 185* (Z!). Braldo Rv. S Biafo base-camp 3080 m, *H.Hartmann 189* (Z!). Biafo Gl. right bank 4110 m, *R.Scott Russell 1804* (BM!). **Saltoro:** Upper Hushe Vy., very common, 2740-3660 m (WEBSTER & NASIR 1965). Dry flats along Hushe Rv., c.3 miles S of Hushe 2740 m, *Nasir & Webster 5944* (K!, RAW „*P. araratica*"). E side of Hushe Vy., c.1 mile S of Shahircho 3510 m, *Nasir & Webster 6065* (K!); *6066* (K!, RAW); Above Hushe 3400-3600 m, *Miehe 1878!; 1891!; 1918!;* 4150 m, *Miehe 1938**(K!); *1972**(K!).

W **Yasin:** Darkot 3290 m, *Bowes Lyon 8106* (K!). Naz Bar 3050-3900 m, *Miehe 3030!; 3292!; 3307!; 3350!; 3359!; 3364!; 3419!; 3516!; 3535!; 3566!; 3569!; 3602!; 3664!.* Panji P. N 3920-3980 m, *Miehe 7004!.* **Ishkoman:** Upper Ishkoman, Baru Gah 3320-3600 m, *Miehe 6773!; 6820!; 6833!; 6841!.* **Gilgit:** Naltar Vy. 2740-3050 m, *Duthie 12396* (K!). Naltar 2740-3050 m (K!, RAW); *R.R.Stewart 26708* (K!); 3050 m, *G.Braun 242!.* Naltar Lakes 3660 m, *R.R.Stewart 26625* (RAW); *26626* (K!, RAW: „*P. nemoralis*"); *26705* (K!); *26707* (K! cf.: *P. attenuata* X *P. sterilis* ?). Kargah Vy. 2500 m, *Bowes Lyon 8021* (K). Upper Dainyor Vy. 2960 m, *Schickhoff 384!*; 3110 m, *Schickhoff 427!* (cf.). Bagrot Vy. 3340 m, *Nüsser 1264!.* Baghrot Vy., above Sat 3050 m, *Schickhoff 452!; 455!*; above Gutumi Nullah 2980 m, *Schickhoff 525!; 528!.* Baghrot Vy. (2860-3340 m), *Miehe 4318!*; 3180-3930 m, *Miehe 3842!; 3862!; 3904!; 3940!; 3976!; 4011!; 4207!; 4221!; 4238!; 4242!; 4271!; 4280!; 4298a!; 4328!; 4539a!; 4564!; 4571!.* Upper Darchan Vy., above Khaltaro 3230 m, *Schickhoff 717!.* Above Phuparash 2860-2870 m, *Schickhoff 791!*; *744!.* Upper Haramosh Vy., above Iskere 2970 m, *Schickhoff 841!.* Shinghai Gah - Pahot Gali 2150-4150 m, *Miehe 645!; 671!; 739!; 757!; 826!; 843!; 860!; 899!; 900* (K!); *922* (K!); *928!; 933!; 1022** (K!); *1038*; 1092* (K!); *1158*!; 1172!; 1179!; 1285!; 1305* (K!); *1314!; 1342!; 1347!; 1381!; 1390!; 1392B** (K!); *1419!; 1458!; 1478!; 1504!; 1520* (K!); *1545!; 1632!; 1645!; 1705!; 1792!.* **Hunza:** Zangia Harar 3960 m, *R.Scott Russell 1062* (BM!). N & E Chaprot 2600-3910 (4000) m, *Klötzli & al. 3.9,19,16!; 4.23!; 6.31!; 11.11,23!; 21.01!*; 22.05!; 23.04a!; 24/25/26.92!* (cf.); *58.22!; 727.95!; 729.28,35,53!.* Upper Rashumaling Vy. 2630-2680 m, *Schickhoff 68!*; *104!.* Minapin, above Hapakund 3030 m, *Schickhoff 344!; 354!; 363!.* Rakaposhi N, above Nilt 3470-3870 m, *Miehe 6429!; 6501!; 6508!; 6560!.* Rakaposhi N & NW opposite Chalt 3500-3700 m, *Miehe 6658!.* Chaprot 3400 m, *G.Braun 607!.* Pisan 3700 m, *G.Braun 529!.* **Hispar:** Snout of Gharesa Gl. 3050 m, *O.Polunin 6103* (BM!). **Batura:** Gulmit - Atabad 3300-4000 m, *Miehe 2699!; 2718!; 2847!; 2986!.* W Khaibar 3300-3520 m, *Klötzli & al. 78.02!; 802.10B!;* 3920 m, *29.30!*.* E Morkhoon 3590-3910 m, *Klötzli & al. 29.30!*; 35.09,10!; 44.02!; 89.01,11!; 804.32,77!*.* **Khunjerab:** SW below Khunjerab P. 3600 m, *Klötzli & al. 111/112.06!* (cf.).

S **Shigar:** Solu Gl., right bank 3810 m, *R.Scott Russell 1745* (BM!). Ganto P. E 3600 m, *Miehe 4915!.* Upper Basna Vy., above Gon 3360 m, *Miehe 5007!.* **Skardu:** Satpura Nullah 3350-3660 m, *Duthie 12030* (K! „*P. araratica*"). Deosai N - Satpara 3640-3880 m, *Miehe 5026!; 5069!; 5194!.* Ganto P. W 3380-3850 m, *Miehe 4681!; 4693!; 4835!.* Upper Stak Nala, Above Khotia Lungma Gl. 3360 m, *Schickhoff 865!.* **Leh:** [Nurla], 1848-07-08, *T.Thomson* s.n. (K!). Ladakh [Saspul - Nimu], 3350-3660 m, 1848-07-10, *T.Thomson* s.n. (K!). Leh, 1856-07-15/08-05, *Schlagintweit 1029* (K!). Yangthang 3750 m, 1993-07-16, *Holzner & Kriechbaum* s.n.!. Hemis Gompa - Gotssangdubhe 3900-4000 m, *Billiet & Leonard 6829* (K!).

A: Kongur: Upper Gez Gorge 3500 m, *Miehe 5311!; 5312!* (smutted, viviparous & sexual); *5326!* (*P. attenuata* X *P. sterilis* ?). Upper Oytag Vy. 2900-3150 m, *Miehe 8686!; 8672!; 8792!.* W Kunlun: Akaz P. 3720 m, *Miehe 8581!.* W Pamir, E Pamir (as *P. relaxa*). Wakhan. Chitral: Golen (Krui Uts) 3960 m, *Bowes Lyon 135* (BM!). Drosh, Beorai 3660 m, *Bowes Lyon 192* (BM!). Chilas: Gor Region.

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below Martal 2650 m, *Nüsser 1170!*. Raikot Vy., Tato - Fairy Meadows, Raikot Vy. 2930-3060 m, *Nüsser 975!; 978!*. Raikot Gl., right lateral moraine 3370 m, *Nüsser 1003!*. Fary, Buldar Vy. 2860 m, *Nüsser 1026!*. Middle Pattaro Vy. 3950 m, *Nüsser 1357!*. Astor: Doyan 2440-2740 m, *Giles 212* (K!). Kalapani, *Giles 63* (K!). Harchu Vy., left slope above Baro Nirril 3160 m, *Nüsser 856!;* right slope above Baro-Nirril 3230 m, *Nüsser 876!* (cf.). Lower Rupal Vy., above Churit 3500 m, *Nüsser 763!* (cf.). Above Zaipur 3120 m, *Schickhoff 1079!*. Deosai: 3960 m, *R.R.Stewart 22156* (K!); *22207** (K!). Dras: Dras, *Bimal Misri 356* (K!). Marpo Nullah 3660-3960 m, *Duthie 11780* (K!). Marpo P. E towards Dras 3960 m, *R.R.Stewart 22313a* (K!); SW above Dras 3450 m, *H.Hartmann 2349!*. S above Matayan 3550 m, *H.Hartmann 2346!*. SE above Matayan 3450 m, *H.Hartmann 2347!*. Suru: Kargil via Suru to Tsringmat, 1856-10-10/11, *Schlagintweit 7196** (K!). [?]Panichar, 1 km NW union Suru E of Chalang Nar Rv. 3810 m, *Southampton Univ. 67* (K! cf.: *P. attenuata* X *P. sterilis* ?). Shispar - Shianku Vy. 4160 m, *H.Hartmann 2348!*. Zanskar: [Phutaksha - Hanupata], 1848-07-04, *T.Thomson* s.n. (K!). [?]Pensi P. 4360 m, *H.Hartmann 2569!*. Swat. Hazara: Kaghan Vy., above Saiful Muluk lake 3760 m, *Schickhoff 90/760!*. Babusar P. 3960-4270 m, *Metz 230** (K!). Kashmir. Himachal Pr.: Lahul, above Lakong, 1992, *Holzner & Kriechbaum* s.n.!.

D: S Ukrania, Caucasus - Pakistan (NWFP, Gilgit), Kashmir, NW India. *Ir.-Tur.*

E: 2630-4400 m, mont. - subalp., common in the SW. *Artemisia brevifolia-Juniperus excelsa* steppe-forest, *Juniperus communis* dwarf scrub.

N: One of the most common plants of the montane and subalpine belts of the W & S Karakorum. Specimens ± intermediate between *P. sterilis* and *P. attenuata* are apparently rather common in the subalpine - alpine transition belt of the SW Karakorum, e.g. **Gilgit** between (3600) 4000-4200 m. Some of these putative hybrids, which were often named *Poa versicolor* subsp. *araratica,* are marked with an asterisk (*), but they are so variable as compared to the typical species on both ends of the range of morphological variation (*P. sterilis*, *P. attenuata*), that it seems to be impossible to keep them for a distinct species. The specimen *H.Hartmann 188* from **Biafo** is cited as *P. nemoralis* (Fl.Pak.), but it is a rather robust plant with ligule 0.8 - 1.3 mm and thus resembles more *P. sterilis;* it may represent a hybrid.

* **Poa stewartiana** BOR 1951 - **A**: Swat: Beyond Bishigram 3660 m, *R.R.Stewart 25642* (K!). Hazara. Kashmir: Gulmarg, 3050 m, *R.R.Stewart 8675* (K!). **D**: NW Himalaya.

194. Poa supina SCHRADER, Fl. German. 1: 289. 1806

Poa annua L. var. *supina* (SCHRADER) LINK 1827, *Poa ustulata* FRÖHNER 1968

CS **Nubra:** [Lower] Nubra Vy., 1848-09-01, *T.Thomson* s.n. (K!, mounted with *P. alpina*).

W **Ishkoman:** Upper Baru Gah, Panji P. S above Holojut 3800 m, *Miehe 6910!*. **Gilgit:** Naltar Lakes 3660 m, *R.R.Stewart 26624* (K!, RAW).

S **Skardu:** 2290 m, *Nasir & Webster 5760* (K!, RAW). **Leh:** Likir 3700 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!.

A: Chitral: Tirich Mir, Barum Gol, Shokor Shal 3500 m, 1950-07-15, *P.Wendelbo* s.n. (K!). Shishi Gol, E of Drosh 2130 m, *Stainton 2380* (W!). Owir An, SE of Tirich Mir 3350 m, *Stainton 2764* (W!). Astor: Lower Rupal Vy., Tarishing Hotel 2910 m, *Nüsser 780!*. Kalapani 3260 m, *Schickhoff 1216!*. Swat: Bishigram, *R.R.Stewart & A.Rahman 25644a* (K!). Beyond Bishigram 3350 m, *R.R.Stewart & A.Rahman 25000* (K!). Hazara: Siran Vy., 1896-06-29, *Inayat 20352* (K! **type** *P. ustulata*). Shinkijari, Khari 3200 m, 1899-06-08, *Inayat* s.n. (K!). Kashmir: 2440-3660 m. Himachal Pr.: Lahul.

D: Eurasia, S to Afgh. (C. Hindukush, Paghman, Nuristan), SW Karakorum, W Himalaya: Chitral - Nepal. *Euro-Sib.*

E: 2290-3800 m, mont.-subalp., rare in the S & W. Wet turf by flushes and irrigation canals.

N: Records from S India (Nilgiri Mts.) and part of those from the Flora Iranica-area (except for high mountain areas of C. & E Afgh.) are probably erroneous, due to confusion with *P. annua.*

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195. Poa suruana H. HARTMANN, Candollea **39**: 516. 1984

Ic.: HARTMANN 1984: fig.7; pl.5. **Fig. 8 (3).**

S **Skardu:** Above Bashu 3230 m, *Schickhoff 917!*.

A: Suru: Sanmodangsa (Gulmatungo) 3950 m, *H.Hartmann 2873* (G **holotype**, **isotypes** K!; hb.Hartmann!). Suru Vy., Shispur-Shianku, side Vy. E Kartse 3830 m, *H.Hartmann 2884!*; Suru 3900-4000 m (HARTMANN 1984).

D: Suru, Baltistan (Indus Vy.). *Endem.*

E: 3230 m, subalp., rare in the S (Indus Vy.). A single specimen from a *Pinus wallichiana* forest. (Suru:) *Artemisia brevifolia-Koeleria cristata* scrub-steppe and turf (with *Polygonum affine*) on fine brown non-calcareous earth (HARTMANN 1984).

N: Very close to and apparently a local derivate of *P. falconeri*, differing largely by the completely glabrous lemma from this.

196. Poa tibetica MUNRO ex STAPF in HOOKER f., Fl. Brit. India 7: 339. 1896

Poa macrocalyx var. *tianschanica* REGEL 1880, *Poa tianschanica* (REGEL) HACKEL ex O. FEDTSCH. 1903, *Poa pricei* SIMPSON 1913, *Poa ciliatiflora* ROSHEV. 1926, *Poa fedtschenkoi* ROSHEV. 1932

Ic.: SIMPSON 1913: fig.23(4-12). Fl.URSS 2: fig.32(4). Fl.Tadzh.1: fig.20. KENG 1959: fig.108. Fl.Xizang.5: fig.50(4-6). Fl.Desert.Sin.1: fig.16(1-6).

N **Mustagh Ata:** Tagarma Vy., 1913-07-23, *Knorring* (Pl.As.Centr.).

S **Leh:** Indus, Wandla - Kalatze [Khalsi] 3200-3350 m, 1848-07-07, *T.Thomson* s.n. (K!). N of Leh 3650 m, *H.Hartmann 3038!*.

A: C.Kunlun: Przhevalsky Mts. N 4600 m, 1890-08-24, *Roborovsky* (Pl.As.Centr.). E Pamir: Pamir Post - Scha Dschan, 1901-07-12, *Fedtschenko 32* (W!). "In palude ad Fl. Murgab", *C.O.Paulsen 708* (W!). Gorno-Badakhshan, W Pshart / Murgab Rv. 3300 m, *Tzvelev 330* (K!). Himachal Pr.: Piti, Ghuyonmoeul, *Jacquemont 1993* (K!). Lahul, Jespa 3140 m, *Bor 16401* (K!); *16912* (K!); *16913* (K!). Rupshu: Grassy plain [Parang P. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!). Tsakzhun Tso 4570 m, *Koelz 2393* (K!, RAW, W!). Nuruchan 4600 m, 1992-07-24, *Holzner & Kriechbaum* s.n.!. Starsa Puk Tso 4550 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!.

D: S Siberia, Mongolia, Altai, Dzungaria, Tian Shan, Pamir; Inner Himalaya: Ladakh, Rupshu - S & E Tibet; Zaidam, E Kunlun. *Centr. As.*

E: 3200-3650 m, (subalp.) - alp., rare in the NW and SE. In the area apparently mainly on wet turf by irrigation canals and flushes at relatively low altitudes. (Rupshu:) Open fluvioglacial sands (*Leymus secalinus*), peat of salt-fens, permafrost-gravel. A characteristic species of the glacial sand-plains of S Tibet.

N: Obviously there is a large gap between the Pamir localities and those from Ladakh to S Tibet. *P. pratensis* subsp. *pruinosa* (see there) apparently substitutes *P. tibetica* in-between.

* **Poa trivialis** L. 1753 - **Ic.:** Fl.Iraq 9: pl.39. **A**: Chitral: Chitral Village 1520 m, *Stainton 2393* (W!). Swat: Khawazakhiela - Shangla (1300-1900 m), *Rechinger 30627b* (W! "*P. jaunsarensis*"). Kashmir: Shabniar near Srinagar 1740 m, *R.R.Stewart 23006* (K!); rice field ditches, *R.R.Stewart 23015* (K!). Baramullah, shady place, *Kuldeep Kumar Koul 1729* (K!). **D**: N hemisphere (introduced almost cosmolitic). **N**: Apparently not common in Kashmir.

Possible hybrids:

Transitional forms, which may be hybridogenous, are frequent in the *P. pratensis* group and especially in the *P. nemoralis* group. They are cited under the respective suggested parent species to which they come nearest. Some specimens of the putative hybrid *P. attenuata* X *P. sterilis* look quite distinctive:

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Poa attenuata X P. sterilis ? (*Poa versicolor* BESSER subsp. *araratica* auct. non (TRAUTV.) TZVELEV 1974 p.p.)

W **Yasin:** Naz Bar 4100-4200 m, Miehe *3470!; 3581!*. **Gilgit:** Baghrot Vy. 4060 m, *Miehe 3799!*. **Hunza:** Rakaposhi N & NW above Nilt 3900 m, *Miehe 6582!*. **Hispar:** Gharesa Gl. 12 miles E Nagar 3880 m, *O.Polunin 6258* (BM!); 3960 m, *O.Polunin 6298* (BM!).

N: An accidental selection of specimens, see also under the putative parents.

* **Pogonantherum paniceum** (LAM.) HACKEL 1906 (*Saccharum paniceum* LAM. 1785) - **A**: Chitral. Swat. Hazara. Kashmir. **D**: Himalaya, SE Asia.

* **Polypogon fugax** NEES ex STEUDEL 1854 (*Polypogon demissus* STEUDEL 1854) - **Ic.**: Fl.Iraq 9: pl.113. Fl.Xizang 5: fig.124. Fl.Desert.Sin.1: fig.33(1-3). **A**: W Kashg.: Kashgar 1330 m, 1933-07-18, *Persson 474* (PERSSON 1938). Kongur: Bostan-Terek 2400 m, 1925-08-01, *Persson 51a* (PERSSON 1938). Swat. Hazara. Kashmir. **D**: Himalaya, E Asia.

197. Polypogon monspeliensis (L.) DESF., Fl. Atlant. 1: 67. 1798

Alopecurus monspeliensis L. 1753

Ic.: Fl.Iraq 9: pl.115. Fl.Iran.70: pl.47. Fl.Xizang.5: fig.125. Fl.Desert.Sin.1: fig.33(4-6).

CS **Saltoro:** Above Hushe 3300, *Miehe 1848!* (dwarf). **Nubra:** Nubra Vy., *Schlagintweit* (GRISEBACH 1868). Tsarasa to Aranu (right side of the Nubra Vy.), 1856-08-03/04, *Schlagintweit* s.n. (BM!, very dwarf specimen with *Vulpia myuros*).

W **Yasin:** Yasin - Darkot 3660 m, *Bowes Lyon 8067* (K). **Gilgit:** Gilgit - Chalt 1800 m, *Klötzli & al. 724.04!*. **Batura:** N Morkhoon 2740 m, *Klötzli & al. 99.08,33,36!*. E Morkhoon 3000 m, *Klötzli & al. 803.28!*.

S **Skardu:** Skardu 2330 m, *C.B.Clarke 30032* (K); 2440-2740 m, *R.R. & I.D.Stewart 20356* (RAW). Bagicha - Olding, Skardu - Ladakh Road 2740 m, *R.R.Stewart 21017* (RAW). **Leh:** Indus Vy., Saspul (STEWART 1916). Leh 3500 m, 1992-07-14, *Holzner & Kriechbaum* s.n.!. W Shey 3300 m, *H.Hartmann 4113!*. **Shyok:** Shyok Vy. [Digar - Tsatti (3230-3960 m)], 1847-10-14, *T.Thomson* s.n. (K).

Unloc.: Ladakh and Yarkand Plains (HENDERSON & HUME 1873).

A: W Kashg.: Kashgar 1330 m, 1933-06-16, *Persson 487* (PERSSON 1938). Kongur: Jerzil 2800 m, 1930-07-22, *Persson 141* (PERSSON 1938). W Kunlun: Tiznap Vy., Kudi 3000 m, *Dickoré 195!*. Wakhan: 2800 m (PODLECH & ANDERS 1977). Ptukh 3300 m (HUSS 1980). Chitral. Chilas: Gor Region, Village Ranote 2120 m, *Nüsser 1187!*. Dras: Mulbekh 3200 m, *H.Hartmann 2577!*. Kashmir. Himachal Pr.: Sissu, *Aswal 6811* (ASWAL & MEHROTRA 1994).

D: Warm-temp. Africa, Eurasia; introduced elsewhere. *?Medit.*

E: 2330-3500 m, coll. - mont., not common. Seasonally moist, ± eutrophic places, often close to villages or resting places; by irrigation canals, cultivated fields (*Solanum tuberosum*), open valley grounds, mudflows, open *Juniperus excelsa* forest.

N: 2n = 28 (HUSS 1980, material from Wakhan).

Puccinellia

"The genus is badly in need of a major revision. Many of the species are represented only by a handful of specimens (some only by the type) so their full range of variation cannot yet be established." (Fl.Pak.). The Karakorum belongs to the C. Asiatic centre of variation of this exceedingly difficult genus. The number of species reported from the Karakorum and adjacent areas, however, seems to be too high. Since a thorough revision should include much more herbarium material and a cytological investigation, only a superficial treatment or a selected enumeration of taxa and some of their probable interrelations can be given here (see also under *Colpodium*). The polymorphism of *Puccinellia* probably is, at least in part, due to hybridisation and resulting polyploidy and aneuploidy, which produces very variable chromosome numbers, similar to those known from *Poa*. The ecology of *Puccinellia* species in C. Asia also presents interesting problems. There are widely-distributed

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halophytes (*P. distans*), as well as apparently highly isolated species confined to singular (hot) springs (*P. thomsonii*). Others are high alpines, one of them probably reaching the highest altitude among the grasses of W Tibet (*P. himalaica*: 5490 m).

Key to *Puccinellia*:

1. Anthers 1.7 - 3 mm **7**
+ Anthers 0.4 - 1.4 mm **2**
2. Lemma hairy at the base **3**
+ Lemma entirely glabrous **5**
3. Anthers 0.4 - 0.7 mm; usually large, rather lax plants of saline places at lower altitudes ..... **P. distans**
+ Anthers 0.7 - 0.9 mm; low, rather rigid, densely tufted plants of high altitudes **4**
4. Panicle effuse, panicle branches long, capillary, scabrid. Leaves glaucous, tightly convolute, c. 0.5 mm in diameter ..... **P. hackeliana**
+ Panicle contracted, panicle branches short, stout, glabrous or slightly scabrid. Leaves green, flat or laxly convolute (then c. 0.8 mm in diameter) ..... **P. humilis**
5. Panicle contracted, with few spikelets, branches mostly simple, glabrous. Leaves fresh green, soft, usually much shorter than the culms. Plants low ..... **P. minuta**
+ Panicle usually effuse (in full flowering), with many spikelets, branches often furcate, glabrous or scabrid. Leaves ± greyish green or glaucous, rigid, reaching up to half of the culm length. Plants often taller **6**
6. Palea keels smooth. Panicle branches usually smooth. Anthers 0.5 - 1.2 mm. Small plants of the upper alpine belt ..... **P. himalaica**
+ Palea keels scabrid. Panicle branches usually scabrid. Anthers 0.9-1.4 mm. Usually robust subalpine plants ..... **P. tenuiflora**
7. Panicle contracted, branches short, mostly simple, smooth. Leaves fresh green, smooth. Plant low, (2-) 5-15 (-20) cm ..... **(P. subspicata)**
+ Panicle branches and pedicels scabrid, panicle effuse, with long ± furcate branches. Leaves scabrid above. Plants robust (15-) 20-50 (-60) cm **8**
8. Lemma obtuse or rounded at the tip ..... **(P. stapfiana)**
+ Lemma acute at the tip ..... **P. thomsonii**

* **Puccinellia akbaitalensis** OVCZ. & CZUK. 1957 - **A**: Reported from Wakhan (PODLECH & ANDERS 1977); probably *P. pamirica* (see there).

198. Puccinellia distans (JACQ.) PARL., Fl. Ital. 1: 367. 1848

Poa distans JACQ. 1764, *Glyceria distans* (JACQ.) WAHLENB. 1820, *Atropis distans* (JACQ.) GRISEB. in LEDEB. 1852

Ic.: Fl.Desert.Sin.1: fig.20(9-13).

W **Ishkoman:** Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Batura:** Borit Jil 2500 m, *F.A.Perrot 11* (K!).

S **Shigar:** Karakorum 3260 m [Shigar - Skoro P.], 1876-08-07, *C.B.Clarke 30133* (K!). **Leh:** [Wandla - Kalatze 3170-3350 m], 1848-07-07, *T.Thomson* s.n. (K!). Leh 3500 m, 1992, *Holzner & Kriechbaum* s.n.!.

Unloc.: Balti, *Schlagintweit 5898!* (GOET!).

A: W Kashg.: Kashgar 1220 m, 1928-05-09, *Wingate* s.n. (Z!); 1280-1300 m, *Dickoré 989!; 1000!*. Hangcheng, *Törnquist* s.n. (Z!). Yarkand 1350 m, 1930-03-18, *Persson 85a* (PERSSON 1938: *P. glauca*). W Kunlun: Tiznap Vy., Kudi 3000-3050 m, *Dickoré 182!* (partly viviparous); *226!*. E Pamir. Wakhan: ? Near Yamit 2800 m, *Roemer 270* (M!).

D: Temp. Eurasia, N Africa; N America. *Holarct.*

E: 2500-3260 (3500) m, coll. - mont., rare. Wet or irrigated saline habitats: "small saline lake, pH 8.9, in marshy ground at edge of lake" (*Perrot 11*); (Kunlun:) flushes, river gravel, by irrigation canals.

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N: Probably represented in the Karakorum by **Puccinellia distans** (JACQ.) PARL. subsp. **distans**; the differential characters of subsp. **glauca** (REGEL) TZVELEV 1976 (*Glyceria distans* (JACQ.) WAHLENB. var. *glauca* REGEL 1881, *Atropis glauca* (REGEL) V. KRECZ. 1934, *Puccinellia glauca* (REGEL) V. KRECZ. ex PERSSON 1938) from C. Asia and Pakistan (Baluchistan) are rather vague. Variable chromosome numbers (2n = 14, 18, 19, 24, 32, 34, 36, 42), counted by *A. Dieterle* in 1968, are marked on a voucher specimen cultivated from *Roemer 270*, the single specimen of *P. distans* seen by me from Wakhan. Since it is morphologically not quite definite, it may be a hybrid (with *P. pamirica* ?). Most of the material cited by PODLECH & ANDERS 1977 (from higher altitudes) apparently belongs to *P. pamirica*. The specimen *Holzner & Kriechbaum* s.n. is very small in all its parts and has only a few hairs at lemma base, untypical and perhaps a recent and casual introduction in Ladakh (hotel surroundings).

subsp. **sevangensis** (GROSSH.) TZVELEV 1976 (*Puccinellia sevangensis* GROSSH. 1928) - **A**: Wakhan: Deh Ghulaman 3000 m, *Roemer 321*; Sarhad 3180 m, *Anders 7167* (M!); (PODLECH & ANDERS 1977). **D**: Caucasus, ? SW Asia. **N**: Poorly understood and perhaps best regarded as a subspecies of *P. distans*. The specimen seen from Wakhan (*Anders 7167*) apparently comes close to subsp. *distans*. The Afghan material determined as *P. sevangensis* (in M!) is not necessarily identical with the Caucasian plant and apparently very heterogenous as well.

199. Puccinellia hackeliana (V. KRECZ.) V. KRECZ. ex PERSSON, Bot. Not. **1938**: 275. 1938

Atropis hackeliana V. KRECZ. 1934

CN **Braldu:** Pamir P. S, near Shuwart 4550-4570 m, *Miehe 6128!*.

W **Khunjerab:** Khunjerab P. SW 4600 m, *Miehe 2480!*.

Unloc.: "Iter pamiro-alaicum" 4330 m, 1911-09-01, *B.A.Fedtschenko & R.I.Roshevitz 167* (K! "*P.humilis*"). **A**: Kongur: Jerzil 2800 m, 1930-07-09, *Persson 75*; 3200 m, 1930-07-14, *Persson 108* (PERSSON 1938). W Kunlun: Akaz P. 3580 m, *Miehe 8602!*. Tiznap Vy., W Kudi 3500-3700 m, *Miehe 8512!*. Upper Tiznap Vy. 3080-4210 m, *Miehe 7637!* (cf.); *7682!* (cf.); *7802!* (3080 m). Mazar P. NE 4320-4890 m, *Miehe 7754!* (cf.); *7784!* (cf.); *8520!* (4890 m). C.Kunlun: N Russian Mts., Upper Aksu Rv. 3500-4000 m, 1890-06-03, *Roborovsky* (Pl.As.Centr.). W Pamir: Prov. Semireczie, Ak-tash Rv., 1913-07-28, *V.Saposhnikov* s.n. (K!). E Pamir: Sassyk-Kul Lake, 1901-07-17, *Fedtschenko* s.n. (K! **cotype**). Gorno-Badakhshan, Bilyand-Kiik Vy. 3900 m, *Tzvelev 1093* (K!).
D: ?Mongol.Altai, Tian Shan, E Pamir, NW Karakorum, W & C. Kunlun. *E Pamir*.
E: 4550-4600 m, alp. - subniv., rare in the NW. High alpine steppes, moderate water-surplus habitats (screes, snow-beds, meltwater streams). Apparently a characteristic indicator of ± saline loess in the alpine belt of the Kunlun N slope.

* **Puccinellia hauptiana** (V. KRECZ.) KITAG. 1939 (*Atropis hauptiana* V. KRECZ. 1934) - **A**: ?W Kunlun: 8-10 km SE Karasay, Rd. to Karakash, *Junatov* (Pl.As.Centr.). **N**: Probably best regarded under *P. distans*.

200. Puccinellia himalaica TZVELEV, Not. Syst. (Leningrad) **17**: 67. 1955

Atropis convoluta (HORNEM.) GRISEB. var. *glaberrima* HACKEL 1907, *Atropis distans* (JACQ.) GRISEB. var. *convoluta* f. *glaberrima* (HACKEL) PAMPANINI 1930, *Puccinellia tenuiflora* auct. non (GRISEB.) SCRIBNER & MERR. 1910: DICKORÉ 1991 p.p., *Puccinellia distans* auct. non (JACQ.) PARL. 1848: SCHMID 1932, ? *Puccinellia nudiflora* (HACKEL) TZVELEV 1962

Ic.: Fl.Xizang.5: fig.65.

CN **Shaksgam:** Aghil P. S 4720-4820 m (*Dickoré*).

CS **Nubra:** [Lower] Nubra Vy., 1848-09-04, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** N 3650 m, *Miehe 5466!*. **Yarkand:** ? 3-4 km S Saryk [Mazar] P. 5000 m, 1959-07-04, *Junatov* (Pl.As.Centr.: "*P. nudiflora*"). Aghil P. N 4620-4800 m, *Dickoré 553!; 569!*. **Upper Yarkand:** Yarkand, foot of the Karakorum P., *Schlagintweit 1279* (GOET!; GRISEBACH 1868: "*Atropis tenuiflora*"). Camp Remo North 5280 m; Camp Oltreremo 5100 m; *Dainelli & Marinelli*

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(PAMPANINI 1930). **Karakash:** Karakash Vy. 4500 m, 1870-07-31, *Henderson* s.n. "Yarkand Exp." (K!). SE Dahongliutan 4750-5240 m, *Miehe 7886!* (cf.); *7889!* (cf.); *7904!* (cf.); *8021!*; (cf.).

S **Leh:** Rumtse 4520 m, *H.Hartmann 4105!*. Kartse 4130 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. **Shyok:** [Calzar - Diskit] 1848-07-25, *T.Thomson* s.n. (K!). **Pangong:** Tankse, 1927-07-20, *Bosshard* (Z!); Pancong Tso, 1927-07-27, *Bosshard* (Z!; SCHMID 1932).

E **Changchenmo:** Kiam 5100 m, 1927-08-11, *Bosshard* (Z!; SCHMID 1932). ? Cone P., *Rhins* (GRENARD 1898: *Atropis distans*"). **Upper Shyok:** Sassar 1848-08, *T.Thomson* s.n. (K!). [Sassir - Murgai], 1848-08-15, *T.Thomson* s.n. (K!). [Murgai], 1848-08-22, *T.Thomson* s.n. (K!). **Depsang:** [Depsang - Karakorum P.], 1848-08-19, *T.Thomson* s.n. (K!). **Aksai Chin:** 5000 m, 1927-09-05, *Bosshard* (Z!; SCHMID 1932: "*Poa annua*"). S Tianshuihai 4850 m, *Miehe 8023!* (cf.). N Tibetan Mts. 5100-5300 m, *Miehe 8238!* (cf., pedicels scabrid).

Unloc.: Yarkand Exp., 1870, *Henderson* s.n. (K! "*Poa laxa*"). Tibet 4940 m, 1891-07/09, *Thorold 89* (K!); *Thorold 91* (K!).

A: Kongur: Rd. Kashgar - Taxkorgan, Gez Vy., 60-65 km S Upal, *Junatov* (Pl.As.Centr.). W Kunlun: Upper Tiznap Vy. 4200-4250 m, *Dickoré 959!*. Mazar P. NE 4380 m, *Dickoré 287!*; 4900 m, *Miehe 7793!; 7794!*. C.Kunlun: Mts. S of Hotan and Keria 5570 m, 1892-07-20, *Rhins* (Pl.As.Centr.). Zanskar: Lahul, Kenlung 3050 m, *Bor 16465* (K!); 4570 m, *Bor 15183* (K!); Kenlung, *Bhattacharyya 40881* (BSD, ASWAL & MEHROTRA 1994). Rupshu: Ravine below Lanak P., 1847-09-14, *T.Thomson* s.n. (K!). Vy. below Hanle, 1847-09-17, *T.Thomson* s.n. (K!). Tsakzhun Tso 4570 m, *Koelz 2387* (K!). Tso Morari Peldo 15000' [4570 m], 1931-07-08, *Koelz 2216* (K! **isotype**, LE). Nuruchan 4600 m, 1992-07-23, *Holzner & Kriechbaum* s.n.!. Starsa Puk Tso 4550 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!. W Tibet: S Gar (N 32°01' E 80°06') 4420 m, *Miehe+9660d!*. Changtang: Guliya Ice Cap (N 35°12' E 81°31') 5490 m, *L.G.Thompson* (GOET!). Tibet, Dali (N 35°18' E 87°35') 4950 m, *Wellby & Malcolm* s.n. (K!).

D: W (? & C.) Tibet, Kunlun, N & E Karakorum, E Ladakh, Lahul. *Tibet.*

E: (3650-) 4620-4900 (-5300) m, alp. - subniv., not common (N & E Karakorum). Permafrost, usually water surplus habitats (glacier run-off, lake shores), up to the highest turf spots (*Kobresia schoenoides, K. royleana, Carex sagaensis*), often eutrophic (animal resting places) gravels and sands. Reported to ascend to the highest altitude (> 5500 m) among the grasses in adjacent NW Tibet.

N: The material cited (cf.) from Karakash and Aksai Chin is very young, with only remains of inflorescences of the previous year. It might well belong here, but other species may also be involved in the very high altitudes of Tibet. The delimitation of *P. himalaica* against *P. tenuiflora*, though a plant of much lower altitudes, seems to be problematic, since the characters (anther length, spines on palea keels and panicle branches) grade into another.

201. **Puccinellia humilis** (V. KRECZ.) ROSHEV., Fl. Kirgiz. 2: 140. 1950

Atropis humilis V. KRECZ. 1934

CN **Braldu:** Pamir P. S, near Shuwart 4650-4750 m, *Miehe 6074!*.

W **Khunjerab:** Khunjerab P. SW 4740 m, *Miehe 2444a!*.

Unloc.: Turkestania 1895-07-14, *S.Korshinsky 6282* (K! **isotype**); 1897, *S.Korshinsky 6340* (K!)

A: Kongur: Torugart NW Kashgar 3500 m, 1959-06-20, *Junatov* (Pl.As.Centr.). E Pamir: Gorno-Badakhshan, W Pshart Vy. 4100 m, *Tzvelev 619* (K!).

D: Tian Shan, Pamir-Alai, NW Karakorum. *E Pamir.*

E: 4650-4750 m, subniv., rare in the NW. High alpine steppe-turf and on free gelifluction gravels.

N: Somewhat intermediate between *P. minuta* and *P. hackeliana*; almost sympatric with *P. hackeliana* though apparently at even higher altitude.

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202. Puccinellia ladakhensis (H. HARTMANN) DICKORÉ comb. nov.
Basionym: *Poa ladakhensis* H. HARTMANN, Candollea 39: 510. 1984
Puccinellia pauciramea auct. ? non (HACKEL) TZVELEV 1934: PODLECH & ANDERS 1977
Ic.: HARTMANN 1984: fig.4, pl.3; RAJBHANDARI 1991: pl.93a, fig.27a-c ("*Poa ladakhensis*").
S **Leh:** Stok Phu, 10-12 km S Stok (Indus Vy.) 4600 m, *H.Hartmann 2614* (K! **isotype**; HARTMANN 1984). Nima Mud 4270 m, *Koelz 2329* (BM!).
A: Wakhan: Upper Tshelab Vy. 4200-4400 m, *Anders 7589* (M!); *7602* (PODLECH & ANDERS 1977: *P. pauciramea*). Rupshu: Starsa Puk Tso 4600 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!.
D: Wakhan, Ladakh: Upper Indus, Rupshu. *Endem.*
E: 4270-4600 m, alp., rare in the SE. Sandy gravel along streams (HARTMANN 1984, *Koelz 2329*). (Rupshu:) Salt steppe (*Holzner & Kriechbaum*).
N: Poorly understood and apparently rare. Close to *P. himalaica*, but larger in its generative parts and spikelets deeply suffused with purple. The species may, however, be not specifically different from *P. pauciramea* or *P. nudiflora*. The specimens cited are of a very distinct habit and apparently identical.

203. Puccinellia minuta BOR in WENDELBO, Nytt. Mag. Bot. **1**: 19. 1952
Puccinellia kashmiriana BOR 1953 (syn. nov.)
Ic.: WENDELBO 1952: fig.8. Fl.Xizang.5: fig.65(1-5) (*P. kashmiriana*).
W **Yasin:** Naz Bar 4400-4470 m, *Miehe 3089!; 3124!*. **Ishkoman:** Upper Ishkoman, Panji P. S., above Holojut 4180-4280 m, *Miehe 6955!; 6965!*. **Gilgit:** Shinghai Gah - Pahot Gali 4430-4470 m, *Miehe 990!*.
A: Chitral: [Tirich Mir], Barum Gol, South Barum Gl., camp 2, 4500 m, 1950-07-27, *P.Wendelbo* s.n. (K! **type**). Astor: Kamri Vy. near Kalapani, on wet debris, 1892-08-25, 11000-12000' [3350-3660 m], *Duthie 12543* (K! **type** *K. kashmiriana*). Himachal Pr.: Bara Lacha P. 4880, *Bor 16360* (DD, K!; ASWAL & MEHROTRA 1994).
D: W Karakorum, NW Himalaya: Chitral, Hazara, Gilgit, Kashmir, Lahul. *Endem.*
E: 4180-4470 m, alp. - subniv., rare. Open cushion vegetation and highest *Cyperaceae* turf in relatively humid areas (with long snow cover).
N: The type of *P. kashmiriana* is more robust than that of *P. minuta* (which was "known only from the type"), but otherwise identical. The Karakorum localities connect the areas of both. Very similar in habit and easily confused with small species of *Colpodium* (especially *C. himalaicum*), *Poa* or *Festuca*.

* **Puccinellia nudiflora** (HACKEL) TZVELEV 1962 - A record from **Yarkand** was tentatively transferred to *P. himalaica*.

* **Puccinellia pauciramea** (HACKEL) TZVELEV 1934 - **A**: Reported from Wakhan (PODLECH & ANDERS 1977): tentatively transfered to *P. ladakhensis* (see there). **D**: Altai, Tian Shan, Pamir-Alai. **N**: Poorly understood.

* **Puccinellia pamirica** V. KRECZ. ex ROSHEV. 1950 (*Atropis distans* (JACQ.) GRISEB. f. *pamirica* ROSHEV. 1924) - **Ic.**: [?] Fl.Xizang.5: fig.64(1-3). **A**: W Pamir: Vakhan - Ishkashim, Abkharv Rv., Dibal, *Ovczinnikov & Afanassjev 269* (K!). E Pamir: Sassyk-Kul - Jaschil-Kul, 1901-07-18, *Fedtschenko* s.n (K!). Gorno-Badakhshan, W Pshart Vy. 3350 m, *Tzvelev 334* (K!). Wakhan: Upper Istmotsh Vy. 4000 m, *Anders 8048* (M!; PODLECH & ANDERS 1977: "*P. akbaitalensis*"); Kol-e Chaqmaqtin W shore 4000 m, Anders 7446 (M!; PODLECH & ANDERS 1977: "*P. distans*"). **D**: Tian Shan, Pamir-Alai. **N**: Poorly understood, superficially intermediate between *P. hackeliana* and *P. tenuiflora* (s.l.). The name, apparently, was misapplied to Himalayan material. Probably a single specimen from Karakash (*Henderson*, 1870-07-31) is cited under *P. himalaica* and *P. pamirica* in Pl.As.Centr.4.

* **Puccinellia roborovskyi** TZVELEV 1968 - **Ic.**: Pl.As.Centr.4: fig.8(2) Fl.Xizang.5: fig.64(4-6). **A**: C.Kunlun: N Russian Mts., Upper Aksu Rv., Tash-Bulak, 1890-06-17, *Roborovsky* (LE **type**, Pl.As.Centr.). **N**: Close to *P. hackeliana*.

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* **Puccinellia schischkinii** TZVELEV 1955 (*Puccinellia kuenlunica* TZVELEV 1955) - **A**: W Pamir: Gorno-Badakhshan, [?]Kukui-Bel-su Vy., 30 km from Sarezko Lake 4000 m, *Tzvelev 892* (K!). **N**: Apparently close to *P. tenuiflora*.

* **Puccinellia subspicata** V. KRECZ. 1934 - **A**: W Tian Shan: Talasskij Ala-Tau 3000 m, 1952-07-27, *Tzvelev* s.n. (K!). W Pamir: "Jugum Hissaricum, in pratis alpinis lapidosis prope trajectum Mura" 3450 m, 1932-08-12, *P.Ovczinnikov & A.Slobodov* s.n. (K!). E Pamir: Gorno-Badakhshan, Bilyand-Kiik Vy. 4 km from Takhta-Korum 4370 m, *Tzvelev 1002* (K!). **D**: Tian Shan, Pamir-Alai (endem.). **N**: Close to *P. humilis* and *P. minuta*, but with long lemmas (3.0-3.6 mm) and anthers (1.6-2.1 mm).

* **Puccinellia stapfiana** R. R. STEWART 1945 (*Glyceria poaeoides* STAPF in HOOKER f. 1896, non *Puccinellia poaeoides* KENG) - **A**: Rupshu: Head of Salt Lake [Tso Kar] 4720 m, 1847-09-25, *T.Thomson* s.n. (K! **type**). Himachal Pr.: Grassy plain [Parang Rv. - Lanak P.] 4510-4820 m, 1847-09-12, *T.Thomson* s.n. (K!). **D**: E Ladakh / SW Tibet (endemic, known only from two collections). **N**: Perhaps conspecific to *P. thomsonii*.

204. Puccinellia tenuiflora (GRISEB.) SCRIBNER & MERR., Contr. U.S. Nat. Herb. **13**: 78. 1910

Atropis tenuiflora TURCZ. ex GRISEB. in LEDEB. 1852

Ic.: Fl.Desert.Sin.1: fig.20(1-4).

CN **K2-North:** Muztagh Vy. 3930 m, *Dickoré 627!; 880!*. Skyang Vy. 4140 m, *Dickoré 829!*. **Shaksgam:** Upper Shaksgam Vy. 3980 m, *Dickoré 909!*.

N **Yarkand:** Ilyk 3520 m, *Dickoré 400!; 401!*. Mazar 3770-3800 m, *Dickoré 266!*. Surukwat Vy. 3700 m; Aghil Vy. 3910 m; 4120-4150 m (*Dickoré*).

W **Batura:** Karimabad - Khaibar 2800 m, *Klötzli & al. 808.06,07,14!*.

D: C. Asia, Mongolia, China.; ?Kashmir, ?Tibet. *Centr. As.*

E: 2800-4150 m, subalp., rare. Wet saline habitats: flushes *(Dilophia salsa, Primula pamirica)*, river sands and lakes shores.

205. Puccinellia thomsonii (STAPF) R. R. STEWART, Brittonia **5**: 418. 1945

Glyceria thomsonii STAPF in HOOKER f. 1896, *Atropis thomsonii* (STAPF) PAMPANINI. 1930

S **Leh:** Rupshu, Puga 4720 m, 1847-09-23, *T.Thomson* s.n. (K! **holotype**, identical material without locality: "Tibet occ. alp., 16. *Poa*" at M!). Puga, *Koelz 2176* (K!). [?] Leh, *Meebold* (STEWART 1916).

D: E Ladakh (endemic, "known only from 3 specimens collected at Puga"). *Endem.*

E: 4720 m, alp., rare in the SE. Known with certainty only from the surroundings of hot springs at Puga. - „around mineral spring with much alkali deposit" (*Thomson*) .

* **Puccinellia vachanica** OVCZ. & CZUK. 1957 - Wakhan: Upper Istmotsh Vy. 3900-4000 m, *Anders 8107*; Langar 3650 m, *Anders 7361* (PODLECH & ANDERS 1977). **N**: Of unknown identity.

* **Rostraria clarkeana** (DOMIN) HOLUB 1974 (*Koeleria clarkeana* DOMIN 1907) - **A**: Kashmir. **D**: endemic, known only from the type.

* **Rostraria cristata** (L.) TZVELEV 1970 (*Festuca cristata* L. 1753, *Koeleria phleoides* (VILL.) PERS. 1805 - **A**: Chitral. Swat. Hazara. Kashmir. **D**: Medit., SW Asia - Pakistan; introduced in N America.

* **Rostraria pumila** (DESF.) TZVELEV 1970 (*Avena pumila* DESF. 1798, *Lophochloa pumila* (DESF.) BOR 1960, *Koeleria sinaica* BOISS. 1853) - **Ic.**: Fl.Iraq 9: pl.134. **A**: Swat (below 1000 m). **D**: Medit. - Pakistan, NW India; introduced in S Africa & Australia.

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206. Saccharum filifolium NEES ex STEUDEL, Syn. Pl. Glum. 1: 409. 1855
Saccharum macratherum (PILGER) SULTAN & STEWART 1958

CS **Shimshal:** Shimshal gorge, Jurjur - Dut 2600-2730 m, *Miehe 5957!*.

W **Gilgit:** Shinghai Gah - Pahot Gali 1800-1900 m, *Miehe 694a!*. **Hunza:** Hunza, Baltit 2440 m, 1954-06-10/15, *F.Schmid* s.n. (RAW). **Batura:** Gulmit - Atabad 2500-2930 m, *Miehe 2671!*. Karimabad - Khaibar 2500-2800 m, *Klötzli & al. 808.03!*. **Khunjerab:** Khunjerab P. SW, *Klötzli & al. 132-135.40!*.

A: Chilas: Indus Vy. - Gor 1860m, *Nüsser 1070!*. Muthat - Raikot Bridge, Buldar Vy. left slope 1300m, *Nüsser 1068!*. Astor: Mushkin, 1950-07-03, *I.I.Chaudhri* s.n. (K). Lower Astor Vy., below Doyan 1660 m, *Nüsser 714!*.

D: W Himalaya (Afgh. - Nepal). *W Himal.*

E: 1800-2930 m, coll.-mont., rare in the SW. *Juniperus excelsa-Artemisia brevifolia*, rocky slopes (*Miehe 2671*).

207. Saccharum ravennae (L.) MURRAY, Syst. Veg. 88. 1774
Andropogon ravennae L. 1763, *Erianthus ravennae* (L.) P. BEAUV. 1812

Ic.: Fl.Iraq 9: pl.207.

CS **Shimshal:** Shimshal gorge, Jurjur - Dut 2600-2730 m, *Miehe 5956!*.

W **Hunza:** Nagar - Minapin 2130-2440, *R.R.Stewart 26670* (K).

A: W Kashg.: 48 km E Yangigissar, 1959-09-18, *Petrovsky*. S Kashg.: Kunlun N 1600 m, 1889-09-13, *Roborovsky* (Pl.As.Centr.). Himachal Pr.: Trilokinath, *Bhattacharyya 45958* (BSD, ASWAL & MEHROTRA 1994).

D: Medit., SW Asia - Himalaya: N Pakistan, N India, Nepal, ? SE Tibet. *?Medit.*

E: 2130-2730 m, coll. - mont., rare in the SW. ? Rocky river-sides. (Generally:) Forests and open scrub-lands.

208. Saccharum spontaneum L., Mant. Pl. **2**: 183. 1771

W **Gilgit:** Gilgit 1520 m, *R.R.Stewart 26643a* (RAW).

S **Shigar:** Shigar Vy. 2350 m, *Schickhoff 1866!*.

A: S Kashg.: 25 km E Guma, 1959-09-21, *Petr.* (Pl.As.Centr.). Astor: Ramghat Camping Ground 1680 m, *Duthie 12282* (K).

D: Warm-temp. - subtrop. Old World. *Palaeotrop.*

E: 1520-2350 m, subtrop.-coll., rare. *Artemisia fragrans* scrub, semi-desert, ? in water-surplus habitats.

* **Sclerochloa dura** (L.) P. BEAUV. 1812 (*Cynosurus durus* L. 1753) - **Ic.:** Fl.Pak.143: fig.45. **A**: Swat. Hazara. Kashmir. **D**: Medit., C. Europe, SW & Middle Asia.

209. Schismus arabicus NEES, Fl. Afr. Austr. **1**: 422. 1841
Schismus spectabilis FIG. & DE NOT. 1852, "*Schismus marginatus* THOMSON", "*Danthonia submutica* C. B. CLARKE"

Ic.: Fl.Desert.Sin.1: fig.18(5-8).

W **Gilgit:** Nomal 1680 m, *R.R.Stewart 26697* (K!). 20 km S Gilgit 1420 m, *Miehe 4653!; 4653a!*. **Batura:** Gulmit - Atabad 3600 m, *Miehe 2711a!*.

S **Skardu:** Shagarthang Vy. 2740-3050 m, 1892-07-18, *Duthie* s.n. (K!). Skardu 2740 m, *C.B.Clarke 29983; 30006; 30017* (K!), *Nasir & Webster 5772* (RAW). **Leh:** Kalatze - Nurla, 1848-07-08, *T.Thomson* s.n. (K!). **Lower Shyok:** Shyok Vy., Blaghar - Kuru 2500 m, *R.R.Stewart 20861* (RAW).

A: W Kunlun: Akaz P. N 2560 m, *Miehe 8635!*. C.Kunlun: Russian Mts. N, Karasay 3000 m, 1890-06-13, *Roborovsky* (Pl.As.Centr.). Wakhan (PODLECH & ANDERS 1977).

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D: Medit., N Africa, SW & Middle Asia (E to Kashmir); introduced in S Australia and N & S America. *Ir.-Tur.*
E: 1680-3600 m, (coll.-) mont. (-subalp.), rare in the SW. Semideserts, steppes and scrub- and forest-steppes (*Juniperus excelsa*), in the "therophyte-belt".

* **Schismus barbatus** NEES 1841 - **Ic.**: Fl.Pak. 143: fig.4. Fl.Iraq 9: pl.144. **A**: Wakhan: Qazideh 2800 m, *Roemer 140* (PODLECH & ANDERS 1977). **D**: Medit. - Pakistan; Arabia; S & SW Africa.

• **Secale cereale** L., Sp. Pl. 1: 84. 1753
A: Kashmir. Himachal Pr.: Lahul, Kyelang - Jaspa 3200 m, *N.L.Bor 16409* (K!); Sanoa 2740 m, *N.L.Bor 14845* (K!); "rye cultivated".
N: "It is, apparently, rarely grown in Pakistan although there are records of it from Baluch., NWFP and Kashmir."

* **Secale montanum** GUSS. 1827 - **Ic.**: Fl.Iraq 9: pl.90. Fl.Iran 70: pl.32. **A**: ?Wakhan (PODLECH & ANDERS 1977). Perhaps to *S. segetale*.

210. Secale segetale (ZHUK.) ROSHEV., Trudy bot. Inst. Akad. Nauk URSS 6: 143. 1947

Secale cereale L. var. *afghanicum* VAV. 1926, *Secale cereale* L. subsp. *segetale* ZHUK. 1928, *Secale afghanicum* (VAV.) ROSHEV. 1947

W **Gilgit:** Naltar - Nomal 2440 m, *R.R.Stewart 26703* (K!).
A: Swat: Lowari top - Dir, *M.A.Siddiqui & A.Rahman 26721* (K!).
D: Caucasus - SW & Middle Asia, Pakistan (Baluch., Gilgit). *Ir.-Tur.*
E: 2440 m, coll. - mont., rare in the SW. "Often a weed in grain fields" (*R.R.Stewart 26703*).

• **Setaria italica** (L.) P. BEAUV., Ess. Agrost. 51, 170, 178. 1812 (*Panicum italicum* L. 1753)
W **Hunza:** Ghama, 1974-08-10, *F.Gartner* s.n. (GZU!).
Commonly cultivated in Pakistan from 1500 to 3600 m (Fl.Pak.).

211. Setaria pumila (POIRET) SCHULTES in SCHULTES & SCHULTES f., Mantissa 2: 274. 1824

Setaria glauca auct. non (L.) ROEMER & SCHULTES 1817

Ic.: Fl.Xizang.5: fig.166. Fl.Desert.Sin.1: fig.44(5-7).
W **Yasin:** Sultanabad 2500 m, *G.Stöber 80!, 89a!*. **Hunza:** Chalt 2050 m, *Klötzli & al. 122.04!*.
S **Skardu:** Flood-plain of Indus Rv. c. 1.5 miles E of Skardu 2290 m, *Nasir & Webster 6582* (K).
A: W Kashg.: Yarkand City (HENDERSON & HUME 1873). Yecheng 1400 m, *Dickoré 984!*. S Kashg.: Kunlun N 2000 m, 1889-09-05, *Roborovsky* (Pl.As.Centr.: *S. glauca*). Hazara: Karman, *F.Gartner* s.n. (GZU!).
D: Warm-temp. Eurasia, N Africa; introduced in S Afr., Austr., N & S America. *Euras.*
E: 2050-2500 m, coll. - mont., not common in the SW. Ruderal, on sandy and loess soils, a weed of cereal crops (wheat).

* **Setaria verticillata** (L.) P. BEAUV. 1812 (*Panicum verticillatum* L. 1762) - **Ic.**: Fl.Iraq 9: pl. 193. **A**: Chilas: Karakorum Highway near Sazin. Kashmir. **D**: Temp. Eurasia.

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212. Setaria viridis (L.) P. BEAUV., Ess. Agrost. 51, 171, 178. 1812
Panicum viride L. 1759
Ic.: Fl.Xizang 5: fig.165. Fl.Desert.Sin.1: fig.44(1-4).
CS **Biafo:** Ste Ste 3080 m, *H.Hartmann 203* (K); *204!* (HARTMANN 1966).
W **Yasin:** Sultanabad 2500 m, *G.Stöber 38!; 89b!.* **Ishkoman:** Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Hunza:** Pisan 2230 m, 1974-07-23, *F.Gartner* s.n. (GZU!). **Batura:** Khaibar 2500 m, *Klötzli & al. 801.68!.*
S **Skardu:** Satpura 3050 m, *Nasir & Webster 6324* (RAW). Skardu, Kachoore Nullah, *A.Ghafoor & Z.L.Butt 613* (KUH). **Leh:** 3450 m (MEEBOLD 1909); Leh (STEWART 1916).
Unloc.: Ladakh, *Schlagintweit* (GRISEBACH 1868).
A: W Kashg.: Yarkand, Kardong 1800 m, 1931-07-25, *Persson 77a* (PERSSON 1938). S Kashg.. Kongur: Bostan-Terek 2400 m, 1934-08-04, *Persson 512*; *570* ("var. *weinmanni*") (PERSSON 1938). Chitral: W Shandur P., Sor Laspur 3100 m, *Miehe 7027!.* Astor: Rupal Nullah 2440 m, *R.R.Stewart 22869* (K). Mushkin Forest, Mushkin Rest House - Turbaling2700 m, *Nüsser 230!.* Hazara: Kaghan Vy. Himachal Pr.: Billing Nala, *Aswal 10433* (ASWAL & MEHROTRA 1994).
D: Temp. Eurasia, N Africa; introduced in Australia, America. *Euras.*
E: 2500-3450 m, mont., not common. Arable land, a weed of cereal crops (wheat), waste places around villages.

• **Sorghum bicolor** (L.) MOENCH, Meth. Pl. 207. 1794 (*Holcus bicolor* L. 1771, *Andropogon sorghum* (L.) BROT. 1804) - **Ic.**: Fl.Iraq 9: pl.209; 210. **A**: W Kashg.: "*Andropogon sorghum* BROT. and *A. saccharatus* are cultivated near Yarkand City" (HENDERSON & HUME 1873). E Kashg. (Pl.As.Centr.).

213. Sorghum halepense (L.) PERS., Syn. Pl. **1**: 101. 1805
Holcus halepensis L. 1753, *Andropogon halepensis* (L.) BROT. 1804
Ic.: Fl.Iraq 9: pl.211. Fl.Pak.143: fig.32.
W **Gilgit:** Hunza Vy., Nomal 1680 m, *Duthie 12318* (K).
A: Kashmir.
D: Medit., SW & Middle Asia, E to Kashmir, India (Madras); (? introduced in) Australia. *?Medit.*
E: "A weed of cultivated fields. Under certain circumstances its tissues contain hydrocyanic acid and are a positive danger to stock." (Fl.Pak.).

* **Sorghum nervosum** BESSER ex SCHULTES & SCHULTES f. 1827 (*Sorghum japonicum* (HACKEL) ROSHEV. 1934) - **A**: W Kashg.: Near Ak-Tash, 1913-08-05, *Knorring* (Pl.As.Centr.).

• **Sorghum saccharatum** (L.) MOENCH 1794 (*Holcus saccharatus* L. 1753, *Andropogon saccharatus* (L.) ROXB. 1814) - **A**: W Kashg.: Yarkand (HENDERSON & HUME 1873: see *S. bicolor*). Cultivated.

* **Sporobolus diander** (RETZ.) P. BEAUV. 1812 (*Agrostis diandra* RETZ. 1789) - **A**: Swat. Hazara: Kaghan Vy. **D**: Himalaya, SE Asia, Australia. **N**: **Sporobolus arabicus** BOISS. 1853 is reported from Ladakh, *Schlagintweit* (GRISEBACH 1868); very doubtful identification.

* **Stephanachne pappophorea** (HACKEL) KENG 1934 (*Calamagrostis pappophorea* HACKEL 1904, *Pappagrostis pappophorea* (HACKEL) ROSHEV. 1934) - **Ic.**: KENG 1959: fig.521. Fl.Desert.Sin.1: fig.36(8-11). **A**: W Kunlun: Ak-kez P., 1959-06-05; Upper Tiznap Vy., 20 km S Kudi 3500 m, *Junatov* (Pl.As.Centr.). N Kudi 3030 m, *Miehe 7519!.* C.Kunlun: Cherchen Vy. 2600-3000 m, 1890-08-07, *Roborovsky* (Pl.As.Centr.). E Pamir: Pas Rabat Rv., Toyli-Bulun, 1909-08-02, *Divnogorskaya* (Pl.As.Centr.). **D**: Mountains around Tarim Basin: Tian Shan, Kunlun, Zaidam, Qinghai, SW Mongolia. **Map:** Pl.As.Centr.4: map 6. **E**: Mont. loess slopes

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N: *Stephanachne* KENG, Contr. Biol. Lab. Sci. Soc. Bot. ser. 9: 136. 1934-08, antedates *Pappagrostis* ROSHEV., Fl. URSS **2**: 231. 1934-09.

Stipa:

Monographed by FREITAG (1985); see for synonyms, key, descriptions and distribution maps; many specimens determined by Freitag. *Timouria* and *Trikeraia* are retained as separate genera here.

Synopsis (FREITAG 1985)

Sect. *Achnatheropsis* TZVELEV: *St. brandisii*, *St. regeliana*
Sect. *Barbatae* JUNGE emend. FREITAG: (*St. arabica*)
Sect. *Lasiagrostis* (LINK) HACKEL: (*St. caragana*), (*St. chitralensis*), *St. jacquemontii*, *St. splendens*
Sect. *Pseudoptilagrostis* TZVELEV: *St. subsessiliflora*
Sect. *Ptilagrostis* (GRISEB.) HACKEL: *St. concinna*, *St. mongholica*
Sect. *Stipa*: *St. breviflora*, *St. capillata*, *St. caucasica*, *St. himalaica*, *St. koelzii*, *St. orientalis*, *St. pennata*, *St. purpurea*, (*St. roborovskyi*), *St. turkestanica*

Key to *Stipa* (adapted from FREITAG 1985):

1. Awn 7-40 mm long **2**
\+ Awn longer than 40 mm **14**
2. Awn plumose throughout, with the hairs at the base at least 1 mm long **3**
\+ Awn scabrous throughout, or only the lower part plumose or pilose **5**
3. Awn longer than 30 mm ..... **(St. roborovskyi)**
\+ Awn shorter **4**
4. Panicle spike-like, contracted ..... **St. concinna**
\+ Panicle loose, with spreading, flexuous branches ..... **St. mongholica**
5. Awn in lower part plumose or pilose, with hairs of at least 0.4mm **6**
\+ Awn scabrous throughout **8**
6. Awn in lower part plumose, hairs at its base 2-3 mm long ..... **St. subsessiliflora**
\+ Awn in lower part pilose, hairs at its base 0.4-1 mm long **7**
7. Callus up to 0.5 mm long, rounded. Lemma membranous, with 0.5-1mm long apical lobes. Hairs at the base of the awn c. 0.5 mm long ..... **(St. duthiei)**
\+ Callus 0.7-1 mm long, acute. Lemma coriaceous, without apical lobes. Hairs at the base of the awn c. 1 mm long ..... **(St. regeliana)**
8. Awn bigeniculate. Lemma dark brown, coriaceous ..... **St. brandisii**
\+ Awn straight or variously geniculate, if geniculate or flexuose or flexuose, the lemma never brown and coriaceous **9**
9. Awn almost straight. Mature lemma chartaceous, with 2-6 deflexed spinules of 1-2 mm at the apex. Panicle contracted ..... **(St. roylei)**
\+ Awn geniculate or flexuose, twisted in lower part. Mature lemma membranous, without deflexed spinules. Panicle effuse or contracted **10**
10. Lemma with prominent apical lobes of 2-3 mm **11**
\+ Lemma lobes only up to 1 mm long **12**

11. Lemma lobes awn-like, setaceous. Awn 8-14 mm long. Glumes 7.5-9.5 mm long ..... **(Trikeraia)**
\+ Lemma lobes plane, membraneous. Awn 18-21 mm long. Glumes 9.5-12 mm long .. **(St. chitralensis)**
12. Panicle contracted, up to 2 cm wide. Awn 20-35 mm long ..... **St. jacquemontii**
\+ Panicle more effuse, at least 4 cm wide. Awn 5-14 mm long **13**
13. Tufts small; culms slender. Glumes subequal. Apical lemma lobes 0.2-0.4 mm long ..... **St. caragana**
\+ Tufts large to very large; culms stout. Glumes unequal, the lower 1-2 mm shorter. Apical lemma lobes 0.5-1 mm long ..... **St. splendens**
14. Awn scabrous throughout ..... **St. capillata**
\+ Awn pilose or plumose throughout or in parts **15**

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15. Awn pilose with hairs up to 0.9 mm only in its lower part, upper part scabrous ..... **St. koelzii**
\+ Awn pilose or plumose throughout, or in upper part only, with longer hairs **16**
16. Awn pilose or plumose throughout **17**
\+ Awn pilose or plumose only in upper part, at least the segment below the first geniculation glabrous **24**
17. Awn pilose, with hairs 0.6-2.5 mm long **18**
\+ Awn plumose, with hairs 4-11 mm long **21**
18. Awn (8-)10-15(-22) cm long. Glumes (22-)25-35(-40) mm long..... **(St. arabica)**
\+ Awn 5-7 cm long. Glumes 12-17 mm long **19**
19. Awn with hairs of 0.6-1(-1.2) mm. Lemma spinulose-scabrid towards the top and with a crown of stiff hairs at the tip..... **St. breviflora**
\+ Awn at least in lower part with longer hairs. Lemma without a crown **20**
20. Panicle contracted, many-spiculate. Anthecium 6.5-7.5 mm. Awn in lower part with longer hairs (1.5 mm) than in the upper (1-1.1 mm) ..... **(St. roborovskyi)**
\+ Panicle usually loose, few-spiculate. Anthecium 8-9.5 mm. Awn in lower part with shorter hairs (1-1.5 mm) than in the upper (2mm) ..... **St. purpurea**
21. Awn unigeniculate ..... **St. caucasica**
21a Hairs below geniculation of awn 1.5-3 mm long. Usually tall, robust plants ..... **St. caucasica** subsp. **caucasica**
21b Hairs below geniculation of awn 1.0-1.5 mm long. Usually low, gracile plants ..... **St. caucasica** subsp. **glareosa**
\+ Awn bigeniculate **22**
22. Anthecium at least 15 mm long. Awn longer than 17 cm ..... **St. pennata** (aberrant forms)
\+ Anthecium 6-11.5 mm long. Awn up to 14 cm long **23**
23. Anthecium 6-9.5 mm long. Awn up to 7 cm long, falcate; hairs below first geniculation c. 1 mm long. Leaf sheaths and dead blades usually pale brown to grey ..... **St. orientalis**
\+ Anthecium 9.5-11.5 mm long. Awn 7.5-14 cm, flexuose; hairs below first geniculation c. 3 mm long. Leaf sheaths and dead blades usually yellowish-brown to bright yellow-orange..... **St. himalaica**
24. Anthecium 6-8 mm long. Awn 6-8 cm long ..... **St. tianschanica**
\+ Anthecium 9-26 mm long. Awn 8-45 cm long **25**
25. Awn 8-16(-19) cm long. Anthecium 9-12.5(-14) mm ..... **St. turkestanica**
\+ Awn (17-)25-38(-45) cm long. Anthecium (15-)17-23(-26) mm ..... **St. pennata**

214. **Stipa arabica** TRIN. & RUPR., Sp. Gram. Stip. 77. 1842

Stipa orientalis TRIN. in LEDEB. var. *persica* TRIN. 1830, *Stipa szovitsiana* (TRIN. & RUPR.) GRISEB. in LEDEB. 1852, *Stipa barbata* auct. non DESF. 1798: BOR 1970 p.p.

Ic.: Fl.Iraq 9: pl.150.

W **?Ishkoman:** Upper Ishkoman, Baru Gah 3050-3130 m, *Miehe 6762!* (cf., veg.). **Hunza:** Rakaposhi N, above Nilt 2450 m, *Miehe 6392!*.

A: W Pamir: Vakhan, pr. Vrang 3120 m, *Ovczinnikov & Afanassiev 1735* (LE **type** *St. pamirica* ROSHEV.); Wakhan: Qala-e-Ust - Baba-e-Tangi 2850 m, *Anders 7075* (*Stipa arabica* TRIN. & RUPR. var. *pamirica* (ROSHEV.) FREITAG 1985); Sar-i Shkhaur 2700 m, *Roemer 35* (PODLECH & ANDERS 1977). Chitral: 2300-3300 (var. *arabica*; FREITAG 1985). Chitral 1830 m, *Harriss 16783* (BM!).

D: S Sinai, Turkey, Caucasus - Iran, Afgh., W Pakistan, W Pamir, Tian Shan. **Map:** FREITAG 1985: fig.25. *Ir.-Tur.*

E: 2450 (-?3130) m, mont., rare in the W. *Artemisia brevifolia-Juniperus excelsa* forest-steppes.

N: A very characteristic Irano-Turanian element. Plants from the extreme E of its distribution area are distinguished as **Stipa arabica** TRIN. & RUPR. subsp. **pamirica** (ROSHEV.) FREITAG 1985 (*Stipa pamirica* ROSHEV. 1949, *Stipa badachschanica* ROSHEV. subsp. *pamirica* (ROSHEV.) TZVELEV 1974). The records of *Stipa barbata* DESF. 1798, from **Leh:** Himis Shukpa; Leh (STEWART 1916) probably are erroneous and may belong to *St. himalaica* or *St. pennata* subsp. *kirghisorum*.

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215. Stipa brandisii MEZ, Feddes Repert. **17**: 207. 1921

Stipa subeffusa OHWI 1957, *Stipa sibirica* auct. non (L.) LAM. 1791: COPE 1982, *Achnatherum sibiricum* auct. non (L.) KENG 1957

W **Yasin:** 1956-10, *Sh.Ali* s.n. (RAW). Yasin 2600 m, *K.Ogino 354; 380; 382*; Gupis - Yasin, Dawalgan 2350 m, *K.Ogino 461* (KYO; FREITAG 1985). **Gilgit:** *Giles* s.n. (CAL; FREITAG 1985). Baghrot Vy. 2890 m, *Miehe 4467!*; W Gutumi Gl. 2900 m, *G.Braun 202!; 203!*. **Hunza:** Above Chalt 1830 m, *R.R.Stewart 26693* (K!, RAW). Minapin - Chalt, 1955-08-22, *Nakao* s.n. (KYO **type** *St. subeffusa*; FREITAG 1985). Upper Rashumaling Vy. 2680-2700 m, *Schickhoff 112!* (veg.); *156!* (veg.). Pisan (2000-3000 m), *G.Braun 572!*; 2600 m, 1974-07-25, *F.Gartner* s.n. (GZU!).

A: Chitral. Chilas: Babusar Vy. 2740 m, *Schickhoff 1744!*. Swat. Hazara: Kaghan Vy. Dras: (HENDERSON & HUME 1873). Kashmir: Baltal - Nunner, 1856-10-15/16, *Schlagintweit 4808* (M!, Z!; FREITAG 1985); common 2440-2740 m. Himachal Pr.: Rasse, *Bhattacharyya 45326* (BSD; ASWAL & MEHROTRA 1994).

D: Himalaya: E Afgh. (Kurram, Nuristan), N Pakistan - SE Tibet, S China (Yunnan). **Map:** FREITAG 1985: fig.11. *Sino-Himal.*

E: 1830-2900 m, mont., scattered in the SW. Coniferous forests (*Juniperus excelsa, Pinus wallichiana*), especially on clearings and at margins, often vigorously at grazing places, because it is avoided by stock. (Generally:) Oak and mesophilous coniferous forests.

N: Poisonous, caused by cyanogenic glycosides (FREITAG 1985). According to FREITAG (1985), *St. brandisii* is closely related to *Stipa sibirica* (L.) LAM. 1791 (N Asia), but differs specifically, although in minor characters.

216. Stipa breviflora GRISEB., Nachr. Ges. Wiss. Göttingen **1868**: 82. 1868

Stipa aliciae KANITZ in SZÉCHENYI 1898

Ic.: Fl.Desert.Sin.1: fig.39(7-12).

S **Leh:** S Rumtse 4560 m, *H.Hartmann 4117!*. **Leh/Shyok:** [Kardong P., probably Kardong (3960-5390 m)], 1848-07-20, *T.Thomson* s.n. (K!).

Unloc.:Ladakh 3960 m, *J.H.Lance 320* (K!).

A: Kongur: Jerzil 2800 m, 1930-07-30, *Persson 45* (PERSSON 1938). W Kunlun: Akkez P. - Kudi, 1959-05-31 *Junatov*; Upper Tiznaf Vy. 25-27 km S Kudi 1959-06-01, *Junatov* (Pl.As.Centr.). Akaz P. N 2500-2630 m, *Miehe 7411!; 8622!; 8630!*. Akaz P. 3300 m, *Miehe 7393!*. Tiznap Vy., N Kudi 2900 m, Miehe 7530!; W Kudi 3500-3700 m, *Miehe 8506!*. C.Kunlun: Russian Mts. N, Linchu Rv. 2500-2800 m, 1885-05-28, *Przewalsky*; Upper Chira Rv., 15-17 km S Ukhu, Sary-Bulun, 1959-05-19, *Junatov*; Cherchen, 4 km N Achan 2720 m, 1959-06-02, *Li & al. 9393*; Cherchen, 3 km W Karamulak, 1959-06-07, *Li & al. 9471* (Pl.As.Centr.). Zanskar: Markha Vy., Tchatchutse 4550 m, *H.Hartmann 3035!*. W Tibet: Tibet, Gnari Khorsum, *Schlagintweit 7105* (GOET! **holotype**, LE).

D: Tian Shan, E Pamir, Inner Himalaya (Ladakh - Nepal), S Tibet. *Centr.As.* **Map:** Pl.As.Centr. 4: map 5.

E: 4560 m, subalp. - alp., rare in the SE. Dry gravel slopes. (Kunlun:) mont. - subalp. loess deserts and scrub-steppes (*Sympegma regelii, Caragana polourensis*), preferably by rocky (calcareous) outcrops. (Generally:) 3000-4000 m, subalp. - alp. semideserts.

N: A characteristic component of C. Asiatic loess steppes and apparently a rather rare "loess-relic" in the Indus Vy. (at unusually high altitude !) and the inner valleys of the Tibetan Himalaya.

217. Stipa capillata L., Sp. Pl., ed.2, **1**: 116. 1762

Ic.: Fl.Desert.Sin.1: fig.41(7-12).

W **Hunza:** Chaprot - Gilgit, *J.E.Winterbottom 962* (K!).

S **Leh:** Mathu, *Bimal Misri 338* (K!).

Unloc.: Hata Pir 2740-3050 m, *Giles* s.n. (K!).

A: Chitral. Deosai: Shingo Vy. 3050-3350 m, *Duthie 11927* (K!, RAW, W; FREITAG 1985). Dras: Chatpani Nullah W of Dras 3350-3660 m, *Duthie 13857* (K!); Dras Vy. 3050-3350 m, *Duthie 13714* (K!); Dras, Gilgit Rd. 3050 m, *R.R.Stewart 9986A* (K!). Kharbu - Dras 2900-3300 m, *R.R.Stewart*

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21127 (NY; FREITAG 1985). Kashmir: Zoji P., *Stoliczka* s.n. (K!). Sonamarg, *Jacquemont 980* (K!). Bangla 2740 m, *C.B.Clarke 29560* (K!); Tilail 2740 m, *C.B.Clarke 30723* (K!). Himachal Pr.: Gondhla, *Bor 12434* (DD; ASWAL & MEHROTRA 1994).

D: Temp. Eurasia, S to Medit., N Iran, E Afgh., Himalaya - Nepal - China, Japan. **Map:** FREITAG 1985: fig.24. *Euro-Sib.*

E: Habitat in the Karakorum unknown; ?2000-3200 m, mont., rare in the S. (Generally:) steppes and various dry open habitats.

218. Stipa caragana TRIN., Mém. Acad. Sci. Pétersb., sér.6, **1**(1): 74. 1830

Lasiagrostis caragana (TRIN.) TRIN. & RUPR. 1842, *Achnatherum caragana* (TRIN.) NEVSKI 1937

W **Ghizar:** Rawat 2700 m, *K.Ogino 496* (KYO; FREITAG 1985). **Yasin:** Sultanabad 2500 m, *G.Stöber 16!*.

A: Swat: Upper Swat, *M.A.Khan* (K; FREITAG 1985). Hazara.

D: NE Turkey, Caucasus - N Iran, Afgh., W Pakistan (Baluchistan, Swat, Gilgit), Pamir-Alai, Tian Shan. **Map:** FREITAG 1985: fig.6. *Ir.-Tur.*

E: 2500-2700 m, mont., rare in the W. By cultivated fields (*Stöber 16*). (Generally:) *Juniperus* and *Pinus gerardiana* woodlands (FREITAG 1985).

219. Stipa caucasica SCHMALH., Ber. Deutsch. Bot. Ges. **10**: 293. 1892

subsp. **caucasica**

Stipa orientalis TRIN. in LEDEB. var. *grandiflora* RUPR. in OSTEN-SACKEN & RUPR. 1869

Ic.: Fl.Xizang.5: fig.151. Fl.Desert.Sin.1: fig.39(1-6).

CN **Braldu:** Upper Braldu tributary, above Chikor 4000-4250 m, *Miehe 6179!; 6180!*.

CS **Shimshal:** Upper Shimshal, Zardgar Bin 3900-4050 m, *Miehe 5997!*. Pamir-tang, Shachmirk P. - Shujerab 3950-4080 m, *Miehe 6030b!*.

N **Mustagh Ata:** P. between Tagama basin & [Little] Karakul 4100 m, *Miehe 5265!*. **Taxkorgan:** Above Dafda 4110 m, *Miehe 5583a!*. **?Mintake:** S Taxkorgan, above Mazar 3810 m, *Miehe 5693!* (veg.); *5694!* (veg.).

W **Yasin:** Naz Bar 3050 m, *Miehe 3672!*. **Batura:** E Morkhoon 3600-3900 m, *Klötzli & al. 804.28!*. **Khunjerab:** P. SW 3520-4350 m, *Miehe 2516!; 2562!; 2570!*.

S **Leh:** Shanti Stupa 3500 m, *Holzner & Kriechbaum* s.n.!. NE Leh 3600 m, *H.Hartmann 2588!*. Basgo - Likir 3400 m, 1993-07-14, *Holzner & Kriechbaum* s.n.!.

A: Kongur: Jerzil 3500 m, 1930-07-14, *Persson 107* (PERSSON 1938). Upper Oytag Vy. 2900-3080 m, *Miehe 8789!; 9189!*. Upper Gez Gorge 3500 m, *Miehe 5317!*. W Kunlun; C.Kunlun: Cherchen 3400 m, 1959-06-05, *Li & al. 9434* (Pl.As.Centr.). W Pamir. E Pamir. Wakhan 3570-4100 m (PODLECH & ANDERS 1977).

D: Caucasus - N Iran, Afgh., W Karakorum, Pamir-Alai, Tian Shan, W Kunlun. *Ir.-Tur.*

E: 3050-4350 m, subalp., scattered in the S & W. Steppes and semideserts.

subsp. **glareosa** (SMIRNOV) TZVELEV, Nov. Syst. Pl. Vasc. **11**: 20. 1974

Stipa glareosa SMIRNOV 1929, *Stipa caucasica* SCHMALH. subsp. *desertorum* (ROSHEV.) TZVELEV 1974, *Stipa orientalis* TRIN. in LEDEB. var. *trichoglossa* HACKEL ex PAULSEN 1903, *Stipa orientalis* TRIN. in LEDEB. var. *humilior* KRYLOV 1928

Ic.: Pl.As.Centr.4: fig.2(4). Fl.Xizang.5: fig.150. Fl.Desert.Sin.1: fig.38(23-30).

CN **Braldu:** Upper Braldu tributary, above Chikor 3900 m, *Miehe 6193!; 6194!*. **K2-North:** Muztagh Vy. 3900-4400 m, *Dickoré 885!; 887!; 893!*. Skyang Vy. 4050-4300 m, *Dickoré 764!; 822!; 832!*. K2-N Vy. 4100-4130 m, *Dickoré 643!*. **Shaksgam:** Aghil P. S 4160-4480 m, *Dickoré 598!*. Upper Shaksgam Vy. 3930-4000 m, *Dickoré 610!*.

N **Mustagh Ata:** N 3930 m, *Miehe 5429!*; SW 4000-4080 m, *Miehe 5893!*. **Yarkand:** Mazar Dala - Mazar, common 3620-3900 m, *Dickoré 327!; 355!; 378!*. Surukwat-, Aghil Vy. 3600-4150 m, *Dickoré 418!; 431!; 473!*. Aghil P. N 4520 m, *Dickoré 510!*. **Karakash:** 10-12 km W Xaidulla, Rd. to Kirgiz-Dzhangil, 1959-06-03, *Junatov* (Pl.As.Centr.).

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S **Leh:** Nima Mud 4800 m, *Koelz 2342a* (NY; FREITAG 1985). Upper Indus, Taktale Vy. 4500 m, 1969-08-23, *Bruhn* (FREITAG 1985).

E **Upper Shyok:** Sassar, 1848-08, *T.Thomson* s.n. (K!). [Sassir - Murgai], 1848-08-28, *T.Thomson* s.n. (K!). **Changchenmo:** Kiam 5100 m, 1927-08-08, *Bosshard* (Z!; SCHMID 1932: "*St. orientalis*").
A: W Kunlun: Upper Tiznap Vy. 4190 m, *Dickoré 953!*. E Pamir. Chitral: Zagar P. 4500 m, *Ogino 548* (KYO; FREITAG 1985). Rupshu: Tsokar Lake 4570 m, *R.R.Stewart 154* (K!). W Tsokar 4700 m, *H.Hartmann 4114!*. N Tso Kar 4600 m, 1992-07-22, *Holzner & Kriechbaum* s.n.!. Nuruchan 4700 m, 1992-07-24, *Holzner & Kriechbaum* s.n.!. Starsa Puk Tso 4550 m, 1992-07-26, *Holzner & Kriechbaum* s.n.!. Ascent towards Lanak P., 1847-09-12, *T.Thomson* s.n. (K!). W Tibet: SE Garyarsa, Upper Gar Vy. (N 31°32' E 80°24') 4650 m, *Miehe+9656a!*.
D: E Pamir, Chitral, Karakorum, Ladakh, W Tibet, NW China, Mongolia. **Map:** Pl.As.Centr.4: map 1. *Centr. As.*
E: 3600-4520 (5100) m, subalp. (-alp.), common in the N, rare in the S. *Krascheninnikovia ceratoides* deserts and semi-deserts, on loess, sand or fine gravel, among boulders on relatively stable scree slopes.
N: The delimitation to subsp. *caucasica* is difficult; many specimens are intermediate in essential characters (*Freitag* in annot.).

* **Stipa chitralensis** BOR 1954 - **A**: Chitral: Guger 9000' [2740 m], 1895-05-18, *S.A.Harris 16800* (K! **holotype**, **isotypes** BM!, E, WU). **D**: Chitral (endemic: known only from the type, a single tussock). **N**: ± Intermediate between *Trikeraia hookeri* and *St. splendens*, and perhaps a hybrid (FREITAG 1985).

220. Stipa concinna HOOKER f., Fl. Brit. India 7: 230. 1896

Ptilagrostis concinna (HOOKER f.) ROSHEV. 1934

Ic.: Fl.Xizang.5: fig.142.

CN **K2-North:** K2-N Gl. E, above Skyang Kangri Gl. 4840-4910 m, *Dickoré 785!*; 5000 m, *Dickoré 791!*. **Shaksgam:** Aghil P. S 4560-4760 m (*Dickoré*).

N **Yarkand:** Aghil P. N 4560-4660 m, *Dickoré 524!*. **Karakash:** SE Dahongliutan 4800-4850 m, *Miehe 7879!*.

W **Gilgit:** Shinghai Gah - Pahot Gali 4230 m, *Miehe 1572!*.
A: ?Kongur (Pl.As.Centr.). W Kunlun: Tiznap Vy. W Kudi 4140-4200 m, *Miehe 8444!; 8455!*. Upper Tiznaf Vy., 3-4 km E Saryk P., 1959-06-04, *Junatov* (Pl.As.Centr.). ?E Pamir (Pl.As.Centr.). Hazara: Kaghan Vy. 3830-3860 m, *Miehe 139!; 182!*. Kashmir: Mt. Apharwat above Gulmarg 4110 m, *R.R.Stewart 8848* (K!); 4270 m, *R.R.Stewart 10372* (K!); 4050 m, *O.Polunin 56/207* (BM!). Himachal Pr.: Bara Lacha P. 5030 m, *Koelz 6293!* (BM!). W Tibet: N Moincer (N 31°15' E 80°15') 5050 m, *Miehe+9639g!*. Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4000-4300 m, *Miehe+9629d!;* 4500-4600 m, *Miehe+9631d!*. Changtang: Lungmu Co 5220 m, *Miehe 8174!*.
D: C. Tian Shan, E Pamir, Karakorum, Tibet, Kashmir, Himalaya. *Tibet.*
E: 4230-5000 m, alp. - subniv., rare, but locally common in high altitudes. Rather humid, ungrazed high alpine turf, up to the highest turf spots (*Carex borii, Kobresia karakorumensis*) in stable, earthy depressions of the free gelifluction belt.
N: Plants from Pamir - Tian Shan are said to differ by having glabrous or almost glabrous anthers and somewhat more scabrous leaves; they are sometimes separated as *Ptilagrostis concinna* (HOOKER f.) ROSHEV. subsp. *schischkinii* TZVELEV 1974. In the Kashmir locality (Mt. Apharwat), *Stipa concinna* has been collected repeatedly together with *St. duthiei* and *St. regeliana*.

* **Stipa duthiei** HOOKER f. 1896 - **Ic.**: Fl.Xizang.5: fig.136. **A**: Kashmir: Khillanmarg above Gulmarg, *R.R.Stewart 8788* (K!); above Gulmarg 4000 m, *R.R.Stewart* [?]*8188* (NY; FREITAG 1985). **D**: Himalaya: Kashmir, Garhwal - Nepal. **E**: (Generally:) Mats and *Rhododendron* scrubland of the alpine belt around 4000 m in regions with abundant summer rain (FREITAG 1985).

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221. Stipa himalaica ROSHEV., Not. Syst. (Leningrad) **5**: 11. 1924

Stipa pennata auct. non L. 1753: HOOKER f. 1896, *Stipa szowitsiana* auct. non (TRIN.) GRISEB. in LEDEB. 1852: HOOKER f. 1896, HARTMANN 1966

CS **Shimshal:** Shimshal Gorge, Jurjur - Dut 2600-2730 m, *Miehe 5953!*. Upper Shimshal, Zardgar Bin 3940 m, *Miehe 5975!*. Pamir-tang, Shachmirk P. - Shujerab 4170 m, *Miehe 6380!* (cf.). **Biafo:** Ashkoley 3060 m, *C.B.Clarke 30311* (K!). W Biafo base-camp 3100 m, *H.Hartmann 206!*; 3110 m, *H.Hartmann 208* (K!; Z!). Biafo Gl. tongue 3100 m, *E.Reiser 48* (Z!). Above Munjung 3230 m, *H.Hartmann 210b!*. **Saltoro:** Hushe via Haldi to Tsorkonda, 1856-07-13/30, *Schlagintweit 5656* (K!). Below Hushe 2840 m, *Miehe 2044!*.

W **Yasin:** Darkot Vy. 2590 m, *Bowes Lyon 8035* (K!). **Gilgit:** Naltar 3050 m, *R.R.Stewart 26692* (K!, RAW). Shinghai Gah - Pahot Gali (2000-2600 m), *Miehe 703!*. **Hunza:** Nagar - Biltit 2300-2500 m, *Lobbichler 429* (M!). Oltali Chish 3100 m, 1955-06-10, *Nakao* (KYO; FREITAG 1985). N Chaprot 2600-2800 m, *Klötzli & al. 730.22, 23, 24!*. Mouchouhar 3200 m, *G.Braun 587!* (cf). **Hispar:** Barpu Gl., oblation vy., right bank (2740-3350 m), *R.Scott Russell 1152* (BM!, E; FREITAG 1985). **Batura:** Khaibar 3000 m, 1935-07-07, *Persson 708* (PERSSON 1938); 2940 m, *Miehe 2666!*. W Khaibar 2500-3000 (-3900) m, *Klötzli & al. 801.20, 30, 51!; 802.56!*. E Morkhoon 2900-3570 m, *Klötzli & al. 35.11!; 106.08!; 803.36!*.

S **Shigar:** Ganto P. - Basna Vy. (2700-3400 m), *Miehe 4936!*. Upper Basna Vy., Doko - Gon, *Miehe 4972e!*. **Skardu:** Satpura Nullah 3050-3350 m, 1892-07-13, *Duthie* s.n. (K!, KUH); *R.R.Stewart 20331* (RAW). **Leh:** Leh, *Schlagintweit 1337* (WU; FREITAG 1985); 3500 m, 1993-07, *Holzner & Kriechbaum* s.n.!. [Wandla - Kalatze 3170-3350 m], 1848-07-07, *T.Thomson* s.n. (K!). Kalatse, *F.Billiet & J.Leonard 6811* (K!). Hemis Gompa - Gotssangdubhe, *F.Billiet & J.Leonard 6823* (K!). Hemis Nullah 3960 m, *Ludlow & Sherriff 8464* (BM!). S Matho 4030 m, *H.Hartmann 2381* (K!). E Leh, E Sabu 3810 m, *H.Hartmann 4116!*; Sabu 3800 m, 1992-07-15, *Holzner & Kriechbaum* s.n.!. Likir, *Holzner & Kriechbaum* s.n.!. 20 km W Likir, NE Yangtang 3720 m, *H.Hartmann 183a!*. E Yangthang 3650-3780 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!. Ladakh, Tog 3660 m, *Koelz 2620* (K!). **Lower Shyok:** Lowermost Shyok Vy., *Schlagintweit 5820* (GOET). Tsumgaks (on the N foot of the Tsorbat La P.) to Poen (opposite Tsorbat), 1856-07-09, *Schlagintweit 6067* (M!); *Schlagintweit* s.n. (BM!). Kunes (on the right side of the Shayok) via Kiris to Neru (right side of the Indus, 1856-08-02/12, *Schlagintweit 6067* (BM!). Shyok Vy., Blaghar - Kuru 2440 m, *R.R.Stewart 20864* (RAW). **Pangong:** Tankse 4000 m, *Koelz 2458* (NY; FREITAG 1985).

A: [?]Kongur: Jerzil 2800 m, 1930-07-11, *Persson 88* (PERSSON 1938). Wakhan 3760 m (PODLECH & ANDERS 1977). Chitral: Brep 2200 m, *Giles 417* (LE **lectotype**, E, K! **isotype**; FREITAG 1985). [?]Drosh 2440 m, *Giles 417* (K! **isotype**). Bomboret 2070 m, *Bowes Lyon 638* (BM!). Chilas: Gor Region, below Martal 2650 m, *Nüsser 1173!*. Buldar Vy. left slope, Muthat - Raikot Bridge2480m, *Nüsser 1041!*. Astor: Astor - Bunji, *F.Schmid 3* (K!, RAW). Deosai: Shingo Vy., 3050-3350 m, *Duthie 11927* (K!). Dras: Matayan 3050 m, 1891-07-31, *Gammie* s.n. (K!). Suru: 3000 m, *Meebold 1950* (G; FREITAG 1985). Zanskar: [Umasi P.], 1848-2.6 [1848-06-20/23], *T.Thomson* s.n. (K!). Hemeling 3510 m, *Southampton Univ. 137* (BM!). Himachal Pr.: Spiti, Poh 3550 m, 1993-08-04, *Holzner & Kriechbaum* s.n.! (cf.). W Tibet: W Gar (N 32°10' E 79°57') 4330 m, *Miehe+9663c!*.

D: NW Himalaya (E Afgh; Chitral, Gilgit, S Karakorum, Ladakh, Himachal Pradesh, SW Tibet). **Map:** FREITAG 1985: fig.15. *W Himal.*

E: (2000) 2440-4000 (4170) m, mont. - subalp., locally common in the S & W. Semi-deserts (*Capparis spinosa*), open scrublands (*Artemisia brevifolia*), steppes, dry rock slopes, screes (*Stachys tibetica*).

N: The type locality apparently is Brep in Chitral, not Gilgit as stated by FREITAG 1985.

222. Stipa jacquemontii JAUB. & SPACH, Ill. Pl. Orient. **4**: 60, pl.339. 1851

Lasiagrostis jacquemontii (JAUB. & SPACH) MUNRO ex BOISS. 1884, *Stipa sibirica* L. var. *pallida* HOOKER f. 1896

Ic.: Fl.Xizang.5: fig.137.

CS **Shimshal:** Shimshal Gorge, Jurjur - Dut 2600-2730 m, *Miehe 5950!*.

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W Gilgit: Shinghai Gah - Pahot Gali 2600-3000 m, *Miehe 781!*.

Unloc.: [?]Tibet, *Strachey & Winterbottom* s.n. (K! **type** *St. sibirica* var. *pallida*).

A: Swat: Mt. Ilam 2450 m, *R.R.Stewart 24395* (W!). Hazara 2150-2800 m. Astor. Kashmir. Himachal Pr.: Keylong, *Bor 16418* (DD; ASWAL & MEHROTRA 1994).

D: E Afgh. (Logar, Kurram, Nuristan), W & N Pakistan (Baluch., Swat, SW Karakorum) - W Himalaya (E to Uttar Pradesh) **Map:** FREITAG 1985: fig.8. *W Himal.*

E: 2600-3000 m, mont., rare in the SW. *Artemisia brevifolia* scrublands (*Miehe 781*); rock crevices.

223. Stipa koelzii R. R. STEWART, Brittonia 5 (3): 441. 1945

Stipa consanguinea auct. non TRIN. & RUPR. 1842: BOR 1960, COPE 1982

S Leh: Ladakh, Gya, 1933-08-13/14, *Koelz 6432* (US **type**; FREITAG 1985).

A: Himachal Pr.: Spiti, Rangrik, *Koelz 7141* (NY; FREITAG 1985).

D: Inner Himalaya: E Ladakh, Himachal Pradesh - Nepal - Bhutan; S & SE Tibet. *S Tibet.*

E: (Generally:) Wet alpine meadows up to 5000 m (FREITAG 1985).

N: *Stipa consanguinea* TRIN. & RUPR. 1842 (Mongolia, Altai, Tian Shan) is, according to FREITAG 1985, close to but not conspecific with *St. koelzii*.

224. Stipa mongholica TURCZ. ex TRIN., Mém. Ac. Imp. Sci. St.-Pétersb. 1: 67. 1836

Lasiagrostis mongholica (TURCZ. ex TRIN.) TRIN. & RUPR. 1842, *Ptilagrostis mongholica* (TURCZ. ex TRIN.) GRISEB. in LEDEB. 1852, *Achnatherum mongholicum* (TURCZ. ex TRIN.) OHWI 1941

Ic.: Fl.Xizang.5: fig.144.

S Pangong: Shushal 4700 m, *Koelz 2445* (NY; FREITAG 1985).

Unloc.: Ladakh 3960 m, *J.H.Lance 321* (K!; HOOKER 1896).

A: E Pamir: Tagdumbash-Pamir, Sarykol Mts., Pistan 4600 m, 1901-07-15, *Alexeenko* (Pl.As.Centr.). Wakhan: Upper Tshelab Vy. 4200-4400 m (PODLECH & ANDERS 1977); Darya-e Birgula e-Jelga Chelab NW Chaqmaqtin 4400, *Anders 7578* (FREITAG 1985). Himachal Pr.: Rohtang P., *Bor 9901* (DD; ASWAL & MEHROTRA 1994). Rupshu: Salt grassy plain [Parang P. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Tsakzhun Tso 4950 m, *Koelz 2401* (NY; FREITAG 1985). W Tibet: Burang Vy., Nepal - Tibet border (N 30°09' E 81°18') 4530 m, *Miehe+9617d!* (veg.); 4570 m, *Miehe+9619d!*.

E: 4700 m, alp., rare in the SE (and NW?). (Generally:) Alpine steppes, apparently usually on glaciofluvial gravel in water-surplus habitats.

D: Pamir-Alai, Tian Shan, Mongolia; Inner Himalaya, Nepal - Sikkim, S & E Tibet. *Centr.As.*

N: *Stipa tibetica* MEZ 1921 (*Ptilagrostis tibetica* (MEZ) TZVELEV 1968) **Map:** Pl.As.Centr.4: map 3. W Tibet: Guge 5000 m, *Strachey & Winterbottom* (HEMSLEY 1902?; PAMPANINI 1930?). This probably belongs here.

225. Stipa orientalis TRIN. in LEDEB., Fl. Altaica 1: 83. 1829

Ic.: Fl.Xizang.5: fig.152.

CN Braldu: Upper Braldu Tributary, above Chikor 4050-4100 m, *Miehe 6204!*.

CS Shimshal: Upper Shimshal, Zardgar Bin 3940 m, *Miehe 5980!*; Shachmirk P. W 3600-3800 m, *Miehe 6052!*. Pamir-tang, Shachmirk P. - Shujerab 3950-4080 m, *Miehe 6030a!; 6032!; 6039!; 6374!; 6375!*. ?Nubra: Nubra Vy., *Schlagintweit* (GRISEBACH 1868).

N Mustagh Ata: Hills W Little Karakul 3900-4200 m, *Miehe 5417!*. Taxkorgan: S Taxkorgan, above Dafda 4110 m, *Miehe 5577!; 5583b!*. Mintake: S Taxkorgan, above Mazar 3810 m, *Miehe 5696!*. Yarkand: E Mazar Dala 3630 m, *Dickoré 944!*. ?Aghil Gorge 3920 m (*Dickoré*, foto).

W Khunjerab: P. SW (3520-) 3760-3900 (-4130) m, *Miehe 2546!; 2571!*; 3800-4250 m, *Klötzli & al. 107.04!; 109.03!*.

S Skardu: Environs of Skardu 2100-2290 m, 1856-08-06/09-04, *Schlagintweit 688* (BM! cf., veg.). Satpura Nullah above Skardu 2900-3300 m, *R.R.Stewart 20331* (NY; FREITAG 1985). Leh: [Saspul - Nimu], 1848-07-10, *T.Thomson* s.n. (K!). Ladakh, SW of Dah, Kharbu Koma - Shaksi, *Schlagintweit*

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5361 (K!). Ladakh <3660 m (HENDERSON & HUME 1873). Namika P. Top, *Bimal Misri 351* (K). 20 km W Likir, NE Yangtang 3720 m, *H.Hartmann 183b!*. E Yangtang 3760 m, *H.Hartmann 3033!*. W Yangtang, Ang 3550 m, *H.Hartmann 3034!*. E Yangthang 3650-3780 m, 1993-07-15, *Holzner & Kriechbaum* s.n.!. E Sabu 3810 m, *H.Hartmann 4115!*. Sabu, 1992-07-15, *Holzner & Kriechbaum* s.n.!. Kanda P. N 4540 m, *H.Hartmann 2587!* (*St. caucasica* X *St. orientalis* ?). Ladakh, Tog 3660 m, *Koelz 2620* (K!). **Lower Shyok:** Shyok Vy., Blaghar - Kuru 2600 m, *R.R.Stewart 20864* (NY; FREITAG 1985).

E **Upper Shyok:** Murgo 4810 m; Sassir Bransa 4650 m, *Dainelli* (PAMPANINI 1934).

Unloc.:[?Wakhan:] N of Hindukush, *Giles 27* (E, K!). Pamir region 3960-4270 m, *Alcock* s.n. (BM!).

A: W Kashg. (Pl.As.Centr.). E Pamir. Wakhan: 2700-4200 m (PODLECH & ANDERS 1977); Little Pamir 4270 m, *Giles 27* (K!). Chitral: Yarkhun (Vendikot) 3350 m, *Bowes Lyon 1012* (BM!). Zanskar: Padam via Abrang to Bok (SE foot of the Pentse-La P.), 1856-06-27/28, *Schlagintweit 7163* (BM!, GOET!). Kurgiakh Vy. 4250 m, 1992-08-06, *Holzner & Kriechbaum* s.n.!. Thoyor 4450 m, 1992-08-03, *Holzner & Kriechbaum* s.n.!. Kenlung, *Bor* s.n. (DD; ASWAL & MEHROTRA 1994). Himachal Pr.: Kunawur - Piti, Hills above Changas, 1847-08-28, *T.Thomson* s.n. (K!). Spiti, Ki 4000 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!.

D: Kasakhstan - E Siberia, Mongolia; Tian Shan, Pamir-Alai, Karakorum, Inner Himalaya - S China; outposts in Elburs Mts. and C. Hindukush. **Map:** FREITAG 1985: fig.14. *Centr.As.*

E: (2100) 2290-4580 (4810) m, subalp., locally common. Steppes, dry scree slopes, rock crevices.

226. Stipa pennata L., Sp. Pl. 78. 1753

subsp. **kirghisorum** (SMIRNOV) FREITAG, Notes Roy. Bot. Gard. Edinb. **42**(3): 438. 1985

Stipa kirghisorum SMIRNOV 1925

W **Ghizar:** Dadarili - Amberzth 3700 m, *Honda 173* (KYO; FREITAG 1985). **Hunza:** Chaprot, *Winterbottom 893* (K!). Rakaposhi NW & W opposite Chalt 3360 m, *Miehe 6698!*.

S **Skardu:** Deosai N - Satpara 3760 m, *Miehe 5074!*.

A: Wakhan: Upper Baroghil Vy., Baroghil P. (3300-3800 m), *Anders 7883* (M!; PODLECH & ANDERS 1977). Chitral: Upper Yarkhun, *F.Schmid 24* (K!). Astor: Descent from Deotso [Deosai] to Das Kirim, *Winterbottom 890* (K!). Deosai: Shingo Vy. 3050-3350 m, *Duthie 11094* (K!, RAW). Shingo Vy., Deosai region, *R.R. & I.D.Stewart 22201* (K!, NY, RAW; FREITAG 1985). Dras: Chatpani Nala 3350-3660 m, *Duthie 13857* (CAL, K!; FREITAG 1985). SW above Dras 3430 m, *H.Hartmann 2385!*. SE above Matayan 3450 m, *H.Hartmann 2384!*. Suru: Parkutse - Julitok, Sanmodangsma plains, *H.Hartmann 2383* (K!); Sanmodangsa 3880 m, *H.Hartmann 2383!*. Himachal Pr.: Lossar, *Bhattacharyya* s.n. (BSD; ASWAL & MEHROTRA 1994). Lahul; Kinnaur.

D: W Mongolia, Pamir - Alai, SW Karakorum, Inner W Himalaya: Chitral - Himachal Pradesh. **Map:** FREITAG 1985: fig.19. *?Pamir*. Species: *Euro-Sib*.

E: 3360-3760 m, mont. - subalp., rare in the SW. *Artemisia brevifolia-Juniperus excelsa* forest-steppes, *Acantholimon lycopodioides* scree, on limestone.

227. Stipa purpurea GRISEB., Nachr. Ges. Wiss. Göttingen **1868**: 82. 1868

Lasiagrostis tremula RUPR. in OSTEN-SACKEN & RUPR. 1869, *Stipa semenovii* KRASN. 1887, *Ptilagrostis purpurea* (GRISEB.) ROSHEV. 1934, *Stipa pilgeriana* HAO 1938

Ic.: Fl.Xizang.5: fig.153.

CN **Braldu:** Pamir P. S, near Shuwart 4420-4520 m, *Miehe 6173!*; 4650-4680 m, *Miehe 6158!* (veg.). Upper Braldu tributary, above Chikor 4100-4220 m, *Miehe 6209!; 6221!; 6226!*. **K2-North:** K2-N Gl. E 4590-4620 m, *Dickoré 717!; 820!*.

N **Yarkand:** Aghil Vy. 3990-4200 m, *Dickoré 472!; 487!*. Aghil P. N 4520-4640 m, *Dickoré 513!*.

W **Khunjerab:** P. SW 4460 m, *Miehe 2495!*; 4500-4600 m, *Klötzli & al. 725.15!, 801.11!, 803.18!*.

E **Aksai Chin:** N Tibetan Mts. 5100 m, *Miehe 8233!*.

Unloc.: [?]Bhimtis, Tibet, "nearly up to 18000' [5490 m]", *T.Thomson* s.n. (K!).

A: W Kunlun: Tiznap Vy., N Kudi 4100 m, *Miehe 7453!*; W Kudi 3930 m, *Miehe 8479!*. Upper Tiznap Vy. 4200 m, *Dickoré 956!*. C.Kunlun: N Przhevalsky Mts. 5000 m, 1890-08-24, *Roborovsky*;

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Cherchen 4060 m, *Li & al. 9400; 9414* (Pl.As.Centr.). E Pamir. Uttar Pr.: Garhwal, Mana - Sarsutti 3500 m, *Schlagintweit 8622* (G; FREITAG 1985). Rupshu: Lake Rukshu 4570 m, *J.H.Lance 322* (K!). W Tibet: Gnari Khorsum, Lomorti - Poling 5180 m, 1855-09-05/15, *Schlagintweit 7016* (K!). Gnari Khorsum 5000 m, 1855-09-05/15, *Schlagintweit 7116* (GOET **holotype**, BM, LE, M! **isotypes**; FREITAG 1985). Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670d!.* E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680d!.* N Moincer (N 31°15' E 80°15') 5000 m, *Miehe+9644d!.* Changtang: N Tibet (N 35°41' E 82°19') 5200 m, 1898-08-16 (DEASY 1901).
D: Tian Shan, Pamir, Kunlun, Karakorum, Inner Himalaya, Tibet. **Map:** TZVELEV 1968: map.4. *Tibet.*
E: 3990-5100 m, alp., not common, locally abundant at high altitudes in the N. Relatively dry alpine turf and steppes, often with *St. subsessiliflora*, but under slightly moister conditions than this, N-facing gravel slopes (granite, limestone), by meltwater-streams. A characteristic component of the alpine steppes of Tibet, Pamir and Tian Shan.

* **Stipa regeliana** HACKEL 1884 - **A**: Kashmir: Apharwat above Gulmarg, *R.R.Stewart 10454* (K!). N of Joché Phirche 4880-5360 m, 1951-08-09, *W.O.Douglas* s.n. (K!). Rupshu: Ascent to Lanak P., 1847-09-13, *T.Thomson* s.n. (K!: p.p., with *St. subsessiliflora*; FREITAG 1985). **D**: Dzung.Alatau, Tian Shan, Pamir; Himalaya: Kashmir - Sikkim.

* **Stipa roborovskyi** ROSHEV. 1920 (*Stipa basiplumosa* MUNRO ex HOOKER f. var. *longearistata* MUNRO ex HOOKER f. 1896) - **Unloc.:** [?Rupshu]: Tibet occ., alp., *T.Thomson* s.n. (K! **holotype** *St. basiplumosa* var. *longearistata*). **A**: C.Kunlun: N Russian Mts., Upper Aksu Rv., Kara-Sai 3300-4200 m, 1890-07-03, *Roborovsky* (**type**; Pl.As.Centr.). Keria Rv., Polur, 1959-05-11, *Junatov*; 4 km S Polur 3600 m, *Li & al. 64* (Pl.As.Centr.). E Pamir: Goo-Dzhiro Rv. 4500-5500 m, 1942-07-27, *Serphukov*; Zaz - Tash-Uy Rv., Kulan-Aryk 3500-3800 m, 1942-07-29, *Serphukov* (Pl.As.Centr.). W Tibet: Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670e!.* E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680e!.* SE Garyarsa, Upper Gar Vy. (N 31°32' E 80°24') 4650 m, *Miehe+9656b!.* Garyarsa - Moincer, Indus-Sutlej divide (N 31°23' E 80°32') 4750 m, *Miehe+9655b!.* Manasarovar Lakes, NW Mapam Yumco (N 30°48' E 81°24') 4700 m, *Miehe+9636!;* Langa Co - Mapam Co (N 30°43' E 81°19') 4870 m, *Miehe+9596a!.* S Langa Co (30°35' E 81°14') 4680 m, *Miehe+9598!;* (30°34' E 81°14') 4700 m, *Miehe+9638c!.* Burang Vy., Nepal - Tibet border (N 30°09' E 81°16') 4250 m, *Miehe+9613b!;* 4450 m, *Miehe+9611f!;* 4680 m, *Miehe+9610f!.* **D**: E Pamir, Kunlun, ?Ladakh/Rupshu - SW Tibet. **N**: Distribution area insufficiently known, apparently disjunct.

* **Stipa roylei** (NEES) MEZ 1921 (*Orthoraphium roylei* NEES 1841, *Stipa orthoraphium* STEUDEL 1855) - **A**: Kashmir: Pagu, 1852, *T.Thomson* (E; FREITAG 1985). Himachal Pr.: Chamba, Sara 3700 m, *C.B.Clarke 24145* (BM, CAL; FREITAG 1985). **D**: Himalaya: Kashmir - Himachal Pradesh - Assam. **E**: Subalp. *Abies*-forests, *Rhododendron* scrubland, alp. mats, 3500-4000 m (FREITAG 1985).

228. Stipa splendens TRIN. in SPRENGEL, Neue Entdeck. 2: 54. 1821

Lasiagrostis splendens (TRIN.) KUNTH 1829, *Stipa altaica* TRIN. in LEDEB. 1829, *Aristella longiflora* REGEL 1880, *Achnatherum splendens* (TRIN.) NEVSKI 1937, *Stipa schlagintweitii* MEZ 1921, *Stipa kokonorica* HAO 1938, *Stipa munroana* BOR 1954

Ic.: Fl.Xizang.5: fig.135. Fl.Desert.Sin.1: fig.42(1-3).

CN **K2-North:** Muztagh Vy. 3920-4130 m, *Dickoré 881!.*

CS **Shimshal:** Shimshal 3000 m, *Visser-Hooft* (DOLK 1929). **Baltoro:** Paiju 3480 m, *H.Hartmann 88* (K!); 3450-3600 m (KITAMURA 1964, HARTMANN 1966); near Baltoro Gl. 3600 m, 1955-07-19 (KYO; FREITAG 1985). **Nubra:** [Lower] Nubra Vy. 1848-08-04, *T.Thomson* s.n. (K!); 1848-09-02, *T.Thomson* s.n. (K!). [Lowermost Nubra Vy.], 1848-07-27, *T.Thomson* s.n. (K!). Panamik 3170 m, 1928-07-23, *F.Ludlow* s.n. (BM!).

N **Mustagh Ata:** Tagarma Vy., Besh-Kurgan, 1909-07-26, *Divnogorskaya* (Pl.As.Centr.). **Yarkand:** Ilyk to Mazar 3550-3900 m, *Dickoré 377!* (dwarf specimen); *947!.* Surukwat Vy. 3760 m; Aghil Vy. 4050 m (*Dickoré*).

W **Ghizar:** Ghizar - Gupis, Rawat 2600 m, *K.Ogino 494*; Dahimal - Gupis 2450 m, *K.Ogino 231* (KYO; FREITAG 1985). **Yasin:** Yasin - Gupis, Dawalgan 2380 m, *K.Ogino 454* (KYO; FREITAG 1985).

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Ishkoman: Bad Swat Vy., 1956-09-19/30, *Honda* (KYO; FREITAG 1985). Imit (rivulet) 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Baghrot Vy. 3280-3340 m, *Miehe 4519!*. **Hunza:** N Chaprot 2600 m, *Klötzli & al. 725.11!*. **Batura:** W Khaibar 2500-3000 m, *Klötzli & al. 801.11, 19!*. E Morkhoon 2900-3000 m, *Klötzli & al. 803.18, 43!*. **Khunjerab:** P. SW 3900-4130 m, *Miehe 2547!*.

S **Shigar:** 2350 m, *C.B.Clarke 30496* (K!). Karakorum [? probably Shigar] 2740 m, 1876-08-06, *C.B.Clarke 30097* (K!). Skardu - Shigar 2440 m, *R.R.Stewart 20506* (RAW). **Skardu:** Skardu 2330 m, *C.B.Clarke 29944* (BM!, K!); 2130-2440 m, *Duthie 12105* (K!); near Skardu 2700 m, *R.R.Stewart 20383* (NY; FREITAG 1985). C.1 mile below Satpura Lake 2740 m, *Nasir & Webster 6330* (K!, M!, RAW). **Leh:** Leh 3500 m, 1992, *Holzner & Kriechbaum* s.n.!. Near Leh, *Stoliczka* s.n. (K!); 3450 m (MEEBOLD 1909). Spituk 2740 m, *R.R.Stewart 443a* (KUH; STEWART 1916). Indus Vy., Kanu [? Kanutse] 3400 m, 1970-09-30, *Bhattacharyya* (BSD; FREITAG 1985). Below Shey Gompa 3300 m, *H.Hartmann 4118!*. **Lower Shyok:** Kunes (right side of the Shayuk) via Kiris to Neru (right side of the Indus), 1856-08-02/12, *Schlagintweit 5490* (BM!). Shayuk Vy., Kiris - Neru, *Schlagintweit 5787* (BM, GOET!; FREITAG 1985). Poen on the left side of the Shayok (opposite Tsorbat), 1856-07-10, *Schlagintweit 6145* (K!). S of Kande 2590 m, *Nasir & Webster 6278* (WEBSTER & NASIR 1965). **Shyok:** Shayuk Vy. [Tsatti - Shyok-Nubra junction c. 3230 m], 1847-10-15, *T.Thomson* s.n. (K!).

A: W Kashg.: Yecheng - Kokyar 1700 m, *Dickoré 134!*. S Kashg. (common; Pl.As.Centr.). Kongur: Jerzil 2800 m, 1930-07-10, *Persson 86* (PERSSON 1938). Lower Oytag Vy. 2100-2300 m, *Miehe 7330!*. W Kunlun: Kentalek 2700 m, 1931-07-14, *Persson 212* (PERSSON 1938). Akaz P. N 2500 m, *Miehe 7412!* (cf.). Pusha - Akaz P. 2650 m; Kudi 3000-3100 m; Upper Kudi Vy. 3200-3300 m, 3650 m (*Dickoré*). W Pamir. E Pamir: Karasu Vy., 1913-07-22, *Knorring* (Pl.As.Centr.). Wakhan 2650-3800 m (PODLECH & ANDERS 1977); Quazi-Deh 2650 m, *Roemer 234* (M!, W!). Middle Wazit Vy. 3500-3800 m, *Anders 8201a* (M!). Pokoui [Pkoi], *K.Lindberg 1094* (W!). Chitral: Brep 2440 m, *Giles 416* (K!). Mastuj - Baroghil track, Brep 2440 m, *Stainton 2888* (BM!, W!); *2889* (BM!, W!). Yarkhun 2440 m, *Bowes Lyon 83* (BM!, W!). Yarkhun Vy., near Peur 2650 m, *Stamm & Wöhrl 167* (W!). Zanskar: Kandala P. via Shingo to Markha (SW of Leh), 1856-08-26/09-08, *Schlagintweit 1722* (M!). Markha Vy., Shingo 4150 m, *H.Hartmann 3042!*. Abring 4200 m, *Koelz 3001a* (NY; FREITAG 1985). Himachal Pr.: Piti [hills above Changas], 1847-08-28, *T.Thomson* s.n. (K!). Spiti, Ki 3800 m, 1972-08-04, *Bhattacharyya* s.n. (BSD; FREITAG 1985, ASWAL & MEHROTRA 1994). Spiti 3550 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!. Rupshu: Vy. below Hanle, 1847-09-17, *T.Thomson* s.n. (K!).

D: C. Asia: Caspian Sea - E Siberia, S to Kopet Dagh, E Pamir, W Himalaya; outpost in C. Afghanistan (Bamian, Parwan). **Map:** FREITAG 1985: fig.7. *Centr. As.*

E: (2130) 2330-4130 m, mont. - subalp., locally common. Usually in reach of groundwater, on sandy soils, dunes, by rivers; in deserts and desert-steppes (*Krascheninnikovia ceratoides*, *Sympegma regelii*), one of the last grasses in the lower montane extreme deserts of the Kunlun-foothills. Overgrazing-indicator: even camels do not feed on the large tufts. To control this weed, the plant is burnt in some areas (FREITAG 1985); the culms are locally used for making baskets (*Roemer 234*).

229. Stipa subsessiliflora (RUPR.) ROSHEV. in FEDTSCH., Fl. Asiat. Ross. **12**: 128. 1916

Lasiagrostis subsessiliflora RUPR. in OSTEN-SACKEN & RUPR. 1869, *Stipa basiplumosa* MUNRO ex HOOKER f. 1896, *Ptilagrostis subsessiliflora* (RUPR.) ROSHEV. in KOMAROV 1934

Ic.: Fl.Desert.Sin.1: fig.39(13-18).

CN **Braldu:** Upper Braldu tributary, above Chikor 4050-4100 m, *Miehe 6201!*. **K2-North:** E Muztagh Vy. 4360 m, *Dickoré 889!*. K2-N Gl. E 4590-4620 m, *Dickoré 720!*. **Shaksgam:** Aghil P. S 4400-4660 m, *Dickoré 596!; 597!*. **Shaksgam/Upper Yarkand:** Shaksgam Vy., 1926-07, *R.C.Clifford* s.n. (K).

N **Taxkorgan:** 10-12 km S Ulug-Rabat P., Rd. Kashgar - Taxkorgan 4300 m, 1959-06-14, *Junatov* (Pl.As.Centr.). **Yarkand:** Mazar P. S 4910 m, *Miehe 8341!*. Aghil Vy. 4130 m (*Dickoré*). **Karakash:** W Xaidulla 4380-4840 m, *Miehe 7835!; 7856!; 8279!*. Xaidulla - Dahongliutan 4140 m, *Miehe 8243!*. SE Dahongliutan 4800-4850 m, *Miehe 7880!*.

W **Khunjerab:** P. SW (4150-) 4350-4600 m, *Miehe 2484!; 2529!*.

E **Upper Shyok:** [Murgai (4570-5180 m)], 1848-08-22, *T.Thomson* s.n. (K!). **Aksai Chin:** N Tibetan Mts. 5080 m, *Miehe 8024!*.

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A: W Kunlun: Akkez-Daban [Akaz P.], Tibet Rd. 110 km S Kargalyk, 1959-06-05, *Junatov* (Pl.As.Centr.); Akaz P. 3200-3600 m, *Miehe 7378!* (cf.)*; 8600!; 8414!; 8645!; 8647!*. Tiznap Vy., N Kudi 3480 m, *Miehe 7463!*; Upper Tiznap Vy. 4200 m, *Dickoré 955!*; SE Kudi 3700-4280 m, *Miehe 7547* (cf.)*; 7622* (cf.)*; 7712!* (cf.); N Mazar P. 4480-4880 m, *Miehe 7785!* (cf.)*; 8371!*. E Pamir: Upper Lapst Rv., 1942-07-20, *Serphukov* (Pl.As.Centr.). Zanskar: Debring 4600 m, 1970-09-04, *Bhattacharyya* (BSD; FREITAG 1985). Rupshu: Ascent to Lanak P. 1847-09-13, *T.Thomson* s.n. (K! **syntype** *St. basiplumosa*). Ravine below Lanak P., 1847-09-14, *T.Thomson* s.n. (K! **lectotype** *St. basiplumosa*). Tsakzhun Tso 4570 m, *Koelz 2387* (K!, RAW). W Tibet: Upper Domar Chu 5070-5130 m, *Miehe 7907; 8061!*. E Shiquanhe (N 32°26' E 81°00') 4500 m, *Miehe+9666d!*. Shiquanhe - Aong Co (N 32°28' E 81°14') 4920 m, *Miehe+9670!*. Manasarovar Lakes, Langa Co - Mapam Co (N 30°43' E 81°19') 4870 m, *Miehe+9596b!*. Changtang: Lungmu Co 5180 m, *Miehe 8167!*.

D: Dzungaria, Tian Shan, E Pamir, Kunlun, Karakorum, W Tibet. *E Pamir.*

E: 4130-4660 m, alp., not common, but locally abundant in the N. Steppes and desert steppes on slightly inclined, ± sheltered, relatively dry slopes, often with *St. purpurea* (but preferring drier situations) or *Festuca olgae*; in the driest areas (Changtang) up to the highest turf spots. Apparently more common on loess slopes of the N Kunlun Shan.

N: The record from Nubra (HOOKER 1896) probably refers to the specimen from **Upper Shyok**.

230. Stipa tianschanica ROSHEV., Fl. Asiat. Ross. **12**: 149. 1916

Ic.: Fl.Desert.Sin.1: fig.38(1-8): var. *gobica*, fig.38(9-16): var. *klemenzii*.

S **Pangong:** Pancong Tso, 1927-07-26, *Bosshard* (Z!).

A: W Kashg.: Kysylsu Vy., Shur-Bulak - Kandzhugan, 1929-07-04, *Popov*; Baykurt and Ulugchat NW Kashgar (several records; Pl.As.Centr.). E Pamir: Tagdumbash-Pamir, Kara-Chukur Vy., Beik Rv., 1901-07-18, *Alexeenko* (Pl.As.Centr.).

D: Tian Shan, E Pamir, W Tibet, Qinghai (Nan Shan); apparently very disjunct. *?E Pamir.*

E: c. 4300 m, alp., rare. Alpine desert steppe.

N: The specimen from **Pangong** has the anthecium 6 mm, stalked 2 mm, awn with glabrous part 1.7 cm and plumose part 5 cm long. In habit it is close to *St. orientalis.*

231. Stipa turkestanica HACKEL, Acta Horti Petrop. **26**: 59. 1906

Stipa trichoides P. SMIRNOV 1925, *Stipa turkestanica* HACKEL subsp. *trichoides* (P. SMIRNOV) TZVELEV 1974

CS **Biafo:** Biafo Gl. 3400 m, 1955-07-22, *Nakao* (KYO; FREITAG 1985). Biafo Base Camp 3230, *H.Hartmann 209* (K!; Z!); above Munjung 3230 m, *H.Hartmann 210a!*. Biafo Gl., old terminal moraines, rare, 3100 m, *E.Reiser 86* (Z!).

W **Yasin:** Naz Bar 3050 m, *Miehe 3668!*; 3530-3850 m, *Miehe 3591!*. **Hunza:** N Chaprot 2600 m, *Klötzli & al. 725.15!*.

A: Wakhan: 3300-4250 m (*St. turkestanica*); 3900-4000 m (*St. trichoides*) (PODLECH & ANDERS 1977). Chitral. Suru: Near Kargil 2950 m, *F.Billiet & J.Leonard 6781* (K!). 25 km S Panichar 2900 m, *Southampton Univ. 46* (K!). Swat: Diwangal - Dardarili P., *Ogino 218* (KYO; FREITAG 1985). ?Kashmir. Himachal Pr.: Heights above Kibar, 1847-09-06, *T.Thomson* s.n. (K!). Spiti, Ki 4000 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!. W Poh 3000 m, 1993-08-05, *Holzner & Kriechbaum* s.n.!.

D: N Iran (Elburs, Kopet Dagh), Pamir, Tian Shan; S Karakorum, Inner W Himalaya: E Afgh. - Himachal Pradesh. **Map:** FREITAG 1985: fig.17. *?Ir.-Tur.*

E: 2600-3530 (3850) m, subalp., *Juniperus - Artemisia brevifolia* forest-steppes and scrublands. (Generally:) In open wood- and scrublands and different types of open vegetation, preferably on shallow soils and in fissures of rocks (*Freitag* in annot.).

* **Stipagrostis grandiglumis** (ROSHEV.) TZVELEV 1976, *Aristida grandiglumis* ROSHEV. 1949 - **Ic.:** Fl.Desert.Sin.1: fig. 37(1-5). **A**: S Kashg. (Pl.As.Centr.). **D**: SW Mongolia, Kashgaria (N, S, Takla-Makan, Lop Nor), endemic. **Map**: Pl.As.Centr.4: map 1.

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* **Stipagrostis hirtigluma** (STEUDEL ex TRIN. & RUPR.) DE WINTER 1963 (*Aristida hirtigluma* STEUDEL ex TRIN. & RUPR. 1842) - **A**: Hazara. **D**: Trop. & S Africa, SW Asia: Arabia - Pakistan, India.

232. Stipagrostis plumosa (L.) MUNRO ex T. ANDERS., J. Linn. Soc., Bot. 5, Suppl. 1: 40. 1860

Aristida plumosa L. 1762

Ic.: Fl.Iraq 9: pl.148. Fl.Pak.143: fig.7(1-10).

W **Gilgit:** Bunji 1100 m, *Klötzli & al. 810.11!*; 1500 m, *Schickhoff 1196!*. Deserts near Gilgit 1520-1830 m, *M.W.Khan 26665* (K!). S Gilgit, *J.Poelt* s.n.!. Indus Gorge 1700 m, *Miehe 5197!*. Nomal - Gilgit, 1974-08-04, *F.Gartner* s.n. (GZU!). **Hunza:** Chalt 1830-2130 m, 1954-08-17, *R.R.Stewart* s.n. (RAW). Hunza Vy. 2200 m, *Paffen 190* (M!).

S **Shigar:** Shigar, near forest nursery, *A.Ghafoor & Z.L.Butt* 687 (KUH). **Skardu:** 2360 m, *C.B.Clarke 30038* (K). Skardu basin (2300-2750 m), *Miehe 5054!*. **Lower Shyok:** Kuru - Kiris 2440-2590 m, *R.R.Stewart 20875* (RAW).

A: Chilas: Gor 1160-1850 m, *Schickhoff 1455!; 1457!*. Gor Region, below Ranote, Haparing 1900 m, *Nüsser 1209!*. Tato - Raikot-Bridge, left slope 2080 m, *Nüsser 568!*. Kashmir.

D: Medit., SW Asia - Pakistan, Kashmir. *Medit.*

E: 1100-2590 m, subtrop. - coll., locally common. Hot desert and desert-steppe of the valley bottoms. "duakunchal=donkey's grass, very common in deserts and desert hillsides" (*M.W.Khan 26665*). "A desert grass of great value not only as a fodder but also by virtue of its ability to act as a sand-binder" (Fl.Pak. 143).

N: The specimens from the SW Karakorum almost lack the floccose indument of the basal sheaths, which in other populations usually is evident. They may represent **Stipagrostis plumosa** var. **brachypoda** (TAUSCH) BOR 1967 (*Stipagrostis brachypoda* (TAUSCH) DE WINTER 1963, *Aristida brachypoda* TAUSCH 1836), which apparently occurs scattered throughout the distribution area of the species.

233. Tetrapogon villosus DESF., Fl. Atlant. 2: 389, pl. 255. 1799

Chloris villosa (DESF.) PERS. 1805

W **Yasin:** Sultanabad 2500 m, *G.Stöber 113!, 114!*. **Gilgit:** Below Bunji 1000-1400 m, *Klötzli & al. 810.02!*. Bunji 1970 m, *G.Braun 123*. Shinghai Gah - Pahot Gali 1780 m, *Miehe 600!*. **Hunza:** 1954-06, *F.Schmid* s.n. (RAW). Baltit, 1954, *F.Schmid* s.n. (K). E Chaprot 2400-2700 m, *Klötzli & al. 730.15!*.

S **Lower Shyok:** E of Kiris 2440 m, *Nasir & Webster 5898* (K). Kuru - Daghoni 2440 m, *Nasir & Webster 5916* (RAW).

A: Chilas: Astor Vy. - Raikot Bridge, Indus Vy. 1470 m, *Nüsser 910!*.

D: Canaries, N Africa, trop. Africa - India. *Sud.-Sind.*

E: (1000-) 1400-2500 (-2700) m, subtrop. - coll., scattered in the SW. Deserts and semi-desert scrub (*Artemisia scoparia*, *Enneapogon persicus*, *Stipagrostis plumosa*), dry gravel slopes and rock crevices; tolerant of strong grazing. "A common grass of desert areas and dry mountain slopes" (Fl.Pak.).

* **Themeda anathera** (NEES ex STEUDEL) HACKEL in DC. 1889 (*Anthistiria anathera* NEES ex STEUDEL 1855) - **A**: Swat. Hazara. Kashmir. **D**: W Himalaya (E Afgh - Nepal).

* **Thysanolaena maxima** (ROXB.) O. KUNTZE 1891 (*Agrostis maxima* ROXB. 1820) - **A**: Kashmir. **D**: Himalaya: Kashmir - SE Tibet, SE Asia, Malaysia.

* **Timouria saposhnikovii** ROSHEV. 1916 (*Achnatherum saposhnikovii* (ROSHEV.) NEVSKI 1937) - **Ic.:** Pl.As.Centr.4: fig.1(2). Fl.Desert.Sin.1: fig.36(1-7). **A**: Alai: 10-12 km N Baikurt, Kashgar - Turugart Rd., 1959-06-20/21, *Junatov*; 2300 m, 1959-06-02, *Li & al.* (Pl.As.Centr.). [?]Kongur: Jerzil 2800 m, 1930-07-04, *Persson 44* (PERSSON 1938). **D**: SW Mongolia, Tian Shan - Transalai, ?Kongur Shan; Qinghai: Nan Shan.

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* **Tragus roxburghii** PANIGRAHI 1974 (*Tragus biflorus* SCHULTES 1824 excl. typo) - **A**: Swat. Hazara. Kashmir. **D**: E Africa; Pakistan - SE Asia.

* **Trikeraia hookeri** (STAPF) BOR 1955 (*Stipa hookeri* STAPF 1895, *Timouria aurita* HITCHCOCK 1933) - **Ic.**: Fl.Xizang.5: fig.140(1-7). **A**: Rupshu: Kugzil 4270 m, 1931-07-16, *Koelz 2328* (K! **type** *Timouria aurita*). W Tibet: E Wuma (N 32°34' E 83°22') 4650-4660 m, *Miehe+9680f!*. **D**: S Tibet (Rupshu/Upper Indus - Lhasa/ Upper Tsangpo), Inner Himalaya (Nepal, Sikkim, ?Bhutan). **N**: Reported in error from Chitral, which was the type of *Stipa chitralensis* (FREITAG 1985). A record from **Nubra**, *T.Thomson* (HOOKER 1896) is doubtful: no specimen seen, perhaps *Stipa splendens*. The type locality probably is in the vicinity of Lhasa: Tibet, sheltered nullahs 14800' [4510 m], 1891-07/09, *W.G.Thorold 124* (K! **type**). The genus *Trikeraia*, which was included into *Stipa* sect. *Lasiagrostis* by FREITAG (1985) is retained here in spite of the somewhat intermediate position of *Stipa chitralensis*. A second species of *Trikeraia*, **T. oreophila**, was described meanwhile. Both species differ from *Stipa* by the awn-like, elongated nerves of the lateral lemma-lobes (hyaline lobes in *Stipa chitralensis* and *Stipa splendens*) and show some (superficial ?) resemblance to *Calamagrostis*-species. **Trikeraia pappiformis** (KENG) P. C. KUO & S. L. LU 1987 (*Stipa pappiformis* KENG) - **Ic.**: Fl.Xizang.5: fig.140(8-12), reported from Tibet 3400-3500 m, might represent a third species.

* **Trikeraia oreophila** COPE 1987 - **A**: W Tibet: N Moincer (N 31°15' E 80°15') 5000 m, *Miehe+9644e!;* 5050-5280 m, *Miehe+9642c!*. **D**: S & SE Tibet, Inner C. Himalaya (Nepal - Bhutan).

* **Tripogon purpurascens** DUTHIE 1901 - **A**: Swat. Hazara: Kaghan Vy. Kashmir. **D**: W Himalaya: Swat - Nepal.

Trisetum s.l.:

The perennial species of *Trisetum* (*T. spicatum* group) are imperfectly understood and apparently intergrading. They are also difficult to distinguish from species of *Koeleria* with short, ± straight awns (*K. argentea, K. litvinowii*), which probably are results of intergeneric crosses. Small specimens of *Calamagrostis holciformis* and *C. tianschanica* are often confused with *T. spicatum* (s.l.), but they lack the wooly indument of the inflorescence axis and branches.

Key to *Trisetaria* and *Trisetum*:

1. Annual ..... **Trisetaria loeflingiana**
\+ Perennial (*Trisetum* s.str.) **2**
2. Culm glabrous below of inflorescence. Leaves subglabrous ..... (**T. aeneum**)
\+ Culm ± densely hairy below of inflorescence. Leaves variously pubescent or ciliate **3**
3. Inflorescence a long, narrow, ± interrupted panicle. Culm usually > 50 cm. Leaves densely hairy with very long hairs or glabrescent except for long ciliae along the leaf-margin ..... **T. clarkei**
\+ Panicle very congested, dense, shortly cylindric. Culm usually less than 30 (-50) cm. Upper surface of leaves with persistent indument of short hairs or densely long hairy or subglabrous, leaf-margin with short or only basally a few long ciliae ..... **T. spicatum**
3a Leaves with short persistent hairs or glabrescent ..... **T. spicatum** subsp. **himalaicum**
3b Leaves densely covered with persistent long hairs ..... (**T. spicatum** subsp. **tibeticum**)

234. Trisetaria loeflingiana (L.) PAUNERO, Anal. Jard. Bot. Madrid 9: 527. 1949

Avena loeflingiana L. 1753, *Trisetum loeflingianum* (L.) C. PRESL 1820, *Trisetum cavanillesii* TRIN. 1830, *Trisetaria cavanillesii* (TRIN.) MAIRE 1942, *Trisetum gaudinianum* BOISS. 1841

Ic.: Fl.Iraq 9: pl.136. Fl.Pak.143: fig.60.

S **Shigar:** Tandoro 2400 m, *H.Hartmann 201!*; *202* (K!).

D: S Eur., Medit. - Pakistan (Baluch., S Karakorum). *Ir.-Tur.*

E: 2400 m, coll., rare in the S. Dry open habitats, usually on sand or gravel.

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* **Trisetum aeneum** (HOOKER f.) R. R. STEWART 1945 (*Avena aenea* HOOKER f. 1896, *Trisetum aureum* auct. non TENORE 1820: NEES ex STEUDEL 1854) - **A**: Swat: Beyond Ushu 2740-3050 m, *R.R.Stewart & A.Rahman 25341* (K!, RAW). Hazara: Kaghan Vy., Chapri 1899-07-28, *Inayat* (K!). Kashmir: Kamri P. 3660-3960 m, *Duthie 12562* (K!). Tajwas Nala, near Sonamarg 2740-3050 m, *Duthie 13646* (K!). Above Gulmarg 3050 m, *R.R.Stewart 10635* (K!). Himachal Pr.: Lahul, Kyelang. **D**: W Himalaya: Swat - Nepal. *W Himal.*

235. **Trisetum clarkei** (HOOKER f.) R. R. STEWART, Brittonia **5**: 431. 1945

Avena clarkei HOOKER f. 1896

Ic.: Fl.Xizang.5: fig.92.

W **Gilgit:** Shinghai Gah - Pahot Gali 3450-4040 m, *Miehe 827!; 851!; 888!; 919!; 1159!; 1374!.* Baghrot Vy. 3210-4060 m, *Miehe 3738; 3761!; 3800!; 3850!; 3928!; 3967!; 3997!; 4081!; 4561!; 4563!; 4624!.* Naltar Vy., Jagot 3210 m, 1974-07-19, *F.Gartner* s.n. (GZU!). **Hunza:** N Chaprot (3150-) 3200 (-3500) m, *Klötzli & al. 4.113!; 50/51.10!.* NE Chaprot 4000 m *Klötzli & al. 12.05!.* Rakaposhi N above Nilt 3950-3970 m, *Miehe !.* Rakaposhi NW & W opposite Chalt 3150 m, *Miehe 6977!* (cf.). **Batura:** E Morkhoon 4100 m, *Klötzli & al. 38.16!.*

S **Shigar:** Thale La to Bagmaharal, 1856-08-30, *Schlagintweit 5901* (GOET!); Balti, 1856-08-30, Schlagintweit 5902 (M!: cf. *T. clarkei* X *T. spicatum*). **Skardu:** Ganto P. W 4200 m, *Miehe 4872!.* **Shyok:** Nubra, Laotse P. to Kardong, N slopes of the P., 1856-08-18, *Schlagintweit 2342* (GOET!).

A: Wakhan: Darya-e Istmoch, Toli Bay Vy. 4000-4200 m, *Anders 8086* (M!). W Darya-e Uch Jelga, Kol-e Chaqmaqtin 4150-4350 m, *Anders 7462* (M!). Dowansu Vy. 4100-4250 m, *Anders 7672* (M!). 3180-[?]4900 m (PODLECH & ANDERS 1977: "*T. litwinowii*"). Chitral. Chilas: Raikot Gl., left lateral moraine, nunatak, base camp area 3990 m, *Nüsser 455!.* Upper Kosto Vy. 4300 m, *Nüsser 1426!.* Astor: Below Sachen Gl. 3380 m, *Schickhoff 990!.* Deosai: 3860 m, *Miehe 2191!.* Hazara: Kaghan Vy. 3200-3830 m, common. Kashmir: common. Himachal Pr.: Keylong, *Bor 9228* (DD; ASWAL & MEHROTRA 1994).

D: W Himalaya: E Afgh. - Nepal. *W Himal.*

E: 3210-4060 m, subalp., locally common in the SW. Humid subalp. forests and scrub (*Betula jacquemontii, Salix karelinii, Juniperus sibirica*; more rarely *Pinus wallichiana, Picea smithiana, Rhododendron anthopogon*); moist turf of the lower alpine belt (*Kobresia nitens*). "Common in alpine pastures" (Fl.Pak.).

236. **Trisetum spicatum** (L.) K. RICHTER, Pl. Eur. 1: 59. 1890

Aira spicata L. 1753, *Aira subspicata* L. 1759, *Trisetum pubiflorum* HACKEL 1902, *Trisetum subspicatum* (L.) P. BEAUV. 1812

subsp. **himalaicum** HULTÉN, Svensk Bot. Tidskr. 53: 213. 1959;

CS **Biafo:** Skoro P. N 4130-4600 m; 4200 m, *H.Hartmann 222!*; Gense 4400 m; Baintha 4780-4960 m (HARTMANN 1966). **Baltoro:** K2 Base Camp 5200 m, *Jacot-Guillarmod* (PAMPANINI 1930: f. *nana* P. BEAUV.). **Nubra:** Siachen Gl., base camp 4850-4950 m, *Dainelli* (PAMPANINI 1934).

N **Mintake:** Above Mazar 4220 m, *Miehe 5670!.* S Taxkorgan, W KKH 4500-4660, *Miehe 5828!; 5861!.*

W **Yasin:** Naz Bar 4120-4500 m, *Miehe 3052!; 3094!; 3163!; 3217!; 3249!.* **Gilgit:** Jutial Nullah, *R.R.Stewart 26631* (K!). Shinghai Gah - Pahot Gali 4580 m, *Miehe 1220!.* **Hunza:** Minapin Gl. (LLOYD & LLOYD 1968). **Batura:** Gulmit - Atabad 4000-4300 m, *Miehe 2769!; 2900!; 2966!.* **Khunjerab:** P. SW 4650-4800 m, *Klötzli & al. 132-135.20, 40, 54!, Miehe 2257!; 2270!; 2312!; 2348!; 2359!.*

S **Shigar/Lower Shyok:** Thalle P. 4270-4570 m, *R.R.Stewart 20648A* (KUH); *20740* (RAW). **Leh:** Kardong P. [S] (STEWART 1916).

E **Upper Shyok:** Sassar, 1848-08-28, *T.Thomson* s.n. (K!, mounted with *Calamagrostis holciformis*). Camp Piccolo Cumdan 4930 m, *Dainelli & Marinelli* (PAMPANINI 1930).

A: Kongur: NW Kongur 4800 m, 1956-08-13/17, *Ikonnikov* (Pl.As.Centr.). Wakhan 4100-4600 m (PODLECH & ANDERS 1977: "subsp. *spicatum*"). Nuristan: Bashgal sources 4250 m, *Breckle 2994* (M!). Astor: Upper Rupal Vy., ascent to Mazeno High Camp 4600-4650 m, *Nüsser 1498!; 1504!.*

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Uppermost Rupal Vy. (Toshain Gah), ascent to Mazeno Gali moraine 5010 m, *Nüsser 1517!*. Deosai: 4050 m, *Miehe 2114* (K!). Deosai E 4290-4300 m, *Miehe 5161!*. Himachal Pr.: Chotadara, *Aswal 6866* (ASWAL & MEHROTRA 1994: *T. spicatum*). W Tibet: N Moincer (N 31°15' E 80°15') 5050 m, *Miehe+9639h!;* 5500 m, *Miehe+9640e!*.

D: ?Pamir, Karakorum, W Himalaya. *?W Himal.* Species: Arctic and alpine regions of the N hemisphere (Pakistan: NWFP, Gilgit; Kashmir). *Holarct.*

E: 4000-4800 m, alp. - subniv., frequent in the SW. Moist to relatively dry alpine turf (*Kobresia capillifolia*) and open cushion-communities, more rarely (lower alpine belt) in snow-valleys, meadows and *Salix* scrub.

N: "An extremely variable grass... In Europe and northern Asia it has been divided into a number of subspecies but material from our area is relatively uniform (except where it grades into *T. clarkei*) and probably all referable to subsp. *spicatum* [which it is not !]. Very common at high altitudes." (Fl.Pak.). Most of the material cited apparently belongs to subsp. **himalaicum** HULTÉN 1959; **Trisetum spicatum** (L.) K. RICHTER subsp. **mongolicum** HULTÉN 1959, to which the plants from the extreme NW (Khunjerab, Yasin) may be referable, is doubtfully distinct from this; subsp. *spicatum*, apparently, does not occur in the Himalaya. Introgression from *T. clarkei* seems to occur to a variable extent all along the Himalayas and in the monsoon-influenced regions of the Karakorum.

* **Trisetum spicatum** (L.) K. RICHTER subsp. **tibeticum** (P. C. KUO & Z. L. WU) DICKORÉ comb. nov.

Basionym: *Trisetum tibeticum* P. C. KUO & Z. L. WU, Fl. Xizang. 5: 188. 1987.

A: Zanskar: Phirtse P. 5000 m, 1992-08-05, *Holzner & Kriechbaum* s.n.!. W Tibet: Upper Domar Chu 5100-5220 m, *Miehe 7951; 8016!*. E Wuma (N 32°34' E 83°22') 4800-5200 m, *Miehe+9679c!*. N Moincer (N 31°15' E 80°15') 5050-5280 m, *Miehe+9641e!; +9642d!*. Changtang: Lungmu Co 5280 m, *Miehe 8163!*. **D**: S, W & C. & SE Tibet. **N**: The plants from very high altitudes in Zanskar, W Tibet and Changtang are very distinctive in having a very dense indument of short hairs on the leaves, but they apparently intergrade with subsp. *himalaicum*, which often has subglabrous leaf-surfaces.

Trisetum aeneum X T. clarkei ?

W **Gilgit:** Baghrot Vy. 3470 m, *Miehe 4029!;* 3800 m, *Miehe 3891* (K!); above Gutumi Nullah 3040 m, *Schickhoff 569!*. **Hunza:** Rakaposhi N above Nilt 3470 m, *Miehe 6428!*. Above Nilt, Masot Gl. 3170-3210 m, *Schickhoff 216!; 257!*.

E: 3040-3800 m, mont.-subalp., rare in the SW. Humid forests (*Picea smithiana, Pinus wallichiana, Betula jacquemontii*) and scrub (*Salix karelinii, Rhododendron anthopogon*).

N: Plants ± intermediate between their putative parents. None of the Karakorum plants seems to represent typical *T. aeneum*. They have the culms subglabrous above, branches and axis of panicle ± pubescent, the leaves ± densely ciliate. They grow together with *T. clarkei*. Typical *T. aeneum* has characteristically shining brown glumes, strongly reflexed awns, and is almost totally glabrous.

Trisetum clarkei X T. spicatum ?

W **Gilgit:** Shinghai Gah - Pahot Gali 4180-4280 m, *Miehe 995!; 1202!; 1237!; 1558!; 1591!*: *T. clarkei* > *T. spicatum*; 3950-4470 m, *Miehe 989!; 1059!; 1253!; 1660!; 1670!*: *T. spicatum* > *T. clarkei*.

A: Hazara: Kaghan Vy., Babusar P.: 3940-4310 m, *Miehe 280!; 318!; 348!; 484!; 509; 527!; Schickhoff 90/955!; 90/975!*.

E: 3950-4470 m. Humid alpine turf of the lower alpine belt.

N: Specimens cited are a purely accidental selection of possible intermediates.

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- **Triticum aestivum** L., Sp. Pl. 85. 1753
  Triticum hyberneum L. 1753, *Triticum sativum* LAM. 1778, *Triticum vulgare* VILL. 1787

Ic.: Fl.Iraq 9: pl.67. Fl.Xizang.5: fig. 81.

CS **Biafo:** Ste Ste - Askole 3080 m (HARTMANN 1966). **Nubra:** Liagtsung to Panamik (left side of the Nubra Vy.), 1856-07-24/31, *Schlagintweit 2034* (BM!).

S **Shigar:** (HARTMANN 1966). **Skardu**: 2300 m (HARTMANN 1966).
A: W Kashg.: "*Triticum vulgare* VILL. - Wheat of several varieties, and of very superior quality, is the principal crop on the plains of Yarkand" (HENDERSON & HUME 1873). W Kunlun: Kentalek 2700 m, 1931-07-21, *Persson 244*, cult. (PERSSON 1938). Wakhan 3200 m, cult. (PODLECH & ANDERS 1977). Zanskar: NW Paddum 3660 m, *Stoliczka 8/65* (BM!).
N: 2n=42 "The most widely grown of the wheats in Pakistan, from the plains to over 4000 m". (Fl.Pak.).

- **Triticum durum** DESF. 1798 - **Ic.:** Fl.Xizang.5: fig.83.

W **Hunza:** Pisan 2230 m, 1974-07-23, *F.Gartner* s.n. (GZU!).
Reported as cultivated from Sind, NWFP and the Punjab. (2n=28).

- **Triticum turgidum** L. 1753 - **Ic.:** Fl.Xizang.5: fig.82. Reported as cultivated from Sind, NWFP, ? Baluch. (2n=28).

237. Vulpia myuros (L.) C. C. GMELIN, Fl. Bad. 1: 8. 1805

Festuca myuros L. 1753

Ic.: Fl.Xizang.5: fig.49.

CS **Nubra:** [Lower] Nubra Vy. 1848-08-01, *T.Thomson* s.n. (K!); 1848-08-04, *T.Thomson* s.n. (K!); 1848-09-04, *T.Thomson* s.n. (K!). Panamik - Tsanglung (left side of the Nubra Vy.), 1856-08-09, *Schlagintweit 2248* (GOET!, "*V. uniglumis*" det. GRISEBACH). Tsarasa to Aranu (right side of the Nubra Vy.), 1856-08-03/04, *Schlagintweit* s.n. (BM!).

W **Gilgit:** 1520 m, *R.R.Stewart 26351* (K!).

E **Shyok:** [Calzar], 1848-07-23, *T.Thomson* s.n. (K!). [Calzar - Diskit] 1848-07-25, *T.Thomson* s.n. (K!).
A: Wakhan: Ptukh 3300 m, *Huss 74a* (PODLECH & ANDERS 1977). Swat. Kashmir: 1848-05-11, *T.Thomson* s.n. (K!). Srinagar 1520-1830 m, *Duthie 10844* (K!).
D: C. & S Eur., Medit. - Middle Asia, Pakistan, Himalaya (S Karakorum, Kashmir - Bhutan), India, Ceylon; 1200-3000 m. *?Euro-Sib.*
E: "Usually found as a weed of cultivation" (Fl.Pak.).

* **Vulpia persica** (BOISS. & BUHSE) V. KRECZ. & BOBROV in KOMAROV 1934 (*Nardurus persicus* BOISS. & BUHSE 1860) - **Ic.:** Fl.Pak.143: fig.40. **A**: Chitral. Swat. **D**: Iraq, Iran - Afgh., W Pakistan.

* **Vulpia unilateralis** (L.) STACE 1978 (*Triticum unilaterale* L. 1767) - **A**: Kashmir: Srinagar 1520-1830 m, *Duthie 10811* (K!). **D**: Medit., SW Asia - Kashmir.

- **Zea mays** L. 1753 - **Ic.**: Fl.Iraq 9: pl.215. W Kashg.: "A common crop on the Yarkand Plains. Not grown in Ladakh" (HENDERSON & HUME 1873). Egiz-Ir; Yangishar, *Knorring* (Pl.As.Centr.). Cultivated throughout Pakistan up to an altitude of about 2500 m (Fl.Pak).

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(Possible) Intergeneric hybrids:

* **Agrostis stolonifera X Polypogon monspeliensis = X Agropogon littoralis** (SM.) C. E. HUBBARD 1946 (*Polypogon littoralis* SM. 1816) - **A**: Hazara, Kashmir.

* **Alopecurus himalaicus X Calamagrostis pseudophragmites ?** - **A**: Dras: Dras, Ladakh - Kashmir Rd. 3050 m, 1928-08, *R.R.Stewart 10020A* (K!). **N**: A curious specimen, *Calamagrostis* is very probably involved, but "callus-hairs" spread all over the lemmas; florets mostly deformed and apparently sterile.

* Hyacinthaceae

* **Scilla griffithii** HOCHR. 1910 (*Hyacinthus purpureus* GRIFF. 1851, non *Scilla purpurea* MILLER 1768) - **Ic.**: Fl.Iran.165: pl.92. **A**: Chitral, Swat (Fl.Iran.). Kashmir. **D**: E Afgh., W Pakistan.

* Hydrocharitaceae

Lit.:
DANDY, J. E. 1971: *Hydrocharitaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **80**: 1-4.
OVCZINNIKOV, P. N. (ed.) 1957: *Hydrocharitaceae*. - In: Flora Tadzhikskoy SSR **1**: 114.

* **Hydrilla verticillata** (L. f.) L. C. RICH. 1811 - **A**: Swat. Kashmir. **D**: C. Europe, Africa, Asia, Australia, introduced in C.America.

* **Hydrocharis dubia** (BLAKE) BACKER 1925 (*Hydrocharis morsus-ranae* auct. non L. 1753) - **A**: Swat. Kashmir: Kashmir lakes, frequent (Ann.Cat.Pak.). **D**: SE Asia, Australia.

Iridaceae

Lit.:
DYKES, W. R. 1913: The genus *Iris*. Cambridge. 1-245.
FEDTSCHENKO, B. 1935: *Iris*. - In: Flora URSS **4**: 511-576.GRUBOV, V. I. & EGOROVA, T. V. 1977: *Iridaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **7**: 88-102.
GUSTAFSSON, M. & WENDELBO, P. 1975: Karyotype Analysis and Taxonomic Comments on Irises from SW and C Asia. - Bot. Not. **128**: 208-226.
KLATT, F. W. 1868: Enumeration of the *Primulaceae*, *Pittosporaceae* and *Irideae* collected during the years 1855-1857 in High Asia by Messrs. de Schlagintweit. - J. Bot. (London) **6**: 116-127.
MATHEW, B. & WENDELBO, P. 1975: *Iridaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **112**: 1-79, pl. 1-24.
RODIONENKO, G. J. 1961: Genus *Iris* L. - Moskwa & Leningrad.
VVEDENSKY, A. I. 1963: *Iridaceae*. - In: OVCZINNIKOV, P. N. (ed.): Flora Tadzhikskoy SSR 2: 370-396
WENDELBO, P. 1958: *Iridaceae*. - In: Symbolae Afghanicae 4. - Biol. Skr. Dan. Vid. Selsk. **10**(3): 185-190.

* **Crocus korolkowii** REGEL & MAW 1880 - **A**: Chitral: *Hamilton* (Ann.Cat.Pak.). **D**: W Tian Shan, W Pamir-Alai, Chitral.

- **Crocus sativus** L., Sp.Pl. 36. 1753
  A: "Saffron, Zafran, is cultivated in the main Kashmir Vy. especially at Pampur" (Ann.Cat.Pak.).

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* **Gynandriris sisyrinchium** (L.) PARL. 1854 (*Iris sisyrinchium* L. 1753) - **A**: Swat (Fl.Iran.). **D**: Medit. - Middle Asia, Tadzh., NW Pakistan.

* **Iris crocea** JACQ. ex R. C. FOSTER 1936 - **A**: Kashmir: "An old introduction in Kashmir possibly from the Caucasus", perhaps a form of *I. spuria* (Ann.Cat.Pak.).

* **Iris decora** WALL. 1830 (*Iris nepalensis* D. DON 1840) - **A**: Hazara, Kashmir (Ann.Cat.Pak.).

* **Iris germanica** L. 1753 - **A**: Cultivated in Swat, Hazara, Kashmir. "Common in gardens and on graveyards (white forms [var. *florentina* ?])" (Ann.Cat.Pak.).

238. Iris hookeriana FOSTER, Gard. Chron. 1: 611. 1887

Iris gilgitensis BAKER 1892

W **Gilgit:** Shinghai Gah - Pahot Gali 3880 m, *Miehe 1353!* (veg.).

S **Leh:** Fotu La, 1905, *Meebold 3222* (K!).

Unloc.: Yarkand Exp., 1870-07-20, *Henderson 342* (K!).

A: Chitral. Astor: Suti Suce beyond Burzil P., 1847-06-30, *Winterbottom 83* (K!). Kumu Kolat, 1885, *Giles* s.n. (K!). Rama Vy., Sachen Gl., left ablation vy. 3530 m, *Nüsser 200!; 201!*. Upper Harchu Vy. 3530 m, *Nüsser 840!*. Lower Rupal Vy., above Churit 3560 m, *Nüsser 760!*. Rupal Vy., Nagachakali, nunatak 3620 m, *Nüsser 613!; 646!*. Upper Rupal Vy., S of Latobo 3780 m, *Nüsser 89!* (cf.); Rupal Gl. ablation Vy. 3950 m, *Nüsser 1544!*. Deosai: Burzil P., 1848, *Winterbottom* s.n. (K!). Marpo P. 2130-3960 m (STEWART 1961), Dras: Dras Vy., *Duthie 25918* (K!). Swat. Hazara: Kaghan Vy., common 2440-3670 m. Above Saiful Muluk Lake 3670 m, *Schickhoff 607!*. Kashmir: common, 2130-4270 m (Ann.Cat.Pak.). Himachal Pr.: Chamba, Lahul, common.

D: W Himalaya: Chitral, Gilgit, Swat, Hazara, Kashmir - Garhwal. *W Himal.*

E: 3880 m, subalp.-alp., rare in the S & W. Meadows and relatively humid meadow steppes. "The common purple iris of alpine meadows. Gregarious and spreading as it is left by grazing animals but ... relished as hay in the winter" (Ann.Cat.Pak.).

* **Iris kashmiriana** BAKER 1877 - **A**: Chitral. Kashmir. **D**: W Himalaya (Chitral, Kashmir); ? cultivated in S Iran, SE & E Afgh.

* **Iris kumaonensis** WALL. ex D. DON 1840 - **A**: Reported from [?]Chitral: Lowari P., [?]Astor: *Inayat 25894* (Ann.Cat.Pak.). Kashmir: 9 km NE Sonamarg on way to Nichinai Vy., *C.C.Townsend 87/161* (K!). **D**: Himalaya: Kashmir, Lahul - Assam, SE Tibet. **N**: "Rare ... and often confused with *I. hookeriana* (Ann.Cat.Pak.). Apparently not rare in Kashmir, but not found with certainty further W.

* **Iris loczyi** KANITZ 1891 (*Iris tenuifolia* PALLAS var. *tianschanica* MAXIM. 1880, *Iris tianschanica* (MAXIM.) VVED. ex VORON. 1932) - **Ic.**: GREY-WILSON 1974: fig.12. Fl.Xizang.5: fig.322(1-2). **A**: Kongur: Lower Oytag Vy. 2100-2300 m, *Miehe 7332!*. Upper Gez Gorge 3500 m, *Miehe 5322!* (fr.). W Kunlun: Ak-kez P. 3400 m, 1959-06-05, *Junatov; Li & al.* (Pl.As.Centr.). Akaz P. 3260 m, *Miehe 7380!* (a form with very broad petals). E Pamir (Fl.Tadzh.). Chitral: 2740-3350 m, *Harriss 16679* (K!). **D**: C. Asia: NE Afgh., E Pamir, Dzungaria, Kashgaria, Kunlun, N, S & E Tibet. **E**: (W Kunlun:) Mont. loess steppes and desert-steppes (*Stipa splendens, Krascheninnikovia ceratoides*). **N**: A characteristic distribution including S Tibet (see *Stipa breviflora*). The basal sheaths of *I. loczyi* are very similar in facies to those of *Allium filifolium*.

* **Iris milesii** R. C. FOSTER 1883 - **A**: Kashmir: Near Aish Mugam 1830 m, 1938-07-14, *P.N.Kohli* s.n. (K!). Himachal Pr.: Manali, *N.L.Bor 14066* (K!). **D**: W Himalaya. **N**: "The common *Iris* in the deodar forest" (*Bor 14066*).

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239. Iris oxypetala BUNGE, Enum. Pl. China Bor. 63. 1832

Iris fragrans LINDLEY 1840, *Iris moorcroftii* WALL. ex D. DON 1841, *Iris pallasii var. chinensis* FISCHER ex SIMS 1822, *Iris ensata* THUNB. var. *chinensis* MAXIM. 1880, *Iris ensata* auct. non THUNB. 1794

CS **Nubra:** [Lowermost Nubra Vy.], 1848-07-27, *T.Thomson* s.n. (K!). Panamik village 3200 m, *A.S.Hughes 26* (K!).

W **Yasin:** Sultanabad 2500 m, *G.Stöber 8* (K!). **Gilgit:** Gilgit, 1847-10-05, *Winterbottom 399* (K!); 1490 m, *R.R.Stewart 26314* (K!). **Hunza:** Pisan 2230 m, 1974-07-23, *F.Gartner* (GZU!).

S **Shigar:** Above Shigar Rv., 1912-05, *Drummond 24834* (K!). **Skardu:** 2250 m (HARTMANN 1966); 2300 m, *H.Hartmann 342* (Z!); 2200 m, *E.Reiser 9* (Z!). **Leh:** Alchi, near Indus Vy. 3000 m, *Billiet & Leonhard 6814* (K!). Upper Indus Vy., Spituk, very common, *Trinkler* s.n. (Z!). Leh, 1848-09, *T.Thomson* s.n. (K!); 3500 m, 1993-07, *Holzner & Kriechbaum* s.n.!. Indus Vy., 1847-09-30, *T.Thomson* s.n. (K!). Chimre 3350 m, *Koelz 2544* (K!).

Unloc.: Yarkand Exp., 1870-06-15, *Henderson 272* (K!). Ladakh, *Edgeworth* (K!).

A: W Kashg.: Kashgar 1220 m, *Wingate* (Z!). Hangcheng, 1928-05-05, *Törnquist* (Z!). Duwa, 1928-05-07, *Bosshard* (Z!). Yangi Hissar, 1874-05-02, *Bellew* (K!). N, E, W & S Kashg. (Pl.As.Centr.). Chitral: Chapalli, *Stamm & Wöhrl 74* (Fl.Iran.). Barum Village, *Choudhri 87* (Fl.Iran.). Dras: Purig [Dras Vy.], *Koelz 6099*. Suru: Suru Vy., Tsatis Kot 2770 m, *B.B.Osmaston 151* (K!). Kargil, 2 km S Biamathanl Plantation 2900 m, *Southampton Univ. 3* (K!). Hazara: Murree Hills, *Saunders* s.n. (K!). Kashmir: 1848-04-21, *T.Thomson* s.n. (K!); 1848-04, *T.Thomson* s.n. (K!). Ash Makaun 1680 m, 1847-05-21, *Winterbottom 245* (K!). Nowshera, ad Baramulla, *Jacquemont 336* (K!). Srinagar 1580 m, *C.B.Clarke 29133* (K!). Bybara 1680 m, *J.L.C.Zuller* (K!). Wular Lake, 1930-04-20, *E.Barnes* s.n. (K!). Kashmir Vy., very common (Ann.Cat.Pak.). Himachal Pr.: Chango, 1847-08-27, *T.Thomson* s.n. (K!). Piti Vy., 1847-09-01, *T.Thomson* s.n. (K!). Gyonmeoul, *Jacquemont 1983* (K!). Spiti, Tabo 3050 m, *H.G.C.Gill 2038* (K!). Lahul, *Jaeschke* (K!).

D: Tian Shan, Pamir-Alai, Kashgaria, W Himalaya, S Tibet. *W Centr.As.*

E: 1490-3200 m, coll. - mont., locally common in the S. Cultivated fields (*Triticum*), roadsides, waste places.

N: "The natives gather the grass for winter-use feeding sheep" (*Törnquist* in sched.). Records of *Iris spuria* L. 1753, from **Leh:** 3780 m, *Visser* (PAMPANINI 1930), and from Kashmir possibly belong here. **Iris spuria** L. subsp. **halophila** (PALLAS) MATHEW & WENDELBO 1975 is reported from Kurram (Fl.Iran.).

* **Iris songarica** SCHRENK in FISCHER & MEYER 1841 - **Ic.**: Fl.Iran.112: pl.11 fig.1. **A**: Chitral. **D**: Iran, Afgh., W Pakistan - Middle Asia - Mongolia, N China. **N**: Closely related to *I. loczyi*.

Juncaceae

Lit.:

BUCHENAU, F. 1885: Die Juncaceen aus Indien, insbesondere die aus dem Himalaya. - Bot. Jahrb. **6**: 187.

BUCHENAU, F. 1890: Monographia *Juncacearum*. - Bot. Jahrb. **12**: 1-495, 622.

BUCHENAU, F. 1906: *Juncaceae*. - In: ENGLER, A., Das Pflanzenreich **25** (IV. 36): 1-284.

COPE, T. A. & STACE, C. A. 1978: The *Juncus bufonius* L. aggregate in western Europe. - Watsonia **12**: 113-128.

EGOROVA, T.V. 1967: *Cyperaceae - Juncaceae*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis 3: 90-104.

JAFRI, S. M. H. 1981: *Juncaceae*. - In: Flora of Pakistan **138**: 1-27.

OVCZINNIKOV, P. N. (ed.) 1963: *Juncaceae*. - In: Flora Tadzhikskoy SSR **2**: 159-178.

SNOGERUP, S. 1971: *Juncaceae*. - In: RECHINGER, K.-H. (ed.), Flora Iranica **75**: 1-35, pl. 1-4.

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240. Juncus articulatus L., Sp. Pl. 327. 1753

Juncus lampocarpus EHRH. ex HOFFM. 1791, *Juncus turczaninowii* (BUCHENAU) V. KRECZ. 1935

Ic.: Fl.Pak.138: fig.3(A-D). Fl.Xizang.5: fig.281.

W **Ghizar:** Pingal - Dahimal 2500 m, *Honda 242* (KITAMURA 1964). **Yasin:** Hilter [Gupis - Yasin] 2300 m, *K.Ogino 518* (KITAMURA 1964). **Ishkoman:** Phakor - Imit, *Honda* s.n. (KITAMURA 1964). Imit 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Gilgit:** Gilgit 1490 m, ditches, *R.R.Stewart 26296* (K!, RAW). Baghrot Vy. (2860-3340 m), *Miehe 4326!*. **Hunza:** Chalt 1950 m, *Klötzli & al. 123.06!*. **Batura:** N Morkhoon 2740 m, *Klötzli & al. 99.15!*.

S **Shigar:** 2350 m, *C.B.Clarke 30071* (K!); *Koelz 9674* (RAW). **Skardu:** Skardu - Shigar, *Schlagintweit* (BUCHENAU 1869). **Leh:** Leh 3200 m, *Koelz 2595* (K!). Shey Gompa 3300 m, *H.Hartmann 4125!*. Spituk, *Koelz 6337* (Ann.Cat.Pak.). **Lower Shyok:** Near Saling, canals and rivulets, 2440 m, *Nasir & Webster 6284* (WEBSTER & NASIR 1965).

A: W Kashg.: Kashgar 1330 m (PERSSON 1938); 1280 m, *Dickoré 993!*. Wakhan 2800-3450 m (PODLECH & ANDERS 1977). Chitral. Chilas: Gor Region, Village Ranote 2120 m, *Nüsser 1193!*. Astor: Faqirkot 2800 m, *Schickhoff 1373!*. Dras: 3050 m, *R.R.Stewart 10027* (K!). Suru: Mulbekh, *Koelz 6181* (Ann.Cat.Pak.). .Swat. Hazara. Kashmir: common. Barzil 3200 m, *C.B.Clarke 29618* (K!).

D: Eurasia, N Africa, N America; introduced in Australia and New Zealand. *Holarct.*

E: 1490-3300 m, coll. - mont., not common. Wet, often eutrophic habitats: ditches, river banks and flushes; reduced specimens occasionally found in *Juniperus excelsa-Artemisia brevifolia* forest-steppes.

* **Juncus benghalensis** KUNTH 1841 (*Juncus sphenostemon* BUCHENAU 1885, *Juncus membranaceus* auct. non ROYLE ex D. DON 1840: HOOKER f. 1894) - **Ic.:** Fl.Pak.138: fig.2(E-G). **A**: Swat. Hazara (Ann.Cat.Pak., Fl.Pak.). **N**: This apparently replaces *J. membranaceus* in the Outer Himalaya. "Differs from **J. leucanthus** DON by its smaller size, whitish perianth segments, capsules not exserted and the lowest bract often much exceeding the flowering head. *J. leucanthus* seems to be confined to C. Himalaya from Sikkim to Kumaon. Its elongated lowest bract and much longer, linear anthers easily distinguish it from *J. membranaceus* DON. It may also be confused with *J. leucomelas* DON but the presence of the cauline leaves and hardly tailed seeds will distinguish it." (Fl.Pak.).

241. Juncus bufonius L., Sp. Pl. 328. 1753 (s.l.)

Ic.: Fl.Pak.138: fig.1(A-C). Fl.Tadzh.2: fig.40(3-4: *J. turkestanicus*). Fl.Xizang.5: fig.277.

CS **Saltoro:** Above Hushe 3200-3300 m, *Miehe 1863!*. **Nubra:** [Lower Nubra Vy.], 1848-07-28, *T.Thomson* s.n. (K!); 1848-09-04, *T.Thomson* s.n. (K!).

W **Ghizar:** Gupis 2170 m, *K.Ogino 534; 586* (KITAMURA 1964). **Ishkoman:** Imit 2400 m, 1974-08-10, *F.Gartner* s.n. (GZU!). **Batura:** Borit Jil 2500 m, *F.A.Perrot 15* (K!).

S **Shigar:** Thalle P., above Shigar 1940-08-13, *R.R.Stewart* s.n. (RAW)*. **Skardu:** *Nasir & Webster 5753* (RAW)*. Kiris - Nar, *Schlagintweit* (BUCHENAU 1885). Indus Vy., Parkutta - Tolti, 1940-08-21, *R.R.Stewart* s.n. (RAW). **Leh:** Leh, 1848-07, *T.Thomson* s.n. (K!); 3500 m, *Holzner & Kriechbaum* s.n.!. Ravine below Giah [c. 3800 m], 1847-09-29, *T.Thomson* s.n. (K!). Leh, Sabu Vy., 1847-10-11, *T.Thomson* s.n. (K!). Kalatze 3350 m, *Roero* (PAMPANINI 1916)*. Leh [?], *Nasir & Siddiqui 103* (RAW). Choglangsar 3200 m, *H.Hartmann 4124!*. NW above Leh 3630 m, *H.Hartmann 4196!*. **Lower Shyok:** Cunes [Blaghar], *Schlagintweit* (BUCHENAU 1885). Near Daghoni, 2440 m, *Nasir & Webster 6297* (WEBSTER & NASIR 1965). **Shyok:** Shayuk Vy. [Liakzun - Hundar c. 3230 m], 1847-10-22, *T.Thomson* s.n. (K!). Deschit 3200-3250 m (STEWART 1869).

Unloc.: [?]Duluoli 1830 m, *Giles* s.n. (K!). Ladakh, Sakti, *Koelz 2503* (Ann.Cat.Pak.).

A: Kongur: Bostan-Terek 2400 m (PERSSON 1938). W Kunlun: Kudi 3000 m, *Dickoré 181!**. W Pamir 800-2800 m (Fl.Tadzh.: *J. bufonius, J. nastanthus, J. turkestanicus*). Wakhan: 2700-3180 m (PODLECH & ANDERS 1977: *J. turkestanicus*). Sar Skhaur 2700 m, *Roemer 294* (Fl.Iran: *J. turkestanicus*). Chitral: Laspur Gol, SE Mastuj 3600 m, *Stainton 3099*; Upper Brumboret Vy., near Bromotul 2000 m, *Kerstan 2084* (Fl.Iran.: *J. turkestanicus*). Swat: Khawazakhiela - Shangla (1300-1900 m), *Rechinger 30552* (Fl.Iran.). Hazara. Astor. Dras: Marpo P. Suru: Lower Wakha Vy. 3500 m,

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H.Hartmann 2711!. Kashmir: 1848-05-30, *T.Thomson* s.n. (K!). [Badarwar - Padri P.], 1848-06-03, *T.Thomson* s.n. (K!). Himachal Pr.: Piti Vy., W of Lara, 1847-09-04, *T.Thomson* s.n. (K!); Kunawar, ravine above Sungnam, 1847-08-20, *T.Thomson* s.n. (K!).

D: Almost cosmopolitic, pantemperate. *Cosmopol.*

E: 2500-3630 m, coll. - mont., not common (mainly Indus Vy.). Wet or seasonally moist open, often somewhat eutrophic or saline habitats.

N: Specimens marked with an asterisk (*) are reported as var. *congestus* WAHLENB., which probably is **Juncus ambiguus** GUSS., Fl. Sic. Prodr. 1: 435. 1827 (*Juncus ranarius* SONG. & PERR. in BILLOT, *Juncus nastanthus* V. KRECZ. & GONTSCH. in KOMAROV, *? Juncus turkestanicus* V. KRECZ. & GONTSCH. 1935), distributed in temp. - subtrop. Eurasia (?). *Juncus bufonius* L. var. *rechingeri* (SNOG.) JAFRI 1981 (*Juncus rechingeri* SNOG. Fl. Iran. 75: 19. 1971) is reported from Kashmir (Fl.Pak.). The *J. bufonius*-complex was revised for Europe (COPE & STACE 1978); its taxonomy in C.Asia still remains uncertain.

* **Juncus compressus** JACQ. 1762 - **Ic.:** Fl.Pak.138: fig.2(H-1: subsp. *pseudogerardii*, K-L: subsp. *jaxarticus*). **A**: W Pamir 600-3000 m (Fl.Tadzh.). Chitral. Hazara. Kashmir. **D**: Eurasia, N America (E). **N**: A record from **Hunza:** ? Nagar (Ann.Cat.Pak.) is unconfirmed, it may prove to be a depauperate *J. articulatus*. *Juncus compressus* JACQ. var. *pseudogerardii* JAFRI 1981 is reported from Afgh., Hazara: Kaghan Vy., Kashmir.

* **Juncus concinnus** D. DON 1825 (*Juncus allioides* FRANCHET 1887, *Juncus macranthus* BUCHENAU 1890) - **Ic.:** Fl.Pak.138: fig.6(C-G). **A**: Chitral. Swat (Fl.Iran; Fl.Pak.). **D**: Himalaya: ?Pakistan - Sikkim. **N**: "It seems primarily an east Himalayan plant" (Fl.Pak.); reported also from **Gilgit**: Hunza, [?] along the Indus river bank, 1977-07-13, *Kamal & Qaiser 498* (KUH) [identity and locality doubtful].

* **Juncus elegans** ROYLE ex BUCHENAU 1867 (*Juncus concinnus* auct. non D. DON: HOOKER f. p.p.) - **A**: ?Kashmir. **D**: Himalaya (Chamba - Sikkim).

* **Juncus gerardii** LOISEL. 1809 - **A**: W Kashg.: Kashgar 1330 m (PERSSON 1938: var. *salsuginosus* TURCZ.); *Bosshard* (Z!). W Kunlun: Jerzil 3100 m. (PERSSON 1938: var. *salsuginosus* TURCZ.). **N**: Anthers much longer than filament.

* **Juncus heptapotamicus** V. KRECZ. & GONTSCH. 1935 - **A**: W Pamir 2400-2500 m (Fl.Tadzh.). **D**: Dzungaria, Tian Shan, Pamir-Alai.

242. **Juncus himalensis** KLOTZSCH in KLOTZSCH & GARCKE, Bot. Erg. Reise Pr. Waldemar 60, pl. 97. 1862

Juncus afghanicus SNOG. in RECH. f. 1971, *Juncus sphacelatus* DECNE. in JACQUEM. var. *himalensis* (KLOTZSCH) JAFRI; 1981

Ic.: Fl.Iran.75: pl.4 fig.1 (*J. himalensis*); fig.3 (*J. afghanicus*). Fl.Pak.138: fig.2(A-D: *J. sphacelatus* var. *himalensis*). ?Fl.Xizang.5: fig.291.

CS **Biafo:** Karakorum [near Askole] 4110 m, 1876-08-10, *C.B.Clarke 30341* (K!; W!; BUCHENAU 1885).

W **Gilgit:** Shinghai Gah - Pahot Gali 3950 m, *Miehe 1061!*. Baghrot Vy. 4280-4340 m, *Miehe 4115!*; *4131!*. Naltar Vy. 3050-3350 m, *Duthie* (K!; PAMPANINI 1928); 3660-3960 m, *R.R.Stewart 26297* (K!, RAW). Naltar Lakes 3170 m, *Schickhoff 41!*. **Hunza:** Oltali Chish 2600 m, 1955-06-10, *S.Nakao* s.n. (KYO!).

A: W Pamir 2500-4200 m (Fl.Tadzh.). Wakhan 3100 m (PODLECH & ANDERS 1977). Chitral. Chilas: Fary, Buldar Vy. 2860 m, *Nüsser 1028!*. Astor: Hasora, N foot of the Dorikoun P. (slopes towards Tashing), 1856-10-01, *Schlagintweit 6834* (W!). Mushkin 2290 m, *Giles 559* (K!). Deosai: Deosai E 3300-3600 m, 1991-07-12, *J.Poelt* s.n.!. Shigar, *B.B.Osmaston 88* (Ann.Cat.Pak.). Dras: Matai up to the Tsoji P. (NE slopes of the P.), 1856-10-14, *Schlagintweit 6668* p.p. (W!). Zanskar: Gamburanjon 4300 m, 1993-07-29, *Holzner & Kriechbaum* s.n.!. Shingo P. 4500 m, 1993-07-30, *Holzner & Kriechbaum* s.n.!. Swat: Diwangar - Pichar 3700 m, *K.Ogino 134* (KYO!). Hazara: Kaghan

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Vy. Kashmir: common. "In humidis ...inter Buspa et Pabul Vy.", *Jacquemont 2181* (K! **type** *J. scirpoides*). Hispoor 2440 m, *C.B.Clarke 28676* (W!). Kunzlwan 2440 m, *C.B.Clarke 29347* (W!). Pahlgam 2740 m, *C.B.Clarke 31091* (W!). Alibad 2900 m, *C.B.Clarke 28635* (W!). Sonamarg 3350 m, *C.B.Clarke 27342* (W!). Pir Pinjul 3350 m, *C.B.Clarke 28766* (W!); *Levinge 27341* (W!). Yakla 4270 m, 1869-10-16, *C.B.Clarke & W.J.Atkinson* s.n. (W!).

D: Pamir-Alai, SW Karakorum, Himalaya: Afgh., N Pakistan, Kashmir - SW China (Yunnan). *Sino-Himal.*

E: 3050-4340 m, alp., rare in the SW. Humid alpine turf with long snow cover.

N: It may be appropriate to separate *J. himalensis*, a western plant, from the eastern *J. sphacelatus*, which has a more succulent habit. But their exact morphological and geoecological limits, if there are any, are uncertain. JAFRI in Fl.Pak. combines them.

* **Juncus inflexus** L. 1753 (*Juncus glaucus* EHRH. 1791, *Juncus brachypetalus* (TRAUTV.) V. KRECZ. & GONTSCH. in KOM. 1935, *Juncus inflexus* L. var. *brachypetalus* (TRAUTV.) KITAMURA 1960) - **Ic.:** Fl.Pak.138: fig.5(F-I). Fl.Tadzh.2: fig.39(3-5: *J. brachypetalus*). **A**: W Pamir, E Pamir 600-3000 m (Fl.Tadzh.: *J. brachypetalus*) Chitral. Swat. Hazara: Kaghan Vy. Astor: Near Rattu, *R.R.Stewart 18807* (Ann.Cat.Pak.). Kashmir. **D**: Eurasia, N Africa, introduced elsewhere.

243. Juncus leucomelas ROYLE ex D. DON, Trans. Linn. Soc. **18**: 320. 1840

Ic.: Fl.Pak.138: fig.1(D). Fl.Xizang.5: fig.283

CS **Biafo:** Karakorum [near Askole] 4110 m, 1876-08-09, *C.B.Clarke 30234* (W!); 1876-08-10, *C.B.Clarke 30337* (B!; K!; W!; BUCHENAU 1885). Below Gense 3700 m (HARTMANN 1966); *H.Hartmann 314* (Z!); *315!*. **?Saltoro:** Chiaveri [Kaberi] Gl. 3700 m (CALCIATI 1914: "*J. leucanthus*"). **Nubra:** Panamik, *Schlagintweit* (BUCHENAU 1869).

S **Leh:** [Leh - Kardong P.], 1848-07-19, *T.Thomson* s.n. (K!). S Stok 4000 m, *H.Hartmann 2712!*. **Pangong:** Pangong Lake - Durgub, *Schlagintweit* (BUCHENAU 1869).

Unloc.: Ladakh, Tiamak, *Koelz 6465* (Ann.Cat.Pak.).

A: Hazara: Kaghan Vy., Kashmir: Barzil 3660 m, *C.B.Clarke 29710* (K!; W!). Himachal Pr.: Parang Vy., 1847-09-11, *T.Thomson* s.n. (K!).

D: S Karakorum, Himalaya: Hazara - Sikkim, ?S Tibet. *?W Himal.*

E: 3700-4110 m, subalp. - alp., rare. Wet N-facing rock ledges.

N: It may be confused with *Juncus leucanthus* ROYLE ex D. DON which occurs from Kumaon to Sikkim. There probably are also problems with its delimitation against *J. thomsonii*, which apparently prefers higher altitudes.

244. Juncus membranaceus ROYLE ex D. DON, Trans. Linn. Soc. **18**(3): 320. 1840

Juncus hoffmeisteri KLOTZSCH in KLOTZSCH & GARCKE 1862, ? *Juncus macrantherus* V. KRECZ. & GONTSCH. 1935, *Juncus castaneus* auct. non SM. 1800

Ic.: Fl.Pak.138: fig.6(A-B). Fl.Tadzh.2: fig.39(1-3) (*J. macrantherus*).

CS **Biafo:** Near Askole 3200 m, 1955-06-24, *S.Nakao* (KITAMURA 1964). Biafo Gl. 3110-3180 m (HARTMANN 1966); 3100 m, *H.Hartmann 313!*; 3200 m, *E.Reiser 68* (Z!); terminal moraine 3110 m, *H.Hartmann 307!*; *310* (Z!); *311* (Z!); lateral moraine N Biafo base-camp 3180 m, *H.Hartmann 312* (Z!). **Saltoro:** Upper Hushe Vy., Ghondokoro Gl. tongue, common, 3350 m, *Nasir & Webster 6261* (K!, RAW, W!; WEBSTER & NASIR 1965). Kondus Gl. 4100-4200 m, 1961-06, *W.Axt* s.n. p.p. (W!).

N **Yarkand:** Surukwat Vy. 3700 m, *Dickoré 932!*.

W **Yasin:** Darkot 3110 m, *Bowes Lyon 8088* (K!). Dalti - Nazbardel 2600 m, 1957-08-09, *K.Ogino 453* (KITAMURA 1964). **Ishkoman:** Mahtantergah 3350 m, *F.Schmid 2203* (RAW). **Gilgit:** Naltar 3960 m, *R.R.Stewart 26298* (K!, RAW). Naltar Lakes 3170 m, *Schickhoff 45!; 46!*. Naltar Vy., Bichgari 3200 m, 1974-08-02, *F.Gartner* s.n. (GZU!). **Hunza:** Ulter nullah 2740-3350 m, 1954-06-26, *R.R.Stewart* s.n. (RAW). Boladas 2700 m, *Paffen 168* (W!). Oltali Chish 2600 m, 1955-06-10,

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S.Nakao s.n. (KITAMURA 1964). **Hispar:** Hispar - Chokutens 3350 m; Chokutens - Gandar 3660 m (CONWAY 1894). Hispar village area 3230 m, *Polunin 6352* (B!).

S **Shigar:** Thalle P. above Shigar, 1940-08-14, *R.R.Stewart* s.n. (RAW). **Skardu:** Skardu 2440 m, *R.R. & I.D.Stewart 17758* (RAW). Tormik Vy., Ganto P. W 3000-3300 m, 1991-07-01, *J.Poelt* s.n.!.

Unloc.: Ladakh 3660 m, *Kohli 26* (K!). "Yarkand Exp.", 1870-06-23, *Henderson 478* (K!: "*J. concinnus*"). Ladakh, Tog, *Koelz 2648d* (Ann.Cat.Pak.).

A: W & E Pamir 2300-3500 m (Fl.Tadzh.: *J. macrantherus*). Wakhan 3200-3300 m (PODLECH & ANDERS 1977). Chitral. Chilas: Gor Region, Martal 2970 m, *Nüsser 1138!*. Raikot Vy., Tato - Fairy Meadows 2670 m, *Nüsser 965!;* Lake Funtory 3300 m, *Nüsser 343!*. Fary, Buldar Vy. 2860 m, *Nüsser 1027!*. Astor: Shankargarh 2930 m, *Giles 655* (K!). Bulashbar Bridge, Astor Vy. 2420 m, *Nüsser 815!*. Kalapani 3050 m, *Schickhoff 1283a!*. Deosai. Dras: 3050 m, *Gammie* s.n. (K!). [Hardas - Dras], 1848-09-25, *T.Thomson* s.n. (K!). [Dras - Matayan], 1848-09-26, *T.Thomson* s.n. (K!). Matai up to the Tsoji P. (NE slopes of the P.), 1856-10-14, *Schlagintweit 6668* p.p. (W!). Suru: Karcha Nar 7 km W Gulmatunga 3600 m (SEYBOLD & KULL 1985). Middle Wakha Vy. 3600 m, *H.Hartmann 2713!*. Swat: Mahodan - Dishei 2500 m, 1957-07-21, *K.Hondo 96*; 2950 m, *K.Honda 105* (KITAMURA 1964). Hazara: Kaghan Vy. Kashmir: Sind Vy., *Stoliczka* s.n. (W!). Bangla 2440 m, *C.B.Clarke* 29530 (W!); 2740 m, *C.B.Clarke 29552* (W!). Alibad 3050 m, *C.B.Clarke 28687* (W!). Sonamarg 3050 m, *C.B.Clarke 24184* (W!). Tilail 3350 m, *C.B.Clarke 30700* (W!). Pir Pinjul 3050 m, *C.B.Clarke 28824* (W!); 3350 m, *C.B.Clarke 28770* (W!); *28371* (W!); *Levinge 27154* (W!). [Sanch P. - Shol], 1848-06-14, *T.Thomson* s.n. (K!). [Asdhari - Shol (2100-2680 m)], 1848-06-16, *T.Thomson* s.n. (K!). Chenab Vy., [Himor], 1848-06-19, *T.Thomson* s.n. (K!). [Umasi P., Chenab - Zanskar], 1848-2.6 [1848-06-20/23], *T.Thomson* s.n. (K!).

D: W Tian Shan, Pamir-Alai, Afgh., W Kashg., Karakorum, W Himalaya (Chitral - Sikkim). *W Centr.As.*

E: (?1830-) 3000-3700 m, subalp., not common. Alpine turf (S Karakorum); wet or shallowly flooded flushes, on moraine-gravel, riverside turf, *Myricaria bracteata* scrub.

? 245. Juncus sphacelatus DECNE. in JACQUEM., Voy. Bot. 172, pl.172. 1844

? *Juncus himalensis* var. *schlagintweitii* BUCHENAU 1890

Ic.: Fl.Xizang.5: fig.289.

S **Leh:** ? Kardong P. (STEWART 1916).

A: Zanskar: Kurgiakh - Gamburanjon 4200 m, 1992-08-08, *Holzner & Kriechbaum* s.n.!. ? Kargiag, *Koelz 5497* (Ann.Cat.Pak.: *J. himalensis* var. *schlagintweitii*). Kashmir: Pahlgam 4040 m, *C.B.Clarke 31065* (W!). Himachal Pr.: "In herbosis altissimis trans Kianbrong Ghati Kunawar", *Jacquemont 1798* (K! **type**). Lahul.

D: ? Inner Himalaya, S Tibet (Ladakh - Upper Tsangpo). ?*S Tibet.*

E: ? subalp. - alp., rare. Flushes.

N: See under *J. himalensis.*

246. Juncus thomsonii BUCHENAU, Bot. Zeit. (Berlin) **25**: 148. 1867

Ic.: Fl.Pak.138: fig.1(E-G). Fl.Tadzh.2: fig.40(5-6). Fl.Xizang.5: fig.282.

CS **Saltoro:** Ghondokoro Gl. 3960 m, *Nasir & Webster 6122* (K!, RAW; WEBSTER & NASIR 1965).

N **Mustagh Ata:** Kamper-Kishlak 4500 m, 1894-07-29, *S.Hedin* (OSTENFELD 1922). **Yarkand:** Aghil P. N 4620 m, *Dickoré 558!*.

S **Leh:** Taglang P. N 4400 m, 1992-07-21, *Holzner & Kriechbaum* s.n.!. S Rumtse 4500 m, *H.Hartmann 4123!*. **Pangong:** Panamik on the lake Tsomognalari to Durguk, 1856-07-01/04, *Schlagintweit 2557* (W!; Ann.Cat.Pak.). Pancong Tso, 1927-07-23, *Bosshard* (Z!).

E **Changchenmo:** Kiam 5100 m, *Bosshard* (Z!).

Unloc.: Tibet "close to water" 4860 m, *Thorold 102* (HEMSLEY 1894). Tsultak, *Koelz 2480* (Ann.Cat.Pak.).

A: W Kunlun: Tiznap Vy., N Kudi 3080 m, *Miehe 7543!*. Upper Tiznap Vy. 3650 m, *Miehe 8540!*. E Pamir. Deosai: 3960 m, *C.B.Clarke 29824* (K!); *R.R.Stewart 20096* (RAW). Zanskar: Nimaling Plains

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4750 m, *H.Hartmann 3046!*. Himachal Pr.: Spiti, N foot of Tari P. via Mud to S foot of Parang P., 1856-06-12/17, *Schlagintweit 6977* (W!). Rupshu: (4570-5490 m), *Stoliczka* (W!). Tsokar Lake, *Koelz 6611*; Tsakzhun Tso, *Koelz 2396* (Ann.Cat.Pak.). W Tibet: Gnari Khorsum, Laptel to Selchell and Hoti (S of the Satlej), 1855-07-16-19, *Schlagintweit 7058* (W!). Changtang: Camp 26 (N 34°38' E 82°10') 4830 m (DEASY 1901).

D: E Pamir, Kunlun, (?Inner) Himalaya, Tibet; Mongolia, NW China. *Centr.As.*

E: 3960-4620 m, alp., rare. Flushes, wet turf by rivulets (*Kobresia schoenoides*, *Dilophia salsa*, *Polygonum viviparum*). "Growing in dense tufts on banks of rivulet" (WEBSTER & NASIR 1965).

N: Closely related to *J. triglumis*, but anthers 1.5-2.0 mm long. At lower altitudes than *J. triglumis* on the Kunlun N slope.

247. **Juncus triglumis** L., Sp. Pl.: 328. 1753

Ic.: Fl.Tadzh.2: fig.40(7-8). Fl.Iran.75: pl.4 fig.2 (subsp. *wakhaniensis*)

CS **Biafo:** Karakorum [near Askole] 4110 m, 1876-08-10, *C.B.Clarke* s.n. (K!, BUCHENAU 1885).

N **Mustagh Ata:** N 3650 m, *Miehe 5458!*. **Karakash:** 15 km E Kirghiz-Dzhangil, 1959-06-02, *Junatov* (Pl.As.Centr.). W Xaidulla 4310 m, *Miehe 8303!*.

Unloc.: Tibet, Raj Hoti 4570 m, *Strachey & Winterbottom 2* (K!).

A: W Kunlun: Upper Tiznap Vy. 3950-4210 m *Dickoré 236!*; *958!*; *Miehe 8553!*. C.Kunlun: Kyuk-Egil Vy. 3750-3900 m, 1885-07-11, *Przewalsky* (Pl.As.Centr.). Wakhan: 3100-4300 m (PODLECH & ANDERS 1977); Badjens Vy. 4300 m, *Roemer 374*; Quazi Deh Vy. 3100 m, *Roemer 156* (M **type** subsp. *wakhaniensis*; Fl.Iran.).

D: Circumarctic - alp.: Eurasia (S to Karakorum, Himalaya, Tibet), Japan; N America. *Holarct.*

E: 3650-4310 m, subalp. - alp., rare. *Kobresia schoenoides*-fens, moist turf of flushes and seasonal water lines.

N: Anthers 0.3 - 0.7 mm long (see *J. thomsonii*). *Juncus triglumis* L. subsp. *wakhaniensis* SNOG., Fl. Iran. 75: 26. 1971, does not seem to be reasonably different from the typical plant.

* **Luzula campestris** (L.) DC. 1805 (*Juncus campestris* L. 1753) - **A**: Kashmir 1830-2740 m (Ann.Cat.Pak.). **D**: Temp. regions, trop. mont. **N**: The records from the Himalaya probably refer to **Luzula multiflora** (RETZ.) LEJ. 1811.

248. **Luzula spicata** (L.) DC. in LAM. & DC., Fl. Franc., ed. 3: 161. 1805

Juncus spicatus L. 1753

Ic.: Fl.Pak.138: fig.6(H-L). Fl.Tadzh.2: fig.40(1-2).

CS **Biafo:** Karakorum [near Askole] 4270 m, 1876-10-09, *C.B.Clarke 30248* (W!). Biafo Gl., *H.Hartmann 319* (RAW); Baintha 4130-4850 m; 4130 m, *H.Hartmann 317* (Z!); 4170 m, *H.Hartmann 318* (Z!); Skoro P. N 4170-4600 m (HARTMANN 1966); 4200 m, *H.Hartmann 319* (Z!). **Saltoro:** Ghondokoro Gl., 3960-4880 m, *Nasir & Webster 6222* (RAW); *6123a* (WEBSTER & NASIR 1965).

W **Yasin:** Naz Bar 4150 m, *Miehe 3447!*. **Gilgit:** Shinghai Gah - Pahot Gali 4000-4280 m, *Miehe 1082!; 1134!; 1239!; 1581!*. Baghrot Vy. 4270-4480 m, *Miehe 3701!; 3710!*. **Batura:** Gulmit - Atabad 4260-4300 m, *Miehe 2784; 2914!*.

S **Shigar/Lower Shyok:** Thalle P. (Ann.Cat.Pak.). **Skardu:** Satpura P., above Skardu, *R.R.Stewart 20225* (RAW). Burji P. (Ann.Cat.Pak.).

Unloc.: Karakorum 4270 m, *C.B.Clarke* (BUCHENAU 1885).

A: Wakhan: 4100-4700 m (PODLECH & ANDERS 1977). Kotal-e Wazit 4700 m, *Breckle A-1326* (Fl.Iran.). Chitral: Tirich Mir, Barum Gol 3700 m, *Wendelbo* s.n.; S Barum Gl. 4500 m, *Wendelbo* s.n. (Fl.Iran.). Chilas: Gor Region, Kahlimay 3610m, *Nüsser 1085/2!*. Raikot Gl., left lateral moraine, nunatak, Base camp area 4300-4430 m, *Nüsser 486!; 503!*. Ganalo Gl., right lateral moraine, nunatak, Base camp area 4200 m, *Nüsser 512!*. Upper Pattaro Vy., Guttum Sagar 4490 m, *Nüsser 1366!; 1387!*. Uppermost Pattaro Vy., Guttum Sagar - Kosto Gali 4860 m, *Nüsser 1408!*. Astor: Upper Rupal Vy.,

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ascent to Mazeno High Camp 4550 m, *Nüsser 1490!*. Deosai 3960 m, *C.B.Clarke 29831* (K!; W!). Hazara: Kaghan Vy., Babusar P. 3810-4300 m. Kashmir.

D: Circumarctic, S to Pakistan, Himalaya. *Holarct.*

E: 4000-4480 (-4850) m, alp., S & W Karakorum locally frequent, but confined to a narrow altitudinal belt. Rather humid alpine *Kobresia*-turf (longer snow cover), up to the highest turf spots of the free gelifluction belt, down to the humid scrub-belt (*Salix karelinii, Rhododendron anthopogon*), and drought limit in meadow steppes of the inner ranges (*Festuca olgae*). "Streambanks and tussocks" (WEBSTER & NASIR 1965).

N: "With little or no fodder value" (Fl.Pak.).

Juncaginaceae

Lit.:

BUCHENAU, F. G. P. 1903: *Juncaginaceae.* - In: ENGLER, A. (ed.), Das Pflanzenreich **16** (IV.14): 1-20.
DANDY, J. E. 1971: *Juncaginaceae.* - In: RECHINGER, K. H. (ed.), Flora Iranica **82**: 1-3.
GRUBOV, V. I. & al. 1971: *Juncaginaceae.* - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **6**: 52-54.
JAFRI, S. M. H. 1973: *Juncaginaceae.* - In: Flora of Pakistan **48**: 1-5.
OVCZINNIKOV, P. N. (ed.) 1957: *Juncaginaceae.* - In: Flora Tadzhikskoy SSR **1**: 103-106.

249. Triglochin maritima L., Sp. Pl.: 339. 1753

Ic.: Fl.Pak.48: fig.1(H-K). Fl.Tadzh.1: fig.14(3-4). Fl.Xizang.5: fig.8. Fl.Desert.Sin.1: fig.7(11-13).

CN **Shaksgam:** Upper Shaksgam Vy. 4060 m, *Dickoré 919!*.

N **Mustagh Ata:** N 3650 m, *Miehe 5448a!*. Sarykol Rv., 25 km S Bulunkul, Rd. to Taxkorgan 3800 m, 1959-06-12, *Junatov & al.* [Little] Karakul Lake 3600 m, *Miehe 5476!*. **Taxkorgan:** 3000 m, 1959-06-13, *Li & al. 300*. Dafdar 3510 m (PERSSON 1938). **Yarkand:** 3 km W Mazar 3850 m, *Dickoré 323!*. **Karakash:** Karakash Vy. 3960-4570 m (HENDERSON & HUME 1873). Abdul Gafuer Langar 4500 m, 1927-10-04, *Bosshard* (Z! **type** var. *fissa*; SCHMID 1932). 12 km W Xaidulla, Rd. to Kirgiz-Dzhangil 3900 m, 1959-06-03, *Junatov & al.* (Pl.As.Centr.). W Xaidulla 4310-4380 m, *Miehe 7849!; 8304!*.

S **Skardu:** Along canals, *Nasir & Webster 5777* (WEBSTER & NASIR 1965). **Leh:** Ladakh "common" (STEWART 1916). Fotu P., *R.R.Stewart* (Ann.Cat.Pak.). **Pangong:** Pancong Tso, 1927-07-24; 1927-07-27, *Bosshard* (Z!; SCHMID 1932).

E **Changchenmo:** Hot springs above Gokra 4880 m (HENDERSON & HUME 1873). Kiam 5100 m, 1927-08-11, *Bosshard* (Z!; SCHMID 1932). **Aksai Chin:** Lingzhi Tang & Aksai Chin "Kuenlun Plains at about 5100 m", *Picot* (HEMSLEY 1895). Kuenlun Plains (3510-5180 m), 1870-07-30, *Henderson 214* (K!).

Unloc.: Xinjiang - Tibet Rd., 27 km W Maygayty, 1959-06-03, *Li & al. 483* (Pl.As.Centr.). Tralse, *R.R.Stewart*; E Ladakh, *de Terra* (Ann.Cat.Pak.).

A: W Kunlun: Tügürmenlik Vy. 4200 m, 1928-07-18, *De Terra* (Z!; SCHMID 1932). Tiznap Vy., N Kudi 3080 m, *Miehe 7538!*. W & E Pamir (Fl.Tadzh.). Wakhan: Ptuch 3100 m, *Roemer 327* (Fl.Iran.). Chitral: Baroghil P., *Stainton 2996* (E; Fl.Iran., Fl.Pak.). Zanskar: Lagong, *Koelz 5427*; Chumikmarpo, *Koelz 5370* (Ann.Cat.Pak.). Himachal Pr.: Beyond Bara Lacha P. 4570 m, *S.R.Kashyap 13* p.p. (K!). Rupshu: Da - Hanle, *Koelz 2288c* (Ann.Cat.Pak.). W Tibet.

D: Circumarctic: N Africa; Eurasia S to Himalaya; N & S America. *Holarct.*

E: (3000) 3850-4500 (5100) m, subalp. (-alp.), generally not common, locally frequent in the N. Moist and ± saline habitats: naka-moors, fens and flushes (*Kobresia schoenoides, Carex orbicularis*), along water-courses, in the highest altitudes apparently associated with hot springs.

N: The species is at least rare on the Karakorum S slope, except for the Indus Vy., and apparently absent from the humid parts of Ladakh and Kashmir. The taxonomic value of var. *fissa* BÄR in SCHMID 1932: 31, "Columella apice ± fissa", described from the *Bosshard*- and *De Terra*-material, is unknown.

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250. Triglochin palustre L., Sp. Pl.: 338. 1753
Triglochin himalensis ROYLE 1839

Ic.: Fl.Pak.48: fig.1(A-G). Fl.Tadzh.1: fig.14(1-2). Fl.Xizang.5: fig.4. Fl.Desert.Sin.1: fig.7(14-16).

CN **K2-North:** Muztagh Vy., Sughet Jangal 3930-3950 m, *Dickoré 879!*. **Shaksgam:** Upper Shaksgam Vy. 4060 m (*Dickoré*).

CS **Saltoro:** Near mouth of Hushe and Saltoro Rv. 2440 m (WEBSTER & NASIR 1965). **Nubra:** [Lower Nubra Vy.], 1848-07-28, *T.Thomson* s.n. (K!); 1848-09-04, *T.Thomson* s.n. (K!).

N **Mustagh Ata:** N 3650 m, *Miehe 5448!; 5449!; 5460!*. Tagarma, 1913-07-23, *Knorring* (Pl.As.Centr.). **Taxkorgan:** 4 km W Taxkorgan, 1959-06-13, *Junatov* (Pl.As.Centr.). **Yarkand:** Ilyk 3520 m, *Dickoré 398!*; Surukwat Vy. 3700 m. **Karakash:** Karakash Vy. 4270 m (HENDERSON & HUME 1873). W Xaidulla 4310 m, *Miehe 8304!*; Xaidulla 3750 m, *Miehe 8333!*.

W **Batura:** Borit Jil 2500 m, *F.A.Perrot 17* (K!). Khaibar 2400-2700 m, *Klötzli & al. 801.47,96,103!*.

S **Leh:** Indus Vy., Ladakh 3350 m (HENDERSON & HUME 1873); "common" (STEWART 1916). **Shyok:** [Calzar - Diskit], 1848-07-25, *T.Thomson* s.n. (K!).

E **Changchenmo:** Kiam 5100 m, 1927-08-11, *Bosshard* (Z!; SCHMID 1932). Kiam - Lumkang 5200 m, 1927-08-27, *Bosshard* (Z!).

Unloc.: 1870-07-31, *Henderson 230* (K!). Raj Hoti 4570 m, *Strachey & Winterbottom 1* (K!). Tibet 4940 m, *Thorold 89* (K!).

A: Kongur: 100 km S Kashgar, Rd. to Taxkorgan, 1959-06-15, *Junatov* (Pl.As.Centr.). W Kunlun: Tiznap Vy., Kudi 3000 m, *Dickoré 172!*; N Kudi 3080 m, *Miehe 7539!*. W Pamir, E Pamir (Fl.Tadzh.). W side of Lake Merganser, Karakol Lakes 75°E 38°N, 3890 m, *W.J.Budenberg & S.T.Meech 45* (K!). Chitral: Khot An, *Stainton 2859* (E). Mastuj, *Bowes Lyon 901* (E). 2000-3300 m. Astor: Rattu, *R.R.Stewart* s.n. (RAW). Deosai: common (STEWART 1961). Zanskar [Umasi P.], 1848-2.6 [1848-06-20/23], *T.Thomson* s.n. (K!). Swat: Utror - Gabrel, *Nasir & Z.Ali* s.n. (RAW). Hazara: Kaghan Vy. 3410 m. Kashmir: Kishenganga Vy., *R.R.Stewart 17841* (RAW). Tilel, *R.R.Stewart 18583* (RAW). Himachal Pr.: Beyond Bara Lacha P. 4570 m, *S.R.Kashyap 13* p.p. (K!). Rupshu: Hanle, *Koelz 2314* (Ann.Cat.Pak.).

D: Eurasia S to Himalaya, N Africa, N America, S America (Chile). *Holarct.*

E: (2400) 2700-4060 (5200) m, mont. - subalp. (-alp.), scatted, locally abundant. Wet or shallowly flooded sands, fens and flushes (*Carex orbicularis, C. microglochin*); usually better drained, moister and less saline habitats than *T. maritimum*, but also often occuring together with this.

* Lemnaceae

Lit.:
EGOROVA, T.V. 1967: *Lemnaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **3**: 90-91.
HASHMI, R. Y. & OMER, S. 1986: *Lemnaceae*. - In: Flora of Pakistan **173**: 1-11.
RIEDL, H. 1976: *Lemnaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **119**.

* **Lemna gibba** L. 1753 - **A**: Hazara: Shogran 2340 m, *R.N.Parker 3405* (K!). Kashmir: Dal Lake 1680 m, *R.R.Stewart 3379* (K!). Scinde Vy., Gund 2130 m, *R.R.Stewart 7159* (K!). Himachal Pr.: Upper Chenab, Padar 1830 m, *R.R.Stewart 2955* (K!). **D**: Europe, SW Asia, India, Africa, N & S America.

* **Lemna minor** L. 1753 - **A**: W Kashg.: Kashgar, in rice fields 1330 m (PERSSON 1938). Yengisar, *Popov*. Swat. Kashmir: Dal Lake 1680 m, *R.R.Stewart 3348* (K!). Anchar Lake, *R.R.Stewart 3370* p.p (K!). **Unloc.:** Tibet occ. temp. 2130 m, *T.Thomson* s.n. (K!). **D**: Temp. Eurasia, Africa, N America, New Zealand. **N**: The specimen "W Tibet", *T.Thomson*, unfortunately without date and further references, may be from Ladakh; to be expected along the Indus.

* **Lemna perpusilla** TORREY 1843 (*Lemna paucicostata* HEGELM. 1868) - **N**: May be found in adjacent regions. **D**: Pantrop. and subtrop.

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* **Lemna turionifera** LANDOLT 1975 - **A**: Kashmir. **D**: Siberia, C. & E Asia, India, N America.

* **Spirodela polyrrhiza** (L.) SCHLEIDEN 1839 (*Lemna polyrrhiza* L. 1753). **A**: Swat. Kashmir: common. Ganderbal 1680 m, *R.R.Stewart 7164* (K!). Dal Lake 1680 m, *R.R.Stewart 3337* (K!). **D**: Cosmopolite.

* **Wolffia arrhiza** (L.) HORKEL ex WIMMER 1857 - **A**: Kashmir. **D**: Cosmopolite.

Liliaceae

Lit.:

DASGUPTA, S. & DEB, B. D. 1985: Taxonomic revision of the genus *Tulipa* L. in India and adjoining regions. - Candollea 40: 157-173.

DASGUPTA, S. & DEB, B. D. 1986: Taxonomic revision of the genus *Lloydia* (*Liliaceae*) in India and adjoining region. - Ind. J. Forestry **9**: 104-112.

GRUBOV, V. I. & EGOROVA, T. V. 1977: *Liliaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **7**: 7-87.

NOLTIE, H. J. 1993: Notes relating to the Flora of Bhutan: XX. *Lloydia* (*Liliaceae*). - Edinb. J. Bot. **50** (1): 51-57.

PASCHER, A. A. 1907: Conspectus *Gagearum* Asiae. - Bull. Soc. Nat. Moscou, nov. ser., **19**: 353-375.

RECHINGER, K. H., BROWICZ, K., PERSSON, K. & WENDELBO, P. 1989: *Liliaceae* II. - In: RECHINGER, K. H. (ed.), Flora Iranica **165**: 1-194, pl. 1-180.

STROH, G. 1937: Die Gattung *Gagea* SALISB. - Beih. Bot. Centralbl. **57**(3): 485-520.

WENDELBO, P. 1958: *Liliaceae*. - In: Symbolae Afghanicae 4. - Biol. Skr. Dan. Vid. Selsk. **10**(3): 151-166.

* **Fritillaria imperialis** L. 1753 - **A**: Chitral (typical and var. *chitralensis* with yellow flowers). Kashmir. **D**: SE Anatolia, NE Iraq - Iran, Afgh., NW Pakistan (Chitral), Kashmir.

* **Fritillaria roylei** HOOKER 1852 (*Fritillaria guilelmi-waldemarii* KLOTZSCH in KLOTZSCH & GARCKE 1862) - **A**: Astor: Kalapani 3050 m, *Schickhoff 1278!*. Deosai: Burzil P. (STEWART 1961). Dras: Zoji - Matayan (STEWART 1917). Suru: Suru-Wardwan. Swat. Hazara: Kaghan Vy., Burji, *Duthie 22619* (K!). Burj Danna 3050 m, *Schickhoff 433* (K!). Above Battakundi 3500-3600 m, *Miehe 71* (K!). Kashmir: Baltal, 1927-06-27, *Trinkler* s.n. (Z!; BOSSHARD 1932). Burzil P. **D**: W Himalaya: Swat - Kashmir, ?Kumaon. **N**: Doubtfully distinct from **Fritillaria cirrhosa** D. DON 1825, from E Himalaya: Nepal - Bhutan, S Tibet, N Burma.

Gagea:

The present stage of examination and species delimitation in the area appears to be more or less a chaos, no consistent revision is available. The number of recorded species appears far too high. The genus certainly exhibits a high degree of variation in the Irano-Turanian region (W Pamir-Alai), but the number of species quickly diminishes towards the East. Realistically, 5-8 species are to be expected for Kashmir, around 4 for the Karakorum, and only one species (*G. elegans*) appears to be distributed throughout the Himalaya. At present can be given only a highly speculative combined list of the various taxa recorded from the Karakorum and adjacent areas, and occasional herbarium material.

* **Gagea capillifolia** VVED. 1923 (*Gagea stipitata* auct. non MERCKL. O. FEDTSCH. 1930) - **A**: W Pamir, E Pamir 2200-4000 m (Fl.Tadzh.). **D**: Tian Shan, Pamir-Alai, ?Kopet Dag.

* **Gagea chitralensis** DASGUPTA & DEB 1983 - **A**: Chitral: Bomboret Gol (35°41' E 71° 38') 2440 m, *Bowes Lyon 611* (BM! **type**). **D**: W Pamir-Alai, Chitral. **N**: A diminutive form of unknown affinity.

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251. Gagea dshungarica REGEL, Acta Horti Petrop. 6: 513. 1880

? *Gagea persica* auct. non BOISS. 1846, ? *Gagea kashmirensis* auct. non TURRILL 1928

W **Yasin:** Darkot 2960 m, *Bowes Lyon 8085* (K!). **Ishkoman:** Karambar Gl. 3440-3660 m, *Bowes Lyon 8221* (K! "*G. kashmirensis*").

S **Skardu:** Ganto P. W 3530 m, *Miehe 4749!*.

A: Chitral: Arandu 1070 m; Drosh 1370 m, *Toppin 18* (K!). Shishi Vy. 2440 m, *Bowes Lyon 623* (BM!); *624* (BM!). Astor: Harchu Vy., right slope above Baro-Nirril 3230 m, *Nüsser 883!*. Lower Rupal Vy., Bayals - Chungphare 3200 m, *Nüsser 792!*. Hazara: Kagan Vy. 2440 m, *Inayat 20241* (K!). Kashmir: Pir Panjal, 1847-05-06, *Winterbottom 109* (K!). Srinagar 1520-1830, *B.O.Coventry* (K!). Sonamarg 2440 m, *Stainton 8641* (BM!). Yusimarg 1830 m, *Stainton 8635* (BM!). Tangmarg 2130 m, *P.Timins 22* (BM!). (1830-2440 m), 1848-04-19, *T.Thomson* s.n. (K!).

D: Dzhung. Alatau, Tian Shan, W Pamir-Alai, Kopet Dagh, Afgh., NW Pakistan. *W Pamir.*

E: 2960-3440 (3660) m, mont., rare in the S & W. Relatively humid open places.

252. Gagea elegans WALL. ex D. DON in ROYLE, Ill. Bot. Himal. 387, pl. 95, fig. 2. 1839

Gagea lutea auct. non KER-GAWLER: ? KITAMURA 1964

CS **Biafo:** Cho Blok 4180 m, *H.Hartmann 334* (Z!); *336!* (HARTMANN 1966: "*G. persica*"). **?Baltoro:** Liligo - Urdokas 3700 m, *Nakao* s.n. (KITAMURA 1964: "*G. persica*"). **Saltoro:** At base of cliffs along Ghondokoro Gl. 3960 m, *Nasir & Webster 6021* (WEBSTER & NASIR 1965).

W **Yasin:** Darkot 3350 m, *Bowes Lyon 8154* (K!). Yasin - Darkot E side 3870 m, *Bowes Lyon 8125* (K!). **Gilgit:** Gilgit, *Biddulph* s.n. (K!). Naltar Lakes 3660 m, *R.R.Stewart 26319* (BM!). Dirran Camp 3020 m, *Conway* (CONWAY 1894 "*G. lutea*"). **Hunza:** Above Toltar 3750-4000 m, *Paffen 56* (M!). Baltar 3500 m, *Paffen 119* (M!). N Chaprot 3150 m, *Klötzli & al. 52.13* (K!). Zangia Harar 3960 m, *R. Scott Russell 1035* (BM!). **Hispar:** Hispar Gl., N lateral moraine 4000 m, *Koncza* (CALCIATI & KONCZA 1909 "*G. lutea*; *G. reticulata*"). **Khunjerab:** Bara-Khun Vy. 4000 m, *Visser-Hooft* (DOLK 1929 "*G. lutea* ?").

S **Skardu:** Ganto P. W 4040 m, *Miehe 4755!*.

A: Chitral: Owir An SE Tirich Mir 3660 m, *Stainton 2759* (BM!). Chilas: Kahlimay, Gor Region 3610 m, *Nüsser 1116!*. Astor: Rasparin, Gurais, *Winterbottom 222* (K!); Kamri Kotul 3960 m, *Giles 128* (K!); Shankargarh 2900 m, *Giles 113* (K!). Rama Vy., *Lankester & Pearson 1395* (BM!). Harchu Vy. 3540 m, *Nüsser 837!*. Lower Rupal Vy., Bayals - Chungphare 3150 m, *Nüsser 797!*. Upper Rupal Vy., Tap Plain, 3460-3490 m, *Nüsser 724!* (cf.); *742!*.Zanskar: Taglang P. SE 5130 m, *H.Hartmann 4135!*. Sarchu 4500 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Surichun P. - Kargiakh 4800 m, 1993-07-27, *Holzner & Kriechbaum* s.n.!. Swat. Hazara. Kashmir: common; 1848-04-18, *T.Thomson* s.n. (K!); 1848-04-20, *T.Thomson* s.n. (K!), 1848-04-21, *T.Thomson* s.n. (K!); 1848-05-03, *T.Thomson* s.n. (K!); 1848-05-08, *T.Thomson* s.n. (K!); 1848-06-01, *T.Thomson* s.n. (K!); 1848-06-10, *T.Thomson* s.n. (K!). [Pangi, foot of Sanch P.], 1848-06-12, *T.Thomson* s.n. (K!). [Umasi P. S], 1848-06-20, *T.Thomson* s.n. (K!). Thajiwas, *N.K.B.Robson 2027* (BM!). Sind Vy., Wosan 1830 m, *Ludlow & Sherriff 7572* (BM!). Zojpal, 1914-06, *M.A.Evershed* s.n. (BM!). Barnaj Nullah, Sapphire Mines 3050 m, *Ludlow & Sherriff 9163* (BM!). Himachal Pr.: Lahul. Uttar Pr.: Kumaon, Pindari 3660 m, *Strachey & Winterbottom* s.n. (BM!).

D: W Himalaya: Chitral - Sikkim. *W Himal.*

E: 3020-4180 m, subalp. - alp., scattered. Moist open places, rocks, forest.

N: Often included in **G. lutea** (recently: Fl.Bhutan).

* **Gagea exilis** VVED. 1946 - **A**: W Pamir, E Pamir 2300-4000 m (Fl.Tadzh.). Wakhan 4400 m (PODLECH & ANDERS 1977). **D**: E Pamir-Alai.

* **Gagea gageoides** (ZUCC.) VVED. 1932 (*Bulbillaria gageoides* ZUCC. 1843, *Gagea amblyopetala* auct. non BOISS. & HELDR.: REGEL 1876, *Gagea persica* BOISS. 1846) - **A**: S Tadzh. 900-2200 m (Fl.Tadzh.). Chitral: Ziarat, Lowari P. 2440 m, *Stainton 2338* (BM!). Kashmir: (1520-2130 m), 1848-04-21, *T.Thomson* s.n. (K!). **D**: Tian Shan, W & S Pamir-Alai, Kopet Dag, Iran. **N**: "Is this the bulbil bearing form of *G. dschungarica* ?" (Ann.Cat.Pak.).

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253. **Gagea gracillima** PAMP., Agg. Fl. Carac. 156. 1934

Ic.: HARTMANN 1966: fig.5.

CS **Biafo:** Cho Blok 4180-4250 m (HARTMANN 1966); 4250 m, *H.Hartmann 331!*; *337* (Z!); 3900 m, *E.Reiser* (Z!). **?Saltoro:** Ghondokoro Gl. 4270 m, *Nasir & Webster 6019* (WEBSTER & NASIR 1965: "*G. gageoides*"). **Nubra:** Siachen Gl., base camp 4750-4800 m, 1930-07-19, *Dainelli* (PAMPANINI 1934, **type**).

W **Khunjerab:** Dhee Sar Vy., 4150-4420 m, *Ebenhöh* s.n. (M!).

S **Leh:** Tirdik, upper Bedashisa Vy., near Sabu 4900 m, *Billiet & Leonard 6866* (K!).

Unloc.: Nubra and Shaksgam Vy., *Clifford 46* (Ann.Cat.Pak.: *G. persica*); Sutyalik 4360 m, *Clifford 46* (K!).

D: S & W Karakorum. *Endem.*

E: 3900-4900 m, alp., scattered. Relatively humid alpine turf; "locally common on grassy banks" (WEBSTER & NASIR 1965).

N: A doubtful and poorly understood species.

* **Gagea jaeschkei** PASCHER 1904 (*Gagea pamirica* GROSSH. 1935) - **A**: Reported from E Pamir: Ucha, 1909-06-17, *Divnogorskaya* (Pl.As.Centr.). Wakhan 4200 m (PODLECH & ANDERS 1977). Asankitchal 4600 m, *Breckle 1362* (Fl.Iran). **D**: NE Afgh., Pamir-Alai, Himalaya: Chitral - Himachal Pr. **N**: Perhaps only a form of *G. elegans*.

* **Gagea kashmirensis** TURILL 1928 - **A**: Kashmir 1520-1830 m. **D**: Endemic. **N**: Of doubtful status.

* **Gagea lowariensis** PASCHER 1910 - **A**: Chitral: Madaklasht 2440 m, *Bowes Lyon 625* (BM!). Lowari P. 2740 m, *Stainton 2331* (BM!). Bundai 2830 m, *Harriss 16698* (BM!). Swat: E Kalam 3000 m, *Lamond 1833* (Fl.Iran.). Hazara (Ann.Cat.Pak.). **D**: E Afgh., NW Pakistan. **N**: RECHINGER in Fl.Iran. considers it a well marked species. R.R.STEWART's view "This is probably only a vigorous form of the common *G. elegans*" (Ann.Cat.Pak.) is perhaps more appropriate.

* **Gagea olgae** REGEL 1865 - **A**: Wakhan: Baroghil 3810 m, *Bowes Lyon 1006* (BM!). Chitral: Owir (Nichagh) 3510 m, *Bowes Lyon 876* (BM!); *Bowes Lyon 887* (BM!). Birmogh Lasht (N 35°55' E 71°46') 3350 m, *Bowes Lyon 733* (BM!). Turikho Rv., Istar 3200 m, *Stainton 2495* (BM!). **D**: Iran, Afgh., W Pamir-Alai, NW Pakistan. **Gagea setifolia** BAKER 1881 (see there) and **Gagea chomotuwae** PASCHER 1907 are closely related.

* **Gagea pseudoreticulata** VVED. 1932 - Reported from **Hunza:** Chalt (Ann.Cat.Pak.); doubtful. **A**: W Pamir 400-2400 m (Fl.Tadzh.). **D**: W Tian Shan, W Pamir-Alai, Afgh.

254. **Gagea setifolia** BAKER, J. Linn. Soc., Bot. 18: 101. 1881

Gagea aitchisoniana A. TERR. 1904

W **Gilgit:** Haramosh 2740 m, 1928, *F.Ludlow 251* (BM!).

A: W Pamir, E Pamir 2300-3400 m (Fl.Tadzh.). Chitral: Owir 3350 m, *Bowes Lyon 873* (BM!); 3810 m, *Bowes Lyon 881* (BM!). Khot An N Mastuj 3960 m, *Stainton 2847* (BM!). Astor: Harchu Vy., left slope above Lathang, 3480 m, *Nüsser 863!;* right slope above Baro-Nirril3230 m, *Nüsser 875!.* Deosai: Deosai 3300-3600 m, 1991-07-12, *Poelt* s.n.!.

D: S Iran, Afgh., Pamir-Alai, NW Pakistan (Kurram, Chitral, SW Karakorum). *Ir.-Tur.*

E: 2740 m, mont., rare in the SW. Habitat unknown.

* **Gagea vvedenskyi** GROSSH. 1935 - **A**: W Pamir, E Pamir 900-3600 m (Fl.Tadzh.). **D**: Tian Shan, Pamir-Alai.

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255. Lilium polyphyllum D. DON in ROYLE, Ill. Bot. Himal. 388. 1839

W **Gilgit:** Shinghai Gah - Pahot Gali 3240 m, *Miehe 1453* (K!); *Miehe 1457!* (veg.); 3030-3360 m, *Miehe 1708!* (veg.).

A: Chitral: Drosh Nullah 2900-3200 m, *Toppin 763* (K!). Swat: Utrore 2290 m, *E.Nasir & Zaffar Ali 3994* (W!). Hazara: Sari Hut 2740 m, *Muqarrab Shah & Dilawar Khan 2171* (W!). Kaghan Vy. Kashmir 2130-3050 m.

D: W Himalaya: E Afgh. - Kumaon. *W Himal.*

E: (3030) 3240 (3360) m, mont., rare. *Picea smithiana* forest, with *Polygonatum geminiflorum.*

N: Vegetative plants are very easily confused with *Fritillaria roylei* and *Polygonatum verticillatum* s.l., which often grow in the same localities. Under the microscope, it may be distinguished by the undulate hyaline leaf-margin from *Fritillaria roylei* (leaf margin smooth, green) and *Polygonatum verticillatum* s.l. (leaf margin ± papillose).

* **Lloydia longiscapa** HOOKER 1852 - **A**: Himachal Pr.: Rothang P. 3400-4000 m, *Holzner & Kriechbaum* s.n.!; *Aswal 10556* (ASWAL & MEHROTRA 1994). Uttar Pr.: Byundar Vy., NE road Josimath - Badrinath 4000-4200 m, *Billiet & Leonard 6623* (K!). **D**: C. Himalaya: ?Kashmir, Himachal Pr. - Kumaon - Bhutan, S Tibet, W China). **N**: Although very distinct in flowering stage (nodding flowers, filaments hairy), fruiting or vegetative specimens may be difficult to distinguish from *L. serotina*. It may be distinguished by the numerous leaves and by the bulb-coating, which appears to be more membranaceous, rather than coriaceous as in *L. serotina.*

256. Lloydia serotina (L.) REICHENB., Fl. German. Excurs. 102. 1830

Bulbocodium serotinum L. 1753, *Lloydia alpina* SALISB. 1812, *Lloydia himalensis* ROYLE 1839

Ic.: Fl.Xizang.5: fig.296(1-3).

CN **Braldu:** Pamir P. S, near Shuwart 4760-4770 m, *Miehe 6102!* (veg.). **K2-North:** K2-N Gl. W 4550 m, *Dickoré 731!* (veg.).

CS **Shimshal:** Pamir P. 4720-4790 m, *Miehe 6302!*. **Biafo:** Skoro P. N 4200 m; Laskam 4430 m; Cho Blok 4210-4280 m; Gense 4000-4510 m; Mango 3730-4220 m; 4150 m, *H.Hartmann 340!*; Baintha 4230-4700 m (HARTMANN 1966). **?Biafo/Shigar:** Karakorum [? probably Skoro P.] 4420 m, 1876-08-08, *C.B.Clarke 30190* (K!). **Baltoro:** Rdokass 4020 m, *De Filippi* (PIROTTA & CORTESI 1912). Liligo - Urdokas along Baltoro Gl. 3700 m, *Nakao* s.n. (KITAMURA 1964). **Saltoro:** Ghondokoro and Chogolisa basins, common, 3960-4880 m, *Nasir & Webster 6139; Francis 9; Francis 32* (WEBSTER & NASIR 1965). Ghondokoro Gl. 4270 m, *Nasir & Webster 6028* (K!). Above Hushe 4150 m, *Miehe 1934!*. Kondus Gl. 4100-4200 m, 1961-06, *W.Axt* s.n. (W!). **Nubra:** Siachen Gl., base camp 4750-4800 m, *Dainelli* (PAMPANINI 1934).

N **Mustagh Ata:** W 4520 m, *Miehe 5545!; 5550a!*; SW 4280-4360 m, *Miehe 5926!* (veg.). Hills W [Little] Karakul 4280 m, *Miehe 5381!*. **Mintake:** S Taxkorgan, above Mazar 4330 m, *Miehe 5658!*.

W **Ghizar:** Zagar An 4500 m, *K.Ogino 543* (KITAMURA 1964). **Yasin:** Darkot SW side 3510 m, *Bowes Lyon 8145* (K!). Nazbar P. 4600 m, *Honda 250* (KITAMURA 1964). Naz Bar 4180-4300 m, *Miehe 3194!; 3229!*. **Gilgit:** Shinghai Gah - Pahot Gali 3690-4470 m, *Miehe 929!* (veg.); *963!* (veg.); *1034* (K!); *1079!; 1112!; 1138!; 1256!; 1562!* (veg.). Baghrot Vy. 3640-3850 m, *Miehe 3774!; 3977!; 4287!*. **Hunza:** Daintar (3200-3900 m), *Lobbichler 112* (M!). Upper Shispar Vy. 3700 m, *Paffen 254* (M!). N Chaprot 3600 m, *Klötzli & al. 60.13* (K!). **Hispar:** Hispar Gl., N lateral moraine 4700 m, *Calciati* (CALCIATI & KONCZA 1909). Gandar Chish - Haigutum 3960-4240 m, *Conway B 200* (K!; CONWAY 1894). Gharesa Gl. base camp 13 miles E of Nagar 4750 m, *O.Polunin 6112* (B!). **Batura:** Gulmit - Atabad 4000-4050 m, *Miehe 2945!* (veg.). E Morkhoon 4300 m, *Klötzli & al. 39.07!*. **Khunjerab:** Buksel Vy. 4000 m, *Visser-Hooft* (DOLK 1929). Khunjerab P. SW 4650-4720 m, *Miehe 2337!* (veg.); *2368!; 2370!*.

S **Shigar/Lower Shyok:** Thalle P. (STEWART 1961). **Skardu:** Ganto P. W, 3000-3850 m, *Miehe 4744!; 4837!*. **Leh:** Upper Bedashisa Vy., near Sabu, Tirdik 4800 m, *Billiet & Leonard 6863* (K!). **Shyok:** [Shyok passage to Nubra], 1848-07-26, *T.Thomson* s.n. (K!).

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E **Upper Shyok:** [Sassir P. - Murgai], 1848-08-13, *T.Thomson* s.n. (K!). **Depsang:** Valletta Camp (no. 17) 4850 m, *Dainelli & Marinelli* (PAMPANINI 1930). Rimu Gl. 5200-5400 m, *Antilli* (PAMPANINI 1926).

A: W Kunlun: Ak-kez P., 1959-06-05, *Junatov & Yuan* (Pl.As.Centr.). Akaz P. 3230-3300 m, *Miehe 7403!*; 3710 m, *Miehe 8589!*. Tiznap Vy., W Kudi 4200 m, *Miehe 8439!*. Upper Tiznap Vy. 4260 m, *Miehe 7693!*. C.Kunlun: 3450-3950 m (Pl.As.Centr.). W Pamir, E Pamir (Fl.Tadzh.). Wakhan: Futur Vy. 3800 m, *Roemer 91* (W!). Nuristan. Chitral: Chatiboi Gl. - Pechus Gl. < 4400 m, *Stamm & Wöhrl 177* (W!). Chilas: Upper Kosto Vy. 4300 m, *Nüsser 1413!*. Astor: Gurais P. N, 1847-06-28, *Winterbottom 570* (K!). Upper Rupal Vy., ascent to Mazeno High Camp 4500 m, *Nüsser 1487!*. Deosai: E 4200-4600 m, *Miehe 5109!; 5165!*. Burzil, Deosai 3050-4570 m (STEWART 1961). Zanskar: [Umasi P. N], 1848-06-23, *T.Thomson* s.n. (K!). [Takti P.], 1848-07-01, *T.Thomson* s.n. (K!). Kargia, *Koelz 5557*. Sumdo 4800 m, 1992-07-29, *Holzner & Kriechbaum* s.n.!. Sarchu 4500 m, 1992-07-30, *Holzner & Kriechbaum* s.n.!. Swat. Hazara: Kaghan Vy., Babusar P. 3810-4300 m, *Miehe 142!* (veg.); *165!; 166!* (veg.); *292!; 510!* (veg.). Kashmir: Above Burzil, *Winterbottom 570* (K!). Gulmarg, Apharwat 3350 m, *J.Venning* (K!). [Umasi P. S], 1848-06-20, *T.Thomson* s.n. (K!). Himachal Pr.: ? Near Yerpa Monastery, *R.S.Kennedy 15* (K!, veg.). Lahul; Chatru, *Aswal 6935* (ASWAL & MEHROTRA 1994). Rohtang P., *Holzner & Kriechbaum* s.n.!. Rupshu: Tsakzhun Tso, *Koelz 2415i*. Hanle, *Koelz 2312a*.

D: Circumarctic - alp., S to Caucasus, Pamir, Hindukush, Himalaya, Japan. *Holarct.*

E: (3000) 3510-4850 m, alp., common in the SW, rare or absent in the NE. Alpine turf, meadow-steppes, among rocks, on open screes.

N: Variable; some plants from the Karakorum S slope are very robust (some N American as well). Since there seems to be no clear altitudinal/ecological separation inside the Karakorum population, regarded as belonging all to *L. serotina*. The genus, however, is polymorphic in the Himalaya. A key is given in Enum.Pl.Nepal and, recently, in Fl.Bhutan. The leaves of *L. serotina* (and other species of *Lloydia* ?) are collected as a Tibetan drug (*Kennedy 15*).

* **Notholirion thomsonianum** (ROYLE) STAPF 1934 (*Fritillaria thomsonianum* ROYLE 1839, *Lilium roseum* WALL. ex HOOKER f. 1853) - **A**: Swat. Hazara. Kashmir 610-1520 m. **D**: W Himalaya: E Afgh. - Nepal.

257. Tulipa clusiana DC. in REDOUTÉ, Les Liliacées 1: tab. 37. 1803

Tulipa stellata HOOKER f. 1827

Ic.: GREY-WILSON 1974: pl.9 (var. *chrysantha*).

W **Hunza:** N Chaprot 3590 m, *Klötzli & al. 4.29* (K!: fr.).

S **Shigar:** Turmik Nala 3350 m, *F.Ludlow 298* (BM!). Upper Basna Vy., above Gon 3160-3320 m, *Miehe 4990!*. S Gon 3000-3100 m, 1991-07-09, *J.Poelt* s.n.!. **Skardu:** Pakora, Ganto P. W 3550-3850 m, 1991-07-01/04, *J.Poelt* s.n.!.

Unloc.: Ladakh, *Meebold 4132* (CAL, DASGUPTA & DEB 1985).

A: Chitral: Ziarat 2440 m, *Harriss 16695* (BM!). Bomboret Gol 2440 m, *Bowes Lyon 603* (BM!). Chitral - Mastuj Track, Kuragh 2740 m, *Stainton 2525* (BM!). Astor: Astor - Doyan, *W.M.Conway 340* (K!). Kalapani 3200 m, *Giles 157* (K!). Rattu - Gurikot 2500-2800 m, *F.Schmid 1764* (BM!). Harchu Vy., left slope above Baro-Nirril 3220 m, *Nüsser 866!*. Lower Rupal Vy., above Churit 3560 m, *Nüsser 759!*. Dras: 4 miles above Dras 3170 m, *B.B.Osmaston 108* (K!). Dras 3140 m, *Schomburg 40* (BM!); 3200 m, *Ludlow & Sherriff 8320* (BM!). Indus Vy., Dras 2740 m, *P.M.Kohli* s.n. (K!). Suru: *T.Hay* s.n. (K!). Swat. Hazara: Kagan Vy. 2290 m, *Inayat 25763* (K!). Kashmir: Kashmir Vy., Daksum 2130 m, *Stainton 7529* (BM!). Sind Vy., Baltal 2960 m, 1925-04-10, *Meinertzhagen* s.n. (BM!). Bandapur, Wular Lake 1580 m, *Ludlow & Sherriff 7589* (BM!). Liddar Vy. 1980 m, *F.Ludlow 10* (BM!). Batkoot, Pahlgam 1980 m, *Ludlow & Sherriff 7600* (BM!). Himachal Pr.: Jaunsar, Moila P. S 2440-2740 m, *Duthie 14451* (BM!). Uttar Pr.: Kumaon, Almora 1520 m, *Strachey & Winterbottom* s.n. (BM!).

D: Anatolia, Iran, Afgh. - W Himalaya: Nuristan - Uttar Pradesh. *Ir.-Tur.*

E: 3000-3850 m, mont. - subalp., rare in the S. Open grassy slopes, *Betula jacquemontii* forest.

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N: Early flowering and probably undercollected in the Karakorum. The Karakorum populations belong to f. **porphyreochrysantha** (BLATTER) DASGUPTA & DEB (? var. *chrysantha* BOISS. in KLOTZSCH) with flowers yellow suffused with red. The f. **clusiana**: flowers white to pink with pink blotch (Chitral, Swat, Kashmir, Uttar Pradesh) and f. **stellata** (HOOKER) DASGUPTA & DEB (var. *stellata* (HOOKER f.) REGEL): flowers white to pink with yellow blotch (Hazara, Kashmir, Himachal Pr., Uttar Pradesh), apparently are confined to lower elevations and more humid situations.

* Melanthiaceae

* **Aletris pauciflora** (KLOTZSCH) HANDEL-MAZZ. 1936 (*Stachyopogon pauciflorus* KLOTZSCH in KLOTZSCH & GARCKE 1862) - **A**: Hazara. Kashmir. Himachal Pr.. **D**: Himalaya: Hazara - Bhutan, SE Tibet, W China.

Najadaceae

Lit.:
DANDY, J. E. 1971: *Najadaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **86**: 1-2.
GRUBOV, V. I. & al. 1971: *Najadaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis **6**: 51-52.
RENDLE, A. B. 1901: *Najadaceae*. - In: ENGLER, A. (ed.), Das Pflanzenreich **7** (IV.12): 1-2.
RIZWAN Y. HASHMI & SAOOD OMER 1987: *Najadaceae*. - In: Flora of Pakistan **176**: 1-6.

258. Najas marina L., Sp. Pl. 1015. 1753

Najas major ALL. 1773

Ic.: Fl.Pak.176: fig.1 A-F.

S **Lower Shyok:** Shayuk Vy. [Kiris], 2130-2440 m, 1847-11-09, *T.Thomson* s.n. (K!).
A: N Kashg. (Pl.As.Centr.). Kashmir: Anchor Lake 5000' [1520 m], 1937-07-25, *Ludlow & Sherriff 37* (BM! **holotype** *Najas marina* L. subsp. *marina* var. *kashmirensis* L. TRIEST). Anchor Lake 1680 m, *R.R.Stewart 3370* (BM!). Dal Lake, *A.P.Young* s.n. (BM!); 1932-09, *M.L.Newland* s.n. (BM!). Manasbal 1580 m, *Ludlow & Sherriff 7678* (BM!).
D: Warm temp. Eurasia, Africa, Australia, N & S America. *Cosmopol.*
E: 2130-2440 m, coll., rare in the S. (Generally:) Summer-warm, ± stagnant lakes and ponds.

* **Najas minor** ALL. 1785 - **Ic.:** Fl.Pak.176: fig.1 G-K. **A**: Kashmir: Dal Lake 1520 m, *Ludlow & Sherriff 2* (BM!). Manasbal 1580 m, *Ludlow & Sherriff 7674* (BM!). **D**: N Africa, warm-temp. - subtrop. Eurasia, Kashmir, Nepal.

* **Najas oguraensis** MIKI 1935 - **Ic.:** Fl.Pak.176: fig.1 M. **A**: Kashmir: Dal Lake 1680 m, *R.R.Stewart 3347* (K, RAW). **D**: ?SE Asia. **N**: Closely related to *N. minor*, but differs by having a more slender habit, height up to 20 cm, and 4-thecous anthers; described from Japan.

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Orchidaceae

Lit.:
DUTHIE, J. F. 1906: Orchids of the North-West Himalaya. - Ann. Roy. Bot. Gard. Calcutta **9** (2): 81-211, pl. 94-151.
GRUBOV, V. I. & EGOROVA, T. V. 1977: *Orchidaceae*. - In: GRUBOV, V. I. (ed.), Plantae Asiae Centralis 7: 102-117.
KLINGE, J. 1898: *Dactylorchidis*, *Orchidis* subgeneris, Monographiae prodromus. I. Specierum subspecierumque synopsis et diagnoses. - Acta Horti Petrop. **17** (1): (1-56).
KLINGE, J. 1899: Zur geographischen Verbreitung und Entstehung der *Dactylorchis*-Arten. - Acta Horti Petrop. **17** (2): (1-104).
NELSON, E. 1976: Monographie und Ikonographie der Orchideen-Gattung *Dactylorhiza*. Text & Tafelband. Zürich.
RENZ, J. 1984: *Orchidaceae*. - In: Flora of Pakistan **164**: 1-63.

The following treatment is mainly based on RENZ (1984). Some of the literature records of *Orchidaceae* (PAMPANINI 1930, and others) may later be specified with herbarium material, presently suggestions are made where these may belong. Species delimitation and taxonomy of C. Asian / Himalayan *Dactylorhiza* and *Epipactis* still appear to be imperfectly understood.

* **Calanthe plantaginea** WALL. ex LINDLEY 1833 - **Ic.**: Fl.Pak.164: fig.10(H-I). Fl.Xizang.5: fig.410(4). **A**: Kashmir. **D**: Himalaya: Kashmir - Bhutan.

* **Calanthe tricarinata** LINDLEY 1833 - **Ic.**: Fl.Pak.164: fig.10(J-K). Fl.Xizang.5: fig.406. **A**: Hazara. **D**: Himalaya: Pakistan - Bhutan, SE Tibet.

* **Cephalanthera longifolia** (L.) FRITSCH 1888 (*Serapias helleborine* var. *longifolia* L. 1753) - **Ic.**: Fl.Pak.164: fig.2(H-K). Fl.Xizang.5: fig.398. **A**: Chitral. Swat. Hazara: Kaghan Vy. Kashmir. **D**: Temp. N hemisphere.

259. Coeloglossum viride (L.) C. J. HARTMAN, Hand. Skand. Fl. 329. 1820

Satyrium viride L. 1753, *Coeloglossum bracteatum* (MÜHLENB. ex WILLD.) PARL. 1858, *Coeloglossum kashmirianum* SCHLECHTER 1920

Ic.: Fl.Tadzh.2: fig.72(3-4). Fl.Pak.164: fig.5(K-N). Fl.Xizang.5: fig.368.

CS **Baltoro:** Along Baltoro Gl., Liligo - Urdokas 3700 m, *Nakao* s.n. (KYO, KITAMURA 1964).

W **Hunza:** Rakaposhi NW & W opposite Chalt 3650 m, *Miehe 6669!*.

S **Skardu:** Tormik Vy., Kushipa 2750 m, 1991-06-30, *J.Poelt* s.n.!. Ganto P. W 3800-3900 m, Miehe *4799!*; Pakora, Ganto P W 3600-3850 m, 1991-07-02/04, *J.Poelt* s.n.!.

Unloc.: Kashgar Mts., *C.P.Skrine* (K painting!).

A: Seravshan: Hissar Mts. N, Makshevat, *O. Fedtschenko*; very rare (Fl.Tadzh.). Kongur: Upper Oytag Vy. 3760 m, *Miehe 8731!*. Chilas: Raikot Vy., Funtory 3300 m, *Nüsser 923!*. Kashmir: Nai Gund, near Kamri Vy., *Inayat 25387* (K!, Ann.Cat.Pak.). Gadsar 3200 m, *Stainton 8695* (K!): apparently rare.

D: Eurasia, S to Caucasus, Tian Shan, Seravshan, Kongur; S Karakorum, Himalaya: Kashmir - Bhutan, SE Tibet; N America. *Holarct.*

E: (2750) 3600-3800 (3900) m, subalp., rare. Pastures (*Carex stenocarpa*), *Salix karelinii*-scrub, *Juniperus turkestanica* forest on shaded slopes.

* **Corallorhiza trifida** CHATEL. 1760 (*Ophrys corallorhiza* L. 1753) - **Ic.**: Fl.Pak.164: fig.10(A-C). **A**: Kashmir **D**: Temp. Eurasia.

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* **Cypripedium cordigerum** D. DON 1825 - **Ic.**: Fl.Pak.164: fig.1(A-E). **A**: Chitral. Swat. Hazara: Kaghan Vy., below Besri Hut 2680 m, *Schickhoff 371* (K!). Below Burji 2850 m, *Schickhoff 371a* (K!). Kashmir: 2440-3350 m. Alibad 3350 m, *C.B.Clarke 28913* (K!). **D**: Himalaya: Pakistan - Bhutan; SE Tibet.

260. Dactylorhiza hatagirea (D. DON) SOÓ, Ann. Univ. Sci. Budap. Sect. Biol. **3**: 341. 1960

Orchis hatagirea D. DON 1825, *Orchis latifolia* auct. non L. 1753: THOMSON 1852, CONWAY 1894, ?STEWART 1917, ?DOLK 1929, KITAMURA 1964

Ic.: Fl.Pak.164: fig.5(A-F). NELSON 1976: pl.4; pl.81(13-18).

CS **Biafo:** Ste Ste 3080 m (HARTMANN 1966). **Baltoro:** Paiju 3450-3480 (HARTMANN 1966). Paiju, near snout of Baltoro Gl. 3300 m, *Nakao* s.n.; Urdokas, *M.Wakisaka* s.n. (KITAMURA 1964). **Saltoro:** Hushe to Brumi Rama (on the way from Hushe up to the Sospor Gl., 1856-07-16, *Schlagintweit 6010* (M!). Haldi - Corcundos, *Schlagintweit* (SOÓ 1928: *Orchis hatagirea* var. *schlagintweitii*). **Nubra:** Panamik 3660 m, *Clifford 41* (K!; MASON 1928).

W **Gilgit:** Bhagrol [? Baghrot], c.25 miles from Gilgit, *Saood Umer, Nazimuddin & Wahid 1066* (KUH). Naltar, *R.R.Stewart* s.n. (RAW); near Dumial RH 3000 m, *Renz 10271* (hb. Renz). Naltar Lakes 3170 m, *Schickhoff 40!*. Sai 3600 m, 1880-07, *Tanner 180* (DD); *Giles 189* (DD). **Hunza:** Ultar Nullah, Baltit, 1954-06-25, *F.Schmid* s.n. (RAW). Banidas 2600 m, *F.Lobbichler 651* (M!); *199* (M!); *274* (M!). Minapin 2000 m, *F.Lobbichler 517* (M!). Oltali Chish 3400 m, *Nakao* s.n. (KITAMURA 1964). N Chaprot (3200-3600 m), *Klötzli & al. 727.11!* (dwarf specimen). Pisan 2230 m, 1974-07-23, *F.Gartner* s.n. (GZU!). **Hispar:** Hopar - Barpu 2850-3150 m, *W.M.Conway 106* (K!); Bualtar Gl. (CONWAY 1894). **Batura:** ? Ghircia 2600 m, *Visser-Hooft* (DOLK 1929). W Khaibar 2800 m, *Klötzli & al. 802.80!*.

S **Leh:** [Wandla], 1848-09-06, *T.Thomson* s.n. (K!). [Wandla - Kalatze], 1848-09-07, *T.Thomson* s.n. (K!). Ladakh, Yuru Kiom via Kandzhi up the Timti La P., 1856-07-02, *Schlagintweit 5269* (M!). Ladakh, Timti La P. via Timti Do to Kharbu Koma, 1856-07-02/03, *Schlagintweit* s.n. (K!). **Lower Shyok:** Near Saling (WEBSTER & NASIR 1965); Sailing - Kande, *Nasir & Webster 5934* (DD, RAW). **Shyok:** Calzar (3660-4270 m), 1848-07-23, *T.Thomson* s.n. (K!, THOMSON 1852). **Pangong:** Shushal 4330 m, *Koelz 2438* (K!, Ann.Cat.Pak.).

Unloc.: Cashmere, *Falconer 1044* (K!). "Yarkand Exp.", 1870-06-20, *Henderson 351* (K!). [?]Kashgar, *Bellew* (K!).

A: Chitral: Chitral 2440 m, *Giles* s.n. (K!). Tirich Vy., Base Camp, *W.J.Budenberg 32* (K!). Madaglasht 2900-3050 m, *Toppin 376* (K!). Astor: Teing [Ting] in Hasora, 1847-07-11, *Winterbottom 758* (K!). Kalapani 3010 m, *Schickhoff 1284!*. Deosai: Burzil P., Deosai 2130-3660 m (STEWART 1961: *O. latifolia* s.l.). Dras: Dras, 1848-09-26, *T.Thomson* s.n. (K!). Dras Vy., *Inayat 25379* (K!). Zoji - Matayan (STEWART 1917: *O. latifolia*). Suru: Paskyum 2830 m, *B.B.Osmaston 148* (K!). Panichar, NW of Union Suru and Chalang Nar Rv. 2900 m, *Southampton Univ. 16* (K!). Zanskar: [NW Zangla] 4270 m, 1848-06-30, *T.Thomson* s.n. (K!). Swat. Hazara: Naran 2740 m, *Jafri & Ali 3455* (K!). Kaghan Vy., Saiful Muluk Nullah, *Schickhoff 90/518* (K!); Above Sharan 2550 m, *Schickhoff 90/340* (K!); above Paludar 3050 m, *Schickhoff 90/491* (K!). Kashmir: Baltal 2740 m, *Inayat 25377* (K!). Sind Vy., Sonamarg 2440-2740 m, *Inayat 25375* (K!); 2740 m, *H.H.Rich 1080* (K!); 2960 m, *R.R.Stewart 12828* (K!). Gurais Vy., *Inayat 25378* (K!). Kamri Vy., *Inayat 25373* (K!). Kukarnag [Kokanag], Barangi Nala, *Inayat 25376* (K!). Below Vishensar Lake 3400 m, *C.C.Townsend 87/190* (K!). Nil Nag, on lake border 2070 m, *R.R.Stewart 23086* (K!). Karogbal - Badwan 2440 m, *R.R.Stewart 22596* (K!). Banihal P. 2740 m, *R.R.Stewart 12830* (K!). Above Pahlgam 3350 m, *R.R.Stewart 7950* (K!). Kishtwar [Chenab, Asdhari - Shol] 2130-2440 m, 1848-06-16, *T.Thomson* s.n. (K!). Chenab to Zanskar [Butna Vy., Chishot (2500-3200 m)], 1848-06-19, *T.Thomson* s.n. (K!). [Umasi P.], 1848-2.6 [1848-06-20/23], *T.Thomson* s.n. (K!). Chamba, Bharmaon, *R.N.Parker* s.n. (K!). Himachal Pr.: Upper part of Hattus, 1847-08-05, *T.Thomson* s.n. (K!). Piti Vy. [Lara - Kibar], 1847-09-05, *T.Thomson* s.n. (K!). Lahol, Rotang P. to Koksar (N slopes of the P.), 1856-06-09, *Schlagintweit* s.n. (K!). Kyelang. Uttar Pr.: Kumaon, Gori Vy., *Inayat 24119* (K!).

D: Himalaya: Chitral - Nepal, Bhutan, SE Tibet. *Sino-Himal.*

E: 2850-3600 m, mont.-subalp., not common. "Marshy open places and coniferous forest" (Fl.Pak.), "gravelly floodplain" (WEBSTER & NASIR 1965).

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N: "SOÓ in J. Bot. 66: 17 (1928) and Ann. Hist. Nat. Mus. Natl. Hung. 26: 346 (1929) recognized two varieties of *D. hatagirea*; var. *schlagintweitii* SOÓ from Skardu and Ladak. This may represent one of the rather dubious alpine dwarf forms of *D. hatagirea*, which can hardly be classified, if the general aspect of the entire population is not known. Var. ? *afghanica* SOÓ from Kurram Vy. (*Aitchison 570*), which is nearest to *D. umbrosa*" (Fl.Pak.).

261. Dactylorhiza kafiriana RENZ in RECH. f., Fl. Iran. **126**: 125. 1978

? *Orchis knorringiana* (KRÄNZL.) CZERNIAK. 1951, *Dactylorhiza umbrosa* auct. non (KAR. & KIR.) NEVSKI 1842: WENDELBO 1952

Ic.: NELSON 1976: pl.5; pl.81(19-20).

N **Yarkand:** 3 km W Mazar 3850 m, *Dickoré 336* (GOET!, K!). 10 km WSW Mazar 3760 m (*Dickoré*). **Karakash:** W Xaidulla 3900 m, *Miehe 8322!*.

W **Ghizar:** Shandur P., Chitral-Gilgit border 3600 m, *Ecker* s.n. (RAW). **Yasin:** Darkot 3110 m, *Bowes Lyon 8093* (K!, RAW). **Gilgit:** Gilgit, *Giles 10* (G). Parabah(?) 2400 m, 1886-06-12 *Giles 275* (DD). **Hunza:** Ultar Nullah, near Baltit, *F.Schmid 1875* (G). Banidas 2600 m, *F.Lobbichler 216* (M!); *254* (M!). Bar 2500 m, 1954-06-16, *Paffen 176* (M!). Nagar, *F.Lobbichler 467* (M!). **Batura:** Kamaris above Gulmit 2750 m, *Renz 13269* (hb. Renz). W Khaibar 2700 m, *Klötzli & al. 801.93!*; 3020 m, *Klötzli & al. 27.21,31!*.

A: ?W Pamir, ?E Pamir 2500-4000 m (Fl.Tadzh.: *Orchis knorringiana*). Wakhan: Quazi Deh Vy., *Roemer 174* (M!). Chitral: Mastuj 2380 m, *Giles 405* (K!). Above Shokor Shal 3700 m, 1950-06-27, *P.Wendelbo* s.n. (K!). Shiger - Arirat 2800 m, *Bowes Lyon 756* (BM). Suru: Suru Vy. (Fl.Pak.). Himachal Pr.: Lahul, Thalong 2740 m, *Thakur Rup Chand 98a* (K!).

D: Hindukush, Karakorum: Pakistan (Chitral, Gilgit), W Himalaya, Yarkand. ?*W Pamir*.

E: 2400-3900 m, mont.-subalp., not common. Damp meadows, marshes and fens by springs and flushes (*Carex orbicularis, C. microglochin, Kobresia royleana*).

Dactylorhiza knorringiana (KRÄNZL.) DICKORÉ comb. nov.

Basionym: *Orchis incarnata* L. var. *knorringiana* KRÄNZL., Feddes Repert., Beih. **65**: 34. 1931 (*Orchis knorringiana* (KRÄNZL.) CZERNIAK., Fl. Kirgiz. **3**: 138. 1951)

This may be the correct name for the taxon.

262. Dactylorhiza salina (TURCZ. ex LINDLEY) SOÓ, Ann. Univ. Sci. Budapest, Sect. Biol. **5**: 340

Orchis salina TURCZ. ex LINDLEY 1835, *Orchis umbrosa* auct. non KAR. & KIR. 1842: ? PERSSON 1934

N **Taxkorgan:** Tashkurgan Rv., 1903-07-25, *Knorring*; Tashkurgan Vy., 1959-06-13, *Junatov & al.*; 3200 m, 1959-06-13, *Li & Chu 320* (Pl.As.Centr.). ? Dafdar 3510 m (PERSSON 1934: *O. umbrosa*).

A: N Kashg.; W Kashg.: Gumbus Rv., Chom-Terek, 1909-06-07, *Divnogorskaya*; Nagra-Galdy, 1929-07-02, *Popov* (Pl.As.Centr.). S Kashg.: Keria Rv., Lyushi, 1885-06-30, *Przewalsky* (Pl.As.Centr.). ?Kongur: Bostan Terek 2400 m; Jerzil 3000 m (PERSSON 1934: *O. umbrosa*). W Kunlun: Tiznap Vy., above Kudi 3000 m, *Miehe 7501!*; Upper Tiznap Vy. 3650 m, *Miehe 8542!*.

D: Siberia (Altai) - E Asia, N China, N Mongolia, Dzungaria, Kashgaria: Tian Shan, Kunlun, Qinghai. *Centr.As.*

E: 3200 (?3510) m, mont.-subalp., rare in the NW. (Generally:) On wet, ± saline turf.

Possible hybrid:

* **Dactylorhiza hatagirea X D. kafiriana** - **A**: Reported from Chitral. Swat. Hazara: Kaghan Vy. (Fl.Pak.).

* **Diphylax griffithii** (HOOKER f.) KRÄNZL. 1901 (*Habenaria griffithii* HOOKER f. 1890) - **Ic.**: Fl.Pak.164: fig.6(L-P). **A**: Chitral, Swat, Kashmir. **D**: W Himalaya: Kurram, Chitral - Kumaon.

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263. Epipactis gigantea DOUGLAS ex HOOKER, Fl. Bor. America **2**: 202. 15. 11. 1839
Epipactis royleana LINDLEY in ROYLE 1839 (nomen nudum), *Cephalanthera royleana* (REGEL) BOISS. 1882, *Helleborine royleana* (LINDLEY) SOÓ 1927

Ic.: Fl.Tadzh.2: fig.70.

CS **Saltoro:** Sailing - Kande, *Nasir & Webster 5937* (RAW). [?] Hushe - Kande, rare, a single plant found in poplar woods, 2740-2900 m, *Nasir & Webster 6272* (WEBSTER & NASIR 1965 [*E. veratrifolia* ?]).

W **Gilgit:** Gilgit, *Winterbottom 956* (K!). Nomal - Chalt, *R.R.Stewart* s.n. (RAW); 1750-2130 m, *F.Schmid 1833* (RAW). **Hunza:** Chalt 2000 m, *F.Lobbichler 617* (M!). N Chaprot (3150-4000 m), *Klötzli & al. 727.90!*. Minapin 2000 m, *F.Lobbichler 533* (M!). **Batura:** W Khaibar 3020 m, *Klötzli & al. 27.32!*.

S **Shigar:** Basna Vy., Matsumdus - Doko 3300-3400 m, 1991-07-07, *J.Poelt* s.n.!. **Skardu:** Indus Vy., near Katzura 2400-2700 m, *Duthie 12075* (E).

A: S Tadzh. 1100-2500 m (Fl.Tadzh.). Chitral. Swat. Hazara: Kaghan Vy.

D: Pamir-Alai, Karakorum (Gilgit, Hunza), Himalaya (Chitral - Nepal, Sikkim, Bhutan), China; N & C.America. *E Asiat.*

E: (1750) 2130-3150 (?4000) m, mont., not common. "Commonly found in marshy places, near springs and rivers".

N: The long creeping rhizomes are distinctive. Fragmentary specimens may be recognized by the very thin indument of the inflorescence axis, which is dense and whitish in *E. veratrifolia*.

264. Epipactis helleborine (L.) CRANTZ, Stirp. Austr., ed. 2, **2**: 57. 1769 (nomen cons.)
Serapias helleborine L. 1753, *Serapias latifolia* (L.) HUDSON 1762, *Epipactis latifolia* (L.) ALL. 1758, *Epipactis macrostachya* LINDLEY ex WALL. 1832 (nomen nudum); 1840, *Epipactis latifolia* var. *thomsonii* HOOKER f. 1890, *Helleborine macrostachya* (LINDLEY) SOÓ 1929, *Epipactis helleborine* var. *thomsonii* (HOOKER f.) R. R. STEWART 1972

Ic.: Fl.Tadzh.2: fig.71(4-6). Fl.Pak.164: fig.3(A-E). Fl.Xizang.5: fig.400.

CS **Baltoro:** Paiju near snout of Baltoro Gl. 3600 m, *Nakao* s.n. (KITAMURA 1964).

S **Shigar:** 2400 m, *R.R.Stewart 20569* (RAW). **Skardu:** Iskardo [Skardu] "out of hay", 1848-02, *T.Thomson* s.n. (K!). **Lower Shyok:** Kasurmik - Doghani 2700 m, *R.R.Stewart 20825*[?] (RAW); below Kasurmik 2600 m, *R.R. & I.D.Stewart 20825*[?] (RAW). **Shyok:** [Calzar], 1848-07-23, *T.Thomson* s.n. (THOMSON 1852: *Epipactis* sp.; Ann.Cat.Pak.: var. *thomsonii* (HOOKER f.) R. R. STEWART).

A: W Pamir, E Pamir 1200-3300 m (Fl.Tadzh.). Chitral. Astor: Astore-Mushkin Forest, *Duthie 12264* (RAW). Mushkin forest 2580 m, *Schickhoff 1128!* (veg.). Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1805!*. Kashmir: Gulmarg 2590 m, *Aitchison 104* (K!). Pahlgam 2130 m, 1920-08-11, *R.R.Stewart* s.n. (K!). Pir Panjal, Fras Nag 2130-2440 m, *R.R.Stewart 23095a* (K!). Himachal Pr..

D: Eurasia S to Medit., SW Asia - E Siberia; Himalaya: Pakistan - Bhutan, SE Tibet; N America. *Holarct.*

E: 2400-2700 (3600) m, mont., rare. "Widespread in coniferous forests".

265. Epipactis persica (SOÓ) NANNFELD, Bot. Not. **1946**: 11. 1946
Helleborine persica SOÓ 1927

W **Yasin:** 2600 m, 1957-08-04, *M.S.Zahur* s.n. (RAW). **Ishkoman:** 2600 m, *Bowes Lyon 8187* (RAW). **Gilgit:** 1520 m, *R.R.Stewart* s.n. (RAW).

A: Swat. Hazara.

D: Anatolia, Iran, Afgh. - NW Pakistan (Gilgit, Hazara). *Ir.-Tur.*

E: 1520-2600 m, coll. - mont., rare in the W.

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266. Epipactis veratrifolia BOISS. & HOHEN. in BOISS., Diagn. Pl. Orient. 1(13): 11. 1854
Epipactis somaliensis ROLFE in THISELTON-DYER 1897, *Helleborine veratrifolia* (BOISS. & HOHEN.) BORNM. 1915, *Epipactis wallichii* SCHLECHTER 1920

W **Gilgit:** Gilgit Bunji, *F.Schmid 1819* (E). Nomal - Naltar, *K.Akhtar & M.Qaiser 540* (KUH). Nomal - Chalt, near Jaglot 1700 m, *J.Renz 13268* (hb. Renz). Gilgit - Chalt 1800 m, *Klötzli & al. 724.06!* (single flower only). **Hunza:** Budelas 2000 m, 1954-06-20, *Paffen 184* (M!).

S **Skardu:** Skardu 2700 m, *Y.Nasir & Zafar Ali 4026* (K). **Lower Shyok:** Above Saling, gravelly streambanks, not common, 2440 m, *Nasir & Webster 5937* (RAW; WEBSTER & NASIR 1965: "*E. mairei*").

A: Chitral. Chilas: Dassu - Chilas 900-1000 m, *Klötzli & al. 723.09!*. Swat. Hazara: Kaghan Vy.

D: Turkey, Cyprus, Palestine, Syria, Sinai; Somalia, Iran - Afgh., Himalaya (Chitral - Nepal). *Ir.-Tur.*

E: 1700-2700 m, coll. - mont., rare. "On moist places, near springs and rivers, on wet and mossy rocks", in *Juniperus excelsa* forests.

* **Epipogium aphyllum** (SCHMIDT) SWARTZ 1814 - **Ic.**: Fl.Pak.164: fig.2(E-G). **A**: Kashmir. **D**: Eurasia S to Caucasus, Kashmir, E Himalaya, SE Tibet.

* **Epipogium tuberosum** DUTHIE 1906 - **Ic.**: Fl.Pak.164: fig.3(F-I). **A**: Hazara. Kashmir. **D**: W Himalaya: Hazara, Kashmir (endemic).

* **Eulophia hormusjii** DUTHIE 1906 - **A**: Chitral. Hazara. Himachal Pr. **D**: ?Turkestan, W Himalaya: Afgh., N Pakistan - NW India, Upper Gangetic Plains.

* **Gastrodia orobanchoides** (FALC.) BENTHAM 1883 (*Gamoplexis orobanchoides* FALC. 1847) - **Ic.**: Fl.Pak.164: fig.8(A-C). **A**: Hazara. Kashmir. **D**: W Himalaya.

267. Goodyera repens (L.) R. BR. in AITON, Hort. Kew., ed.2, **5**: 198. 1813
Satyrium repens L. 1753

Ic.: Fl.Pak.164: fig.4(A-H). Fl.Xizang.5: fig.414.

W **Gilgit:** Baghrot Vy. 3310 m, *Miehe 4507* (K!); *4513* (K!); above Gutumi Nullah 3040 m, *Schickhoff 591!*. Upper Darchan Vy., above Khaltaro 3190-3230 m, *Schickhoff 658!*; *724!*.

A: Chilas: Rakhiot Vy. 3220 m, *Schickhoff 1687!*. Swat. Hazara: Kaghan Vy. Kashmir: (2130-2740 m), *Aitchison 103* (K!). Gulmarg 2590 m, *R.R.Stewart 10531* (K!). Ferozepore Nullah 2130 m, *H.H.Rich 1270* (K!).

D: Eurasia S to SW Asia, Afgh. (Kurram), Himalaya: Pakistan - Bhutan, SE Tibet, Assam; N America. *Holarct.*

E: 3040-3310 m, mont., rare in the SW. Shady N-facing *Picea smithiana* forests.

* **Gymnadenia orchidis** LINDLEY 1835 (*Gymnadenia himalayica* SCHLECHTER 1919) - **Ic.**: Fl.Pak.164: fig.5(G-J). **A**: Hazara. Kashmir. **D**: Himalaya: Pakistan - Bhutan - W China: Yunnan, Sichuan.

* **Habenaria aitchisonii** REICHENB. f. in AITCH. 1886 - **A**: Hazara. Kashmir. **D**: W Himalaya: Afgh. (Kurram), Pakistan (Waziristan, Hazara), Kashmir - Sikkim.

* **Habenaria edgeworthii** HOOKER f. ex COLLET 1902 - **A**: Swat. Hazara. Kashmir. **D**: W Himalaya: Swat - Nepal.

* **Habenaria latilabris** (LINDLEY) HOOKER f. 1890 (*Platanthera latilabris* LINDLEY 1835) - **A**: Swat. Hazara. Kashmir. **D**: W Himalaya: Swat - Bhutan.

* **Habenaria marginata** COLEBR. in HOOKER 1824 - **A**: Hazara. Kashmir. **D**: Himalaya: Hazara - Bhutan, Burma.

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* **Herminium lanceum** (THUNB. ex SWARTZ) J. VUIJK. 1961 (*Ophrys lancea* THUNB. ex SWARTZ 1800) - **Ic.**: Fl.Pak.164: fig.6(D-F). Fl.Xizang.5: fig.370(1-2). **A**: Hazara. Kashmir. **D**: Himalaya: Pakistan - Bhutan, SE Tibet; China, Manchuria, Japan, Taiwan, Java, Timor, Celebes, Ryukyu.

268. Herminium monorchis (L.) R. BR. in AITON, Hort. Kew, ed. 2, 5: 191. 1813

Ophrys monorchis L. 1753

Ic.: Fl.Pak.164: fig.6(A-C). Fl.Xizang.5: fig.371(1-3).

CS **Biafo:** Askole 3100 m, *Nakao* s.n. (KITAMURA 1964); 3050 m, *H.Hartmann 346* (RAW); Ste Ste 3080 m; below Munjung 3080 m (HARTMANN 1966). **Saltoro:** Hushe - Kande, poplar woods, quite common, 2740-2900 m, *Nasir & Webster 6271* (WEBSTER & NASIR 1965; RAW).

W **Hunza:** Banidas 2600 m, *F.Lobbichler 198* (M!). **Batura:** Khaibar (2500-3000 m), *Klötzli & al. 801.13!*.

S **Skardu:** Satpura Nullah, *Duthie 12012* (K, BM, E). Bagicha - Olding, *R.R.Stewart 21004* (RAW). **Leh:** Himis Shupka [3350 m] (STEWART 1916). **Shyok:** Karsar [Calzar] (THOMSON 1852: *Herminium* sp.).

A: Astor: Lower Rupal Nullah, *R.R.Stewart 18848* (Ann.Cat.Pak.). Kashmir: Gund 2100 m, *H.H.Rich 1190* (K!). Sonamarg 2500 m, *C.C.Townsend 87/224* (K!); 2740 m, *R.R.Stewart 9722* (K!).

D: Eurasia, S to Himalaya, S Tibet, China, Japan. *Euras.*

E: (2500) 2600-3350 m, mont., rare. "In wet meadows up to 4300 m."

* **Herminium pugioniforme** LINDLEY ex HOOKER f. 1890 - **Ic.**: Fl.Xizang.5: fig.372(1-3). **A**: Kashmir. **D**: Himalaya: Kashmir - Sikkim, SE Tibet. **N**: This dwarf alpine species probably reaches the highest altitudes among the Orchids (more than 5000 m in SE Tibet).

* **Liparis rostrata** REICHENB. f. 1876 - **A**: Hazara. **D**: W Himalaya: Hazara - Nepal.

* **Listera ovata** (L.) R. BR. in AITON 1813 (*Ophrys ovata* L. 1753) - **Ic.**: Fl.Pak.164: fig.2(A-D). **A**: Hazara: Kaghan Vy. ?Astor. Kashmir. **D**: Temp. N hemisphere: Eurasia, N America.

* **Malaxis cylindrostachys** (LINDLEY) O. KUNTZE 1891 (*Dienia cylindrostachya* LINDLEY 1830) - **A**: Kashmir. **D**: Himalaya: Kashmir - Bhutan, Yunnan.

* **Malaxis muscifera** (LINDLEY) O. KUNTZE 1891 (*Dienia muscifera* LINDLEY 1830) - **Ic.**: Fl.Pak.164: fig.8(H-K). **A**: Hazara: Kaghan Vy. Kashmir. **D**: Himalaya: Hazara - Bhutan, SE Tibet, W China: Yunnan, Sichuan.

* **Neottia camtschatea** (L.) REICHENB. 1851 (*Ophrys camtschatea* L. 1753) - **Ic.**: Fl.Tadzh.1: fig.65(4-7). **A**: E Pamir: Kaindy Vy. 2100-3100 m (Fl.Tadzh.). **D**: Kamtchatka, Siberia, N China, Mongolia, Altai, Tian Shan, Dzungaria, Kashgaria, Pamir-Alai.

* **Neottia inayatii** (DUTHIE) BEAUVERD 1926 (*Listera inayatii* DUTHIE 1902, *Listera kashmiriana* DUTHIE 1906) - **A**: Hazara: Kaghan Vy. (where only known from the type): Bhurji, 1897-07-08, *Inayat 22596* (DD **holotype**, K!, E **isotypes**). ?Astor. Kashmir. **D**: Hazara, Kashmir (endemic).

269. Neottia listeroides LINDLEY in ROYLE, Ill. Bot. Himal. 368. 1839

Neottia lindleyana DECNE. in JACQUEM. 1844, *Listera lindleyana* (DECNE.) KING & PANTL. 1898

Ic.: Fl.Pak.164: fig.1(F-J).

W **Gilgit:** Upper Dainyor Vy. 3110 m, *Schickhoff 428!*.

A: Chitral. Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1787!*. Kashmir: 1520-3050 m. Sind Vy. 3050 m, *C.B.Clarke 31015* (K!). Sind Vy., above Kulan, towards Sonamarg, *R.R.Stewart 12838* (K!).

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Above Gulmarg 3050 m, *Aitchison 105* (K!). Gulmarg 2740 m, *J.Venning* s.n. (K!). Above Pahlgam 2440 m, *R.R.Stewart 21499* (K!). Pir Panjal, Fras Nag 2740 m, *R.R.Stewart 23160* (K!). Himachal Pr..
D: Himalaya: Chitral - Bhutan, S China. *Sino-Himal.*
E: 3110 m, mont., rare in the SW. *Picea smithiana* forest. (Kashmir:) not rare in forest humus (*Stewart 12838*).

* **Oreorchis micrantha** LINDLEY 1859 - **Ic.**: Fl.Xizang.5: fig.461. **A**: Kashmir. **D**: Himalaya: Kashmir - Bhutan, Assam, SE Tibet, W China.

* **Satyrium nepalense** D. DON 1825 - **Ic.**: Fl.Pak.164: fig.7(D-G). Fl.Xizang.5: fig.353. **A**: Hazara. Kashmir. **D**: Himalaya: Hazara - Bhutan; China, S India, Sri Lanka.

270. Spiranthes sinensis (PERS.) AMES, Orchid. **2**: 53. 1908
Neottia sinensis PERS. 1807, *Spiranthes australis* (R. BR.) LINDLEY 1824, *Spiranthes lancea* (THUNB.) BAKH. f. & v. STEENIS 1950
Ic.: Fl.Pak.164: fig.7(H-J). Fl.Xizang.5: fig.352.
W **Ghizar:** Panial, near Sher Qila, Gilgit Rv. 2000 m, *Renz 10270* (hb. Renz). **Gilgit:** 1954-07-15, *R.R.Stewart* s.n. (RAW); *26316* (RAW). Gilgit 1520 m, *Giles 536* (K!). Chhachti 1520-1830 m, *J.Giles 235* (K!). **Hunza:** Chalt - Chaprot 2080 m, *Klötzli & al. 121.01!*. Baltit 2300 m, *O.Polunin* s.n. (E).
S **Shigar:** Skardu - Shigar, *R.R.Stewart 20489* (RAW). Shigar, *R.R.Stewart 20548* (RAW). **Skardu:** Skardu, *Zaffar Ali & Y.Nasir 4125* (RAW).
A: Chitral. Swat. Hazara. Kashmir: 1848-10-03, *T.Thomson* s.n. (K!).
D: E Russia, China, Himalaya, SE Asia, Japan, New Guinea, Australia, Tasmania, New Zealand. *E Asiat.*
E: 1520-2300 m, coll.-mont., rare. Moist turf of springs and flushes.

* **Zeuxine strateumatica** (L.) SCHLECHTER 1911 (*Orchis strateumatica* L. 1753) - **Ic.**: Fl.Pak.164: fig.4(I-M). **A**: Swat. Hazara. **D**: S & SE Asia (Iran - Himalaya, Burma, China, Japan.

* Pontederiaceae

Lit.:
RECHINGER, K. H. 1990: *Pontederiaceae*. - In: Flora Iranica **167**: 1-2.

* **Monochoria vaginalis** (L.) PRESL 1830 (*Pontederia vaginalis* BURM f. 1768 - **A**: Nuristan (Fl.Iran.). ?Swat. Hazara. ?Kashmir. **D**: Himalaya, SE Asia - Malaysia.

Potamogetonaceae

Lit.:
ASCHERSON, P. & GRAEBNER, P. 1907: *Potamogetonaceae*. - In: ENGLER, A., Das Pflanzenreich **31** (IV. 11): 1-184.
DANDY, J. E. 1971: *Potamogetonaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **83**: 1-9. Graz.
GRUBOV, V. I. & al. 1971: *Potamogetonaceae*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **6**: 40-50.
KHADIJA AZIZ & JAFRI, S. M. H. 1975: *Potamogetonaceae*. - In: Flora of Pakistan **79**: 1-11.
OVCZINNIKOV, P. N. (ed.) 1957: *Potamogetonaceae*. - In: Flora Tadzhikskoy SSR **1**: 90-101.

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Potamogeton:

The species of *Potamogeton* grow submerged or with floating leaves in ± freshwater lakes, ponds, ditches or not too fast flowing streams and rivers. Some tolerate certain salt contents (*P. pectinatus, P. amblyphyllus, P. nodosus*). Suitable habitats are not many in the Karakorum, which is due to the dry climate, high relief energy, absolute altitude, and the resulting scarcity or high salinity of permanent water-bodies. Since the determination of reduced vegetative specimens is often impossible and the systematic position of several taxa is unsettled (especially of the subgenus *Coleogeton*), generally it is not possible to give any more detailed ecological data for the few records from the Karakorum.

Key to *Potamogeton*:

1. Stipular sheath adnate to the leaf forming a sheathing leaf base. Leaves linear to filiform (Subgen. *Coleogeton*) **2**
\+ Stipular sheaths free from the base. Leaves mostly broader (Subgen. *Potamogeton*) **3**
2. Leaf apex acute; stipular sheaths open, convolute. Fruitlets 3-5 mm long ..... **P. pectinatus**
\+ Leaf apex broadly rounded; leaves 0.5-1.5 mm broad; stipular sheaths tubular towards the base. Fruitlets 3-3.5 mm long ..... **P. amblyphyllus**
(Leaf apex gradually narrowed, obtuse; leaves usually less than 1 mm broad. Fruitlets 2-2.8 mm long: *P. filiformis*)
3. Leaves all alike, submerged **4**
\+ Leaves mostly dimorphic, with coriaceous floating leaves **7**
4. Leaves narrowly linear, less than 3 mm broad ..... **P. pusillus**
\+ Leaves broadly linear to ovate, more than 3 mm broad **5**
5. Leaves shortly petiolate; stipules 2.5-5 cm long ..... **P. lucens**
\+ Leaves sessile; stipules caducous, less than 2 cm long **6**
6. Leaves cordate-amplexicaul, ovate to lanceolate ..... **P. perfoliatus**
\+ Leaves not amplexicaul, oblong to broadly linear ..... **P. crispus**
7. Submerged leaves narrowly linear, with a broad band of lacunae bordering the midrib; lamina of floating leaves up to 3.5 cm long. Spikes few-flowered ..... **(P. octandrus)**
\+ Submerged leaves broader or reduced to narrowly linear, opaque phyllodes; lamina of floating leaves more than 3.5 cm long. Spikes many-flowered **8**
8. Floating leaves with a discoloured joint at the top of the petiole; submerged leaves, if present, reduced to narrowly linear, opaque phyllodes ..... **P. natans**
\+ Floating leaves without a discoloured joint at the top of the petiole; submerged leaves, if present, narrowly lanceolate to elliptic-oblong **9**
9. Submerged leaves petiolate, lanceolate or broadly lanceolate-oblong ..... **P. nodosus**
\+ Submerged leaves sessile, linear-lanceolate to elliptic **10**
10. Apices of submerged leaves obtuse, margin entire ..... **(P. alpinus)**
\+ Apices of submerged leaves acute or acuminate, margin minutely denticulate ..... **(P. gramineus)**

* **Potamogeton alpinus** BALBIS 1804 - **A**: ?Deosai: Gulteri - Sumbal in Shingo Vy. (Ann.Cat.Pak.). [?]Kashmir: Dal Lake. **D**: Eurasia, N America.

271. Potamogeton amblyphyllus C. A. MEYER, Beitr. Pflanzenk. Russ. Reich. 6: 10. 1849

("*P. amblyophyllus*")

? *Potamogeton pamiricus* BAAGÖE 1903, ? *Potamogeton filiformis* PERS. var. *tibetanus* HAGSTR., ? *Potamogeton filiformis* auct. non PERS. 1805, *Potamogeton pectinatus* auct. non L. 1753: DICKORÉ 1991, ? *Zostera marina* auct. non L. 1753: DEASY 1901

Ic.: Fl.Iran.83: pl.1.

CS **Nubra:** [Lower] Nubra Vy., 1847-10-19, *T.Thomson* s.n. (K!); 1848-08-04, *T.Thomson* s.n. (K!). Panamik 3350 m, *Ludlow & Sherriff 9397* (BM!).

N **?Mustagh Ata:** Little Karakul 3720 m, 1894-07-17, *S.Hedin* (OSTENFELD 1922: *P. filiformis*). **Yarkand:** 3 km W Mazar 3770 m, *Dickoré 358!*.

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W **Hispar:** Barpu Gl., close to Mir Camp 3550 m, *Conway 126* (K!; CONWAY 1894). **Batura:** W Khaibar 2800 m, *Klötzli & al. 802.73!.*

S **Skardu:** 2350 m, *C.B.Clarke 30502* (K!; Ann.Cat.Pak.: *P. filiformis*). **Leh:** [Saspul - Nimu], 1848-07-10, *T.Thomson* s.n. (K!). Spitok, Treaty Road 3200 m, *F.Ludlow 8396* (BM!). Leh - Thikse, at base of Shey Gompa 3300 m, *Billiet & Leonard 6856* (K!). Pugha (3660-4570 m), 1847-09-22, *T.Thomson* s.n. (K!). **?Lower Shyok:** ? Blagar (THOMSON 1852: *P.* sp.). **Pangong:** Shushal 4330 m, *Koelz 2435* (K!). Swamp above Pancong Tso, 1927-07-26, *Bosshard* (Z!). ? Shushal; Sharma P. 4400 m (STEWART 1869: "*P. heterophyllus*").

E **Changchenmo:** Kiam 5100 m, 1927-08-11, *Bosshard* (Z!). **Aksai Chin:** Sirigh Yilga 5250 m, 1927-09-03, *Bosshard* (Z!).

A: ?Kongur: Tjakker-agil 3320 m, 1895-07-22; Bulun-kul 3400 m, 1895-07-23; Lower Basik-kul 3730 m, 1894-07-21/23, *Hedin* (HAGSTRÖM in HEDIN 1922: "*P. filiformis*"). W Pamir. E Pamir. Wakhan: Near Yamit 2800 m, *Roemer 268* (M!). Chitral: Baroghil P. 3660 m, *Stainton 3028* (BM!); 3960 m, *Stainton 2993* (BM!). Zanskar: Zanskar - Zu, *Drummond 23156* (K!). Hazara: Below Gittidas 4300 m, *F.Schmid 494* (BM!). Kashmir: Kishenganga Vy., Gurez 2440 m, *Ludlow & Sherriff 8286* (BM!). Himachal Pr.: Chandrabagha Vy., 3050-3350 m, *Kashyap 70* (K!). Uttar Pr.: Raj Hoti 4570 m, *Strachey & Winterbottom 8* (K!). Rupshu: River in marsh [Parang Rv. - Lanak P.], 1847-09-12, *T.Thomson* s.n. (K!). Above Tzakzhun Tso 5330 m, *Koelz 2414d* (K!). Tso Kar, 4570 m, *Koelz 2144* (K!). Hanle, 1847-09-17 *T.Thomson* s.n. (K!); 4360 m, *Koelz 2308* (K!). Changtang: ? Near Yepal Ungur 4450 m (DEASY 1901: "*Zostera marina*").

D: NE Anatolia, Caucasus - Afgh., Pakistan, C. Asia, Tibet, China. *Centr.As.*

N: Most records of *P. filiformis* from C. & S Asia probably belong here, as well as the record of "*Zostera marina*" (a strictly marine plant !) of DEASY (1901), occasionally repeated in literature. *P. amblyphyllus*, under the above concept, is very variable as regards the width of the leaves, which apparently is positively correlated with the salt content. Large beds of dead plants entirely consisting of this species appear to be a common feature of the Tibetan lakes. It ascends to 5300 m in C.Tibet (Tangula Shan, *Dickoré*).

272. Potamogeton crispus L., Sp. Pl. 126. 1753

Ic.: Fl.Pak.79: fig.2(A-E).

S **Leh:** Ladakh 2740-3350 m (J.L.STEWART 1869).

A: Swat. Kashmir: 1520-1830 m, common in Kashmir Lakes!

D: Eurasia (S to India, Java), Africa, Australia, N America. *Cosmopol.*

N: Record from the Karakorum unlocalized and unconfirmed, but not improbable. It may well occur along the Indus Rv.

* **Potamogeton filiformis** PERS. 1805 (*Potamogeton setaceus* auct. non L.: SCHUM. 1801) - **Ic.:** [?]Fl.Iran.83: pl.2. **D**: Temp. - arctic Eurasia, N America. **N**: Reported from numerous localities in C. & S Asia. Records from the area are tentatively transferred to *P. amblyphyllus*.

* **Potamogeton gramineus** L. 1753 (*Potamogeton heterophyllus* SCHREBER 1771) - **D**: Temp. - arctic Eurasia (S to ? Pamir), N America. **N**: Doubtful in adjacent areas; the next stations apparently in Serawshan / W Pamir. A record from Chitral (Fl.Iran.) probably refers to a high altitude form of *P. lucens*. Records of "*P. heterophyllus*" from **E Pangong** (STEWART 1869) are tentatively transferred to *P. amblyphyllus*.

273. Potamogeton lucens L., Sp. Pl. 126. 1753

Ic.: Fl.Pak.79: fig.1D-F. Fl.Desert.Sin.1: fig.6(11-13).

S **Skardu:** Satpura Lake, *M.Mushtaque* s.n., 1965-05-29 (RAW).

A: Chitral: Baroghil P. Lake 3900 m, *Stainton 2988* (BM!, Fl.Iran.: "*P. gramineus*"). Kashmir: 1520-1830 m, common in Kashmir Lakes!. Burzil P. Lake 3960 m. Dal Lake.

D: Temp. Eurasia, N Africa. *Euras.*

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274. Potamogeton natans L., Sp. Pl. 126. 1753

Ic.: Fl.Iran.83: pl.3. Fl.Desert.Sin.1: fig.6(6-7).

S **Skardu:** *S.A.A.Shah* s.n. (RAW).

Unloc.: [?] E Ladakh, *de Terra* (Ann.Cat.Pak.) [probably *P. nodosus*].

A: Dras: Dras Vy. 3350-3660, *Duthie 11689* (K!; Ann.Cat.Pak.). Kashmir: 1520-1580 m, common in Kashmir Lakes!. Dal Lake.

D: Eurasia, NW Africa, N America. *Holarct.*

N: "A rare species, confined to the temperate Himalayan regions of our area" (Fl.Pak.). Very similar to and easily confused with *P. nodosus*.

275. Potamogeton nodosus POIRET in LAM., Encycl. Meth. Bot., Suppl. **4**: 535. 1816

Potamogeton indicus auct. non ROTH: ROXB. 1820, HOOKER f. p.p., *Potamogeton oblongus* auct. non VIV. 1804: AITCH. 1880, *Potamogeton polygonifolius* auct. non POURR. 1788: BOSSHARD 1932, *Potamogeton natans* auct. non L. 1753: RECH.f. 1964, *Potamogeton heterophyllus* auct. non SCHREBER 1771: JUZ. 1934 p.p.

Ic.: Fl.Iran.83: pl.4. Fl.Pak.79: fig.1(A-C). Fl.Iraq 8: pl.8.

W **Hunza:** Chalt 1830 m, *O.Polunin 6473* (BM!). **Batura:** N Morkhoon 2740 m, *Klötzli & al. 99.09!* (veg.).

S **Shigar:** Shigar, *Koelz 9672* (Ann.Cat.Pak.). **Skardu:** Skardu, *R.R.Stewart 20743* (Ann.Cat.Pak.). Floodplain of Indus Rv. c. 1.5 miles E of Skardu 2290 m, *G.L.Webster 6583* (K!). Skardu, *S.A.A.Shah* s.n., 1965-09-05 (RAW). Satpura Lake, *Siddiqi, Y.Nasir & Z.Ali 4101* (RAW). **Shyok:** Head of Rongdu Nala 4720 m, *R.C.F.Schomburg 30* (BM!).

A: W Kashg.: *Bosshard* (Z!, veg.). Swat. Hazara: Karakorum Highway, *M.Qaiser & A.Ali 5440* (KUH). Kashmir: Nil Nag, *R.R.Stewart 23075* (K!). Jhelum Vy., Shadipur 1580 m, *Ludlow & Sherriff 7812* (BM!).

D: Warm-temp. Eurasia, Africa, N & C. America. *Holarct.*

N: "Common from the hills to the plain" (Fl.Pak.).

* **Potamogeton octandrus** POIRET in LAM. 1816 (*Potamogeton javanicus* HASSK. 1856) - **Ic.**: Fl.Pak. 79: fig. 2(K-M). A record from **Skardu** (Ann.Cat.Pak.). is unconfirmed and probably erroneous. **D**: Africa, S Asia, NE Australia. **N**: The species apparently is often confused with *P. nodosus*. Forms without floating leaves may be very similar *P. pusillus*, but are distinguished by a very broad band of air-spaced cells bordering the midrib. Both, *P. nodosus* and *P. pusillus*, occur with certainty around Skardu.

276. Potamogeton pectinatus L., Sp. Pl. 127. 1753

Ic.: Fl.Pak.79: fig.2(F-G).

W **Batura:** Borit Jil 2500 m, *F.A.Perrot 24* (K!). Karimabad - Khaibar 2500 m, *Klötzli & al. 808.10!*.

S **?Skardu:** (WEBSTER & NASIR 1965 [? to *P. amblyphyllus*]. **?Leh:** Common along the Indus Vy. in Ladakh (HENDERSON & HUME 1873; STEWART 1916 [? to *P. amblyphyllus*]).

A: Kashmir.

D: Almost cosmopolitic. *Cosmopol.*

E: 2500-2800 m, coll. - mont., rare.

N: Apparently much rarer and confined to lower elevations than *P. amblyphyllus*, to which probably refer most literature records.

277. Potamogeton perfoliatus L., Sp. Pl. 126. 1753

Ic.: Fl.Pak.79, fig.1(G-K). Fl.Xizang.5: fig.4. Fl.Desert.Sin.1: fig.6(8-10).

S **Skardu:** 2290 m, cold pond, *Nasir & Webster 5750* (K!, RAW). **Leh:** Spitok, Treaty Rd. 3200 m, *Ludlow & Sherriff 8397* (BM!). Common along the Indus Vy. in Ladakh (HENDERSON & HUME

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1873; STEWART 1916). **Lower Shyok:** Saling, *Nasir & Webster 6291* (WEBSTER & NASIR 1965; RAW).
A: Swat, Kashmir.
D: Eurasia, Africa, N America, Australia. *Cosmopol.*

278. Potamogeton pusillus L., Sp. Pl. 127. 1753
Ic.: Fl.Xizang.5: fig.5. Fl.Desert.Sin.1: fig.7(1-4).
CS **Nubra:** Panamik 3350 m, *Ludlow & Sherriff 9397a* (BM!).
S **Skardu:** *Koelz 9613* (Ann.Cat.Pak.). Skardu 2130-2440 m, *Duthie 12063* (K!); 2290 m, cold pond, *Nasir & Webster 5752* (K!, RAW); *R.R.Stewart 20430* (RAW).
A: Kashmir: Achabal 1680 m, *F.Ludlow 8270* (BM!).
D: Eurasia, Africa, N America. *Holarct.*
N: The identifications are meant in an aggregate sense. If *Potamogeton pusillus* L. s.str. (*Potamogeton panormitanus* BIV. 1838): stipules tubular, 0-2 lacunae on each side of the midrib, and *Potamogeton berchtoldii* FIEBER in BERCHT. & OPIZ 1838: stipules convolute, 1-5 lacunae, can be separated, most of the material possibly will prove to be *P. pusillus* s.str. One specimen from Kashmir (*Ludlow 8270*) was named *P. berchtoldii*.

* **Potamogeton lucens X P. natans** (? *Potamogeton* X *fluitans* ROTH 1788 p.p., ? *Potamogeton* X *hindostanicus* HAGSTR. 1916 - **A**: Kashmir: Dal Lake 1520 m, *Ludlow & Sherriff 9* (BM!). Canal leading into Dal Lake 1580 m, 1915, *Prescott-Decie* s.n. (BM!).

* Smilacaceae

Lit.:
GHAZANFAR, S. 1977: *Smilacaceae*. - In: Flora of Pakistan **107**: 1-5.

* **Smilax aspera** L. 1753 - **A**: Hazara, Kashmir. **D**: Medit., N Africa - Pakistan, India, Sri Lanka.

* **Smilax glaucophylla** KLOTZSCH in KLOTZSCH & GARCKE 1862 (*Smilax parvifolia* WALL. ex HOOKER f. 1892) - **A**: Swat. Hazara: Kaghan Vy., above Malkandi 1680 m, *Schickhoff 90/231a!*. Kashmir 1220-2440 m. **D**: Himalaya: Swat - SW China.

* **Smilax vaginata** DECNE. in JACQUEM. 1844 - **A**: Kurram. Swat. Hazara: Kaghan Vy. 2300 m, *Schickhoff 1781!*. Kashmir 1680-3350 m. **D**: Himalaya: E Afgh. - Assam. **E**: *Cedrus deodara* forests.

* Sparganiaceae

Lit.:
GRAEBNER, P. 1900b: *Sparganiaceae*. - In: ENGLER, A., Das Pflanzenreich **2** (IV. 10): 1-26.
GRUBOV, V. I. & al. 1971: *Sparganiaceae*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **6**: 38-39.
OVCZINNIKOV, P. N. (ed.) 1957: *Sparganiaceae*. - In: Flora Tadzhikskoy SSR **1**: 89-90.
RIEDL, H. 1969: *Sparganiaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **59**.

* **Sparganium emersum** REHMANN 1871 (*Sparganium simplex* HUDSON 1778) - **A**: Astor: Nanga Parbat, Rama, in pond 3050 m, *R.R.Stewart 22873*; *22944* (K!); common at the edge of shallow pond in pine woods, *G.L.Webster 6442* (K!). **D**: Temp. N hemispere. **N**: The Astor station apparently is the only Himalayan locality known.

* **Sparganium erectum** L. 1753 (*Sparganium ramosum* HUDSON 1778) - **A**: Swat. Hazara. Kashmir. **D**: Temp. N hemisphere. **N**: Which subspecies of the polymorphic species occur in the W Himalaya is unknown.

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* Trilliaceae

Lit.:
ECKER, E. J. 1976: *Trilliaceae*. - In: Flora of Pakistan **105**: 1-3.

* **Paris polyphylla** SMITH in REES 1813 - **A**: Kashmir, rare. **D**: Himalaya - W China.

* **Trillidium govanianum** (WALL.) KUNTH 1850 (*Trillium govanianum* WALL. ex ROYLE 1839) - **Ic.**: Fl.Pak.105: fig. 1A-D. **A**: Chitral. Swat. Hazara: Kaghan Vy. Kashmir 2130-3960 m. Himachal Pr.: Khoksar, *Aswal 10232* (ASWAL & MEHROTRA 1994). **D**: W Himalaya: NE Afgh. (Nuristan) - Sikkim.

Typhaceae

Lit.:
GRAEBNER, P. 1900a: *Typhaceae*. - In: ENGLER, A., Das Pflanzenreich **2** (IV. 8): 1-16.
GRUBOV, V. I. & al. 1971: *Typhaceae*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **6**: 36-38.
OVCZINNIKOV, P. N. (ed.) 1957: *Typhaceae*. - In: Flora Tadzhikskoy SSR **1**: 84-89.
RIEDL, H. 1970: *Typhaceae*. - In: RECHINGER, K. H. (ed.), Flora Iranica **71**: 1-8, pl. 1-4.
SAOOD OMER & RIZWAN Y. HASHMI 1987: *Typhaceae*. - In: Flora of Pakistan **177**: 1-8.

* **Typha angustifolia** L. 1753 - **Ic.**: Fl.Desert.Sin.1: fig.5(3-4). **A**: [?] W Kashg. (BOSSHARD 1932, veg.). **D**: Eurasia, Australia, N America. **N**: The species is apparently not known from C. Asia. The record may refer to *T. laxmannii*.

279. Typha domingensis PERS., Syn. Pl. **2**: 532. 1807

Typha australis SCHUM. & THONN. 1829, *Typha angustata* BORY & CHAUB. in BORY 1832

Ic.: Fl.Desert.Sin.1: fig.5(1-2). Fl.Pak.177: fig.2 A-E.

W **Gilgit:** (Ann.Cat.Pak.).

S **Skardu:** Floodplain of Indus Rv., c. 1.5 miles E of Skardu 2290 m, locally common, *G.L.Webster 6592* (K!, ?RAW). Skardu 2290 m, *W.Koelz 9649* (RAW).

A: W & S Kashg. (Pl.As.Centr.). Swat. Kashmir: Dal Lake 1680 m, *R.R.Stewart 3266* (K!). Nasim Bagh 1580 m, *R.R. & I.D.Stewart 3266* (RAW).

D: Medit., Asia, Africa, America: pantrop. - subtrop. (-temp.). *Pantrop.*

E: c. 1500-2290 m, coll., rare. (Seasonally) wet, sometimes ± saline habitats; swamps, ditches, river beds.

N: The specimen *Nasir & Webster 6592* (RAW) is cited as **Typha elephantina** ROXB., Fl. India **3**: 566. 1832 - **Ic.**: Fl.Pak.177: fig.2 F-H. **N**: Doubtfully distinct.

? 280. Typha laxmannii LEPECHIN, Nova Acta Acad. Petrop. **12**: 84, 335, pl.4. 1801

Ic.: Pl.As.Centr.6: pl.5 fig.1.

S **?Shigar:** *Koelz 9675* (Ann.Cat.Pak.).

A: N Kashg., Takla Makan, Lob Nor, W Kashg. (Pl.As.Centr.). Kurram. Kashmir: 1520 m, *T.Thomson* s.n. (K!).

D: S & C. Europe, temp. Asia - Japan, ?Australia.

E: c. 2300 m, coll., rare. Wet habitats. *Euras.*

N: No Karakorum specimen seen. The record from Shigar is not quite certain and may also prove to be a form of *T. minima*.

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281. Typha minima FUNCK in HOPPE, Bot. Taschenb. 1794: 118, 181, 187. 1794
Typha angustifolia L. var. *minor* L. 1762

Ic.: Fl.Iran. 71: pl.3 (*T. minima*); pl.4 ("*T. martinii*"). Fl.Desert.Sin.1: fig.5(7-8). Fl.Pak.177: fig.1.

S **Shigar:** Basna Vy. N Chutran 2550 m, 1991-07-10, *J.Poelt* s.n. (GZU!).

A: W & S Kashg. (Pl.As.Centr.). Wakhan 2800 m (PODLECH & ANDERS 1977).

D: Temp. Eurasia - Japan. *Euras.*

E: 2550 m, coll.-mont., rare. Wet habitats, open riverbeds.

N: The specimen from Shigar has the cauline leaves with well developed blades and therefore represents *Typha minima* FUNCK in HOPPE var. *gracilis* DUCOMMUN 1869 (*Typha gracilis* JORDAN 1848, non RAFIN. 1836 nec SUHR ex REICHENB. 1847, *Typha martinii* JORDAN 1851). This character does not seem to be correlated to any other, which precludes a higher rank of the taxon. A different opinion is followed in Fl.Iran. and by CASPER & KRAUSCH (1980).

Zannichelliaceae

Lit.:
DANDY, J. E. 1971: *Zannichelliaceae*. - In: RECHINGER, K.-H. (ed.), Flora Iranica **85**: 1-4.
GRUBOV, V. I. & al. 1971: *Zannichellia*. - In: GRUBOV, V. I. (ed.): Plantae Asiae Centralis **6**: 51.
KHADIJA AZIZ & ALI, S. I. 1972: *Zannichelliaceae*. - In: Flora of Pakistan. **18**: 1-3.
OVCZINNIKOV, P. N. (ed.) 1957: *Zannichellia*. - In: Flora Tadzhikskoy SSR **1**: 101.

282. Zannichellia palustris L., Sp. Pl. 969. 1753
Zannichellia palustris L. subsp. *pedicellata* WAHLENB. & ROSEN 1821, *Zannichellia pedunculata* REICHENB. in MÖSSLER 1829

Ic.: Fl.Pak.18: fig.1. Fl.Xizang.5: fig.7. Fl.Desert.Sin.1: fig.7(5-10).

S **Skardu:** 1847-11, *T.Thomson* s.n. (K!). **Leh:** [Marsilang - Shushot c. 3600 m], 1847-10-01, *T.Thomson* s.n. (K!). Pugha [4720 m, hot borax-springs], 1847-09-22, *T.Thomson* s.n. (K!; THOMSON 1856). Tikse (STEWART 1869: *Zannichellia* sp.).

Unloc.: Ladakh, common, *Koelz 2571; 2575; 2584; 6331* (Ann.Cat.Pak.).

D: *Cosmopol.*

E: c. 2300-3600 (4720) m, scattered along the Indus Vy. In stagnant to slowly running, often eutrophic or somewhat saline water, shallow ponds and streams; hot springs in the highest altitudes.

* Zingiberaceae

* **Roscoea alpina** ROYLE 1839 - **A**: Hazara. Kashmir. **D**: Himalaya (Hazara - Bhutan).

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6 Vegetation - Vegetation

Die Vegetation des Karakorum und angrenzender Gebiete ist mit außergewöhnlich scharfen Grenzen altitudinal (MEEBOLD 1909, DICKORÉ 1991) und standörtlich (STEWART 1982) stark differenziert. Trotzdem bestehen grundsätzliche Schwierigkeiten in der Beschreibung und Definition der Vegetationstypen, deren Ursachen zu einem Teil in den unterschiedlichen Sippenfassungen verschiedener Autoren liegen.

6.1 Vegetationskundliche und pflanzensoziologische Arbeiten - Works on Vegetation and Phytosociology

Vegetationskundliche Pionierarbeiten leistete im Nanga Parbat-Massiv TROLL (1939) mit einer detaillierten Vegetationskarte, die im gesamten Himalaya bis heute ihresgleichen sucht. Die Bestimmungsarbeiten waren allerdings nicht abgeschlossen und sein Belegmaterial ist im Krieg anscheinend vollständig in Berlin verbrannt. Daher ist die taxonomische Grundlage seiner Arbeit teilweise unsicher. Die Monographie von SCHICKHOFF (1993) bildet mit einer großmaßstäblichen Vegetationskarte einen Anschluß an das Kaghan Vy. der Himalaya-Südabdachung. Für den Zentral-Karakorum bietet HARTMANN (1968, subalpine Stufe) und HARTMANN (1972, alpine Stufe), eine auch taxonomisch (HARTMANN 1966, 1984) hervorragend abgesicherte Grundlage.

Gute Vegetationsbeschreibungen für Teilgebiete des Karakorum finden sich weiterhin bei PAFFEN, PILLEWITZER & SCHNEIDER (1956), WEBSTER & NASIR (1965) und LLOYD & LLOYD (1968). Die Arbeiten von AHMED & QADIR (1976) und AHMED (1976) aus der Talstufe des S & W Karakorum entbehren demgegenüber einer reproduzierbaren taxonomischen Grundlage. DURANI, SINGH & KACHROO (1975) geben eine Beschreibung der Vegetation von Ladakh, die von HARTMANN (1983, 1987) in Tabellenform belegt und übersichtlich gegliedert wird.

Die zusammenfassende Darstellung der dreidimensionalen Zonierung der Flora des Himalaya von SCHWEINFURTH (1957) ist bis heute gültige Grundlage. Die "alpine Steppe" des Tibetanischen Plateaus und des größten Teils des Karakorum bleibt jedoch ungegliedert. WISSMANN (1959, 1960-1961) gibt einen Überblick über den Zusammenhang zwischen den Schneegrenzhöhen und Vegetationsstufen. ZHANG JINGWEI & al. (1981) untersuchen die latitudinale Differenzierung der Vegetation Tibets und deren klimatische Grundlage. Die umfassendste Vegetationsmonographie aus dem zentralen Himalaya ist die Arbeit über den Langtang-Himalaya von MIEHE (1990); eine allgemeine Übersicht gibt MIEHE (1991). Für Tibet sind neben der chinesischen Monographie (ZHANG JINGWEI & al. 1988), die Arbeiten von WANG JINTING (1981, 1987, 1988) sowie MIEHE (1988) zu nennen.

Die Vegetation von Chitral behandeln in Einzelaspekten KERSTAN (1937), BEG & BAKHSH (1974) und KHAN (1978). Insbesondere die *Quercus*-Waldstufe von Swat untersuchen BEG & KHAN (1980) sowie BEG & KHAN (1984); temperierte Wälder beschreibt AHMED (1988). AITCHISON (1864) und MOHAN (1955) beschreiben die Vegetation des Punjab. Grasland- und Wiesengesellschaften des W Himalaya charakterisieren JOHNSTON & EJAZ HUSSAIN (1963), GUPTA & NANDA (1970), KAUL & SARIN (1971) und GUPTA (1974).

WALTER (1974) bietet einen Überblick über die Vegetation Zentralasiens. Die Vegetationsgliederung Afghanistans ist in zahlreichen Arbeiten untersucht worden (LINCHEVSKY & PROZOROVSKY 1949, VOLK 1954, NEUBAUER 1955, FREITAG 1971a, FREITAG 1971b, GILLI 1977, BRECKLE 1971, 1974, 1988, BRECKLE & FREY 1988), darunter am umfassendsten wohl von FREITAG (1971a). Die außerordentlich reichhaltige Flora Afghanistans erschwert die Vergleichbarkeit, da eine einheitliche floristische Grundlage fehlt. Ähnliches gilt für Tadzhikistan und den Pamir, der von zahlreichen russischen Autoren untersucht wurde. Eine Vegetationskarte findet sich im "Atlas of the Tadzhik Soviet Socialist Republic". Vegetationskarten von China präsentieren SONG YONGCHANG (1983) und HOU (1984).

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6.2 Die aktuelle Vegetation des Karakorum - Actual Vegetation of the Karakorum

"I find it extremely difficult to describe in an adequate manner the extreme desolation of the most barren parts of Tibet, where no luxuriant forest or bright green herbage softens the nakedness of the mountains, but everywhere the same precipices, heaps of rocks, and barren monotonous deserts meet the eye."
(T.THOMSON 1852: 376)

Die Vegetation des CN Karakorum kann aus eigener Ansicht relativ ausführlich beschrieben werden. Für die übrigen Gebiete werden auf die existierende Literatur und die geplante Vegetationsmonographie (MIEHE in prep.) verwiesen und einige aus der vorliegenden Bearbeitung der Monocotyledoneae gewonnene Daten dargelegt.

6.2.1 Zentraler Nord-Karakorum - CN Karakorum

Die Vegetation der Gebirgswüstenregion des CN Karakorum ist sehr artenarm, gering differenziert und stark kontrahiert. Große Gebiete sind nahezu frei von höheren Pflanzen, Moosen und Flechten. Eine Waldstufe fehlt völlig; Steppen-, Polsterpflanzen- und Rasengesellschaften kommen nur lokal vor. Dennoch zeigt die Vegetation eine außerordentlich deutliche altitudinale Zonierung (DICKORÉ 1991). Die folgende Schilderung basiert im wesentlichen auf eigenen Untersuchungen in K2-North. Die Vegetation von Braldu im W, im Bereich des Shimshal P., einer wesentlichen Depression der Hauptkette, ist sicher reicher und differenzierter. Shaksgam im E ist kaum bekannt, aber jedenfalls noch ärmer als K2-North.

6.2.1.1. Subalpine Stufe - Subalpine belt

Uniforme *Krascheninnikovia ceratoides*-Wüsten beherrschen die Vegetation des CN Karakorum unterhalb 4200-4400 m Meereshöhe und sind gegen die etwas reicheren alpinen Gesellschaften scharf abgegrenzt. Auf vergleichsweise günstigen (Wasserzuschuß-) Standorten beträgt die Artenzahl höherer Pflanzen 4-5 / 100 m^2, die Vegetationsbedeckung überschreitet selten 15 % der Fläche und liegt meist unter 5 %. Moose und Flechten fehlen oft praktisch vollständig. Charakteristische Arten sind *Stipa caucasica* subsp. *glareosa*, *Tanacetum fruticulosum* und *Oxytropis microphylla*. *Ephedra intermedia* ist unterhalb 4000 m häufig und tritt oft als alleiniger Besiedler in Felsschluchten auf; *K. ceratoides* bildet "Einartgesellschaften" am Fuß der gigantischen vegetationslosen Schutthalden. *Berberis ulicina* kennzeichnet eine etwas reichere Halbwüstenvegetation auf Wasserzuschußflächen mit sehr lokalen Vorkommen von *Rhamnus prostrata*, *Ribes orientale* und *Juniperus turkestanica*.

Grund- und quellwasserabhängige Pflanzengesellschaften sind, offensichtlich aufgrund extremer Temperatur- und Wasserstandsschwankungen, aber auch katastrophaler Flutereignisse durch Gletscherseeausbrüche, auf sehr kleine Flächen beschränkt. Eine etwas größere Ausdehnung erreichen nur *Myricaria bracteata*-Auengebüsche. In geschützten Buchten der Talböden und an den wenigen Quellaustritten kommen, sehr lokal und meist scharf begrenzt, relativ artenreiche Quell- und Flachmoorrasen vor (*Carex pseudofoetida*, *Carex orbicularis*, *Carex microglochin*, *Kobresia royleana*, *Blysmus compressus*, *Puccinellia tenuiflora*, *Triglochin palustre* und *T. maritima*), sehr selten *Salix pycnostachya*. Vereinzelte Pflanzen oder kleinere Siedlungen von *Artemisia santolinifolia*, *Lonicera asperifolia*, *Crepis flexuosa*, *Corydalis adiantifolia* s.l., *Arnebia guttata*, *Rheum tibeticum*, *Elymus nutans* kennzeichnen die mobilen Geröllflächen der Flußterrassen und Gletschervorfelder. *Calamagrostis pseudophragmites* und *Leymus secalinus* bilden stellenweise wiesenähnliche Bestände auf geschützteren sandigen Standorten im Bereich verfügbaren Grundwassers.

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6.2.1.2 **Alpine Stufe** - Alpine belt

Ein unterbrochener, nur an weniger steilen und nicht direkt S-exponierten Hängen gut ausgebildeter Steppengürtel mit *Festuca olgae* kennzeichnet die untere alpine Stufe (ca. 4300-4600 m). Die Artenzahl mittlerer Standorte ist, bedingt durch das Zusammentreten subalpiner und alpiner, aber auch mehrerer ± auf den übergangsbereich beschränkter Taxa (*Allium carolinianum*, *Carex alexeenkoana*, *Poa lipskyi*, *Astragalus nivalis*, *Astragalus webbianus*), in dieser Höhenstufe am größten (bis ca. 15-20 Arten /100 m^2).

Die Vegetation der mittleren alpinen Stufe mit durch *Tanacetum tibeticum* (*Ajania tibetica*) gekennzeichneten lückigen Chamaephyten- und Hemikryptophyten-Gesellschaften ist relativ artenreich, aber bereits auf schmale gletscherbegleitende Streifen beschränkt oder in inselartige Einzelbestände aufgelöst, die daher auch als extrazonale Standorte innerhalb der alpinen Wüste aufgefaßt werden können.

Tanacetum tibeticum, *Thylacosperum caespitosum*, *Rhodiola fastigiata*, *Rheum spiciforme*, *Potentilla (Dasiphora) dryadanthoides*, *Androsace flavescens*, *Elymus schrenkianus* und *Festuca tibetica* sind häufige Schuttbesiedler, die bis in die hochalpin-subnivale Stufe aufsteigen. *Oxytropis chiliophylla*, *Dracocephalum heterophyllum* und *Tanacetum pyrethroides* scheinen deutlicher auf die mittlere alpine Stufe beschränkt. Auffällig ist eine Hochstaudengesellschaft auf etwas stabilisiertem Blockschutt mit *Carex nivalis* und *Delphinium brunonianum*. Alpine Steppen und Rasen sind nur sehr kleinflächig ausgebildet und wohl durch die hohe Reliefenergie begrenzt. *Poa attenuata* und *Leontopodium nanum* sind häufig, *Poa lipskyi*, *Stipa subsessiliflora*, *St. purpurea*, *Lagotis decumbens* kommen nur in geschützten Mulden vor.

Die standörtliche Differenzierung der alpinen Vegetation ist generell gering. Die meisten Arten besiedeln je nach Meereshöhe und Exposition unterschiedliche Fels-, Schutt- oder rasenähnliche Standorte ("Relative Standortskonstanz"). Im Gegensatz zur subalpinen Stufe gibt es jedoch einige spezialisierte Chasmophyten (*Saxifraga pulvinaria*, *Eritrichium* spp., *Viola biflora*, *Dolomiaea macrocephala*). Ebenfalls überwiegend auf die N-Expositionen beschränkt sind lithophytische Flechten und felsspaltenbesiedelnde Laubmoose artenreich vertreten.

6.2.1.3 **Hochalpin / subnivale Stufe** - High alpine / subnival belt

Die "Solifuktionsakrobaten" *Saussurea gnaphalodes* und *Sibbaldia tetrandra* kennzeichnen die Frostschuttstufe (free gelifluction belt) oberhalb (4400-) 4700 m bis zur Obergrenze des Vorkommens höherer Pflanzen (ca. 5200 m; Schneegrenze ca. 5500 m). Seltener sind *Lagotis globosa*, *Silene gonosperma*, *Waldheimia tomentosa*, *Waldheimia tridactylites*. Die innerhalb gewaltiger vegetationsfreier Schutt- und Felsmassen nur noch sehr vereinzelten hochalpinen Pflanzensiedlungen können lokal auch zu geschlossenen und relativ artenreichen Rasenflecken (*Carex borii*, *Kobresia karakorumensis*, *Stipa concinna*, *Potentilla pamirica*, *Gentianella pygmaea*) zusammentreten.

6.2.2 **Zentraler Süd-Karakorum** - CS Karakorum

Die Vegetation des repräsentativen Biafo-Gebietes wurde von HARTMANN (1968, 1972) ausführlich dargestellt; WEBSTER & NASIR (1965) geben eine erste Übersicht über Saltoro. Generell ist die Vegetation stärker differenziert als auf der Nordabdachung. *Tab. 1* gibt eine Übersicht analoger Vegetationsformationen der N- und S-Abdachungen des Zentral-Karakorum. Alpine Rasengesellschaften bedecken im CS relativ große Flächen und sind floristisch wesentlich reichhaltiger als im CN Karakorum. Der westliche CS Karakorum ist Waldgrenzgebiet, in dem unter optimalen Bedingungen erste Vorposten subalpiner Gehölze (*Juniperus turkestanica*, *Betula utilis* subsp. *jacquemontii*) auftreten, ohne jedoch größere Bestände zu bilden. In östlicher Richtung ist nach dem vorliegendem floristischen Material ebenfalls eine abnehmende Differenzierung der Vegetationsbedeckung zu erwarten.

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Karakorum-Südabdachung (Biafo, HARTMANN 1968,1972)	**Karakorum-Nordabdachung** (K2-North, DICKORÉ 1991; unpubl.)
Subalpine Pflanzengesellschaften	
Moränen- und Schotterflur der Talsohle	Gebüsche und Pionierges. auf glaziofluvialen Schottern: *Crepis flexuosa-Myricaria bracteata*-Ges., *Leymus secalinus-Calamagrostis pseudophragmites*-Ges., *Corydalis adiantifolia-Crepis flexuosa*-Ges., *Lonicera asperifolia-Artemisia santolinifolia*-Ges.
(Grundwassergehölze:) *Salix (pycnostachya)-Hippophae rhamnoides*-Gebüsch	Flachmoorgebüsche und Quellsümpfe: *Salix pycnostachya*-Ges., *Carex microglochin-C. orbicularis*-Ges., *Blysmus compressus-Carex pseudofoetida*-Ges., *Dilophia salsa*-Ges. (Yarkand: *Hippophae rhamnoides* subsp. *turkestanica*)
Mesophile Stauchbestände: *Rosa (webbiana)-Spiraea lycioides*-Gebüsch	fehlen (selten in Felsspalten: *Juniperus turkestanica*, *Ribes orientale*)
Schutthalden-Vegetation der subalpinen Stufe: *Artemisia (maritima)*[1] *- Echinops tibetica*-Ges.	fehlt (keine spezialisierte Gesellschaft, als Pionier: *Krascheninnikovia ceratoides*)
Felsflur der subalpinen Stufe: *Inula obtusifolia- Anaphalis virgata*-Ges.	fehlt (*Ephedra intermedia*, *Potentilla salesowiana*, *Myricaria elegans* als unspezifische Pioniere)
Oxytropis mollis[2]*-Koeleria gracilis*[3]-Steppe	fehlt (verwandte Ges. auf der Kunlun-Nordabdachung mit *Koeleria litwinowii*)
Artemisia (maritima)[1] *- Ephedra regeliana*-Steppe	fehlt (Fragmente mit *Carex stenophylla*, *Ephedra fedtschenkoae*; Aghil-Nordabd.: *Artemisia compacta*)
Kochia (prostrata)- Ephedra intermedia-Steppe	Subalpine (Halb-)Wüsten: *Ephedra intermedia-Krascheninnikovia ceratoides-*, *Stipa caucasica* subsp. *glareosa-Krascheninnikovia ceratoides*-Wüsten, *Berberis ulicina-Krascheninnikovia*-Halbwüste
Alpine Pflanzengesellschaften	
Salix karelinii-Gebüsch	fehlt
Festuca alatavica-Carex tristis[4]-Rasen	subalpin/alpine Steppen: *Astragus webbianus-Festuca olgae*-Ges., *Astragalus nivalis-Festuca olgae*-Ges.
Leontopodium leontopodioides[5]*-Koeleria gracilis*[3]-Rasen	alpine Steppenrasen: *Stipa purpurea-Stipa subsessiliflora*-Ges.
Colpodium (himalaicum)[6] *-Carex borii*-Rasen	(hochalpin-subnivale Rasenflecken: *Kobresia karakorumensis-Carex borii*-Ges., s.u.)
Sedum crassipes[7]*-Leontopodium leontopodioides*[5] Schuttflur	alpine Schutt- und Stauden-Ges.: *Tanacetum tibeticum*-Ges., *Nepeta longibracteata-Lonicera semenovii*-Ges., *Delphinium brunonianum-Carex nivalis*-Ges.
Potentilla sericea[8]*-Saxifraga imbricata*[9]-Felsflur	alpine Felsspalten-Ges.: *Saxifraga pulvinaria*-Ges., *Thylacospermum caespitosum*-Ges.
Hochalpin / Subnivale Pflanzengesellschaften	
Keine Angaben (s.o.)	Frostschutt-, Felsspalten-Ges. und Rasenflecken: *Saussurea gnaphalodes-Sibbaldia tetrandra*-Ges., *Lagotis globosa-Silene gonosperma*-Ges., *Potentilla pamirica-Thylacospermum caespitosum*-Ges., *Kobresia karakorumensis-Carex borii*-Ges.

[1] *Artemisia brevifolia*
[2] *Oxytropis* cf. *lehmanniana*
[3] *Koeleria cristata*
[4] *Carex stenocarpa*
[5] *Leontopodium ochroleucum*
[6] *Colpodium baltistanicum*
[7] *Rhodiola crassipes*
[8] *Potentilla pamirica* s.l.
[9] *Saxifraga pulvinaria*

Tab. 1: **Vegetationsvergleich der Süd- und Nordabdachung des Zentral-Karakorum** (nach HARTMANN 1966, 1972, DICKORÉ 1991 und unpublizierten Ergänzungen; Ges. = Gesellschaft; taxonomisch/nomenklatorische Differenzen in Fußnoten) - Comparison of the vegetation of the CN and CS Karakorum (Ges. = plant community; taxonomic/nomenclatorial differences in footnotes).

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Die kollinen Wüstensteppen erreichen unterhalb 2000 (-2700) m in Baltistan noch die tiefsten Taleinschnitte des CS Karakorum (*Artemisia fragrans*). Montane *Artemisia brevifolia*-"Strauchsteppen" (*Koeleria cristata*, *Piptatherum gracile*, *Poa sterilis*) sind unterhalb von ca. 3100 m weit verbreitet, *Juniperus excelsa* kommt nur vereinzelt vor und bildet nur lokal offene Steppenwälder. Auf strikte N-Exposition beschränkt keilt die subalpine *Betula utilis* subsp. *jacquemontii*-Stufe gegen 3100-3600 m aus, ebenso *Juniperus communis* subsp. *sibirica*-Zwergstrauch-Gesellschaften. *Salix karelinii*-Gebüsche sind ebenfalls auf N-Expositionen der unteren alpinen Stufe beschränkt (3700-4000 m), alpine Steppen und Rasengesellschaften dominieren zwischen 3900 und 4300 m (-4800) (*Carex borii*, *Colpodium baltistanicum*). Die Untergrenze der subnivalen Frostschuttstufe liegt etwa zwischen 4300 und 4700 m.

6.2.3 **Nord-Karakorum** - N Karakorum

Die Kunlun-Hauptkette schirmt den größten Teil des N Karakorum gegen den Lößgürtel um das Tarim-Becken und die von NW übergreifenden höheren Niederschläge ab. Die Vegetation der zentralasiatischen Wüsten und Lößsteppen in Hochlagen der Kunlun-Nordabdachung (*Picea schrenkiana*-Wälder: Kongur) greift daher nur in stark verarmter und abgewandelter Form in den N Karakorum über.

Die alpinen Steppen des N Karakorum vermitteln zwischen denen Tibets und des Tian Shan. Besonders charakteristisch scheint eine „alpine Polstersteppe", die sich durch *Poa attenuata* und *Oxytropis densa* kennzeichnen läßt. *Oxytropis ampullata* und *O. chionobia* sind weitere polsterförmige und weißfilzige Arten von lokaler Bedeutung. Neben *Stipa purpurea* und *Stipa subsessiliflora* kommen vor allem im Nordwesten eine Reihe E Pamirischer Elemente vor (*Calamagrostis anthoxanthoides, Colpodium leucolepis, Acantholimon diapensioides*). *Festuca valesiaca* subsp. *hypsophila*-Steppenrasen vermitteln ebenfalls zu Vegetationsformen des E Pamir. In ± geschlossenen *Cyperaceae*-Rasen in der oberen alpinen Stufe dominieren meist die weitverbreiteten *Carex pseudofoetida* und *Kobresia capillifolia*.

Subalpine und montane Vegetationstypen greifen nur in den großen Durchbruchstälern (Gez, Yarkand, Karakash) geringfügig und von W nach E abnehmend in den N Karakorum über. Die subalpinen *Krascheninnikovia ceratoides*-Wüsten des N Karakorum gleichen offensichtlich weitgehend denen des CN Karakorum (s.o.). *Sympegma regelii* und *Nitraria schoberi* als Kennarten der montanen Wüsten finden ihre südliche Verbreitungsgrenze am Fuß des N Karakorum (unterhalb 3600-3800 m).

6.2.4 **West-Karakorum** - W Karakorum

Vegetation und Flora des W Karakorum weisen aufgrund der relativ günstigen und extrem vielfältigen klimatischen Bedingungen die höchste Diversität auf. Die S und W Flanken des Rakaposhi-Haramosh-Massivs (Gilgit, Hunza) werden offensichtlich noch von durch das Indus-Durchbruchstal kanalisierten Sommermonsun-Ausläufern erreicht. Die Bedingungen oberhalb der montanen Stufe sind subhumid bis humid. Die übrigen Gebiete sind als semihumid - semiarid einzustufen; nur die direkte Umgebung des stark abgeschirmten Khunjerab P. ist arid (WEIERS 1993, S. MIEHE mskr.) und der Region der zentralasiatisch-alpinen Steppen des CN und N Karakorum zuzurechnen. Im äußersten W (Ghizar, Yasin) macht sich ein gewisser Irano-Turanischer Einfluß bemerkbar (Winterregen). Die altitudinale Vegetationgliederung des W Karakorum ist vergleichsweise komplex und kann hier nur kurz umrissen werden.

6.2.4.1 **Kolline Stufe** - Colline belt

Eine durch tropisch-subtropische Elemente geprägte Halbwüsten-Vegetation (*Stipagrostis plumosa*, *Aristida adscensionis*, *A. cyanantha*, *Pennisetum orientale*, *Artemisia fragrans*, *Haplophyllum gilesii*) charakterisiert die kolline Stufe im SW Karakorum, Bewässerungs-Oasen sind scharf begrenzt. Die "Federgras-Wüstensteppe" (TROLL 1939) enthält keine *Stipa*-Arten; *Stipagrostis plumosa* ist kennzeichnend. Die Obergrenze der kollinen Stufe liegt bei etwa 2400 m (Ishkoman, Gilgit, Hunza, Skardu, Shigar). Einzelne

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Vertreter der subtropisch-collinen Flora erreichen an klimatisch begünstigten Standorten noch etwa die 2700 m-Isohypse (Batura, Eingang Shimshal Vy.).

6.2.4.2 **Montane Stufe** - Montane belt

Die aride untere montane Stufe charakterisieren *Haloxylon thomsonii* und *Daphne mucronata*; vereinzelt kommen *Berberis lycium* und *Pinus gerardiana* vor. Oberhalb ca. 2700 m dominieren „Zwergstrauch-Steppen" (*Artemisia brevifolia, Koeleria cristata, Poa sterilis, Piptatherum gracile*) und auf Schatthängen relativ weit verbreitet Steppen-Wälder (*Juniperus excelsa*). *Pinus gerardiana* kommt nur sehr lokal vor (Vorposten in Hunza bei Chaprot). Subhumide Bedingungen der äußeren Ketten charakterisieren *Pinus wallichiana*-Wälder. Zwischen 3000 und 3300 m kommen auf N-Expositionen unter optimalen hygrischen Bedingungen geschlossene *Picea smithiana*-Wälder vor, *Pinus wallichiana* mit einer breiteren ökologischen Amplitude ist meistens beigemischt. Die *Picea smithiana*-Wälder enthalten eine artenreiche und eigenständige Flora mit zahlreichen temperat Eurasiatischen (*Goodyera repens*), Himalayischen (*Neottia listeroides, Polygonatum geminiflorum, Pyrola karakoramicola*) und auch einigen endemischen Arten (*Carex oligocarya, Allium gilgiticum, Poa gilgitica*). Mehr oder weniger auf die reinen *Pinus wallichiana*-Wälder und mit einem weiteren Höhenspektrum greifen z.B. *Polygonatum leptophyllum* und *Orthilia secunda* über. *Abies webbiana* findet sich nur (? noch) in Einzelexemplaren (Kar Gah, Baghrot Vy., ?Naltar Vy.). REPP (1963) gibt für das Naltar Vy. auch *Cedrus deodara* an, weder DUTHIE (1893) noch andere erwähnen die Himalaya-Zeder von dort. *Cedrus deodara* ist im Indus Vy. knapp außerhalb des Karakorum weit verbreitet (bis Chilas, Astor), ein Vorposten im floristisch reichhaltigen Naltar Vy. ist daher nicht ausgeschlossen. Ähnliches gilt für *Quercus baloot*, die in der Gor-Region (Chilas) noch ausgedehnte Bestände besitzt.

6.2.4.3 **Subalpine Stufe** - Subalpine belt

Geschlossene *Betula utilis* subsp. *jacquemontii*-Wälder mit einer Untergrenze bei ca. 3500 m charakterisieren die humide subalpine Stufe, in Lawinenbahnen reichen *Betula*-Krummholzgebüsche weit abwärts in die montane Stufe. Die feuchtesten Bereiche, Schatthänge im Rakaposhi-Massiv zwischen 3600 und 3800 m, nehmen subalpine Gebüsche aus *Rhododendron anthopogon* und *Salix* spp. ein. Im inneren subhumid-subariden Gebiet wird der montane *Juniperus excelsa* in der subalpinen Stufe durch *Juniperus turkestanica*, verbreitet zwischen (3600-) 3700-3900 (-4100) m, ersetzt. *Salix karelinii*-Gebüsche auf Schatthängen, im W (Yasin) ein breiter Zwergstrauch-Gürtel mit *Juniperus communis* subsp. *sibirica* (3200-3900 m), vermitteln zur alpinen Stufe.

6.2.4.4 **Alpine bis subnivale Stufe** - Alpine to subnival belts

Alpine Rasen sind in der alpinen Stufe des äußeren W Karakorum großflächig und artenreich entwickelt (*Kobresia nitens, Poa alpina, Carex stenocarpa, Festuca alatavica*), gegen die subariden inneren Bereiche dominieren „alpine Steppen" (*Festuca olgae, Kobresia capillifolia, K. schoenoides*). Arten wie *Carex borii, Kobresia karakorumensis, Puccinellia kashmiriana* charakterisieren die Untergrenze der alpinen Frostschuttstufe bei ca. 4000-4200 m.

6.2.5 **Süd-Karakorum** - S Karakorum

Die breite subhumide Höhenstufe des SW Karakorum keilt östlich des Deosai-Plateaus aus. Insgesamt vollzieht sich indusaufwärts von Skardu nach Leh ein starker Floren- und (physiognomisch weniger auffälliger) Vegetationswandel von warm- zu kalt-ariden Bedingungen. *Capparis spinosa* als Vertreter der subtropisch-ariden Talstufe steigt im Indus Vy. etwa bis 3200 m auf. Letzte Vorposten von *Juniperus excelsa* finden sich im Wakha-Vy. (Suru) und im heiligen Hain von Himis Shukpa (Indus Vy.). Diese „Reliktstandorte" bieten anscheinend auch besonders günstige mikroklimatische Voraussetzungen, wenn

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auch die potentielle Verbreitung der *Juniperus*-Wälder eventuell etwas weiter wäre. Die montanen *Haloxylon thomsonii*-Schutthalbwüsten reichen etwa bis 3600 m aufwärts. *Artemisia brevifolia*-Strauchsteppen sind oberhalb 3600 m weit verbreitet, viele der eher subhumid verbreiteten Arten fallen jedoch aus. Die alpine und subnivale Stufe N des Indus ist relativ wenig bekannt; anscheinend finden Arten der humiden alpinen Stufe (z.B. *Carex stenocarpa*) ebenfalls ihre Verbreitungsgrenzen in der mittleren Ladakh-Kette. Die durch hohe Anteile weitverbreiteter Eurasiatischer und Holarktischer, aber auch Tibetanischer Elemente charakterisierte Vegetation von Ladakh wurde in mehreren Arbeiten ausführlich dargestellt (z.B. HARTMANN 1983, 1984, 1987, BILLIET & LÉONARD 1986), so daß hier auf nähere Ausführungen verzichtet werden kann.

6.2.6 **Ost-Karakorum** - E Karakorum

Die Vegetation des E Karakorum entspricht als derem westlichen Fortsatz im wesentlichen der W Tibets (Changtang). Ausgedehnte hochalpin-subnivale Frostschuttwüsten auf Grundmoränen und Sandern im Permafrostbereich sind außerordentlich artenarm und dünn von höheren Pflanzen besiedelt. *Carex moorcroftii*, *Carex sagaensis*, *Kobresia robusta*, *Puccinellia himalaica*, *Krascheninnikovia compacta*, *Saussurea thomsonii*, *Thylacospermum caespitosum* kennzeichnen vielleicht den nördlichen Teil (Changtang). Der zum Indus entwässernde Süd-Teil ist etwas artenreicher (z.B. *Kobresia pygmaea, Poa tibetica, Trikeraia hookeri, Saussurea glanduligera, S. thomsonii, Artemisia stracheyi, Artemisia minor*); geschlossene *Kobresia pygmaea*-Rasen, die weiter östlich zonal dominieren, kommen im östlichen Grenzgebiet des Karakorum nur sehr kleinflächig auf Grundwasser-Standorten vor.

7 **Phytogeographie und Verbreitungsmuster** - Phytogeography and distribution patterns

Pionierarbeiten zur Pflanzengeographie von W China, E Tibet und des Himalaya leistete DIELS (1913, 1942). CHATTERJEE (1939) gibt eine erste Übersicht über die endemische Flora des Indischen Subkontinents. Die Standardarbeiten von HULTÉN (1962) und MEUSEL & al. (1965-1992) vertieften auch das Verständnis der Sino-Himalayischen Diversitätszentren vieler Gruppen der Zirkumpolaren und Eurasiatischen Flora. Die Pflanzengeographie des W Himalaya wird von MEUSEL & SCHUBERT (1971) monographisch dargestellt. MEUSEL (1971, 1972) und WENDELBO (1971) untersuchen die Beziehungen zwischen den semiariden Mediterranen und Irano-Turanischen Florengebieten und dem Himalaya / Hochasien. ZHENG DU (1983) präsentiert eine chorologische Analyse der Flora von Tibet. MIEHE (1990) und SCHICKHOFF (1993) diskutieren phytogeographische Charakteristika des C. und W Himalaya.

Der Karakorum trennt als eine der mächtigsten Gebirgsbarrieren Asiens die fundamental unterschiedlichen Zentralasiatischen, Irano-Turanischen und Sino-Himalayischen Klima- und Vegetationsregionen. Exakte Grenzziehungen sind im Karakorum durch eine artenarme, vertikal und horizontal jedoch stark differenzierte Flora erschwert. Die Chorologie der Karakorum-Flora muß daher mindestens auf den drei Ebenen der (1.) Phytogeographischen Regionen, (2.) Geobotanischen Elemente und (3.) Regionalen Verbreitungsmuster untersucht werden. Da sowohl über die Hierarchie der phytogeographischen Gliederung Asiens als auch über die Benennung und Abgrenzung der phytogeographischen Regionen beträchtliche Differenzen bestehen, sind die folgenden Umschreibungen als informelle, an den Verhältnissen des Übergangs- und Grenzgebiets Karakorum orientierte Übersicht gedacht. Komplexere Definitionssysteme können in diesem Rahmen nicht diskutiert werden. Ähnliches gilt für die Einordnung einzelner Sippen, die zudem stark von der taxonomischen Abgrenzung abhängt. CLAYTON & COPE (1980) bieten ein System für die altweltlichen *Gramineae*.

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7.1 **Phytogeographische Regionen** - Phytogeographical regions

7.1.1 **Zentralasiatische Region** - Central Asiatic region

Die Zentralasiatische Region wurde von GRUBOV (1963) scharf abgegrenzt. Sie umfaßt drei unterschiedliche Teilgebiete. Holzige Vertreter der *Chenopodiaceae* und *Zygophyllaceae*, die für die Tieflands- und Gebirgs-Strauchsteppen und Wüsten der Dzungarischen und der Kashgaro-Mongolischen Subregionen charakteristisch sind, fehlen fast völlig in der Hochgebirgsvegetation der Tibetanischen Subregion.

7.1.1.1 **Dzungarische Subregion** - Dzungarian subregion

Flora und Vegetation der Dzungarischen Subregion vermitteln zu den Wüsten Mittelasiens, zum Winterregengebiet der Irano-Turanischen Region und zum Euro-Sibirischen Waldgebiet in den Gebirgen. Charakteristisch für die Höhenstufen ist eine starke Durchmischung von alpinen und Steppenelementen (WALTER 1975). Einige Dzungarische Elemente erreichen im S noch die kashgarische Pforte (*Krascheninnikovia ewersmanniana*) und die Nordabachungen des Alai und westlichsten Kunlun Shan (King Ata Tagh, Kongur Shan). *Picea schrenkiana*-Wälder, die sich lokal als isolierte Vorposten auf der Kongur-Nordseite zwischen (2100) 2700-3000 (3400) m finden (SKRINE 1925), enthalten im Unterwuchs kennzeichnende Arten wie *Carex alaica, Carex turkestanica* und *Elymus tschimganicus*.

7.1.1.2 **Kashgaro-Mongolische Subregion** - Kashgaro-Mongolian subregion

Die Kashgarische Flora ist im wesentlichen ein artenarmer, weit nach Westen vorgeschobener Teil der Mongolischen Wüstenflora. Kashgaro-Mongolische Elemente dominieren rings um das Tarim-Becken bis in mittlere Meereshöhen (ca. < 3000 m, vgl. GRUBOV 1963, DICKORÉ 1991) der Kunlun-Nordabdachung. Im Karakorum sind sie deutlicher nur im Bereich der größeren Durchbruchs-Täler nach N repräsentiert (Taxkorgan, Yarkand, Karakash). Typische und häufige montane Elemente sind *Nitraria schoberi*, *Sympegma regelii* und *Peganum harmala* (auch mediterran-vorderasiatisch); seltener ist *Cynomorium mongolicum*, ein Parasit auf *Nitraria*. Ausgedehnte Steinwüsten (Gobis) am Gebirgsrand sind durch microphylle Sträucher wie *Haloxylon ammodendron*, *Calligonum* spp., *Zygophyllum* spp. und *Ephedra przewalskianum* charakterisiert. Therophyten fehlen, mit Ausnahme einiger ± sukkulenter Sommerannueller (*Zygophyllum lehmannianum*, *Halogeton glomeratus*, *Salsola* spp., *Atriplex sibirica*, *Bassia dasyphylla*) Die Endemiten *Poacynum hendersonii* und *Myricaria pulcherrima* sind an Oasen und sandige Grundwasserstandorte der Tieflandswüsten gebunden. Auf subhumide höhere Lagen beschränkt sind *Caragana polourensis*, *Reaumuria soongorica* und die Gräser *Stephanachne pappophorea* und *Stipa breviflora*. Die alpine Flora der Kunlun-Nordabdachung ist sehr unvollkommen bekannt und offensichtlich artenarm. Sie enthält jedoch einige in den Hochgebirgen um das Tarim-Becken ± endemische Sippen (*Braya pamirica, Calamagrostis tianschanica, Carex tangulashanensis, Kobresia kashgarica*).

E Pamir und der größte Teil der Karakorum-Nordabdachung, die (in Abhängigkeit von der floristischen Ausstattung und der Meereshöhe) der Kashgaro-Mongolischen oder der Tibetanischen Subregion zugerechnet werden können, besitzen eine außerordentlich arme Flora, in der charakteristische Elemente beider Subregionen kaum vertreten sind. Häufige subalpine Arten wie *Krascheninnikovia ceratoides*, *Stipa splendens* und ein Teil der alpinen Flora bilden eine gewisse Rechtfertigung für den Einschluß der Karakorum-Nordabdachung in die Kashgaro-Mongolische Subregion. Exklaven Kashgaro-Mongolischer Elemente finden sich in gewissem Umfang in den Trockentälern des S Karakorum, von Ladakh und S Tibet (*Ephedra przewalskianum, Carex alexeenkoana, Stipa breviflora, Allium oreoprasum, Iris oxypetala*). Die Areale einiger Hochgebirgssippen erstrecken sich entlang des NW Hindukush bis etwa zum Salang P., der kontinentalste Teil des Zentralen Hindukush (Koh-i-Baba, Bamian Prov.) kann ebenfalls als Zentralasiatische Exklave aufgefaßt werden (vgl. Verbreitung von *Stipa splendens*: FREITAG 1985). Der generelle Vegetationscharakter erlaubt eventuell auch den von verschiedenen Autoren vorgenommenen Einschluß des größten Teils der Karakorum-Südabdachung in die Zentralasiatische Florenregion

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(GRUBOV 1963 [Tibetanische Subregion], HARTMANN 1966, MEUSEL & SCHUBERT 1971), die Durchmischung mit Himalayischen und anderen humid-temperaten Elementen ist hier jedoch wesentlich stärker. *Nitraria schoberi* ist im S Karakorum eventuell nur eingeschleppt (HARTMANN 1966); *Sympegma regelii* ist durch den habituell und ökologisch ähnlichen, endemischen *Haloxylon thomsonii* ersetzt.

7.1.1.3 Tibetanische Subregion - Tibetan subregion

Die Hochgebirgsflora des Tibetanischen Plateaus ist sehr charakteristisch und vergleichsweise gut abgrenzbar. Problematisch sind jedoch die engen genetischen Beziehungen zur Sino-Himalayischen Flora und eine drastische Verarmung der Flora von SE nach NW. Gattungen wie *Kobresia* und *Saussurea*, aber auch zahlreiche Arten von *Primula, Androsace, Gentiana, Gentianella* (§ *Comastoma*), *Corydalis*, sind bezeichnend, besitzen aber grundsätzlich Sino-Himalayische Diversitätszentren (E Himalaya, SE Tibet, W China). Im E Karakorum ist die artenarme Frostschutt-Flora W Tibets gut repräsentiert.

Die Tibetanische Subregion kann in eine reichere S Tibetanische Domäne der oberen Indus- , Sutlej- und Tsangpo-Einzugsgebiete sowie benachbarter interner Entwässerungssysteme und eine artenarme Changtang-Domäne der abflußlosen Becken NW Tibets unterteilt werden. Die S Tibetanische Domäne erstreckt sich zwischen Gandise / Nyainqentanglha Shan und Himalaya etwa von der Umgebung von Lhasa westwärts bis Rupshu, Pangong und Changchenmo. Typische Arten hochalpiner Rasen sind *Kobresia pygmaea*, generell eine der charakteristischsten Arten des Tibetanischen Plateaus, *Carex montis-everestii* und andere. Gräser wie *Poa tibetica*, *Trikeraia hookeri, Orinus thoroldii* und *Calamagrostis holciformis* kennzeichnen die ausgedehnten Sander ehemaliger Gletscher und Frostschutt-Habitate. Die Changtang-Domäne umfaßt die Hochgebirgswüstenregion etwa vom Nam Co und W Tangula Shan bis Aksai Chin und Upper Karakash, wahrscheinlich auch Upper Yarkand. Aufgrund der extremen Meereshöhe (überwiegend > 5000 m), Trockenheit und wahrscheinlich totaler letzt-eiszeitlicher Vergletscherung, ist die Vegetation außerordentlich spärlich und artenarm. *Krascheninnikovia compacta, Saussurea thomsonii, Soroseris glomerata, Kobresia robusta, Puccinellia himalaica,* sind charakteristische Arten; andere wie *Myricaria prostrata, Hippophae thibetana, Carex moorcroftii* und *Festuca tibetica* kommen in S Tibet ebenfalls vor.

7.1.2 Sino-Himalayische Region - Sino-Himalayan region

Die Sino-Himalayische Region, in weiterem Sinne auch als "Sino-Japonische Region" bezeichnet, erstreckt sich in der hier verwendeten Abgrenzung (vgl. WARD 1927, FRASER-JENKINS 1984) von Sichuan, Yunnan, E Tibet über SE Tibet und entlang der Himalaya-Südabdachung bis an die SE-Seite des Hindukush (NE Afghanistan, Nuristan). Exklaven finden sich im äußersten W im Safed Koh / Kurram Vy., südwestwärts haben auch die Gebirge Baluchistans (Takht-i-Sulaiman, Umgebung von Quetta) Himalayischen Charakter, wenn auch stark mit Irano-Turanischen Elementen durchmischt (STEWART 1982).

Die außerordentlich reiche Sino-Himalayische Flora besitzt starke Beziehungen zu den ostasiatischen Entfaltungszentren der extratropischen (Laubwald-) Flora, aber auch zu den disjunkten Hyrkanischen und E Mediterranen Floren, und wird daher als Relikt eines im mittleren Tertiär geschlossenen subtropisch-meridional humiden Vegetationsgürtels aufgefaßt (MEUSEL & SCHUBERT 1971). Expositionsabhängig parallel verlaufen über den Himalaya Migrationswege sowohl E Asiatischer, monsun- (sommerregen-) angepaßter Sippen nach W, als auch winterregen- / sommertrockenheits-adaptierter Irano-Turanischer Elemente in umgekehrter Richtung (TABATA 1988). Das Florengefälle in E-W Richtung ist teilweise diskontinuierlich und differenziert eine West-Himalayische und Ost-Himalayische Subregion. Im Bereich des "East Nepal - Sikkim Gap" (STAINTON 1972) ist die Humidität der Himalaya-Südabdachung so hoch, daß an semiarid bis subhumide Bedingungen angepaßte Arten des offenen Geländes ausfallen, soweit sie nicht auf den hochgelegenen Tibetischen Himalaya ausweichen können. Ein Teil dieser Sippen erscheint disjunkt in den Trockentälern Bhutans wieder, oder wird dort oder im Tsangpo Vy. durch vikariierende Arten vertreten. In umgekehrter Richtung scheint die abnehmende Humidität von E nach W und die starke

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Kontraktion der humiden Zone der Himalaya-Südabdachung zwischen W Nepal und Himachal Pradesh eine gewisse Differenzierung und Auslese für feuchtigkeitsangepaßte Taxa zu bedeuten.

An den Karakorum angrenzend, ist die W Himalayische Subregion im Bereich vom Indus-Durchbruchtal bis Kashmir als breiter und stark differenzierter Gürtel ausgebildet. Während die im weiteren Sinne Sino-Himalayischen Sippen des zumindest warm-semiariden Gürtels zu einem Großteil auf die Himalaya-Südabdachung beschränkt sind (*Pinus roxburghii*, *Parrotiopsis jacquemontiana*, *Quercus* spp.), erreichen zahlreiche W Himalayische Elemente den SW-Karakorum. Diese umfassen sowohl Arten der warm-ariden Talstufe (*Olea cuspidata*, *Daphne mucronata*, *Berberis lycium*, *Aristida cyanantha*), als auch der gemäßigt- bis kalt-subhumiden Höhenstufen mit Nadelwäldern (*Pinus wallichiana*, *Picea smithiana* [Verbreitungskarte: MIEHE 1990], selten *Abies webbiana*) und subalpin-alpinen Gebüschen und Rasengesellschaften (*Rhododendron anthopogon*, *Betula utilis* subsp. *jacquemontii*, *Kobresia nitens*).

7.1.3 Irano-Turanische Region - Irano-Turanian region

Das Irano-Turanische Winterregengebiet erstreckt sich von Anatolien durch SW Asien bis Tian Shan, SW Pamir, Afghanistan und dem westlichsten Pakistan. Exklaven Irano-Turanischer Steppen-Elemente finden sich auf mittleren Meereshöhen in den Trockentälern des W Himalaya (s.o.). Die Definition der Ostgrenze der Irano-Turanischen Region ist ebenso schwierig wie an ihrer Westgrenze (DAVIS 1965), da die Verteilung einzelner Sippen oft disjunkt und expositionsabhängig inselhaft ist, läßt sich aber etwa vom NW Tian Shan, W Pamir, den unteren Wakhan entlang des Hindukush-Hauptkamms relativ klar fassen. Bedeutende Einflüsse der sehr artenreichen Irano-Turanischen Flora machen sich auch im mittleren Chitral und schwächer im angrenzenden westlichsten Karakorum (Yasin) bemerkbar. Mehr oder weniger isolierte Vorposten Irano-Turanischer Sippen finden sich auch in den Tälern des SW Karakorum (*Stipa arabica*, *Carex diluta*, *Enneapogon persicus*), Kashmir und dem angrenzenden Himalayisch-Zentralasiatischem Übergangsgebiet (Astor, Dras: *Carex songorica*). Artenreiche Gattungen mit Irano-Turanischen Diversitätszentren wie *Cousinia*, *Eremostachys*, *Acantholimon*, *Tulipa*, *Eremurus* sind in der Flora des Karakorum nur mit einzelnen Vertretern, andere wie *Astragalus* und *Nepeta* ebenfalls mit vergleichsweise wenigen Arten vertreten.

7.2 Phytogeographische Elemente der Monocotyledoneae des Karakorum - Phytogeographical elements of Karakorum-Monocotyledoneae

Eine vereinfachte Aufschlüsselung der unter 5.5 bezeichneten phytogeographischen Elemente der Monocotyledoneae des Karakorum (282 Arten) ergibt für das Gesamtgebiet eine ausgewogene Verteilung (*Tab.2*). Diese unterstreicht die zentralkontinentale Position und den Grenzcharakter des Karakorum. Fig. 9 gibt die Artenzahlen und Anteile chorologischer Elemente für die Teilgebiete des Karakorum an.

Geobotanische Elemente	n = 282	%
Kosmopoliten	15	5.3
Tropisch-Subtropisch	28	9.9
Holarktisch	33	11.7
Eurasiatisch	40	14.2
Zentralasiatisch	40	14.2
Ost-Pamirisch	11	3.9
Tibetanisch	19	6.7
Himalayisch	45	16.0
Irano-Turanisch	32	11.3
Endemiten	19	6.7

Tab. 2: Geobotanische Elemente der Moncotyledoneae des Karakorum - Geobotanical elements of the Monocotyledoneae of the Karakorum (total).

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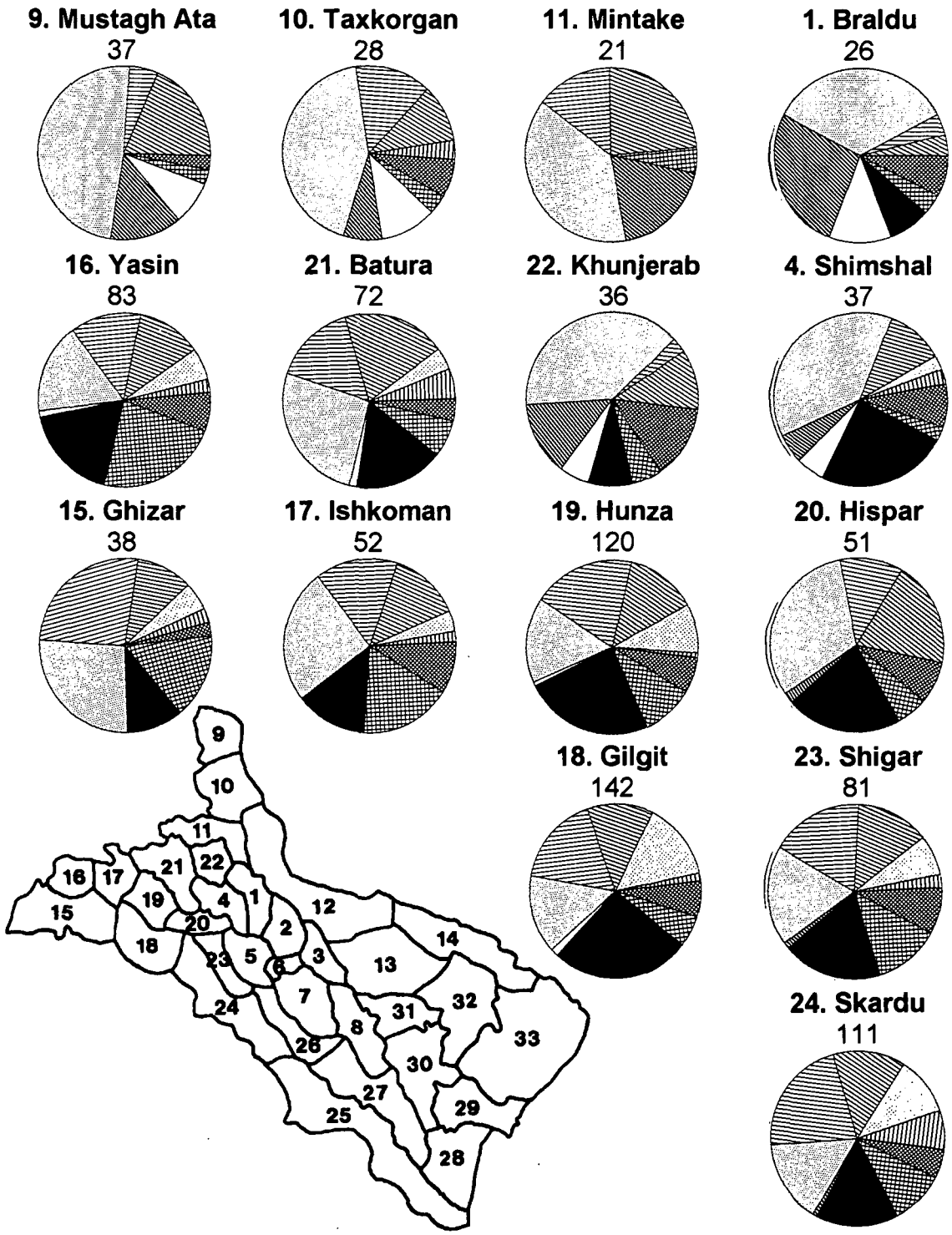
Fig. 9: Artenzahlen und phytogeographische Elemente
- Species numbers and phytogeographical elements



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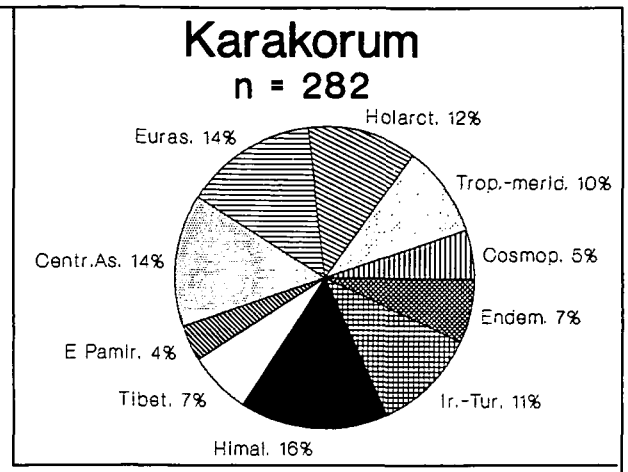
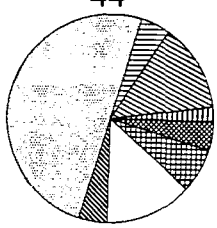
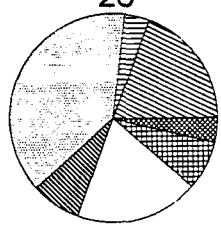


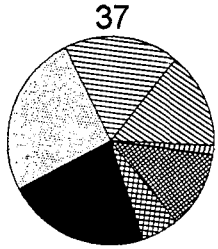
12. Yarkand
44



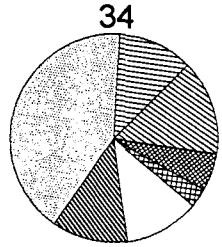
14. Karakash
26



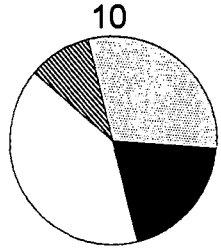
5. Biafo
37



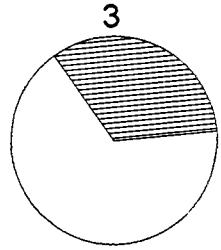
2. K2-North
34



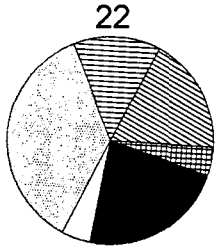
13.Upper Yarkand
10



32.Upper Karakash
3



6. Baltoro
22



3. Shaksgam
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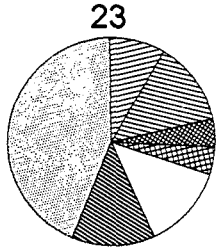
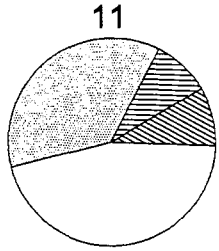
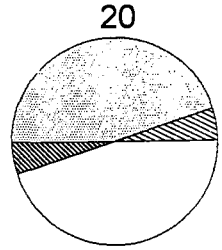


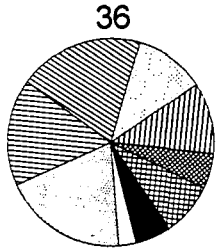
31. Depsang
11



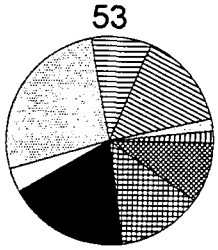
33. Aksai Chin
20



26. Lower Shyok
36



7. Saltoro
53



8. Nubra
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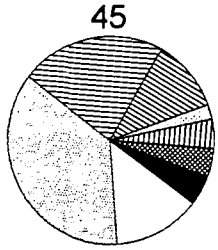
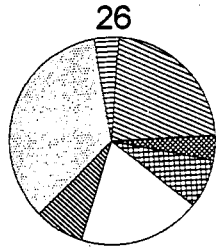


30. Upper Shyok
26



25. Leh
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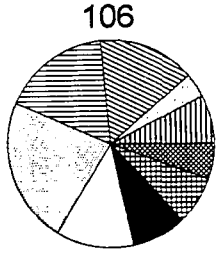
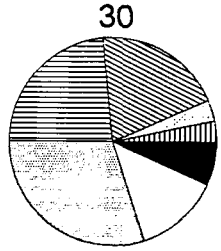
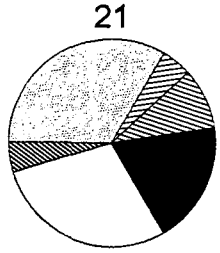


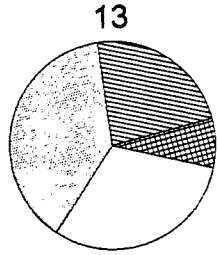
27. Shyok
30



28. Pangong
21



29. Changchenmo
13



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7.2.1 **Kosmopoliten** - Cosmopolites

Kosmopoliten (*Cosmop.*, 5,3 %) umfassen weltweit verbreitete Wasserpflanzen und Unkräuter (z.B. *Alisma plantago-aquatica, Echinochloa crus-galli*). Sie sind vorwiegend in der collinen und montanen Stufe des S Karakorum (Indus Vy.) vertreten. Ihr weitgehendes Fehlen im N Karakorum (außer *Phragmites australis*) entspricht der größeren Meereshöhe der intramontanen Talböden im Norden (Yarkand, Karakash); die meisten Arten kommen in Kashgaria vor.

7.2.2 **Tropische und subtropisch-meridionale Elemente** - Tropical and subtropical meridionale elements

Tropisch-subtropische und meridionale Elemente (*Trop.-merid.*) sind mit 9,9 % der Gesamtartenzahl gut vertreten (z.B. *Cyperus rotundus, Chrysopogon gryllus*), jedoch nahezu ausschließlich auf die subtropisch-colline Stufe des SW Karakorum (Ghizar, Ishkoman, Gilgit, Hunza, Shigar, Skardu) beschränkt und auch dort meist selten. Sie fehlen weit überwiegend in der collinen Stufe Zentralasiens (Kashgaria). Zusammengefaßt werden in dieser Gruppe Mediterrane Elemente (*Medit.*) sowie Pantropische (*Pantrop.*), Paläotropische (*Palaeotrop.*) und Sudano-Sindische (*Sud.-Sind.*) Elemente. Innerhalb der Gruppe dominieren die Paläotropischen Elemente; Indo-Malesische Elemente fehlen vollständig.

7.2.3 **Holarktische Elemente** - Holarctic elements

Weitverbreitete Arten der gemäßigten bis arktischen Zonen der Nordhalbkugel, Holarktische und Eurasiatische Elemente, bilden zusammen einen wesentlichen Bestandteil der Flora des Karakorum, unterschieden sich jedoch in ihrer lokalen Verteilung. Holarktische Elemente (*Holarct.*, 11,7 %, z.B. *Carex atrofusca, Festuca rubra, Lloydia serotina*) mit häufig disjunkten, in Zentralasien jedoch ± kontinuierlichen "arktisch-alpinen" Arealen (Nordhalbkugel und teilweise im südlichen Südamerika) sind im Karakorum gleichmäßig, vorwiegend montan - subnival verbreitet.

7.2.4 **Eurasiatische Elemente** - Eurasiatic elements

Die Eurasiatischen Elemente (*Euras.*, 14,2 %) umfassen einen ebenfalls beträchtlichen Teil der Flora des Karakorum, konzentrieren sich aber in der (potentiellen) Fichtenwaldstufe der montanen Stufe des SW Karakorum. Die zentralasiatischen Teilareale sind häufig sehr disjunkt und eventuell als Relikte einer (interglazialen) weiteren Verbreitung der Laub- und Fichtenwälder aufzufassen. Südlich der kontinuierlichen Areale im Altai finden sich Exklaven eurasiatischer Arten auf der Nordseiten des Tian Shan und Seravshan sowie eine kleinere und artenärmere im Alai und auf der Kongur - King Ata Tagh-Nordseite (*Picea schrenkiana*-Wälder). Die Vorkommen im SW Karakorum stehen im Zusammenhang mit der bedeutenden, bis nach E Afghanistan und W Nepal ausstrahlenden Exklave von Kashmir (*Picea smithiana*-Wälder). Auch die Himalayischen Teilareale der Eurasiatischen Arten sind meist diskontinuierlich (W Himalaya - SE Tibet). Eurasiatische Elemente ohne deutlichen Schwerpunkt (*Poa nemoralis, Coeloglossum viride*) dominieren über westliche, Euro-Sibirische (*Euro-Sib.*: *Stipa pennata, Epipactis helleborine*), diese über östliche, Ost-Asiatische Elemente (*E Asiat.*: *Carex karoi, Helictotrichon hookeri, Epipactis gigantea, Spiranthes sinensis*).

7.2.5 **Zentralasiatische Elemente** - Central Asiatic elements

Zentralasiatische Elemente (*Centr.As.*, 14,2 %) und die hier aufgrund unterschiedlicher regionaler Verbreitungstendenzen gesondert aufgeführten Ost-Pamirischen und Tibetanischen Elemente dominieren insgesamt sowohl über Himalayische als auch über Irano-Turanische Elemente. Der trotz der insgesamt artenarmen zentralasiatischen Flora hohe Anteil in fast allen Teilgebieten rechtfertigt den Einschluß des gesamten Karakorum, mit Ausnahme des extremen SW (Gilgit) in die zentralasiatische Florenregion. Die Abgrenzung und Definition der zentralasiatischen Elemente ist allerdings durch ungenügende

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Sippenabgrenzungen und große, in den Höhenstufen der Gebirge oft disjunkte Areale schwierig. Im systematischen Teil (5.5) wurde versucht, zwischen West-Zentralasiatischen Elementen (*W Centr.As.*, *Carex nivalis*, *Carex stenocarpa*), deren Verbreitung sich vorwiegend auf den West-Teil Hochasiens konzentriert (Tian Shan, Pamir Alai, Karakorum, Innerer W Himalaya), und den weiter verbreiteten (Kaukasus, Ural, Altai bis Tibet) eigentlichen Zentralasiatischen Elementen (*Centr.As.*, *Carex orbicularis*, *Kobresia schoenoides*, *Stipa splendens*) zu unterscheiden. Da die Gesamtverbreitung jedoch häufig unsicher bleibt und sich in der regionalen Verbreitung im Karakorum keine wesentlichen Unterschiede ergeben, werden sie hier zusammengefaßt.

7.2.6 **Ost-Pamirische Elemente** - E Pamirean elements

Ost-Pamirische Elemente (*E Pamir.*, 3,9 %) bilden einen von den Zentralasiatischen Elementen undeutlich abgegrenzten endemischen Bestandteil der Hochgebirgsflora am W Rand des Tarim-Beckens, deren Verbreitung etwa vom W Tian Shan über E Pamir bis zum NW Karakorum und W Kunlun reicht (*Puccinellia hackeliana*, *Calamagrostis anthoxanthoides*). Einige hier eingeordnete Sippen zeigen eine charakteristisch disjunkte Verbreitung bis auf die Karakorum S-Abdachung und zum W Rand Tibets (*Carex alexeenkoana*, *Stipa subsessiliflora*).

7.2.7 **Tibetanische Elemente** - Tibetan elements

Die Gruppe der Tibetanischen Elemente (*Tibet.*, 6,7 %) ist relativ gut abgrenzbar, aber heterogen. Hochasiatische, im weiteren Sinne Tibetanische Elemente (*Tibet.*) sind über große Teile des Tibetanischen Plateaus, durch den C. und N Karakorum, E Pamir bis zum C. Tian Shan verbreitet (*Stipa purpurea*, *Allium przewalskianum*). Auf das Tibetanische Plateau beschränkte Arten (*Carex moorcroftii*, *C. sagaensis*) der alpin-subnivalen Höhenstufen finden ihre Verbreitungsgrenzen im NE Karakorum. Wenige Arten charakterisieren das extrem kalt-aride Changtang-Plateau NW Tibets (*Kobresia robusta*, *Puccinellia himalaica*). S Tibetische Elemente (*S Tibet.*, *Kobresia pygmaea*, *Orinus thoroldii* sind dagegen im Gebiet ± auf das obere Indus-Einzugsgebiet beschränkte subalpin-alpine Arten, deren Verbreitungs- und vermutetes glaziales Rückzugsgebiet die Indus - Tsangpo-Depression S Tibets umfaßt.

7.2.8 **Himalayische Elemente** - Himalayan elements

Die Gruppe der Himalayischen Elemente (*Himal.*, 16,0 %) ist im Karakorum fast ausschließlich auf die Südseite beschränkt und besitzt im SW Karakorum einen ähnlichen Verbreitungsschwerpunkt wie die Eurasiatischen Elemente. Ein geringfügiges Übergreifen Himalayischer Elemente auf die Karakorum-Nordabdachung ist für die direkte Umgebung des Khunjerab P. und Shimshal P. belegt; umgekehrt ist das Übergreifen Zentralasiatischer Arten über diese einzige bedeutende Depression der Gebirgsketten zwischen Pamir und Tibet weit stärker ausgeprägt. Aufgrund der geringen Artenzahlen sind die Vorkommen Himalayischer Elemente im NE Karakorum nicht signifikant. W Himalayische Elemente (*W.Himal.*, *Kobresia nitens*, *Festuca kashmiriana*) sind mehr oder weniger trockenheitsangepaßte Arten, die kontinuierlich etwa von E Afghanistan (Nuristan) bis W Nepal verbreitet sind (vgl. *Picea smithiana*, MIEHE 1990). W Himalayische Elemente besiedeln im SW Karakorum ein weites Spektrum verschiedener Wald- (*Pinus wallichiana*, *Picea smithiana*, *Betula jacquemontii*), Gebüsch- (*Rhododendron anthopogon*, *Salix* spp.), Rasen- und Steppen-Gesellschaften sowie azonale Feuchtstandorte und strahlen gegen die Karakorum-Hauptkette aus. Monsunangepaßte Sino-Himalayische (*Sino-Himal.*, *Stipa brandisii*, *Neottia listeroides*), von SW China durch den gesamten Himalaya verbreitete Sippen, sind im Karakorum wesentlich seltener und deutlicher in der montanen *Picea schrenkiana*-Waldstufe in N-Exposition in unmittelbarer Nachbarschaft des Indus-Durchbruchs konzentriert. Das Verhältnis W Himalayischer zu Sino-Himalayischen Elementen kehrt sich auf der S-Seite des W Himalaya (Swat, Hazara, Kashmir), bei einer weit stärkeren Repräsentanz der gesamten Gruppe, offenbar um. Die direkte Umgebung des Indus-Durchbruchs (Gilgit: Kohistan-Kette, Haramosh, Rakaposhi S; Hunza: Rakaposhi N) kann insgesamt noch als Teil der Sino-Himalayischen Florenregion angesehen werden.

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7.2.9 Irano-Turanische Elemente - Irano-Turanian elements

Irano-Turanische Elemente (*Ir.-Tur.*, 11,3 %, *Bromus stenostachyus, Festuca karatavica, Stipa arabica, Colchicum luteum*) sind im W und S Karakorum mit relativ vielen Arten vertreten. Sie konzentrieren sich auf offene Trockenstandorten der montanen Stufe im äußersten W (Yasin) und SW (Gilgit, Hunza), sind jedoch nirgends, außer in direkter Nachbarschaft der westlichsten Pässe, vegetationsbestimmend und fehlen auf der inneren Karakorum-Nordseite völlig. W Pamirische Endemiten (*W Pamir.*), die mit Vorposten den SW Karakorum erreichen (*Carex decaulescens, Piptatherum vicarium*) wurden in die Berechnung des Anteils Irano-Turanischer Elemente mit einbezogen.

7.2.10 Endemiten - Endemics

Der Anteil endemischer Arten (*Endem.*, 6,7 %) ist angesichts der Größe und geoökologischen Diversität des Karakorum gering und aufgrund taxonomischer Probleme eventuell noch zu hoch angesetzt. Die berücksichtigten Arten strahlen zudem häufig ± in benachbarte Gebirgssysteme aus. Das Areal der in der hochalpinen Stufe des W Karakorum verbreiteten *Carex borii*, einem der wenigen morphologisch gut charakterisierten Endemiten, strahlt zum Pamir und lückenhaft durch Ladakh bis an die Grenze von Zanskar - Himachal Pradesh aus. Ein vergleichbares, aber größeres Areal besitzt auch die ökologisch ähnliche *Kobresia karakorumensis*. Die größte Zahl endemischer Arten ist auf den S Karakorum beschränkt, die relativen Anteile sind aber auch in den artenarmen Teilgebieten vergleichbar hoch. Die isolierte *Picea smithiana*-Waldstufe in Gilgit enthält eine auffallende Konzentration von Endemiten (*Allium gilgiticum, Poa gilgitica, Carex oligocarya*; mit zunehmender Arealgröße). *Poa suruana* und *Digitaria stewartiana* kommen im mittleren Indus Vy. (Skardu, Suru) vor. Eine etwas weitere Verbreitung im inneren NW Himalaya, vorwiegend im SW Karakorum und ± zentriert um den Indus-Durchbruch, besitzen *Calamagrostis stoliczkae* und *Elymus stewartii, Elymus russellii* (montan-subalpin), *Puccinellia minuta* und *Gagea gracillima* (alpin). *Puccinellia ladakhensis* und *Puccinellia thomsonii* sind im Tibetanischen Grenzbereich zentrierte Endemiten (Oberer Indus, Rupshu) von unsicherem taxonomischen Status.

7.3 Regionale Verbreitungsmuster - Regional distribution patterns

Die Verbreitungskarten im Anhang bieten Bespiele regionaler Verbreitungsmuster, die insgesamt eine klare Klassifikation erlauben. Da diese mit der Abgrenzung der Florenregionen (7.1) und Definition der Phytogeographischen Elemente (7.2) verknüpft ist, kann die Zuordnung zu regionalen Arealtypen hier nur exemplarisch und vorbehaltlich unterschiedlicher Gesamttendenzen erfolgen.

1. Hochasiatisch alpin, *Poa attenuata*-Typ - Eine kleine, aber oft vegetationsbestimmende Artengruppe ist ± kontinuierlich und mit weiten subalp. - subniv. Amplituden über das gesamte innere Hochgebirgssystem vom E Pamir über den Karakorum bis W Tibet verbreitet, ebenso im Kunlun Shan und im Inneren Himalaya: *Carex microglochin, Kobresia royleana, Kobresia schoenoides, Elymus jacquemontii, E. schrenkianus, Poa attenuata, Potamogeton amblyphyllus.*

2. C. Karakorum, *Festuca olgae*-Typ - Die größte und für die Flora des Karakorum bezeichnendste Gruppe ist wie 1. verbreitet, mit dem Unterschied, daß die eher montan-subalpin verbreiteten oder alp.-subniv., aber auf etwas humidere Bedingungen angewiesenen Taxa gegen das Tibetanische Plateau / Changtang (bis auf die Täler S Tibets) zurücktreten: *Allium carolinianum, Blysmus compressus, Carex atrofusca, C. orbicularis, C. pseudofoetida, C. stenocarpa, C. stenophylla, Eleocharis quinqueflora, Kobresia capillifolia, K. karakorumensis, Trichophorum pumilum, Calamagrostis pseudophragmites, Elymus nutans, Eremopoa altaica, Festuca olgae, Hordeum brevisubulatum, Leymus secalinus, Stipa caucasica, St. orientalis, St. splendens, Tristeum spicatum* subsp. *himalaicum, Lloydia serotina.*

3. Tibetanisch - Die kleine, heterogene Gruppe umfaßt recht unterschiedliche Areale: N Karakorum, *Stipa purpurea*-Typ: Einige Arten sind ± kontinuierlich von W Tibet / Rupshu, Ladakh über die Karakorum-Nordabdachung bis E Pamir (Tian Shan) verbreitet: *Poa calliopsis, Stipa purpurea, Stipa subsessiliflora, Allium przewalskianum. Stipa concinna* besitzt außerdem Vorkommen im inneren Himalaya. „Karakorum-Gap", *Poa tibetica*-Typ: Diese Arten zeigen zwischen E Pamir / Kunlun Shan und Ladakh / SW Tibet eine Verbreitungslücke, die ± das gesamte Karakorum-System umfaßt: *Blysmus rufus,*

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Elymus thomsonii, *Poa tibetica*, *Stipa breviflora*, *St. mongholica*. Tibetanisch, *Kobresia pygmaea*-Typ: Hochalpine Arten, die ± auf das Tibetanische Plateau beschränkt sind: *Carex moorcroftii*, *Carex sagaensis* (vikariierend zu *Carex melanantha* bzw. *C. pseudofoetida* unter 2.), *Kobresia pygmaea* und einige weitere. Die westliche Verbreitungsgrenze zeigt charakteristischerweise Vorstöße nach Rupshu und zum Karakash / Yarkand oder CN Karakorum. *Puccinellia himalaica* und *Festuca tibetica* sind noch weiter nordwestwärts verbreitet. Mehrere Arten sind auf das obere Indusgebiet / SW Tibet beschränkt: *Calamagrostis holciformis* (vikariierend zu *C. tianschanica* unter 6), *Festuca nitidula*, *Orinus thoroldii*; nur *Kobresia robusta* charakterisiert im Gebiet das Changtang Plateau / NW Tibet.

6. E Pamirisch, *Calamagrostis anthoxanthoides*-Typ - Diese charakteristische und relativ homogene Gruppe umfaßt vorwiegend alpine Taxa, die im E Pamir, NW Karakorum und W Kunlun Shan verbreitet sind und gegen die kontinentale Wasserscheide (Khunjerab, Shimshal) ihre Verbreitungsgrenze finden oder mit Vorposten auf Wakhan, NE Hindukush (Tirich Mir) und Hunza übergreifen: *Carex curaica*, *Calamagrostis anthoxanthoides*, *C. tianschanica*, *Colpodium leucolepis*, *Festuca valesiaca* subsp. *hypsophila*, *Poa lipskyi*, *Puccinellia hackeliana*, *Allium filifolium*. Einige Arten greifen stärker auf den S Karakorum oder Ladakh über: *Allium oreoprasum*, *Carex alexeenkoana*, *Elymus dentatus*.

7. S Karakorum / Ladakh, *Pennisetum flaccidum*-Typ - Die Arten dieser Gruppe besiedeln die inneren Trockentäler (mont.-subalp.) des S Karakorum. Einige Arten: *Bothriochloa ischaemum*, *Bromus pectinatus*, *Pennisetum flaccidum* zeigen neben der charakteristischen Häufung im Gilgit-Indus-Ladakh-Becken einen weiteren Schwerpunkt in den Trockentälern des äußeren Himalaya; *Pennisetum flaccidum* und *Iris oxypetala* kommen außerdem in den Kashgarischen Randgebirgen vor. Weitere Beispiele dieses Verbreitungstyps sind: *Elymus canaliculatus*, *Festuca alaica*, *Melica persica*, *Piptatherum gracile*, *Stipa himalaica* und Kulturfolger wie *Bromus tectorum* und *Vulpia myuros*. Zahlreiche weitere Arten besitzen Vorposten oder Teilareale im Indus Vy., wobei z.B. von *Bromus gracillimus*, *Koeleria argentea* das relativ humide Gilgit-Becken ausgespart wird.

8. SW Karakorum, *Poa alpina*-Typ - Eine mont.- alp. Gruppe mit mehreren gemäßigt-eurasiatischen Arten besiedelt eine breite Zone im inneren W Himalaya und W Karakorum bis etwa zum Khunjerab P., mit ± ausgeprägter Häufung auf der zentralen Karakorum S Abdachung. Die (Teil-) Areale umfassen außerdem meist W Pamir-Alai und Kongur und keilen nach SE in einen schmalen Inner-Himalayischen Streifen aus, E Pamir sowie das Ladakh-Becken werden weitgehend ausgespart: *Alopecurus arundinaceus*, *Koeleria cristata*, *Poa alpina*, *P. pratensis* subsp. *pratensis*, *P. sterilis*, *Carex melanantha*, *Carex nivalis*. *Festuca alatavica* und *F. coelestis* besitzen isolierte Teilareale im SW Karakorum.

9. SW Karakorum, Endemisch, *Carex oligocarya*-Typ - Die endemischen Areale sind unter 7.2.10 aufgeführt: *Allium gilgiticum*, *Poa gilgitica*, *Carex oligocarya* sind ± an die montane *Picea schrenkiana*-Stufe (Gilgit, W Baltistan) gebunden; alp. sind *Colpodium baltistanicum*, *Calamagrostis stoliczkae*. *Carex borii* überschreitet die Hauptkette nach N (vgl. unter 2). Weitere Arten sind ± diffus um das Upper Indus Vy. gruppiert.

10. Inner-Himalayisch, *Kobresia nitens*-Typ - Eine große Artengruppe charakterisiert den inneren Himalaya und SW Karakorum bis zum Hunza-Durchbruch. Die Areale keilen nach E (wie unter 8.) entlang der Himalaya-Hauptkette (Chenab, Spiti, W Nepal) aus. *Carex plectobasis*, *C. pseudobicolor*, *Kobresia nitens*, *Festuca hartmannii*, *F. kashmiriana* erreichen ihre NW-Verbreitungsgrenze im Gilgit-Becken. Weiter westlich verbreitet (± einschließlich Nuristan, Chitral, W Pamir) sind *Allium consanguineum*, *Carex infuscata*, *Kobresia laxa*, *Alopecurus himalaicus*, *Aristida cyanantha*, *Agrostis vinealis*, *Bromus confinis*, *Pennisetum lanatum*, *Pennistum orientale*, *Phleum himalaicum*, *Piptatherum munroi*, *P. vicarium*, *Trisetum clarkei*, *Tulipa clusiana*. Einige Arten sind im himalayisch-zentralasiatischen Grenzgebiet nahezu linear verbreitet (Chitral-Gilgit-Dras-Spiti): *Allium fedtschenkoanum*, *Puccinellia minuta*, *Stipa pennata* subsp. *kirghisorum*, *St. turkestanica*.

11. Äußerer Himalaya, *Eremurus himalaicus*-Typ - Vorwiegend S-Himalayische Areale (Nuristan, Lower Chitral, Swat, Hazara, Kashmir, Himachal Pradesh) sind im Indus-Durchbruchstal bis Gilgit nur mit einzelnen Vorposten vertreten: *Eremurus himalaicus*, *Polygonatum geminiflorum*, *Carex cruenta*, *Carex setosa*, *Carex vulpinaris*, *Colpodium himalaicum*, *Neottia listeroides*.

12. Irano-Turanische Vorposten, *Carex decaulescens*-Typ - Nur in den äußersten W Karakorum (Yasin) greifen *Eremurus fuscus*, *Carex decaulescens*, *Festuca karatavica* über; einige Areale die weiter in das obere Indus-System ausgreifen (*Carex diluta*, *C. karoi*, *C. pamirensis*, *C. songarica*, *Deschampsia koelerioides*), vermitten zu 7.

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8 Diskussion der Differenzierungsmuster - *Discussion of differentiation patterns*

8.1 Abiotische Faktoren - Abiotic factors

8.1.1 Aktuelles Klima - Actual climate

Aktuell-klimatische Faktoren scheinen ausweislich der untersuchten Monocotyledoneae einen wesentlichen Teil der horizontalen und vertikalen Areale zu determinieren. Mehrere Artenpaare zeigen eine ausgeprägte, in verschiedenen Verwandtschaftskreisen gleichlaufende vertikale oder peripher-zentrale Vikarianz. Da direkte klimatische Daten weitgehend fehlen, kommt der Flora und Vegetation eine wichtige Indikatorfunktion zu. Die Höhen- bzw. hygrische Zonierung zeigt einen charakteristischen absoluten Verlauf mit von SW nach NE stark ansteigender Tendenz (vgl. Arealkarten mit Höhendiagrammen im Anhang).

8.1.2 Klimageschichte und geographisch-geologische Faktoren - Climate history and geographical-geological factors

AGACHANJANC (1980) stellt die klimageschichtliche Grundlage der aktuellen Areale der zentralasiatischen Flora dar. HSÜ JEN (1982, 1984) untersucht die paläoökologischen Folgen der Auffaltung des Tibetanischen Plateaus.

BHATTACHARYYA (1989) präsentiert eine pollenanalytische Untersuchung der Sedimente des Tso Kar an der SE Grenze des Karakorum, rezent an der Grenze der Tibetanischen Florenregion gelegen. Paläoklimatische Untersuchungen aus dem Karakorum liegen abgesehen von DEEVEY (1937) offensichtlich nicht vor. Die geringe Verbreitung und das junge Alter von pollenführenden Ablagerungen (Moore, Seesedimente) im Karakorum hängt wahrscheinlich mit den insgesamt ariden Bedingungen und einer vollständigen eiszeitlichen Ausräumung entsprechender Sedimente zusammen. BHATTACHARYYA (1989) rekonstruiert für das frühe Holozän, ca. 30000 B.P., eine der heutigen Vegetation ähnliche alpine Steppe, die zwischen 21000-18000 B.P. und 18000-11800 B.P. von wärmeren Interstadialen (*Juniperus*, *Pinus*) unterbrochen wurde. DEVEEY (1937) fand keine interstadialen Warmzeiten, seine Altersbestimmungen sind allerdings unsicher. BEUG (1987) folgert aus der Untersuchung eines Pollenprofils aus NE Tibet, daß die Klimaverbesserung und der Rückzug der Gletscher am Ende des Würm-Glazials (9500 B.P.) bereits beendet war. Ältere Profile sind vom Tibetanischen Plateau allerdings anscheinend unbekannt. Ein Pollenprofil aus dem Wakhan (BORTENSCHLAGER & PATZELT 1978) umfaßt nur etwa 2000 Jahre mit Schwankungen, aber keiner anscheinend keiner grundsätzlichen Änderung des Klimas.

Eine Ableitung klimatischer Tendenzen aus der aktuellen Vegetation, wie sie MIEHE (1988) für die beobachtete Zerstörung von *Kobresia pygmaea*-Polstern an der Trockengrenze als Aridisierungstrend annimmt, ist zumindest nur von lokaler und zeitlich sehr begrenzter Aussagekraft (WEIERS 1993). Mehrere Indizien deuten auf eine Erwärmung und Nachlassen der Niederschlagsaktivität im SW Karakorum in den letzten 50 Jahren, unterbrochen allerdings von Jahren mit ungewöhnlich hohen Sommer-Niederschlägen (1986, 1992, 1993).

Die kleine Zahl und die verwandtschaftlichen Beziehungen der meist gering differenzierten Endemiten deuten auf ungünstige eiszeitliche Überlebensmöglichkeiten, eine prähistorisch wahrscheinlich nahezu vollständige Vergletscherung des Karakorum und stark schwankende, auch rezent ungünstige Lebensbedingungen. Die Endemiten konzentrieren sich im relativ isolierten Waldgrenzgebiet um den Indus-Durchbruch, der wahrscheinlich nicht vollständig vergletschert war und auch heute die günstigsten thermo-hygrischen Bedingungen bietet. Die Areale Tibetanischer Elemente könnten mit den Eisrandlagen des vermutlich geschlossenen pleistozänen Eisschildes über Tibets zusammenhängen, sind aber wahrscheinlich eher an die rezente Permafrostverbreitung gebunden.

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Die Verbreitung endemischer Sippen mit einer auffälligen Konzentration um das Gilgit-Indus-Becken könnte ebenfalls mit der Glazialgeschichte zusammenhängen. Die hochalpine *Carex borii* besiedelt mit einem Verbreitungsschwerpunkt im SW Karakorum beide Seiten des Indus-Tales und ein charakteristisches Teilareal an der Grenze Zanskar / Himachal Pradesh. Das endemische Areal von *Carex oligocarya* ist wahrscheinlich als Relikt einer interstadial weiteren Verbreitung mesophiler Waldpflanzen zu deuten. *C. alaica* aus der *Picea schrenkiana*-Stufe des W Tian Shan, des Alai und der Kongur-Nordseite ist nächst verwandt, etwas entfernter *C. kashmirensis* der Himalaya-Südabdachung. *Allium gilgiticum* ist wahrscheinlich ein Relikt eines geschlossenen himalayischen Areals. Die Endemiten *Poa suruana* und *Poa gilgitica*, eng verwandt mit dem himalayischen *Poa falconeri*, sind gering differenzierte, nördlich der Hauptkette isolierte Segregate des Verwandtschaftskreises.

Zahlreiche zentralasiatische Sippen, die die Karakorum-Hauptkette nach S überschreiten und auch das Gebiet bis an den Rand des Himalaya besiedeln, deuten eine ältere geologische Geschichte, die wahrscheinlich mit der Plattentektonik zusammenhängt, an. Verbreitungsgrenzen zeigen häufig eine gewisse Übereinstimmung mit den tektonischen Großstrukturen (Suturen, Verwerfungen, Karte 2 - map 2). Die ± disjunkten Teilareale von *Allium oreoprasum*, *Stipa breviflora* und einigen weiteren Arten, könnten Reste einer kontinuierlichen Süd-Zentralasiatischen Verbreitung, vom Tarim-Becken entlang der Karakorum-Verwerfung (Karakoram Fault) zum Inneren Himalaya / S Tibet darstellen (Lößrelikte, "Tethys elements", vgl. HUANG RONGFU 1988). Die Häufung Himalayischer Elemente im SW Karakorum zeigt eine gute Übereinstimmung mit der Ausdehnung der Indischen Platte (Nanga-Parbat-Syntaxis); Häufungszentren endemischer Arten liegen hauptsächlich im Bereich der des Kohistan-Ladakh-Inselbogens zwischen der Indischen und Asiatischen Platte. Klimatische und stratigraphische Interferenzen lassen sich jedoch kaum von den vermuteten plattentektonischen Grundlagen trennen.

Über geochemische Präferenzen einzelner Arten liegen kaum Untersuchungen vor (vgl. 3.2). Areale alpiner Arten mit einer Konzentration im Zentral-Karakorum (*Carex borii*, *Carex nivalis*) deuten eventuell auf die Bevorzugung saurer Substrate (Granit), während z.B. *Carex pseudofoetida*, mit Verbreitungsschwerpunkt in den äußeren Ketten, wahrscheinlich (± kalkhaltige) Sedimente bevorzugt.

Die charakteristische Verbreitungslücke einiger im E Pamir und W Tibet verbreiteter Arten im Karakorum ("Karakorum Gap": *Blysmus rufus*, *Elymus thomsonii*, *Poa tibetica*, *Stipa mongholica*) läßt sich eventuell mit geomorphologisch-geologischen Faktoren erklären: Die Arten besiedeln hochgelegene, ± salzhaltige Sand- und Schotterstandorte, die in E Pamir und W Tibet weite Flächen der ehemaligen Plateaugletscher einnehmen. Im Karakorum fehlen diese Standorte aufgrund der hohen Reliefenergie weitgehend.

8.2 Anthropo-zoogene Faktoren, Pflanzenverbreitung, Bestäubungsbiologie - Anthropo-zoogenous factors, dispersal of plants, pollination biology

Anthropo-zoogene Faktoren scheinen zumindest für die aktuelle Arealgestalt der Monocotyledoneae des Karakorum eine untergeordnete Bedeutung zu besitzen. Einige mögliche Interferenzen:

Die zentrale und östliche Karakorum-Nordabdachung gehört zu den wenigen anthropogen noch nahezu unbeinflußten Gebieten der Erde. Die nördlich des K2 nächste Siedlung mit Ackerbau liegt auf der Kunlun-Nordabdachung (Kudi, 3000 m). Mazar (3800 m) im Yarkand Vy. ist eine Relaisstation an der durch das obere Yarkand-Tal verlaufenden Straße nach Tibet. Unterhalb Mazar ist die Straße verfallen, wird aber als Karawanenweg benutzt. Ackerbau wird in diesem Abschnitt des Yarkand-Tales nicht mehr betrieben (wenige aufgelassene Felder bei 3740 m), es finden sich aber noch zahlreiche (potentiell) anthropozoogen verbreitete Unkräuter (*Cirsium arvense*, *Chenopodium schraderianum*, *Eremopoa altaica*). Auch transhumante (Wander-) Weidewirtschaft endet am Kamm des Aghil Shan. Die letzte permanente menschliche Besiedlung gegen den Karakorum-Hauptkamm findet sich im Surukwat-Tal (3700 m Winter-, 4150 m Sommersiedlung einer einzigen Kirghisen-Familie) an der Nordseite des Aghil Shan. Entlang wichtiger Straßen (Khunjerab, Karakorum Highway; Xinjiang - Tibet Highway), Karawanen-, Handels- (Karakorum P.) und strategisch wichtiger Routen sowie der Zugangswege zu den prominentesten Gipfeln finden sich jedoch auch außerhalb des Siedlungsgebietes bereits deutliche Zeichen menschlichen Einflusses.

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Am K2-Nord-Basecamp im Muztagh Vy. (Sughet Jangal), beispielsweise, fanden sich einige annuelle Arten, die wahrscheinlich mit Expeditionskamelen dort eingeschleppt wurden (*Bassia dasyphylla*, *Halogeton arachnoideus*, *Salsola* sp.). Obwohl zumeist ohne spezielle Verbreitungseinrichtungen, können eventuell auch Vorposten einiger Monocotyledoneae (*Carex cruenta*, *Danthonia cachemyriana*, *Eremopoa altaica*) weit außerhalb des Hauptverbreitungsgebiets und in relativ großer Meereshöhe als vorübergehende Verschleppung gedeutet werden.

Im gesamten S und W Karakorum besteht ein erheblicher und zunehmender Weidedruck, der sich floristisch offensichtlich in der häufigen Vorherrschaft dorniger Sippen (*Astragalus*, *Acantholimon*, *Echinops*, *Berberis*) oder solcher mit giftigen oder ungenießbaren Inhaltsstoffen (z.B. *Artemisia* spp.) gegenüber den meisten Grasartigen bemerkbar macht. Unter den Monocotyledoneae stellen z.B. *Stipa brandisii*, *St. splendens* und *Iris hookeriana* ausgesprochene Weideunkräuter dar.

Auch außerhalb des menschlichen Siedlungsgebietes existiert ein gewisser Weidedruck durch Wildtiere (Angaben nach GRZIMEK 1968-1972). Vorwiegend den Tibetanischen Grenzbereich (Changtang) charakterisieren Argali-Schaf - argali sheep (*Ovis ammon*), Blauschaf - blue sheep (*Pseudois nayaur*), Orongo - Tibetan antelope (*Pantholops hodgsoni*), Tibetgazelle - Tibetan gazelle (*Procapra picticaudata*), Wildyak - wild yak (*Bos mutus mutus*) und Kiang - Tibetan wild ass (*Equus hemionus kiang*), die teilweise noch in historischer Zeit in großen Herden vorkamen (DEASY 1901), heute aber bis auf Restbestände dezimiert sind (SCHALLER 1993). Die Bestände des Marco-Polo-Schafs (*Ovis ammon polii*) im Pamir sind ebenfalls stark rückläufig (NAUMANN 1978). *Pseudois nayaur* scheint nach eigenen Beobachtungen der einzige in der Karakorum-Nordabdachung verbreitete Großsäuger zu sein. Der sibirische Steinbock - ibex (*Capra ibex sibirica*) kommt auf der Südabdachung vor (HARTMANN 1966). Gleichfalls stark dezimiert dürften heute auch die Populationen der natürlichen Predatoren sein: Tibetanischer Braunbär - Tibetan brown bear (*Ursus arctos pruinosus*), im Himalaya: Isabell-Braunbär - Isabelline brown bear (*Ursus arctos isabellinus*), Tibetanischer Fuchs - Tibetan sand fox (*Vulpes ferrilatus*), Nordluchs - lynx (*Lynx lynx*) und Schneeleopard - snow leopard (*Uncia uncia*).

Schafe und Ziegen werden überall im menschlichen Siedlungsbereich gehalten. Von den Nutztieren hat der Hausyak - domestic yak (*Bos mutus grunniens*) im ariden Gebiet des CN Karakorum keine größere Bedeutung. Hier werden Baktrische Kamele als Transporttiere eingesetzt, von denen auch im Shimshal und Nubra des CS Karakorum kleinere Populationen gehalten werden.

Insbesondere die tibetanische Flora ist hochgradig beweidungsangepaßt. Unter den Monocotyledoneae bilden die harten Zwergpolster von *Kobresia pygmaea* eine Hauptfutterpflanze des Yak; der Kiang (*Equus hemionus kiang*) weist offensichtlich eine gewisse Bindung an seine Hauptfutterpflanze auf, *Carex moorcroftii* mit harten, stechenden Blättern (SCHALLER 1993).

Die Mehrzahl der wenigen endemischen Gattungen Tibets sind bemerkenswerterweise einjährige nitrophytische Lägerpflanzen: *Microgynoeceum tibeticum* (*Chenop.*, monotypisch), *Microula tibetica* (*Borag.*, ca. 10 weitere Arten), sowie die nicht im Karakorum nachgewiesenen: *Metaeritrichium microuloides* (*Borag.*, monotypisch), *Pomatosace filicula* (*Primul.*, monotypisch) und *Circaeaster agrestis* (*Ranunc./Circaeasteraceae*, monotypisch; primär eine Waldpflanze). Entsprechende Lebensformen finden sich unter den Monocotyledoneae nicht. *Lancea tibetica* (*Scroph.*, monotypisch), eine niedriger Rhizomgeophyt, und *Przewalskia tangutica* (*Solan.*, monotypisch) können ebenfalls zu den beweidungstoleranten Endemiten gerechnet werden. Dieses deutet eventuell auf eine lange Koevolution zumindest der Tibetanischen Flora mit Weidetieren.

Unter den Kleinsäugern charakterisieren Pfeifhasen - pikas (*Ochotona* spp.), z.B. *Ochotona roylei* (Tian Shan, Pamir, Himalaya, Tibet, 2500-6000 m) ebenfalls überwiegend den tibetanischen Bereich mit (hoch)alpinen Rasen. Verschiedene *Ochotona*-Arten kommen auch im Zentral-Karakorum vor. Durch ihre Grabetätigkeit, das Eintragen von Früchten und lokale Eutrophierung bei hohen Populationsdichten, scheinen sie eine gewisse Bedeutung für das Vegetationsgefüge von Rasengesellschaften, eutrophierten "Lägerfluren" und Deflationspflaster-Steppen zu besitzen. Seltener sind Tibetanischer Wollhase - Tibetan

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wooly hare (*Lepus oiostolus*) und die an tiefgründigere Standorte angepaßten Murmeltiere - marmots (*Marmota caudata* mit westlicher, *Marmota himalayana* mit östlicher Verbreitung).

Als wichtige Vektoren für die Flora der im Zentral-Karakorum eng begrenzten Feuchtgebiete kommen Zugvögel aus Nord- und Zentralasien in Betracht. Zufallsbeobachtungen von Vogelarten im CN Karakorum im Herbst 1986 (DICKORÉ unpubl.) umfassen Krickente (*Anas crecca*), Sumpfhuhn (*Porzana* sp.), Temminckstrandläufer (*Calidris temminckii*), Stelzenläufer (*Himantopus himantopus*), Baumpieper (*Anthus* cf. *trivialis*), Schafstelze (*Motacilla flava*), Bachstelze (*Motacilla alba personata*) und Star (*Sturnus vulgaris*). Ein Teil dieser Arten versuchte zumindest, den Karakorum-Hauptkamm im Bereich des Muztagh P. und Sella-Sattel (6258 m) direkt westlich des K2-Gipfels zu überqueren.

Verbreitungsbiologisch sind in der Flora des Karakorum verschiedene Strategien vertreten, die Verbreitung durch den Wind erscheint am häufigsten. Auffällige Formen von Anemochorie kommen z.B. bei *Oxytropis ampullata* mit blasig aufgetriebenen Früchten und *Nepeta longibracteata* mit "wollknäulartigen" abbrechenden Fruchtständen vor. Für diese alpinen Arten beobachtete ich an Strahlungstagen eine effektive Hangaufwärtsverbreitung mit thermischen Luftströmungen. Die verbreitungsbiologischen Anpassungen der Monocotyledoneae sind grundsätzlich eingeschränkter. Die Anemochorie z.B. von *Stipa*, *Calamagrostis*, und selbst der alpinen *Carex nivalis*, mit großen flach-membranösen Schläuchen, dürfte ebenfalls mit der Notwendigkeit der Arterhaltung in hygrisch günstigen Höhenstufen zusammenhängen. Viele Pflanzen haben aber auch relativ große und schwere Diasporen ohne spezielle Verbreitungseinrichtung. Etwas rätselhaft erscheinen die auf Exozoochorie ausgelegten Klettfrüchte von *Eritrichium* in kaum zugänglichen Felsspalten und die Elaiosomen von *Viola* weit oberhalb des Vorkommens von Ameisen.

Die Invertebratenfauna der klimatisch extremen Karakorum-Nordabdachung ist arten- und meist auch individuenarm. In der alpinen Stufe sind nur Springschwänze und Spinnen an Biomasse und Artenzahl reicher. Trotzdem scheint an Insekten als Blütenbestäubern in der alpinen Stufe kein Mangel zu bestehen. Als wichtigste, in geringen Arten-, aber relativ hohen Individuenzahlen auftretende (potentielle) Blütenbestäuber konnten wir entlang des K2-N-Gletschers (z.B. an den gelben Köpfchen des verbreiteten *Tanacetum tibeticum*) verschiedene Dipterengruppen, solitäre Wespen (*Halictus* spp.) und zwei Großschmetterlinge (*Vanessa cardui*, *Macroglossum stellatarum*) feststellen. Die Schmetterlinge waren häufig bereits kurz nach Sonnenaufgang in schnellem Flug zu beobachten, auch über dem K2-North-Gl. in über 5000 m Meereshöhe.

Die aspektbildenden Pflanzenarten der subalpinen Trockenstufe des CN Karakorum (*Krascheninnikovia ceratoides*, *Ephedra intermedia*) und der collin-montanen Halbwüsten und Steppen des S Karakorum (*Stipagrostis plumosa, Haloxylon thomsonii, Artemisia fragrans*) sind anemophil, was mit den hier noch schlechteren Lebensmöglichkeiten für Insekten zusammenhängen könnte.

Phytophage Insekten (z.B. *Chrysomelidae*, *Curculionidae*) sind in der Karakorum-Nordabdachung schwach vertreten. Eine Ausnahme machen in Samen (z.B. von *Astragalus*, *Oxytropis*, *Corydalis*, *Ephedra*) parasitierenden Dipterenlarven. Die häufig beobachteten blasig aufgetriebenen Früchte von *Corydalis adiantifolia* "var. *heterocarpa* JAFRI" sind auf einen solchen Parasitenbefall zurückzuführen.

8.3 Interne Evolutionsfaktoren - Internal evolutionary factors

8.3.1 Lebensformen - Life forms

Die Lebensformen der Karakorum-Flora werden einzig von HARTMANN (1986, 1972) einer genaueren Betrachtung unterzogen. Da die Monocotyledoneae ein eingeschränktes Lebensform-Spektrum besitzen, sollen hier nur einige allgemeinere Aspekte zusammengefaßt werden. Hemikryptophyten und Chamaephyten dominieren in der Hochgebirgsflora des Karakorum.

Therophyten sind in der Tibetanischen Flora erstaunlich reichhaltig vertreten, insbesondere Arten der *Gentianaceae*, *Cruciferae* und anderer Dicotyledoneae (kaum Monocotyledoneae) finden auf dem

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oberflächlich auftauendem Permafrost gute Lebensbedingungen. Arten wie *Gentianella pygmaea*, *G.* (*Comastoma*) *azurea* und *Koenigia islandica*, die auch im Karakorum vorkommen, dürften zu den am höchsten steigenden Einjährigen gehören. Frühjahrstherophyten, darunter auch einige *Gramineae* (*Phleum himalaicum*, *Eremopoa songorica*) sind weitgehend auf einen "Therophytengürtel", der in mittlerer Höhenstufe des S und W Karakorum bei relativer Wärme ausreichende Winterniederschläge erhält, beschränkt. Mehr oder weniger sukkulente Sommertherophyten (überwiegend *Chenopodiaceae*) kennzeichnen die collin - subalpinen Stufen der Zentralasiatischen Nord-Abdachung und die inneren Täler des S Karakorum.

Geophyten sind allgemein schwach repräsentiert, ein Schwerpunkt liegt ebenfalls im Grenzbereich zur Irano-Turanischen und Himalayischen Region im SW Karakorum (*Lilium polyphyllum*, *Tulipa clusiana*, *Gagea* spp., *Allium* spp., *Orchidaceae*). Die meisten *Allium*-Arten des Karakorum repräsentieren einen gewissen Übergang zur chamaephytischen Lebensform (Subgen. *Rhiziridium*: z.B. *A. przewalskianum*, *A. oreoprasum*), die sonst unter den Monocotyledoneae des Karakorum kaum vertreten ist.

Das Tibetanische Plateau im engeren Sinne, einschließlich Changtang und NE Karakorum charakterisieren die eigentümlichen Spaliersträucher *Hippophae tibetica*, *Myricaria prostata* und *Krascheninnikovia compacta* (N Tibet, Changtang), die jeweils altitudinale Vikarianten normal strauchförmiger Arten (*H. rhamnoides*, *M. bracteata*, *K. ceratoides*) darstellen. Vergleichbare Lebensformen und Differenzierungsmuster kommen bei den Monocotyledoneae nicht vor.

Unter den bei *Cyperaceae* und *Gramineae* weit dominierenden Hemikrytophyten ist zu beobachten, daß in den extremen Trockengebieten (CN Karakorum) außerhalb der Grundwasserbereiche streng horstförmiger Wuchs überwiegt (*Festuca olgae*, *Poa attenuata*, *Stipa subsessiliflora*). Arten mit Stolonen oder kriechenden Rhizomen sind an relativ feuchtere und lockerere Böden gebunden, so z.B. *Poa pratensis* s.l. im SW Karakorum. *Carex atrofusca* und *Poa calliopsis* sind Beispiele rhizomatöser Arten in feuchten alpinen Rasen und Quellsümpfen. Neben Sandern und Flußterrassen mit ausgesprochenen Psammophyten wie *Leymus secalinus* und *Orinus thoroldii,* haben auch die hochalpinen Frostschutt-Flächen des Tibetanischen Plateaus einen höheren Anteil von Rhizom-Hemikrytophyten (*Carex moorcroftii*, *Poa tibetica*).

8.3.2 Populationsdynamik und taxonomische Differenzierungsmuster - Population dynamics and taxonomic differentiation patterns

Taxonomisch repräsentiert die Flora des Karakorum ein artenarmes, aber hochgradig vernetztes System aus einander häufig sehr nahestehenden Sippen. Die Gesamtpopulationen (Areale) einzelner Sippen sind meist sehr groß (zentralasiatisch, eurasiatisch, holarktisch), bestehen aber häufig aus relativ kleinen, untereinander isolierten Subpopulationen. Viele Arten zeigen in Abhängigkeit von den ökologischen Bedingungen eine außerordentliche phänotypische Plastizität, die anscheinend häufig auch mit einer klinalen oder diskontinuierlichen lokalen Variabilität gekoppelt ist (z.B. *Kobresia royleana* und *K. schoenoides*). *K. royleana* ist wie viele andere Sippen des Karakorum von Nachbararten (*K. humilis*, *K. karakorumensis*) zwar anscheinend spezifisch getrennt, aber im Kontaktbereich durch (hybridogene ?) Zwischenformen verbunden. Ähnliches gilt wahrscheinlich für die tibetanischen Verwandten von *K. schoenoides*, die auch ein gutes Beispiel für einen charakteristischen Biotopwechsel ("relative Standortskonstanz") bildet: während *K. schoenoides* im relativ humiden SW Karakorum alpine Weiderasen ohne ausgesprochenen Wasserzuschuß besiedelt, ist sie auf der trockenen Nordseite streng an Quell- und Grundwasserstandorte gebunden. *Thylacospermum caespitosum* (Caryoph.), auf dem Tibetanischen Plateau eine charakteristische Polsterpflanze auf Blockschuttstandorten, ist im ariden K2-North ein reiner Chasmophyt.

Viele alpine und subnivale Sippen bilden aufgrund wechselnder und langjährig ungünstiger Keimungsbedingungen anscheinend sehr langlebige und langsamwüchsige Populationen, die sich vorwiegend vegetativ vermehren. Auf der anderen Seite erforden physikalisch instabile Bedingungen (z.B.

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Gletscher-Vorfelder) aber auch eine hohe Innovationsfähigkeit und Kolonisationsfähigkeit (vgl. DICKORÉ 1991).

Die untereinander eng verwandeten Taxa einiger Gruppen (z.B. *Carex stenophylla*, *C. pseudofoetida*, *C. sagaensis*; *Carex alexeenkoana*, *C. plectobasis*, *C. haematostoma*; *Elymus* spp.; *Poa nemoralis* agg.; *Poa pratensis* agg.) bilden scheinbar kontinuierliche Komplexe mit an altitudinalen, peripher-zentralen oder ökologischen Grenzlinien scheinbar ineinander "umschlagenden" Sippen. Die Artabgrenzung ist innerhalb dieser Komplexe häufig extrem schwierig. Über die Evolutionsmechanismen ist nichts bekannt, die Deutung von Zwischenformen als Bastarde (z.B. *Elymus*) rein morphologisch begründet. Allopatrische Speziation scheint eine wichtige Rolle zu spielen, ebenso aber auch sympatrische (allopolyploide ?) Artbildung und ökologische Konservierung entlang klimatischer Grenzlinien.

Konvergenzen sind oft sehr weitreichend, z.B. kann der Habitus von (Kümmerformen von) *Blysmus compressus*, *B. rufus*, *Kobresia pygmaea*, *Carex microglochin*, *C. parva*, *C. stenophylla*, *C. pseudofoetida* und *C. sagaensis* praktisch identisch sein. Zu einem gewissen Maß ist diese „Konvergenz" jedoch auch ein Ausdruck näherer Verwandschaft. Die nah verwandten, aber üblicherweise distinkten Arten von *Kobresia* § *Elyna* (*K. capillifolia*, *K. schoenoides*, *K. nitens*, *K. robusta*) bilden im Extremfall ebenfalls nahezu identische Wuchsformen.

8.3.3 Genetik und Cytologie - Genetics and cytology

Die genetische und cytologische Differenzierung der Flora des Karakorum kann als weitgehend unbekannt gelten. Cytologische Daten aus angrenzenden Gebieten geben für die Flora des W Himalaya z.B. MERAH & REMANANDAN (1973), MERAH & SHARMA (1975, 1977), VASUDEVAN (1975, 1976), FARUQI & al. (1979), SHARMA (1985), NADEEM AHSAN & al. (1994), MOINUDDIN & al. (1994); HUSS (1980) für einige Arten aus dem Wakhan. Eine bessere Kenntnis der genetischen Differenzierung der Karakorum-Flora könnte, auf der Grundlage tragfähiger morphologischer Konzepte, zu einem besseren Verständnis der oben diskutierten Probleme führen. Viele der morphologisch schwierigen Formenkreise der Flora des Karakorum, mit vikariierenden oder anscheinend hybridogenen oder introgressiven Sippen, bedürfen einer weiteren Aufklärung jenseits der Grenzen (makro-)morphologischer Methoden. Eigene Untersuchungen wurden nicht durchgeführt.

Einige wirtschaftlich wichtige Sippen, wie *Poa pratensis* s.l., aber auch sekundäre Genpools von Nahrungspflanzen (*Allium*, *Hordeum*) sind in der Flora des Karakorum mit geographisch zentralen und hochadaptierten Vertretern enthalten. Auch die Aufklärung der Klimageschichte und der Wanderungswege einzelner Sippen hängt wesentlich von einer besseren Kenntnis der genetischen Grundlagen der floristischen Differenzierung ab.

Die meist junge (? interglaziale) Speziation der Endemiten des Karakorum dürfte in vielen Fällen auf Isolation und Segregation (vorwiegend) himalayischer Elemente nördlich der Himalaya-Hauptkette und zentralasiatischer Verwandschaftskreise im Gilgit-Indus-Becken beruhen. Die periglaziale Invasion in Gletscherrückzugsgebiete begünstigte anscheinend auch die Durchsetzung und Stabilisation von hybridogenen oder introgressiven Sippen (vermutet z.B. *Calamagrostis stoliczkae*, *Colpodium baltistanicum*, *Elymus stewartii*). In welchem Maße (Allo-) Polyploidie und Apomixis eine Rolle spielen, bedarf entsprechender Untersuchungen.

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Zusammenfassung

Im Rahmen einer kritischen Revision der Monocotyledoneae werden 282 Arten aus 17 Familien für den Karakorum sicher belegt bzw. als wahrscheinlich vorkommend angegeben. Vier neue Arten werden beschrieben und sieben neue Kombinationen werden angeführt. Chorologische und ökologische Daten werden für die im Karakorum vorkommenden Taxa zusammengestellt. Soweit derzeit möglich, wurden neue oder revidierte Bestimmungsschlüssel für einige Gattungen erstellt. Die Flora des Karakorum ist artenarm, aber von ausgesprochenem Übergangscharakter und durch taxonomisch komplexe und weit verbreitete Gruppen geprägt. Nah verwandte oder vikariierende Arten angrenzender Gebirgssysteme erfahren daher in der vorliegenden Arbeit eine orientierende Berücksichtigung.

Das Karakorum-System verbindet die Hochgebirgsplateaus von Ost-Pamir und West-Tibet und wird im Norden durch die Hochgebirgskette des Kunlun Shan, im Süden durch die Ketten des Himalaya und Hindukush begrenzt. Das gewaltige Gebirgsmassiv des Karakorum, gipfelnd im K2 (8611 m), dem zweithöchsten Berg der Erde, bildet einen zentralkontinentalen Schnittpunkt der Eurasiatischen Flora. Der Karakorum bildet eine außerordentlich scharfe Grenze zwischen der Holarktis und subtropischen Regionen sowie Barrieren zwischen den Zentralasiatischen, Irano-Turanischen und Sino-Himalayischen Florenregionen mit grundlegend unterschiedlichen klimatischen Bedingungen. Andererseits stellen die Ränder der großflächig vergletscherten Gebirgsketten des Karakorum einen bedeutenden Wanderweg und Filter dar, der die Südost-Tibetanischen Diversitätszentren zahlreicher „arktisch-alpiner" Florenelemente mit Hochgebirgen und hohen Breitengraden der Holarktis verbindet.

Generell dominieren im kalt-ariden Karakorum Zentralasiatische Elemente. Flora und Vegetation sind jedoch altitudinal und peripher-zentral stark gegliedert. Auffallend ist eine extreme Verarmung des Floreninventars von Südwesten nach Nordosten, bei einem starken Anstieg des altitudinalen Vorkommensbereiches einzelner Sippen und Vegetationsformationen. Die artenreiche Sino-Himalayische Flora fehlt nördlich der Himalaya-Hauptkette weitgehend, eine relativ reiche (Inner-) Westhimalayische Flora ist jedoch durch die Indus-Schlucht bis in den Südwest-Karakorum (Gilgit) verbreitet. Um das Gilgit-Becken sind auch die insgesamt relativ wenigen endemischen Arten des Karakorum zentriert. Das obere Chitral, ein größerer Teil des Süd-Karakorum (Yasin, Hunza, Baltistan) und ein schmaler Keil entlang der Himalaya-Hauptkette bis Südost-Zanskar sind ebenfalls relativ reich an Himalayischen Elementen, die nördlich der Karakorum-Hauptkette praktisch völlig ausfallen. Irano-Turanische Elemente werden hauptsächlich durch die Ketten an den Grenzen von Afghanistan und Chitral ausgeschlossen, ein reduzierter Artensatz ist jedoch in den inneren Tälern des Süd-Karakorum weit verbreitet. Zentralasiatische und Ost-Pamirische Elemente charakterisieren den Norden und Nordwesten des Karakorum. Einige Areale erstrecken sich, mehr oder weniger disjunkt, auf die Südabdachung bis Ladakh und Süd-Tibet. Die Verbreitungsgebiete einiger der im Nordosten dominierenden Tibetanischen (Hochasiatischen) Elemente zeigen eine charakteristische Disjunktion („Karakorum gap") zwischen Ost-Pamir und West-Tibet.

Der in verschiedenen Verwandtschaftskreisen gleichlaufende altitudinale und regionale Florenwechsel (vikariierende Arten) wird offenbar in erster Linie durch die außerordentlich steilen klimatischen Gradienten im Karakorum determiniert. Geologische, ökologische und entwicklungsgeschichtlich-systematische Aspekte der Flora des Karakorum werden diskutiert. Einige charakteristische Verbreitungsbilder deuten auf Zusammenhänge mit paläoökologische Bedingungen und Ereignissen und können eventuell als Indikatoren für die Geschichte der pleistozänen Eiszeiten oder sogar der tertiären Plattentektonik dienen.

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Angeführt werden ausschließlich Verweise auf die Systematische Aufzählung. - Familien: unterstrichen; akzeptierte Namen im Karakorum nachgewiesener Familien, Arten und Unterarten und fragliche, aber wahrscheinliche Nachweise: **fett**; nicht im Karakorum nachgewiesene Familien, Arten und Unterarten: normal; Synonyme und Taxa unter subspezifischem Rang: *kursiv*.

References to the Systematic Enumeration are solely included. - Families: underlined, accepted names of families, species and subspecies recorded for the Karakorum or probable, but doubtful records: **bold**; families, species and subspecies not recorded for the Karakorum: normal; recognized synonyms and taxa below of subspecific rank: *italic*.

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Verzeichnis der Verbreitungskarten / Konsolidierter Index der Flora des Karakorum I. Monocotyledoneae - Index to distribution maps / Consolidated index to the Flora of the Karakorum I. Monocotyledoneae

In der folgenden konsolidierten Liste der Monocotyledoneae sind Verbreitungskarten mit Diagramm der Höhenverbreitung im Karakorum mit „ * " gekennzeichnet, zusätzlich dargestellte Arten mit „ + " und Hinweis auf die Artnummer der jeweiligen Verbreitungskarte.

Distribution maps with diagram of altitudinal distribution in the Karakorum are marked " * ".
Additional distribution maps are marked " + " , with reference to species number of map concerned.

Alismataceae

1. **Alisma plantago-aquatica** L.

Alliaceae

2. **Allium caesioides** WENDELBO
3. * **Allium carolinianum** DC. in REDOUTÉ
4. * **Allium consanguineum** KUNTH
5. * **Allium fedtschenkoanum** REGEL
6. * **Allium filifolium** REGEL
7. * **Allium gilgiticum** WANG & TANG
8. **Allium glomeratum** PROKHANOV
9. + **Allium hymenorrhizum** LEDEB. (→7)
10. **Allium jacquemontii** KUNTH
11. * **Allium oreoprasum** SCHRENK
12. + **Allium platyspathum** SCHRENK (→7)
13. * **Allium przewalskianum** REGEL
14. **Allium tuberosum** ROTTLER ex SPRENGEL

Asparagaceae

15. **Asparagus neglectus** KAR. & KIR.

Asphodelaceae

16. * **Eremurus fuscus** (O. FEDTSCH.) VVED. ex NIKITIN
17. + **Eremurus himalaicus** BAKER (→16)
18. + **Eremurus korshinskii** O. FEDTSCH. (→16)

Colchicaceae

19. **Colchicum luteum** BAKER

Convallariaceae

20. **Polygonatum geminiflorum** DECNE. in JACQUEM.
21. **Polygonatum leptophyllum** (D. DON) ROYLE

Cyperaceae

22. * **Blysmus compressus** (L.) PANZER ex LINK
23. * **Blysmus rufus** (HUDSON) LINK
24. **Bolboschoenus maritimus** (L.) PALLA in W. D. J. KOCH
25. * **Carex alexeenkoana** LITV.
26. * **Carex atrofusca** SCHKUHR
27. * **Carex borii** NELMES
28. * **Carex cruenta** NEES in WIGHT
29. * **Carex curaica** KUNTH
30. * **Carex decaulescens** V. KRECZ. subsp. **alsia** (RAYMOND) KUKKONEN
31. * **Carex diluta** M. BIEB.
32. * **Carex infuscata** NEES in WIGHT
33. * **Carex karoi** (FREYN) FREYN
34. * **Carex melanantha** C. A. MEYER in LEDEB.
35. * **Carex microglochin** WAHLENB.
36. * **Carex moorcroftii** FALC. ex BOOTT
37. * **Carex nivalis** BOOTT
38. * **Carex oligocarya** C. B. CLARKE in HOOKER f.
39. * **Carex orbicularis** BOOTT
40. * **Carex pamirensis** C. B. CLARKE
41. + **Carex parva** NEES in WIGHT (→35)
42. * **Carex plectobasis** V. KRECZ.
43. * **Carex pseudobicolor** BOECK.
44. * **Carex pseudofoetida** KÜKENTHAL
45. * **Carex sagaensis** Y. C. YANG
46. * **Carex setosa** BOOTT
47. + **Carex songorica** KAR. & KIR. (→40)
48. * **Carex stenocarpa** TURCZ. ex V. KRECZ. in KOMAROV
49. * **Carex stenophylla** WAHLENB.
50. + **Carex viridula** MICHX. (→31)
51. + **Carex vulpinaris** NEES in WIGHT (→29)
52. **Cladium mariscus** (L.) POHL
53. **Cyperus cuspidatus** KUNTH
54. **Cyperus haspan** L.
55. **Cyperus rotundus** L.
56. **Cyperus squarrosus** L.

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57. + **Eleocharis palustris** (L.) ROEMER & SCHULTES (→59)
58. * **Eleocharis quinqueflora** (F. X. HARTMANN) O. SCHWARZ
59. * **Eleocharis uniglumis** (LINK) SCHULTES in SCHULTES & SCHULTES f.
60. **Fimbristylis bisumbellata** (FORSKAL) BUBANI
61. **Fimbristylis sieberiana** KUNTH
62. **Isolepis setacea** (L.) R. BR.
63. * **Kobresia capillifolia** (DECNE.) C. B. CLARKE
64. * **Kobresia karakorumensis** DICKORÉ
65. * **Kobresia laxa** NEES in WIGHT
66. + **Kobresia macrantha** BOECK. (→68)
67. * **Kobresia nitens** C. B. CLARKE
68. * **Kobresia pygmaea** (C. B. CLARKE) C. B. CLARKE in HOOKER f.
69. + **Kobresia robusta** MAXIM. (→68)
70. * **Kobresia royleana** (NEES) BOECK.
71. * **Kobresia schoenoides** (C. A. MEYER) STEUDEL
72. **Pycreus flavescens** (L.) REICHENB. in MÖSSLER
73. **Pycreus flavidus** (RETZ.) KOYAMA
74. **Pycreus sanguinolentus** (VAHL) NEES
75. **Schoenoplectus lacustris** (L.) PALLA
76. ***Schoenoplectus tabernaemontani*** (C. C. GMELIN) PALLA
77. **Schoenoplectus triqueter** (L.) PALLA
78. * **Trichophorum pumilum** (VAHL) SCHINZ & THELL.

Gramineae (Poaceae)

79. * **Agrostis gigantea** ROTH
80. **Agrostis munroana** AITCH. & HEMSLEY
81. **Agrostis pilosula** TRIN.
82. **Agrostis stolonifera** L.
83. * **Agrostis vinealis** SCHREBER
84. **Agrostis viridis** GOUAN
85. * **Alopecurus arundinaceus** POIRET in LAM.
86. * **Alopecurus himalaicus** HOOKER f.
87. **Aristida adscensionis** L.
88. * **Aristida cyanantha** (NEES) STEUDEL
89. **Arthraxon lancifolius** (TRIN.) HOCHST.
90. **Avena fatua** L.
91. **Avena sterilis** L.
    subsp. **ludoviciana** (DUR.) GILLET & MAGNE
92. **Bothriochloa bladhii** (RETZ.) S. T. BLAKE
93. * **Bothriochloa ischaemum** (L.) KENG
94. **Brachypodium sylvaticum** (HUDSON) P. BEAUV.
95. * **Bromus confinis** NEES ex STEUDEL
96. * **Bromus gracillimus** BUNGE
97. + **Bromus japonicus** THUNB. ex MURRAY (→98)
98. * **Bromus pectinatus** THUNB.
99. + **Bromus stenostachyus** BOISS. (→95)
100. * **Bromus tectorum** L.
101. **Calamagrostis alaica** LITV.
102. * **Calamagrostis anthoxanthoides** (MUNRO) REGEL
103. **Calamagrostis decora** HOOKER f.
104. * **Calamagrostis epigejos** (L.) ROTH
105. * **Calamagrostis holciformis** JAUB. & SPACH
106. * **Calamagrostis pseudophragmites** (HALLER f.) KOELER
107. * **Calamagrostis stoliczkae** HOOKER f.
108. * **Calamagrostis tianschanica** RUPR. in OSTEN-SACKEN & RUPR.
109. * **Catabrosa aquatica** (L.) P. BEAUV.
110. **Chrysopogon gryllus** (L.) TRIN.
    subsp. **echinulatus** (NEES) T. A. COPE
111. * **Colpodium baltistanicum** DICKORÉ
112. + ***Colpodium himalaicum*** (HOOKER f.) BOR (→111)
113. * **Colpodium leucolepis** NEVSKI
114. **Crypsis schoenoides** (L.) LAM.
115. **Cymbopogon jwarancusa** (JONES) SCHULTES
    subsp. **jwarancusa**
    subsp. **olivieri** (BOISS.) SOENARKO
116. **Cymbopogon pospischilii** (K. SCHUM.) C. E. HUBBARD
117. **Cynodon dactylon** (L.) PERS.
118. **Dactylis glomerata** L.
    subsp. **himalayensis** DOMIN
119. * **Danthonia cachemyriana** JAUB. & SPACH
120. **Deschampsia cespitosa** (L.) P. BEAUV.
    subsp. **pamirica** (ROSHEV.) TZVELEV
121. * **Deschampsia koelerioides** REGEL
122. **Digitaria ischaemum** (SCHREBER) SCHREBER ex MUHL.
123. **Digitaria sanguinalis** (L.) SCOP.
124. **Digitaria stewartiana** BOR
125. **Echinochloa crus-galli** (L.) P. BEAUV
126. * **Elymus canaliculatus** (NEVSKI) TZVELEV
127. **Elymus caninus** (L.) L.

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128. * **Elymus cognatus** (HACKEL) T. A. COPE
129. * **Elymus dahuricus** TURCZ. ex GRISEB. in LEDEB.
130. * **Elymus dentatus** (HOOKER f.) TZVELEV
131. * **Elymus fedtschenkoi** TZVELEV
132. * **Elymus jacquemontii** (HOOKER f.) TZVELEV
133. + **Elymus mutabilis** (DROBOV) TZVELEV (→**135**)
134. * **Elymus nutans** GRISEB.
135. * **Elymus repens** (L.) GOULD
136. + **Elymus russellii** (MELDERIS) T. A. COPE (→**131**)
137. * **Elymus schrenkianus** (FISCHER & MEYER) TZVELEV
138. + **Elymus schugnanicus** (NEVSKI) TZVELEV (→**126**)
139. **Elymus semicostatus** (NEES ex STEUDEL) MELDERIS in HARA, STEARN & WILLIAMS
140. + **Elymus stewartii** (MELDERIS) T. A. COPE (→**135**)
141. * **Elymus thomsonii** (HOOKER f.) MELDERIS in HARA, STEARN & WILLIAMS
142. * **Enneapogon persicus** BOISS.
143. **Eragrostis minor** HOST
144. **Eragrostis pilosa** (L.) P. BEAUV.
145. * **Eremopoa altaica** (TRIN.) ROSHEV.
subsp. **songarica** (SCHRENK) TZVELEV
146. * **Festuca alaica** DROBOV
147. * **Festuca alatavica** (ST.-YVES) ROSHEV. in KOMAROV
148. * **Festuca coelestis** (ST.-YVES) V. KRECZ. & BOBROV in KOMAROV
149. * **Festuca hartmannii** (MARKGR.-DANNENB.) ALEXEEV
150. + **Festuca karatavica** (BUNGE) B. FEDTSCH. (→**153**)
151. * **Festuca kashmiriana** STAPF in HOOKER f.
152. + **Festuca nitidula** STAPF in HOOKER f. (→**147**)
153. * **Festuca olgae** (REGEL) KRIVOT.
154. * **Festuca pamirica** TZVELEV
155. **Festuca rubra** L.
subsp. **arctica** (HACKEL) GOVOR.
subsp. **rubra**
156. * **Festuca tibetica** (STAPF) ALEXEEV
157. + **Festuca valesiaca** SCHLEICHER ex GAUDIN (→**154**)
subsp. **hypsophila** (ST.-YVES) TZVELEV
subsp. **valesiaca**
158. + **Helictotrichon desertorum** (LESS.) NEVSKI (→**159**)
159. * **Helictotrichon hookeri** (SCRIBNER) HENRARD
160. **Heteropogon contortus** (L.) P. BEAUV. ex ROEMER & SCHULTES
161. * **Hordeum bogdanii** WILENSKY
162. * **Hordeum brevisubulatum** (TRIN.) LINK
subsp. **nevskianum** (BOWDEN) TZVELEV
subsp. **turkestanicum** (NEVSKI) TZVELEV
163. **Imperata cylindrica** (L.) RAEUSCHEL
164. * **Koeleria argentea** GRISEB.
165. * **Koeleria cristata** (L.) PERS.
166. * **Leymus secalinus** (GEORGI) TZVELEV
167. * **Melica persica** KUNTH
168. **Muhlenbergia huegelii** TRIN.
169. **Orinus thoroldii** (STAPF ex HEMSLEY) BOR
170. * **Pennisetum flaccidum** GRISEB.
171. * **Pennisetum lanatum** KLOTZSCH
172. * **Pennisetum orientale** L. C. M. RICHARD in PERS.
173. **Phacelurus speciosus** (STEUDEL) C. E. HUBBARD
174. **Phleum alpinum** L.
175. * **Phleum himalaicum** MEZ
176. **Phragmites australis** (CAV.) TRIN. ex STEUDEL
177. **Phragmites karka** (RETZ.) TRIN. ex STEUDEL
178. **Piptatherum aequiglume** (DUTHIE ex HOOKER f.) ROSHEV.
179. * **Piptatherum gracile** MEZ
180. **Piptatherum hilariae** PAZIJ
181. * **Piptatherum munroi** (STAPF) MEZ
182. * **Piptatherum vicarium** (GRIG.) ROSHEV. in SHISHKIN
183. * **Poa alpina** L.
184. **Poa annua** L.
185. * **Poa attenuata** TRIN.
186. **Poa bactriana** ROSHEV.
187. * **Poa calliopsis** LITV. ex OVCZ.
188. * **Poa gilgitica** DICKORÉ
189. * **Poa lipskyi** ROSHEV.
190. **Poa nemoralis** L.

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191. * **Poa pratensis** L.
subsp. **angustifolia** (L.) GAUDIN
subsp. **pratensis**
subsp. **pruinosa** (KOROTKY) DICKORÉ
192. **Poa sikkimensis** (STAPF) BOR
193. * **Poa sterilis** M. BIEB.
194. **Poa supina** SCHRADER
195. + **Poa suruana** H. HARTMANN (→**188**)
196. * **Poa tibetica** MUNRO ex STAPF in HOOKER f.
197. **Polypogon monspeliensis** (L.) DESF.
198. * **Puccinellia distans** (JACQ.) PARL.
199. * **Puccinellia hackeliana** (V. KRECZ.) V. KRECZ. ex PERSSON
200. * **Puccinellia himalaica** TZVELEV
201. + **Puccinellia humilis** (V. KRECZ.) ROSHEV. (→**198**)
202. + **Puccinellia ladakhensis** (H. HARTMANN) DICKORÉ (→**198**)
203. * **Puccinellia minuta** BOR in WENDELBO
204. + **Puccinellia tenuiflora** (GRISEB.) SCRIBNER & MERR. (→**198**)
205. + **Puccinellia thomsonii** (STAPF) R. R. STEWART (→**198**)
206. **Saccharum filifolium** NEES ex STEUDEL
207. **Saccharum ravennae** (L.) MURRAY
208. **Saccharum spontaneum** L.
209. **Schismus arabicus** NEES
210. **Secale segetale** (ZHUK.) ROSHEV.
211. **Setaria pumila** (POIRET) SCHULTES in SCHULTES & SCHULTES f.
212. **Setaria viridis** (L.) P. BEAUV.
213. **Sorghum halepense** (L.) PERS.
214. **Stipa arabica** TRIN. & RUPR.
215. **Stipa brandisii** MEZ
216. * **Stipa breviflora** GRISEB.
217. **Stipa capillata** L.
218. **Stipa caragana** TRIN.
219. * **Stipa caucasica** SCHMALH.
subsp. **caucasica**
subsp. **glareosa** (SMIRNOV) TZVELEV
220. * **Stipa concinna** HOOKER f.
221. * **Stipa himalaica** ROSHEV.
222. **Stipa jacquemontii** JAUB. & SPACH
223. **Stipa koelzii** R. R. STEWART
224. + **Stipa mongholica** TURCZ. ex TRIN. (→**216**)
225. * **Stipa orientalis** TRIN. in LEDEB.
226. * **Stipa pennata** L.
subsp. **kirghisorum** (SMIRNOV) FREITAG
227. * **Stipa purpurea** GRISEB.
228. * **Stipa splendens** TRIN. in SPRENGEL
229. * **Stipa subsessiliflora** (RUPR.) ROSHEV. in FEDTSCH.
230. **Stipa tianschanica** ROSHEV.
231. * **Stipa turkestanica** HACKEL
232. **Stipagrostis plumosa** (L.) MUNRO ex T. ANDERS.
233. **Tetrapogon villosus** DESF.
234. **Trisetaria loeflingiana** (L.) PAUNERO
235. * **Trisetum clarkei** (HOOKER f.) R. R. STEWART
236. * **Trisetum spicatum** (L.) K. RICHTER
subsp. **himalaicum** HULTÉN
237. **Vulpia myuros** (L.) C. C. GMELIN

Iridaceae

238. **Iris hookeriana** FOSTER
239. * **Iris oxypetala** BUNGE

Juncaceae

240. **Juncus articulatus** L.
241. **Juncus bufonius** L.
242. **Juncus himalensis** KLOTZSCH in KLOTZSCH & GARCKE
243. **Juncus leucomelas** ROYLE ex D. DON
244. **Juncus membranaceus** ROYLE ex D. DON
245. **Juncus sphacelatus** DECNE. in JACQUEM.
246. **Juncus thomsonii** BUCHENAU
247. **Juncus triglumis** L.
248. **Luzula spicata** (L.) DC. in LAM. & DC.

Juncaginaceae

249. **Triglochin maritima** L.
250. **Triglochin palustre** L.

Liliaceae

251. **Gagea dshungarica** REGEL
252. **Gagea elegans** WALL. ex D. DON in ROYLE
253. **Gagea gracillima** PAMP.
254. **Gagea setifolia** BAKER
255. **Lilium polyphyllum** D. DON in ROYLE
256. * **Lloydia serotina** (L.) REICHENB.
257. * **Tulipa clusiana** DC. in REDOUTÉ

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Najadaceae

258. **Najas marina** L.

Orchidaceae

259. **Coeloglossum viride** (L.) C. J. HARTMAN
260. **Dactylorhiza hatagirea** (D. DON) SOÓ
261. **Dactylorhiza kafiriana** RENZ in RECH. f.
262. **Dactylorhiza salina** (TURCZ. ex LINDLEY) SOÓ
263. **Epipactis gigantea** DOUGLAS ex HOOKER
264. **Epipactis helleborine** (L.) CRANTZ
265. **Epipactis persica** (SOÓ) NANNFELD
266. **Epipactis veratrifolia** BOISS. & HOHEN. in BOISS.
267. **Goodyera repens** (L.) R. BR. in AITON
268. **Herminium monorchis** (L.) R. BR. in AITON
269. **Neottia listeroides** LINDLEY in ROYLE
270. **Spiranthes sinensis** (PERS.) AMES

Potamogetonaceae

271. * **Potamogeton amblyphyllus** C. A. MEYER
272. **Potamogeton crispus** L.
273. **Potamogeton lucens** L.
274. **Potamogeton natans** L.
275. + **Potamogeton nodosus** POIRET in LAM. (→**271**)
276. **Potamogeton pectinatus** L.
277. **Potamogeton perfoliatus** L.
278. **Potamogeton pusillus** L.

Typhaceae

279. **Typha domingensis** PERS.
280. **Typha laxmannii** LEPECHIN
281. **Typha minima** FUNCK in HOPPE

Zannichelliaceae

282. **Zannichellia palustris** L.

Zusätzliche auf Verbreitungskarten dargestellte Taxa - Additional taxa represented on distribution maps:

Alliaceae

Allium atrosanguineum SCHRENK (→**5**)
Allium nuristanicum KITAMURA (→**13**)
Allium oreoprasum X A. przewalskianum (→**11**)
Allium schoenoprasoides REGEL (→**7**)
Allium schoenoprasum L. (→**7**)
Allium stoliczkae REGEL (→**13**)

Cyperaceae

Carex alaica LITV. (→**38**)
Carex enervis C. A. MEYER in LEDEB. (→**49**)
Carex kashmirensis C. B. CLARKE in HOOKER f. (→**38**)
Carex montis-everestii KÜKENTHAL (→**27**)
Carex supina L. (→**30**)
Carex tangulashanensis Y. C. YANG (→**30**)
Carex turkestanica REGEL (→**30**)
Kobresia hissarica (PISSJAUK.) DICKORÉ (→**65**)
Kobresia kashgarica DICKORÉ (→**68**)

Gramineae

Alopecurus apiatus OVCZ. in KOMAROV (→**85**)
Alopecurus mucronatus HACKEL ex PAULSEN (→**85**)
Colpodium nutans (STAPF) BOR in RECH. f. (→**111**)
Danthonia cumminsii HOOKER f. (→**119**)
Elymus himalayanus (NEVSKI) TZVELEV (→**126**)
Eremopoa bellula (REGEL) ROSHEV. (→**145**)
Eremopoa persica (TRIN.) ROSHEV. (→**145**)
Helictotrichon fedtschenkoi (HACKEL) HENR. (→**159**)
Koeleria argentea X K. cristata (→**164**)
Poa falconeri STAPF in HOOKER f. (→**188**)
Poa pratensis L. subsp. staintonii (MELDERIS) DICKORÉ (→**191**)
Puccinellia pamirica V. KRECZ. ex ROSHEV. (→**198**)
Puccinellia stapfiana R. R. STEWART (→**198**)
Trisetum aeneum R. R. STEWART (→**235**)
Trisetum spicatum (L.) K. RICHTER subsp. tibeticum (P. C. KUO & Z. L. WU) DICKORÉ (→**236**)

Liliaceae

Lloydia longiscapa HOOKER (→**256**)

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Ausgewählte Verbreitungskarten
- Selected distribution maps

Ausgewählt wurden die im Karakorum häufigsten Sippen und besonders charakteristische Verbreitungsbilder möglichst gleichmäßig erfaßter Taxa. Unterrepräsentiert sind vor allem himalayische und subtropische Areale, die den Karakorum meist nur im äußersten SW erreichen und deren Verbreitung in den Randgebieten häufig nur unzureichend untersucht werden konnte.

Nachweise aus der Literatur sind Fl.Tadzh., Pl.As.Centr., Fl.Iran. und Fl.Pak., sowie den weiteren zitierten Quellen entnommen. Literaturangaben für Randgebiete (außerhalb des Karakorum wie definiert) sind nur teilweise im Text angegeben. Gesehene Belege aus Randgebieten sind überwiegend, aber nicht grundsätzlich im Text zitiert.

Die Erfassung von Fundpunkten aus Randgebieten ist bei einzelnen Sippen aufgrund ungleichmäßiger Durchforschung, unterschiedlicher Sippenauffassungen und Schwierigkeiten bei der Lokalisierung sehr heterogen. Abgesehen von den Tiefländern sind insbesondere Belege und Literaturangaben aus Afghanistan und Tadzhikistan (außer Pamir) sowie dem zentralen Himalaya (Himachal Pradesh ostwärts) unterrepräsentiert. Die armen Floren W Tibets und des Kunlun Shan sind vergleichsweise gut belegt. Die Auswahl der in Verbreitungskarten dargestellten Sippen kompensiert die bei der Interpretation von Verbreitungsbildern zu berücksichtigen Ungleichmäßigkeiten nur teilweise.

Aussagekräftig sind vor allem die Verbreitungskarten vieler relativ weit verbreiteter *Cyperaceae* und *Gramineae*. Auf die Darstellung sehr unvollständig erfaßter Areale, z.B. Arten der *Juncaceae* und *Orchidaceae*, wurde verzichtet.

Symbole in den Verbreitungskarten - symbols used on distribution maps:

- ● Gesehener Beleg - Specimen seen
- ○ Literaturangabe - Literature record
- ⊙ Geographische Unschärfe - Geographical uncertainty
- ⊕ Fraglicher Nachweis - Doubtful record

Höhenschichten - Altitudinal intervals:

- < 1000 m
- 1000-2000 m
- 2000-4000 m
- 4000-5000 m
- > 5000 m.

Gebirgskämme > 5000-6000 m hervorgehoben - Crests above of > 5000-6000 m marked.

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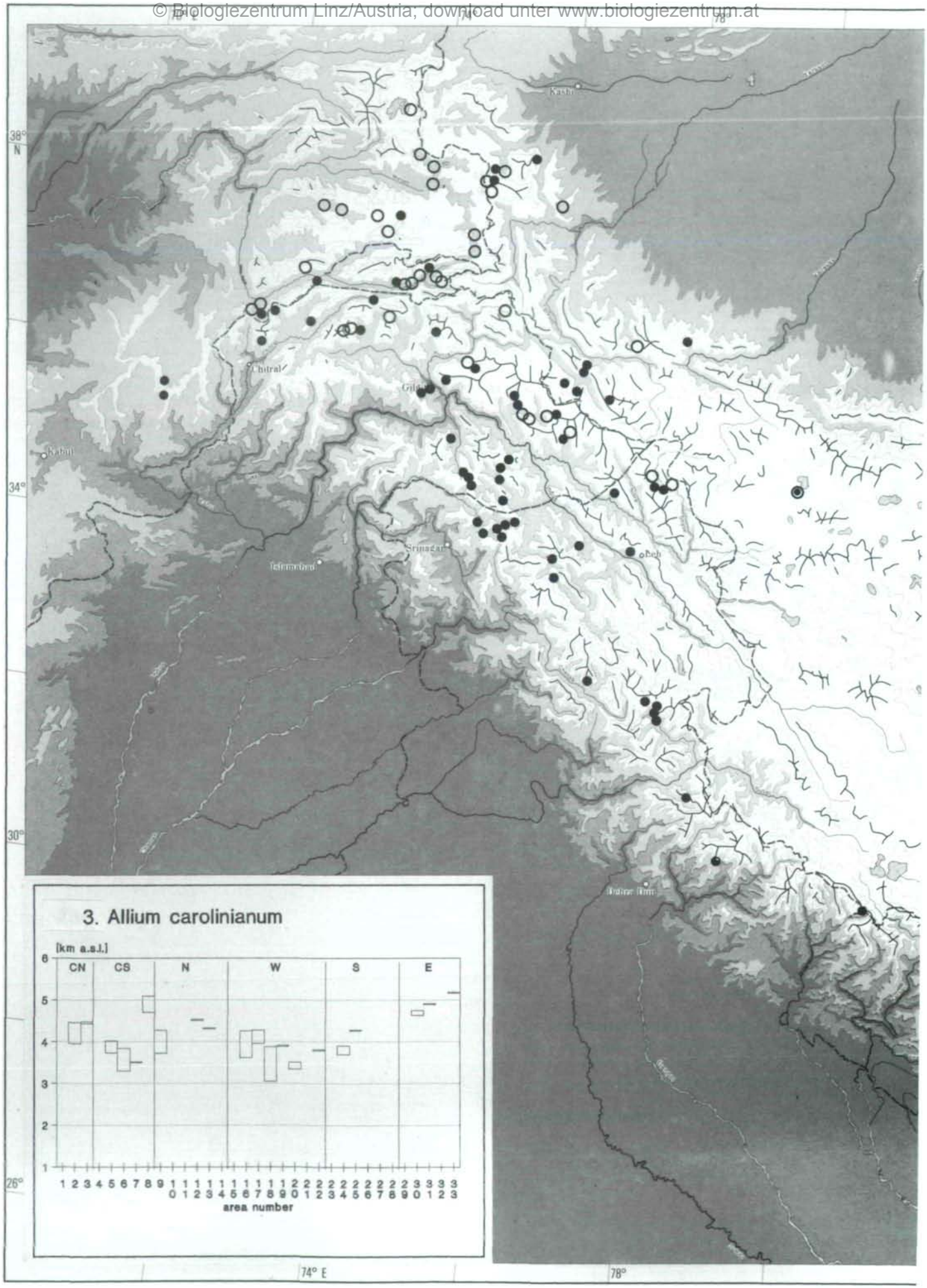

3. Allium carolinianum

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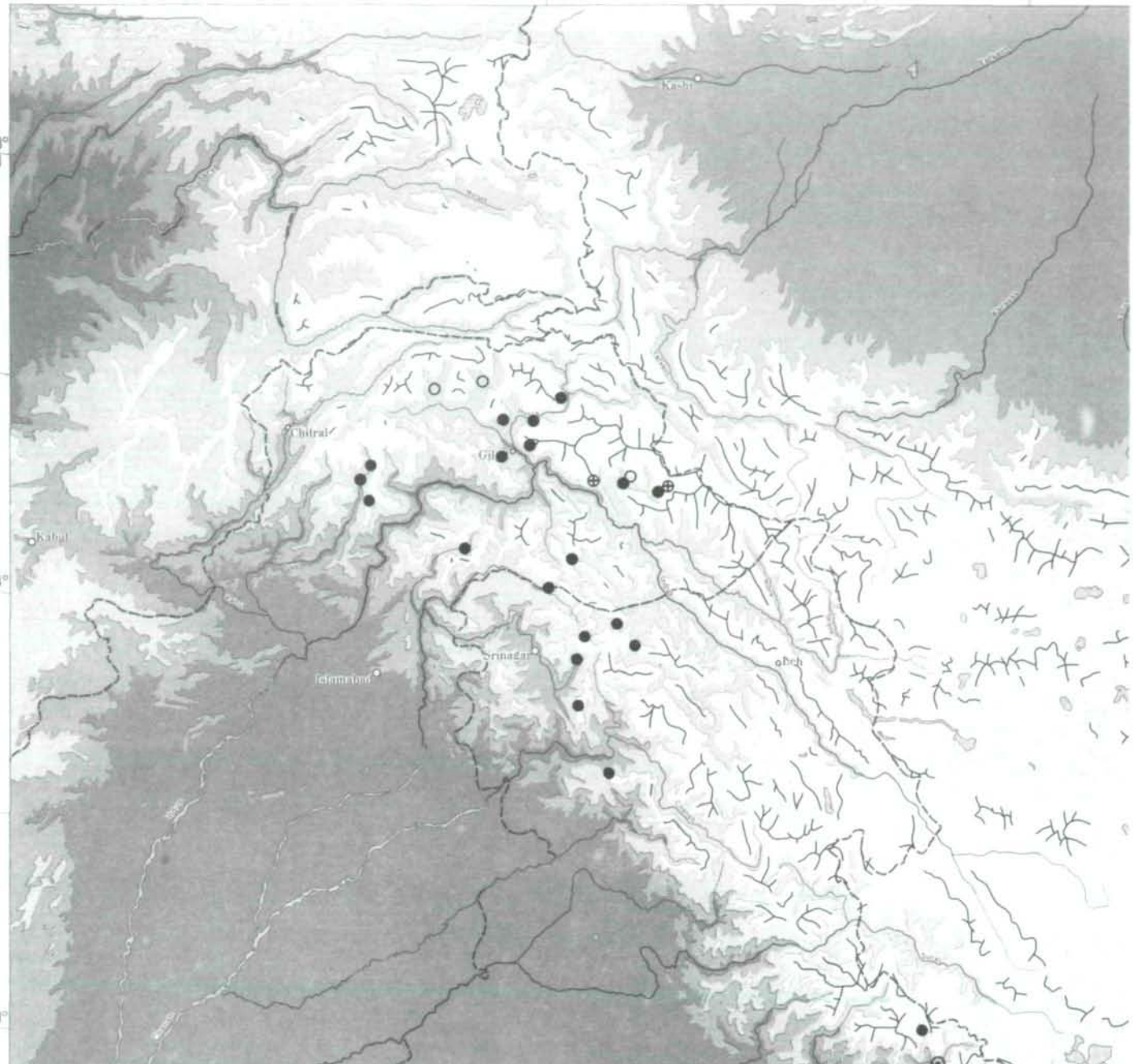
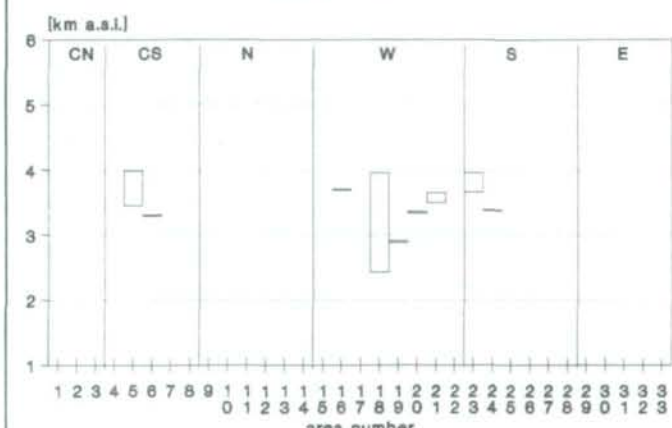


4. Allium consanguineum



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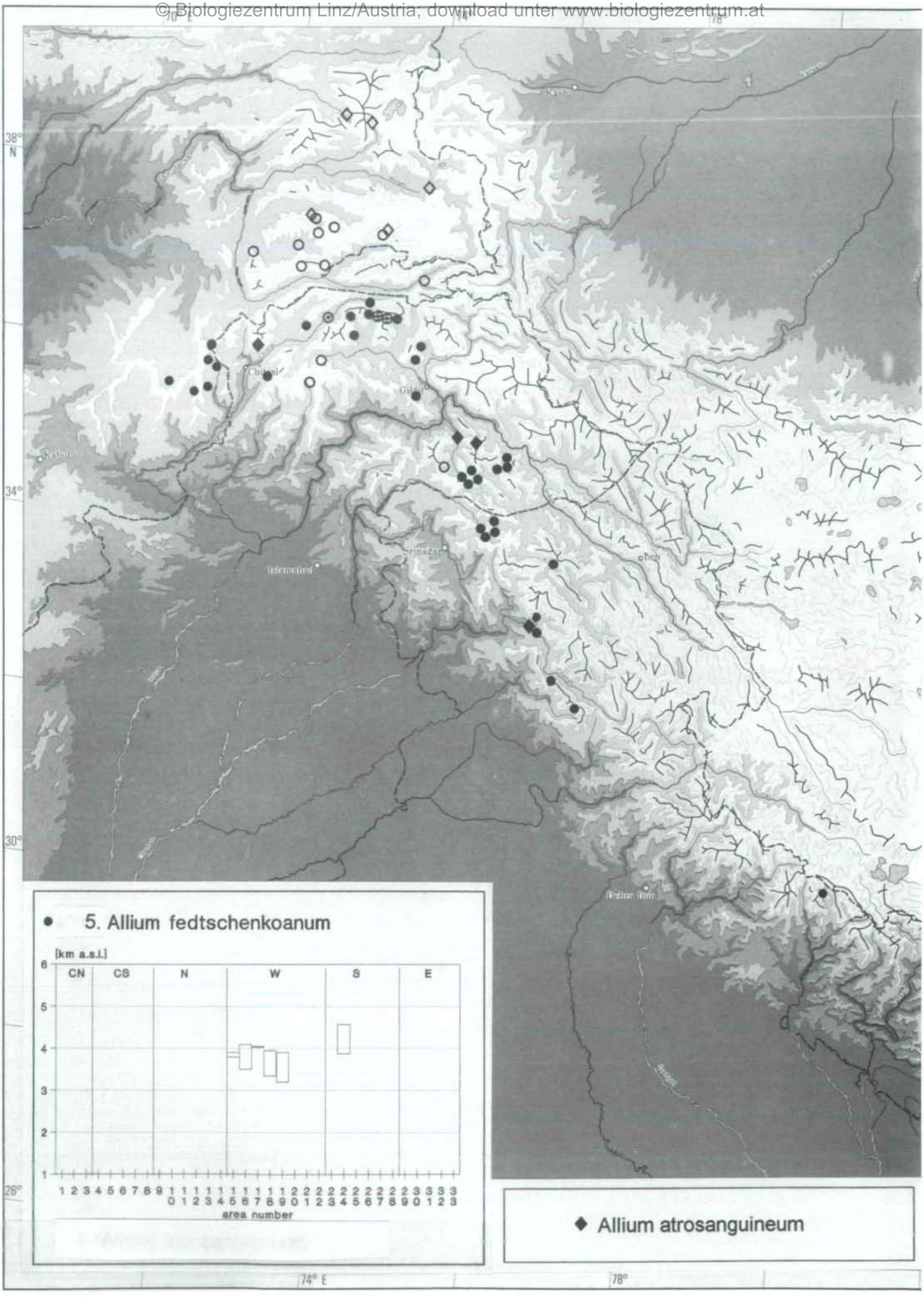

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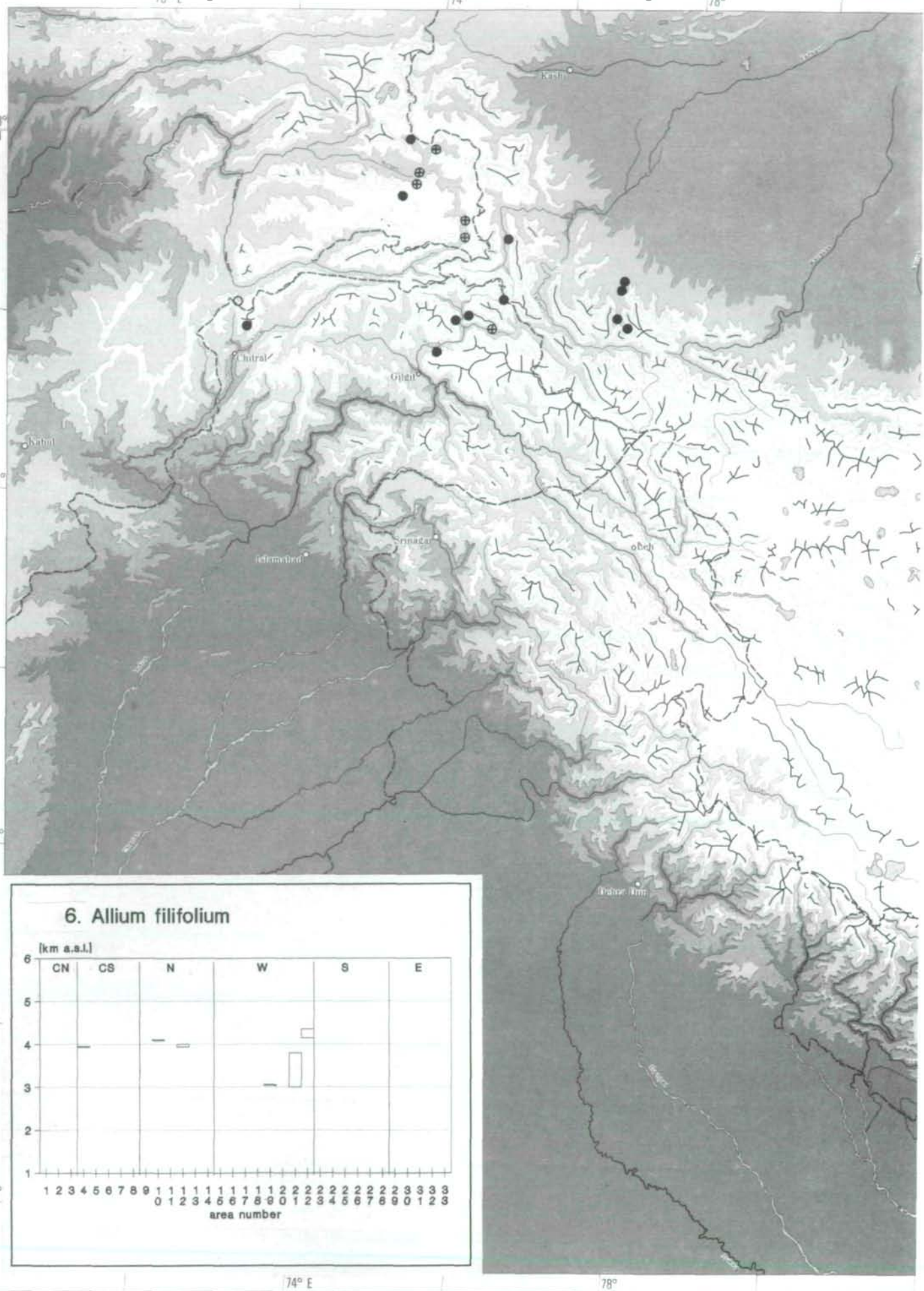

6. Allium filifolium

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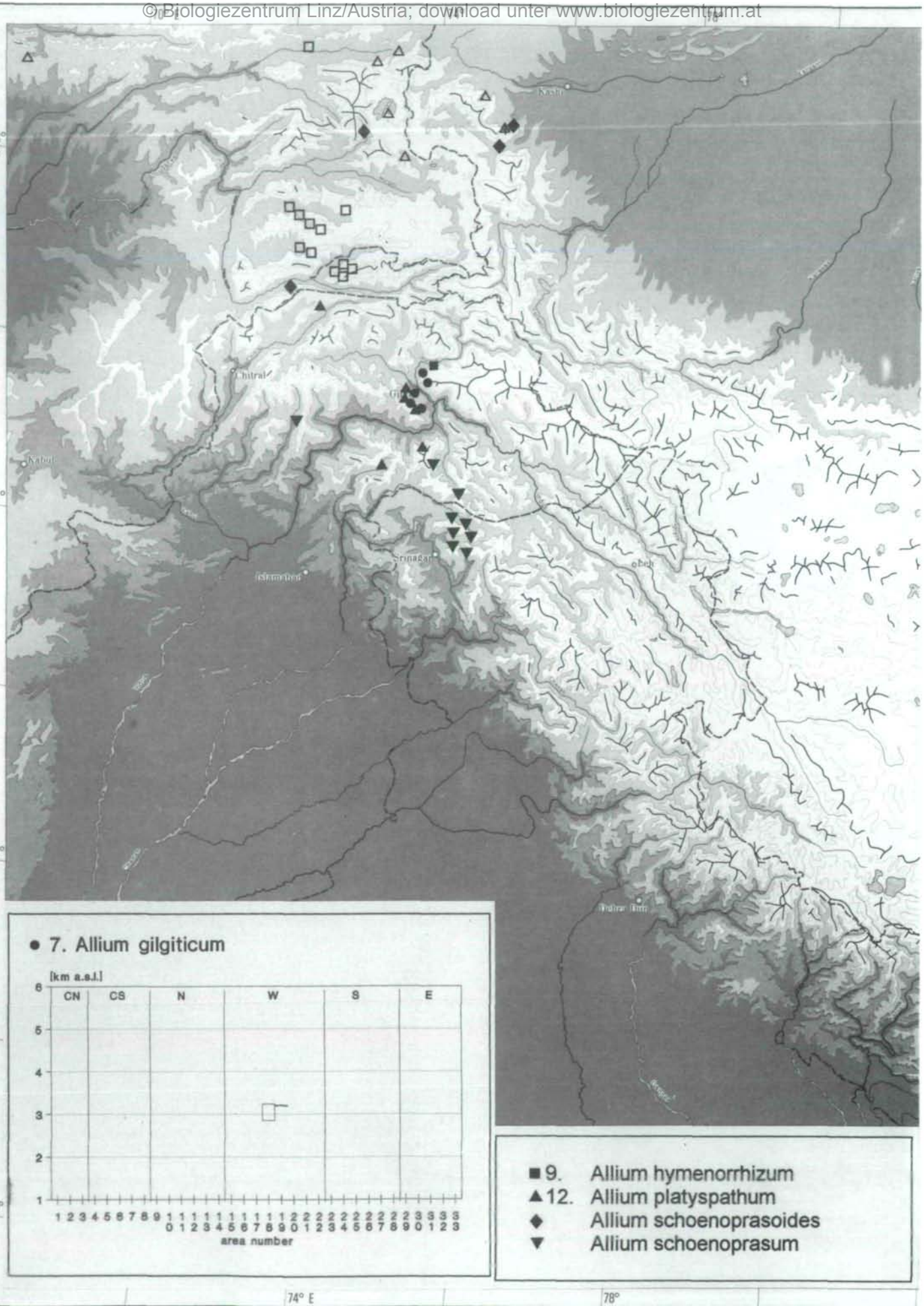

● 7. Allium gilgiticum

■ 9. Allium hymenorrhizum
▲ 12. Allium platyspathum
◆ Allium schoenoprasoides
▼ Allium schoenoprasum

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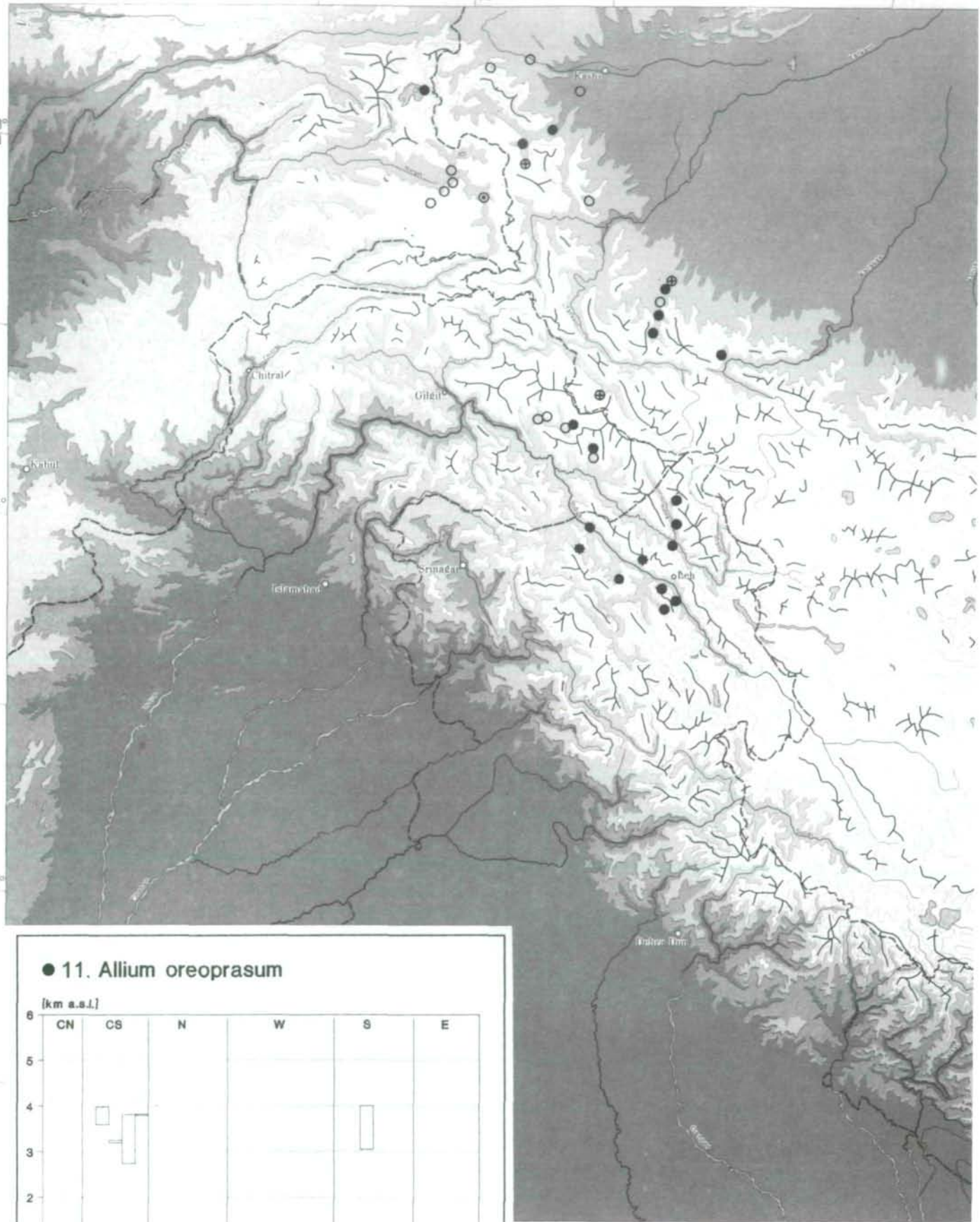
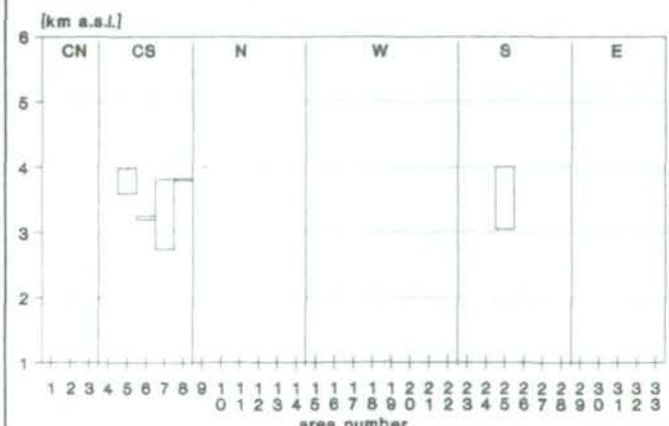


● 11. Allium oreoprasum



● Allium oreoprasum
X A. przewalskianum ?

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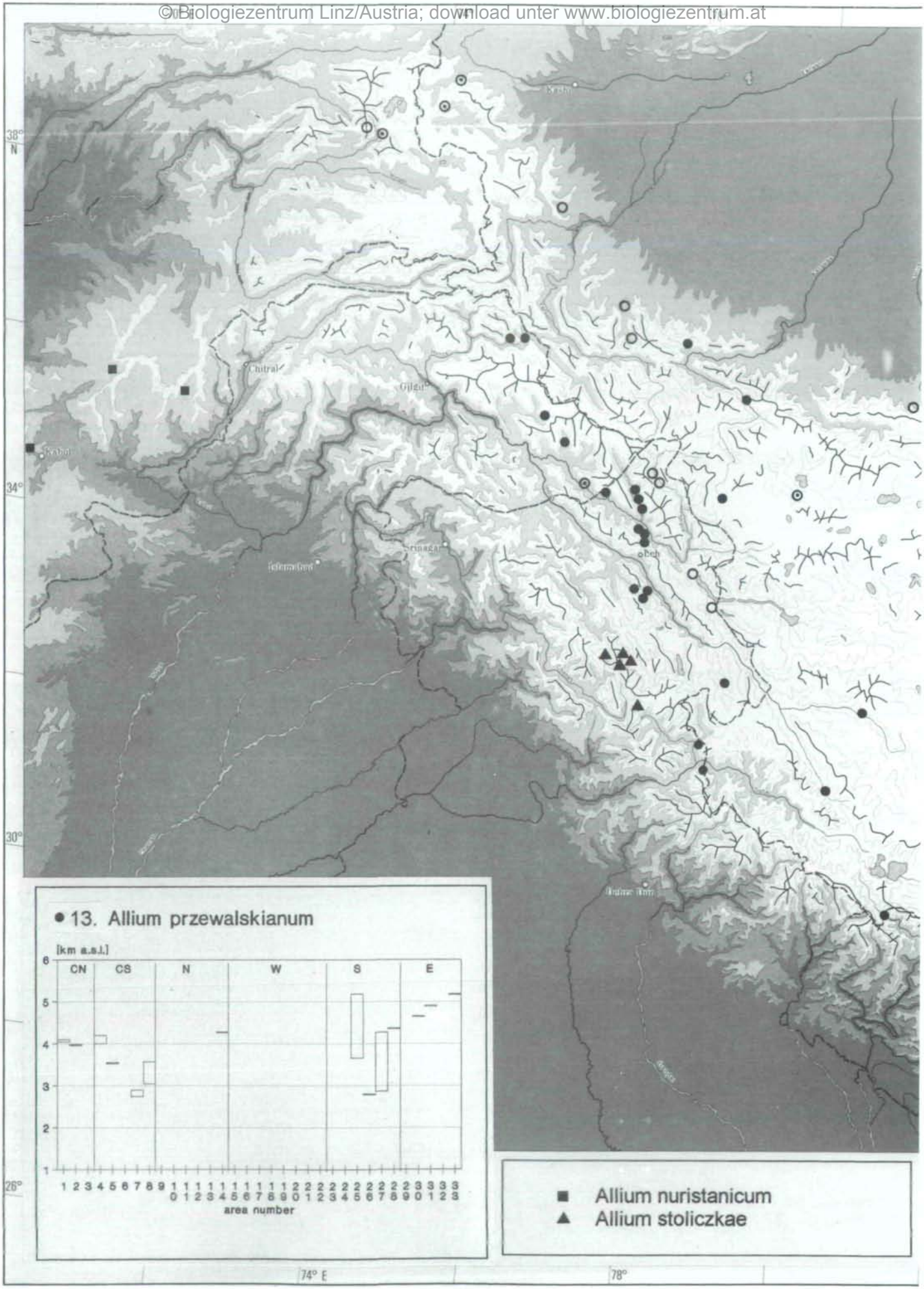

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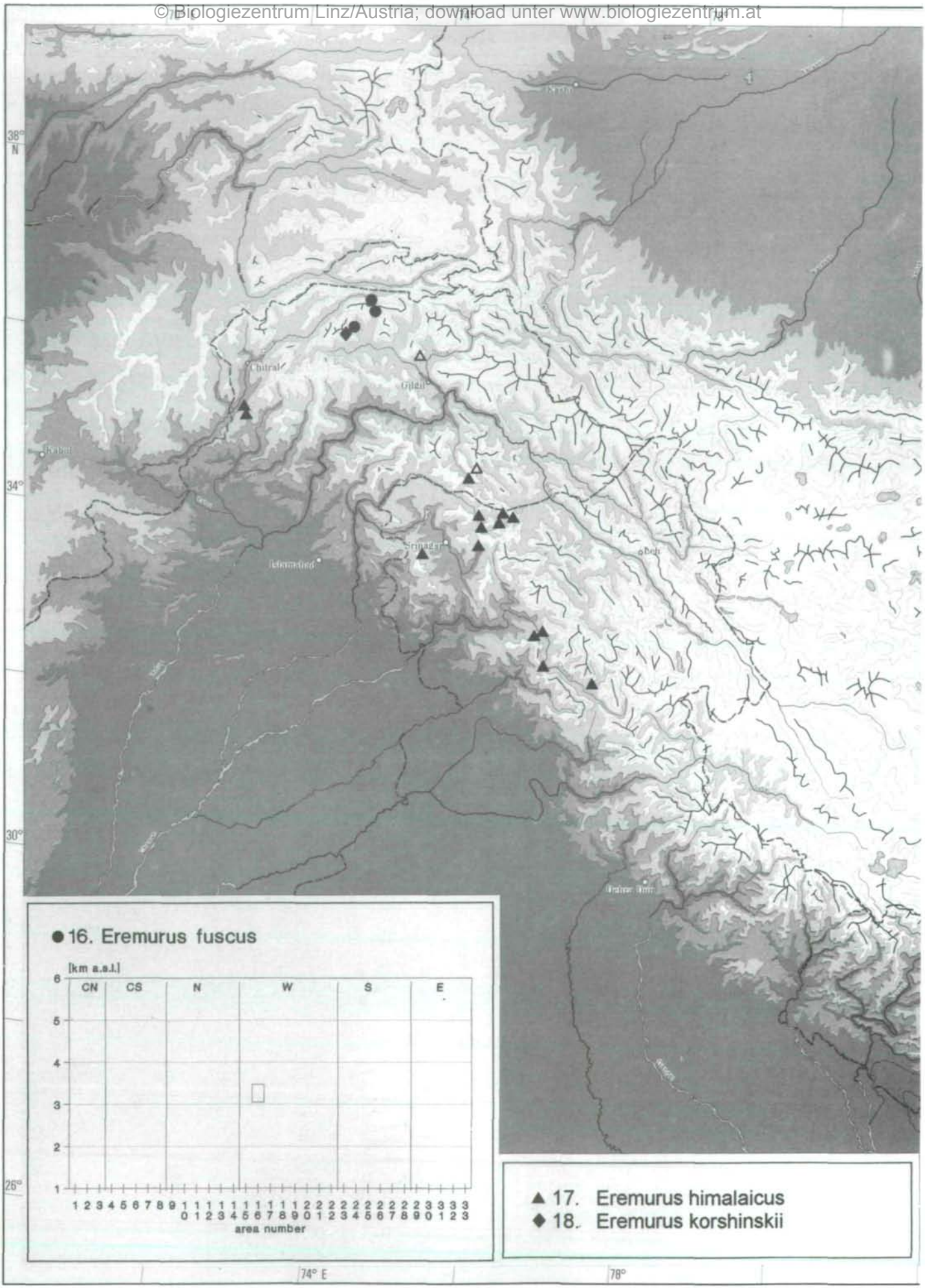

● 16. Eremurus fuscus

▲ 17. Eremurus himalaicus
◆ 18. Eremurus korshinskii

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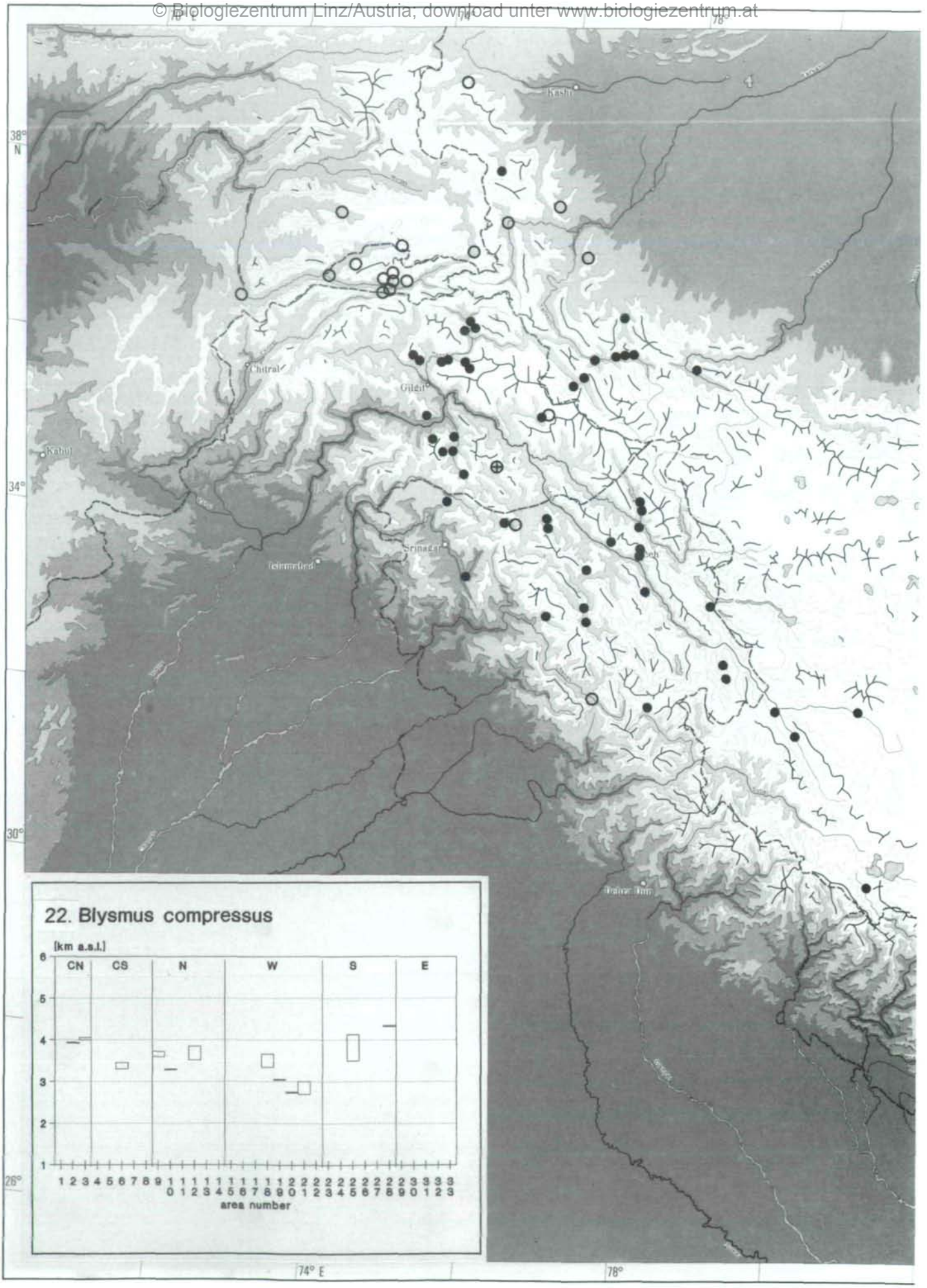

22. Blysmus compressus

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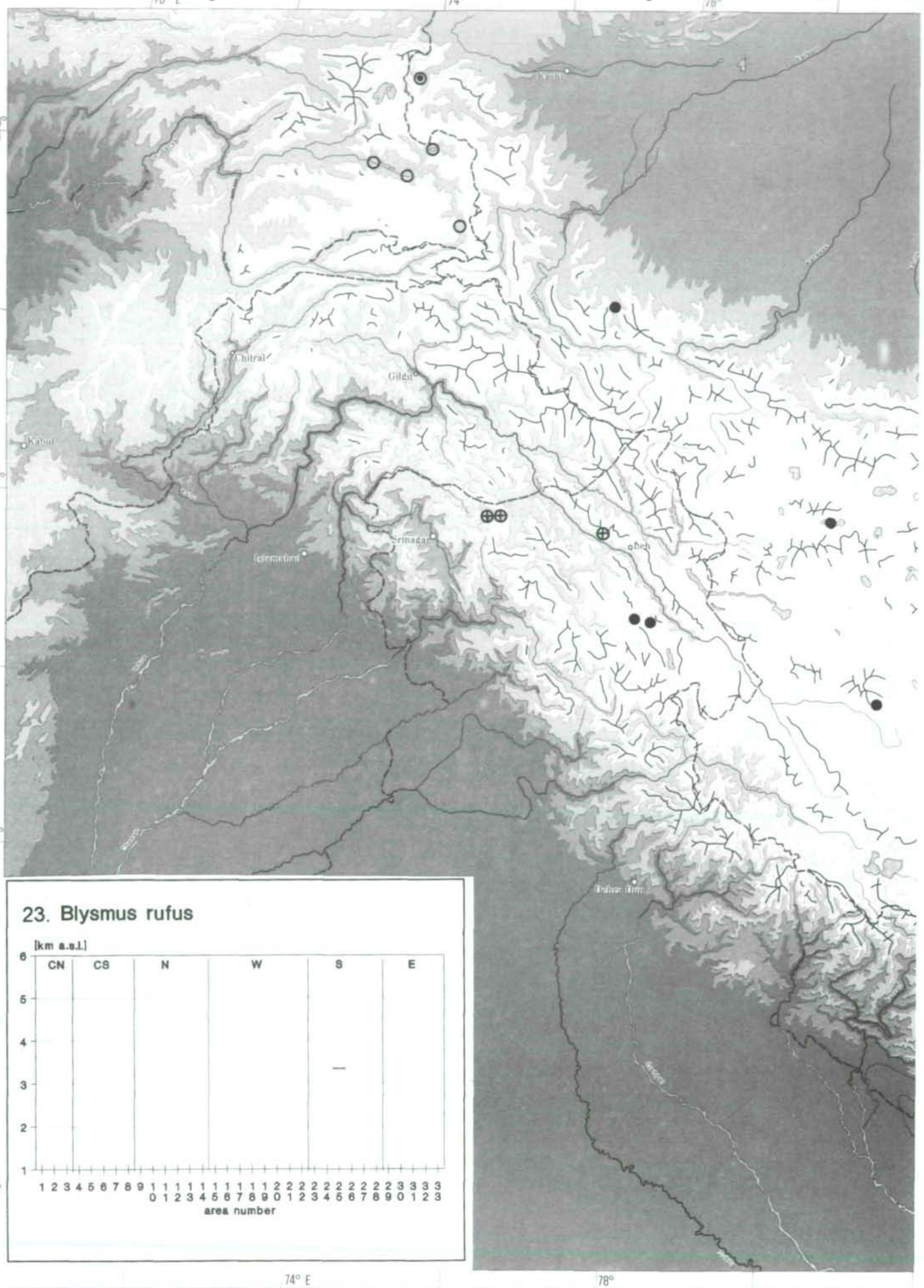

23. Blysmus rufus

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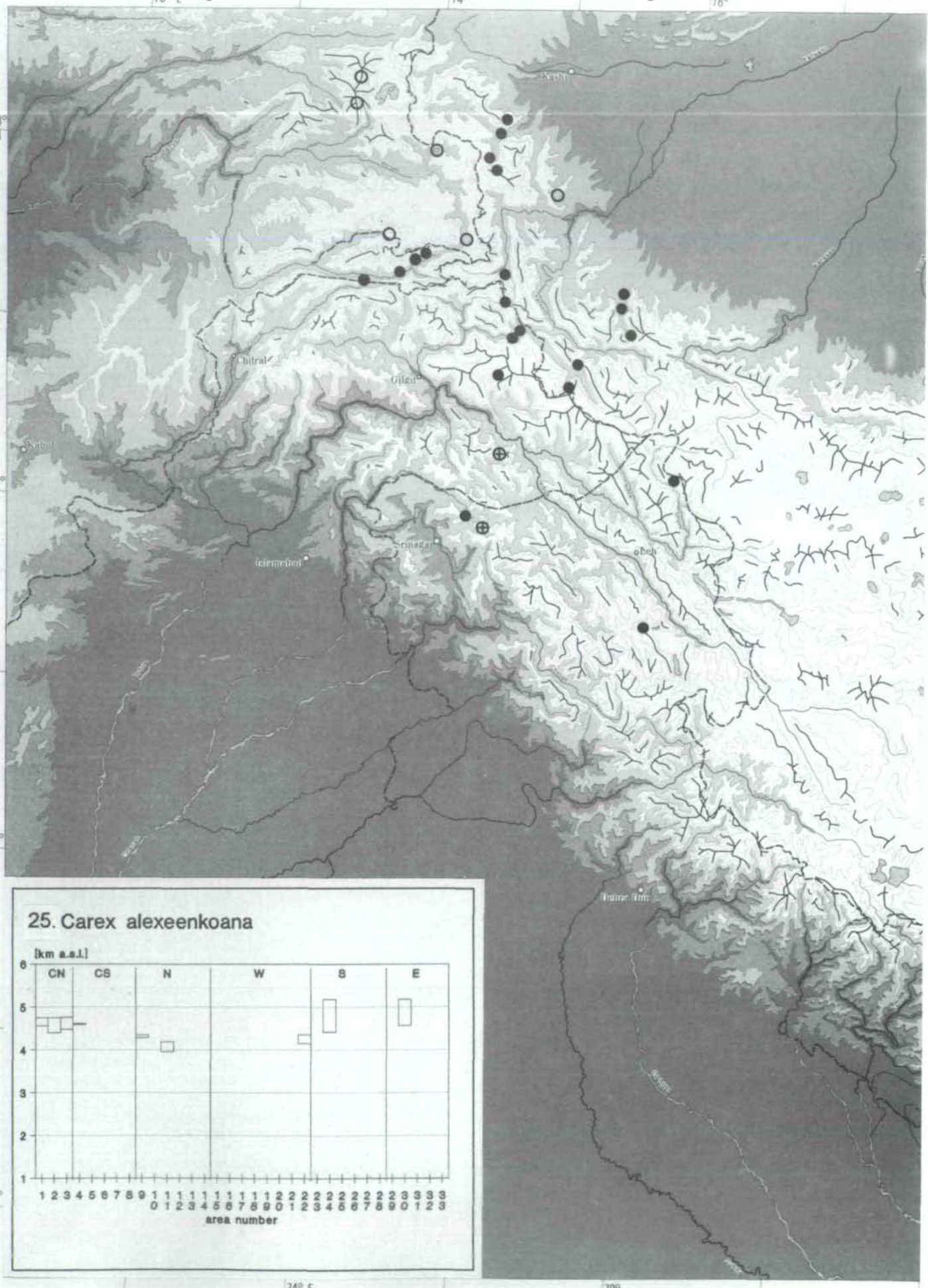

25. Carex alexeenkoana

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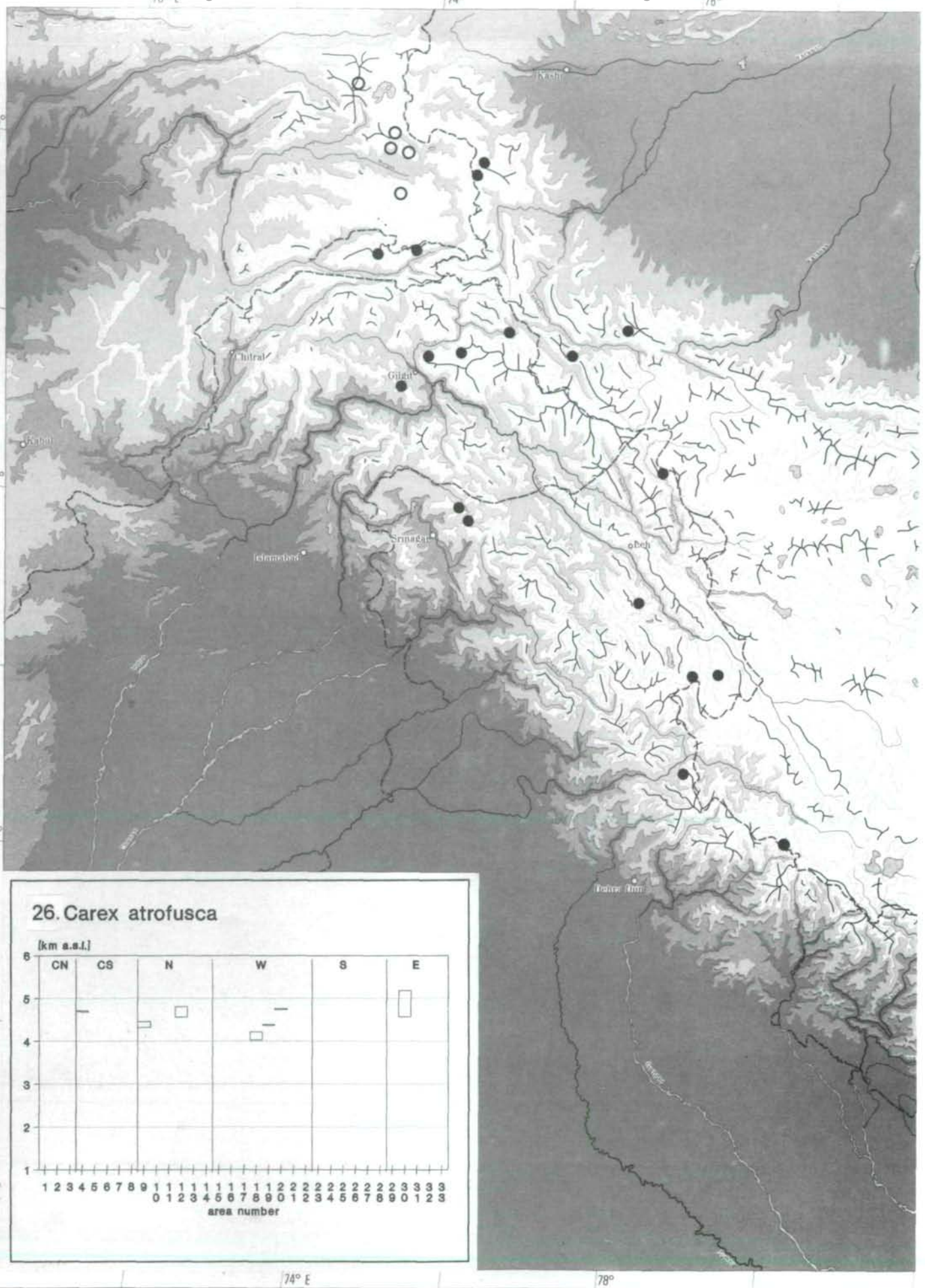

26. Carex atrofusca

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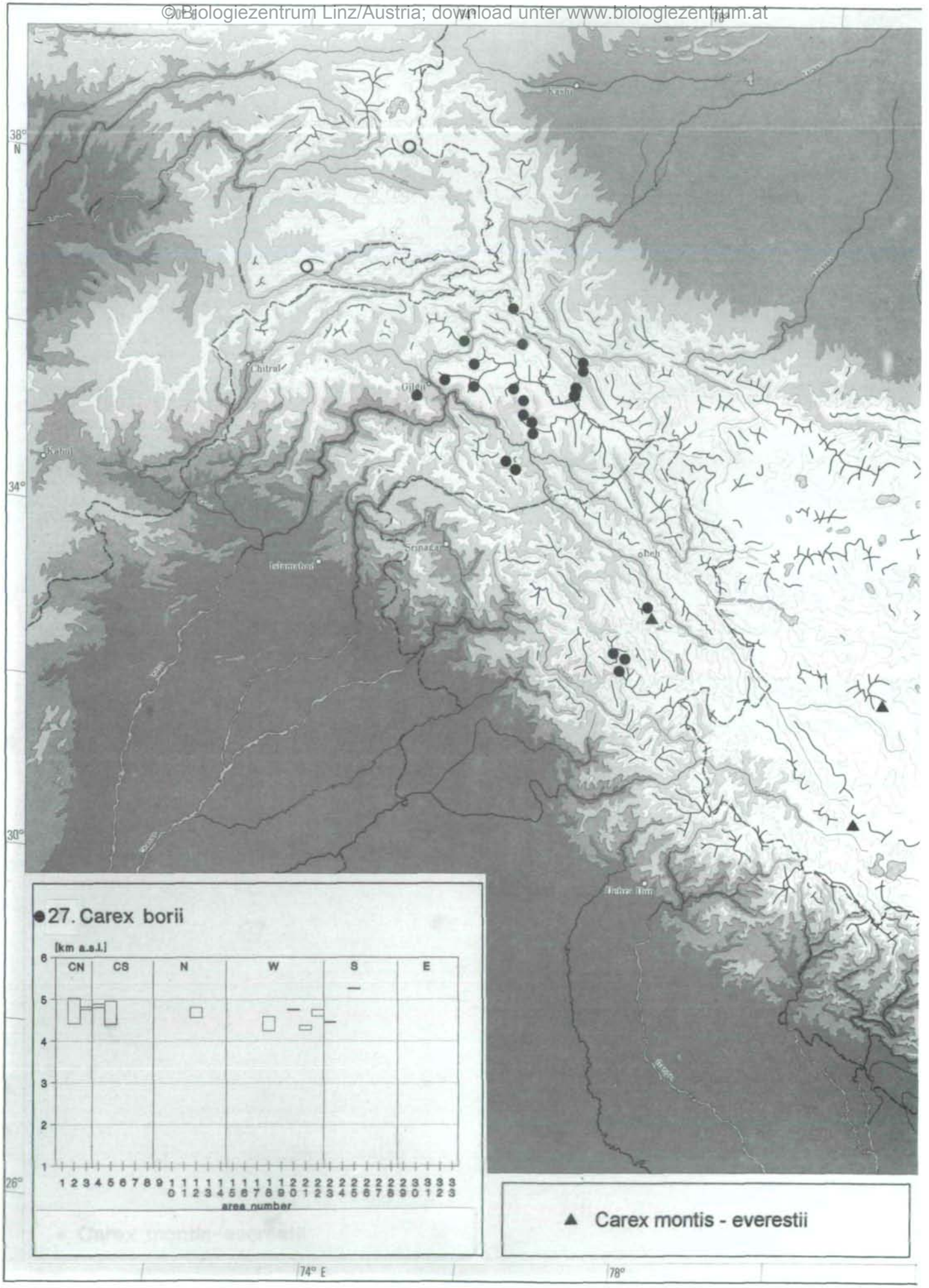

● 27. Carex borii

▲ Carex montis - everestii

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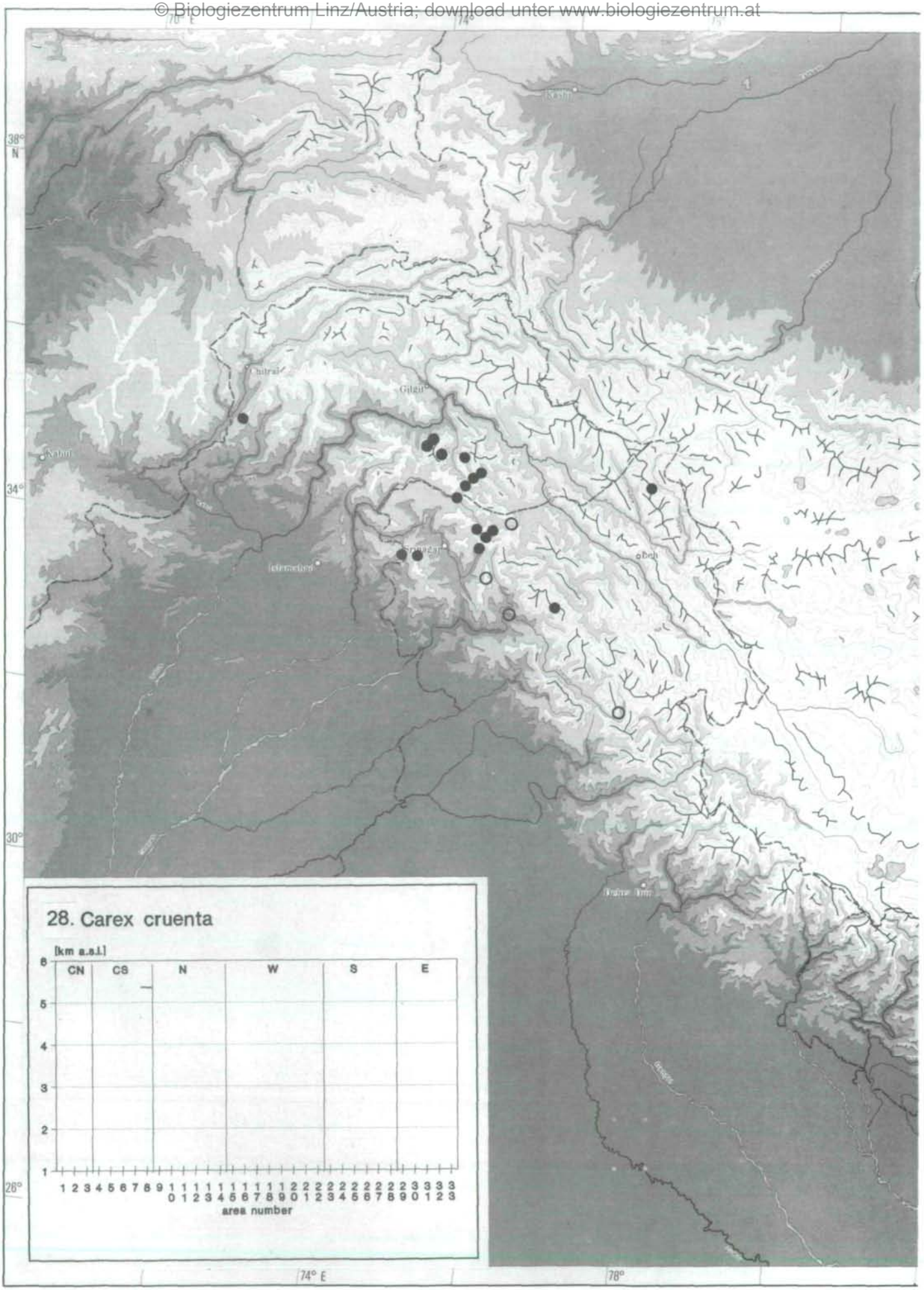

28. Carex cruenta

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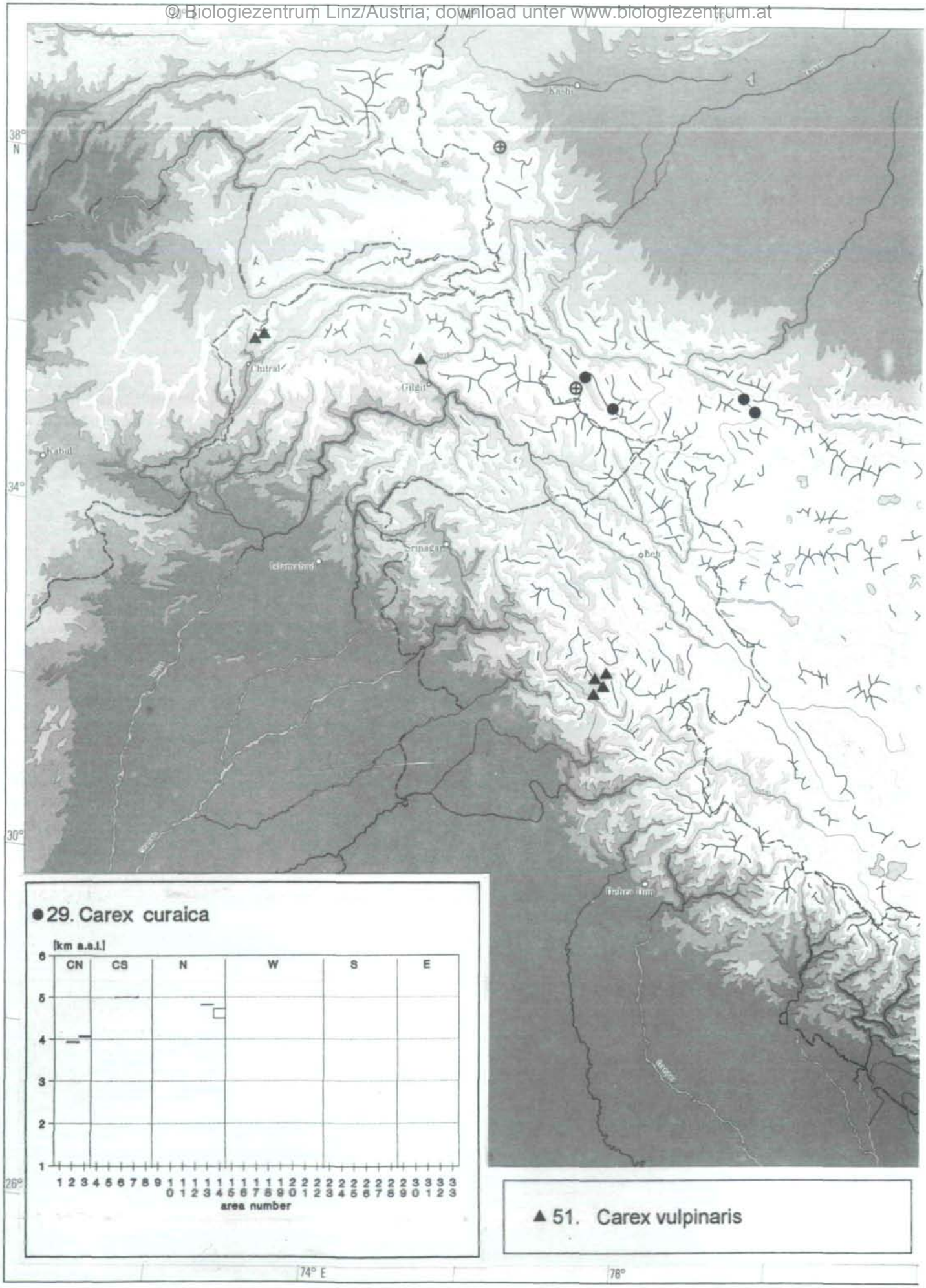

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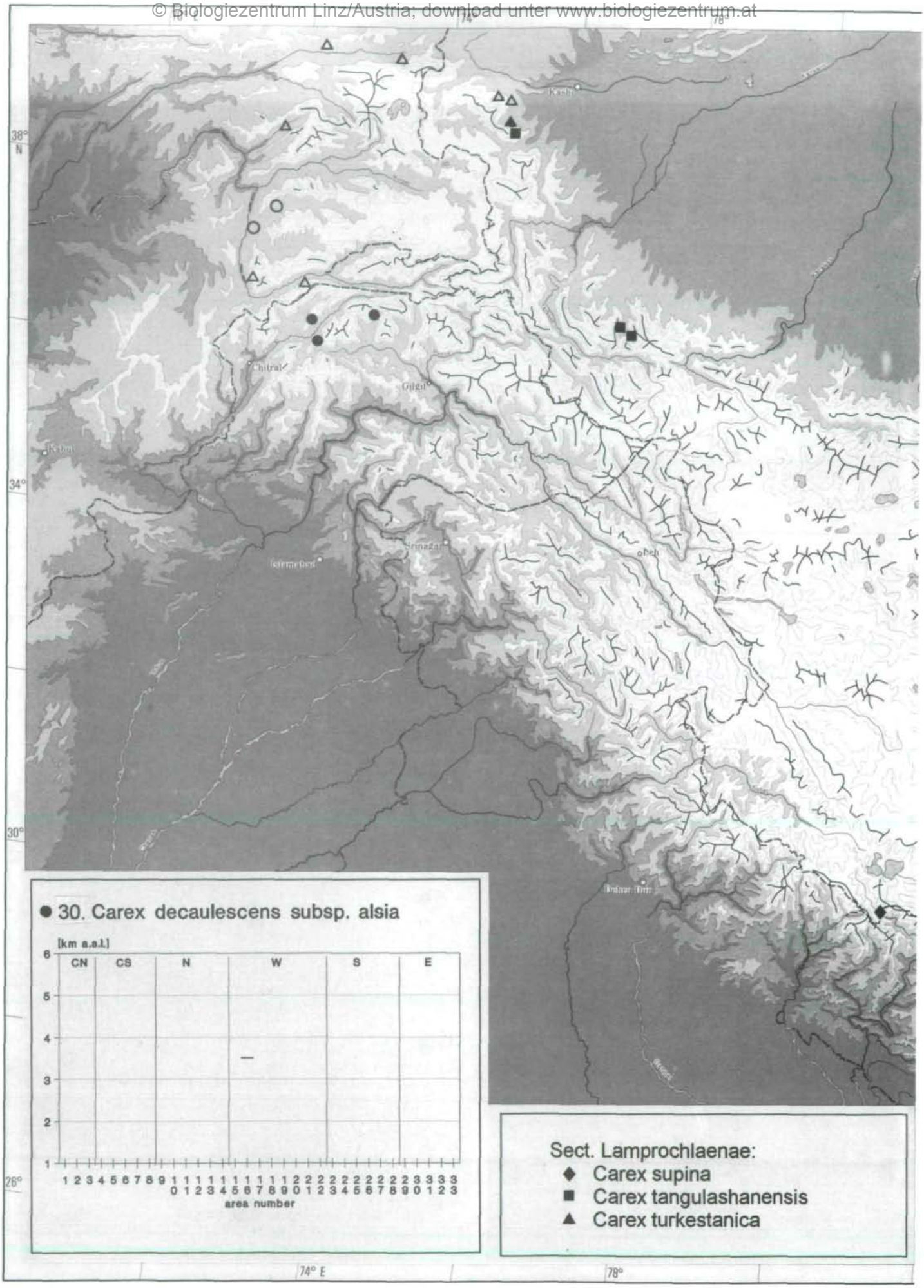

● 30. Carex decaulescens subsp. alsia

Sect. Lamprochlaenae:

- ◆ Carex supina
- ■ Carex tangulashanensis
- ▲ Carex turkestanica

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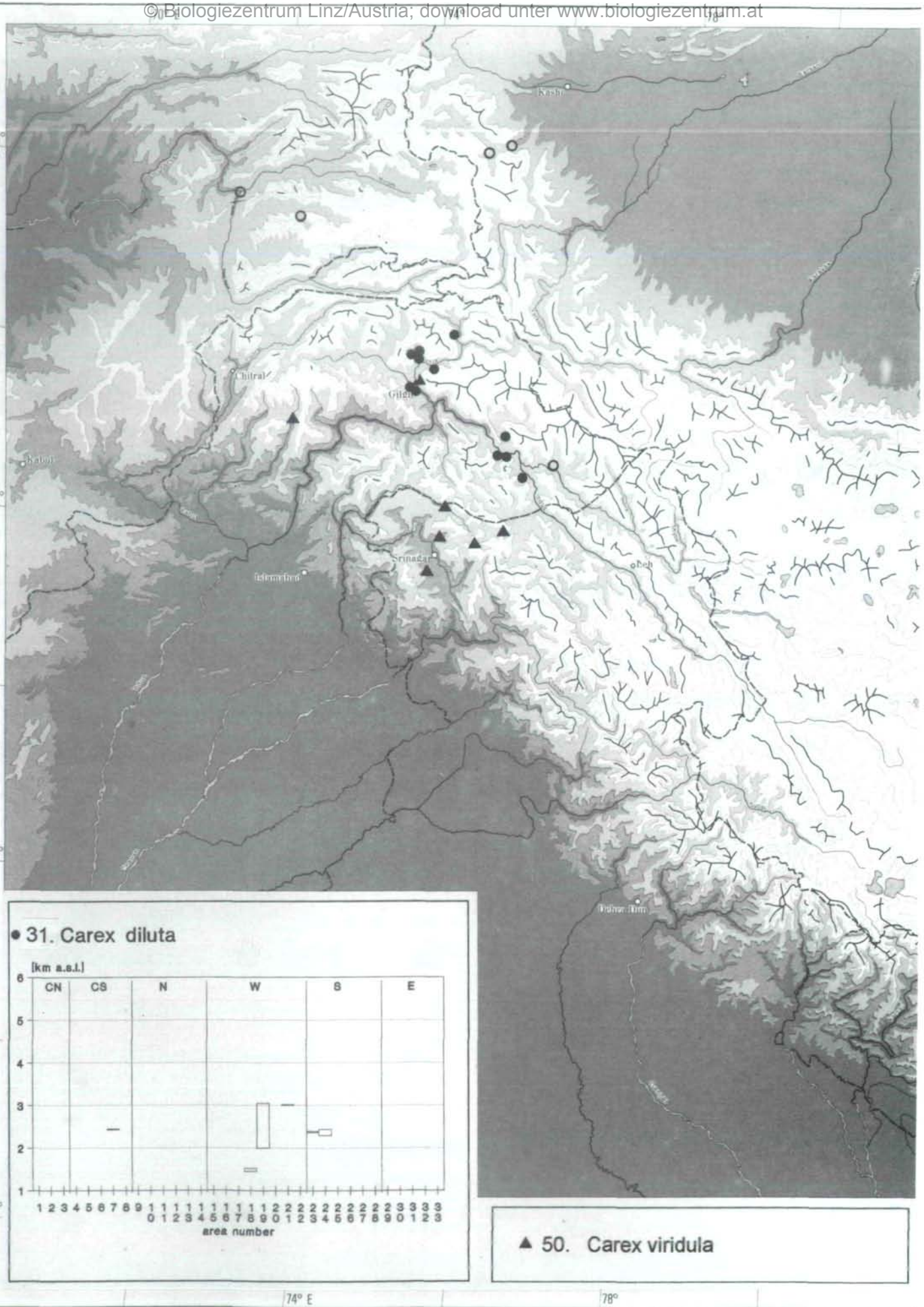

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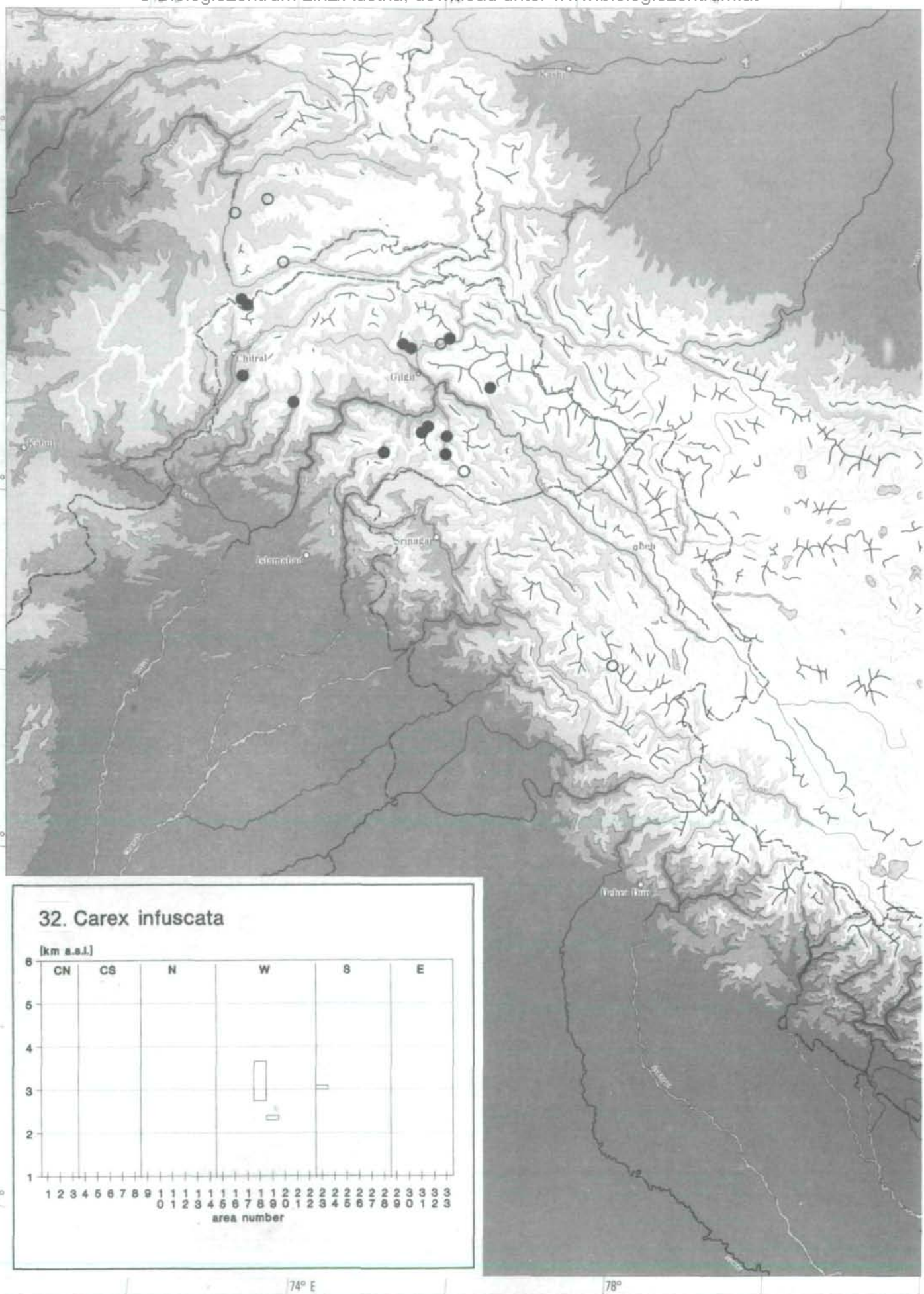

32. Carex infuscata

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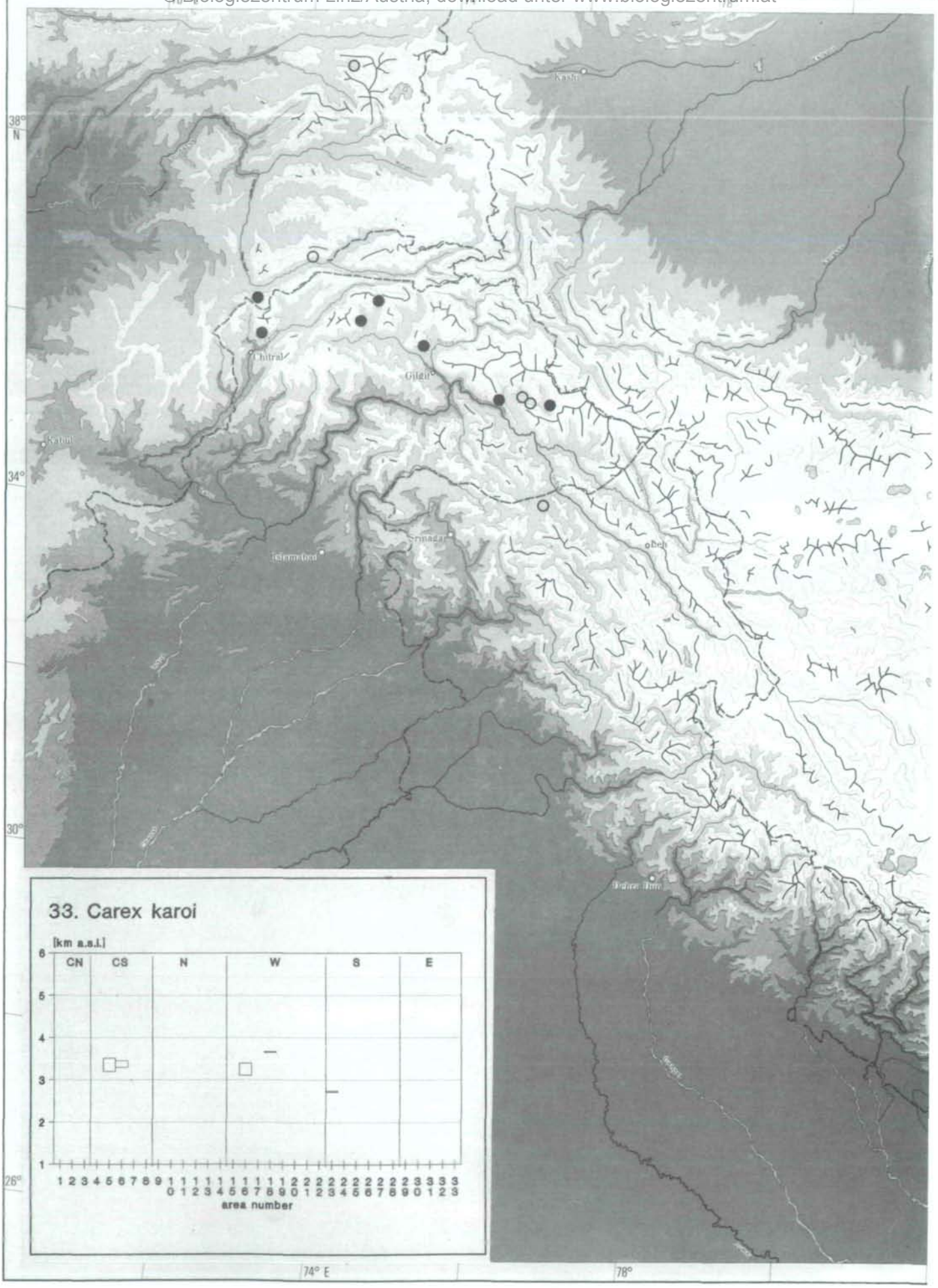

33. Carex karoi

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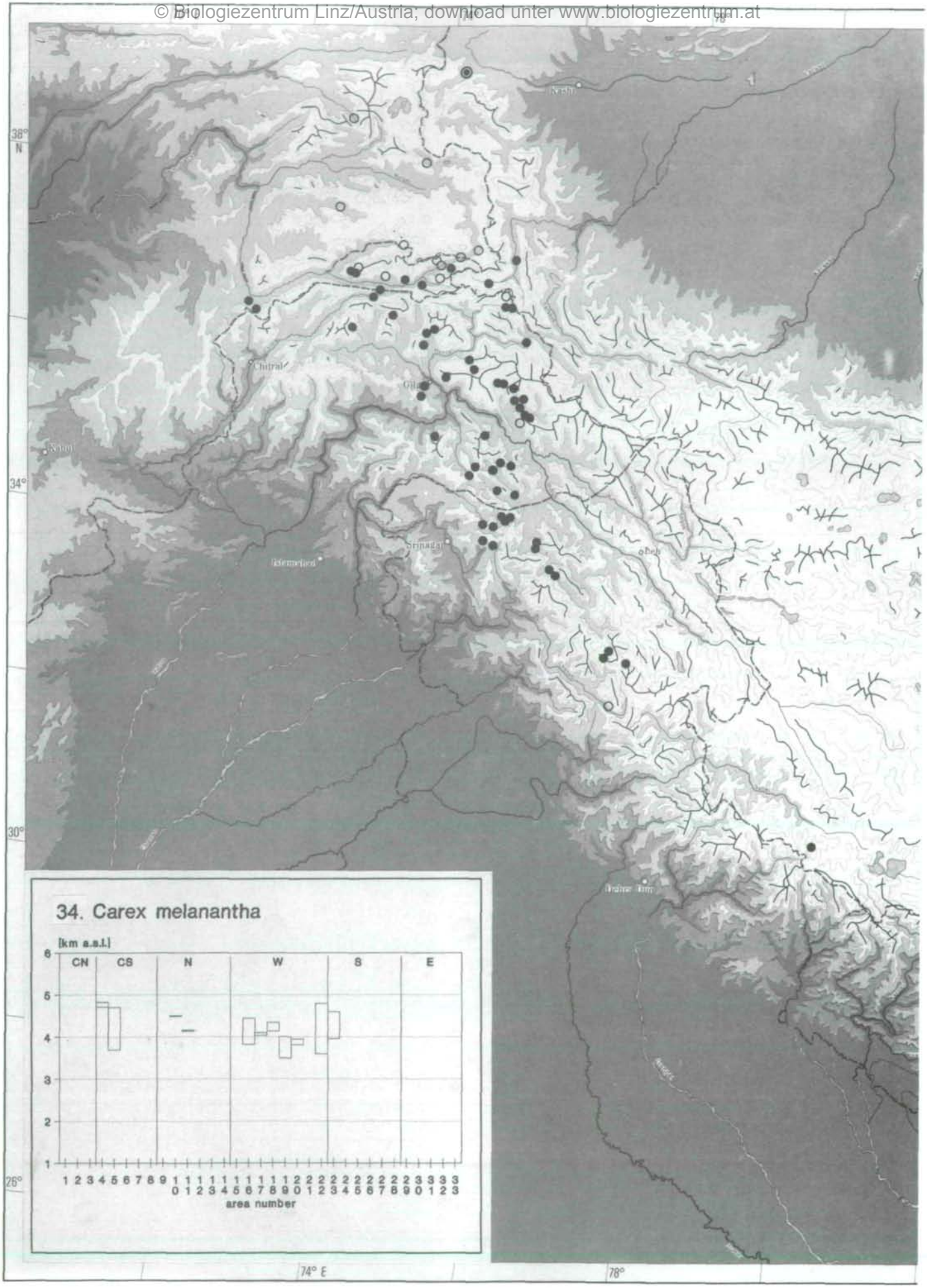

34. Carex melanantha

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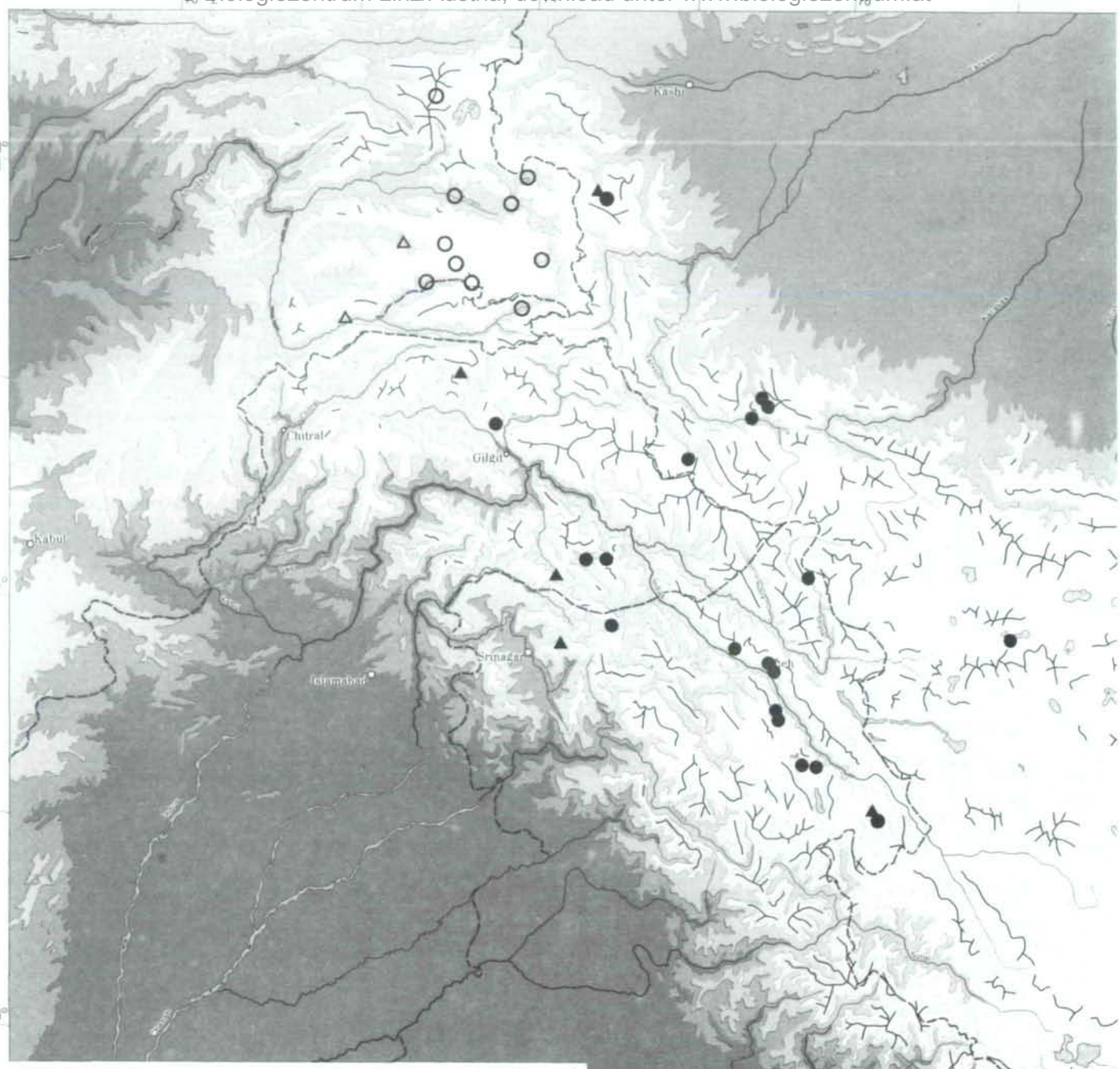
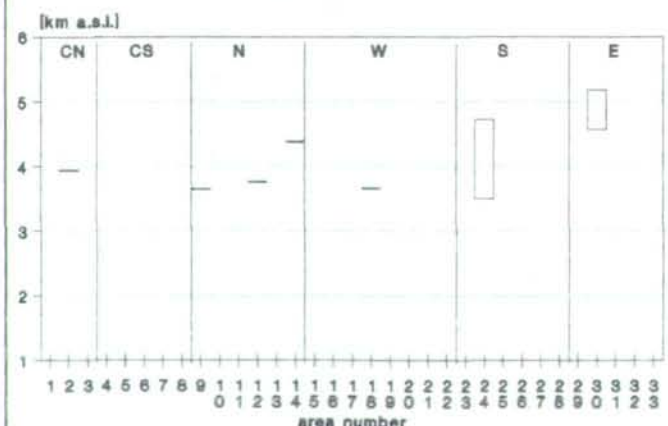


● 35. Carex microglochin



▲ 41. Carex parva

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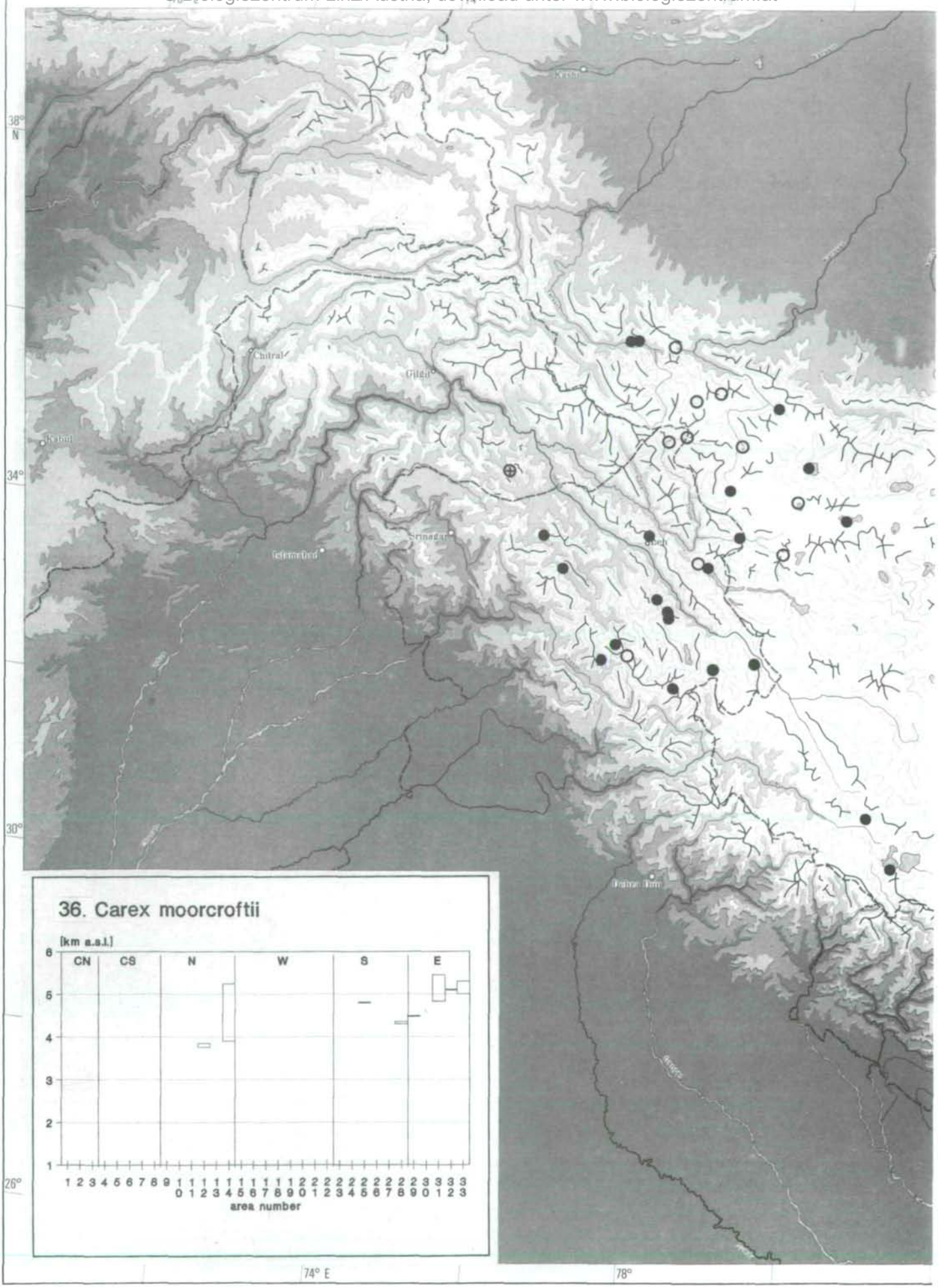

36. Carex moorcroftii

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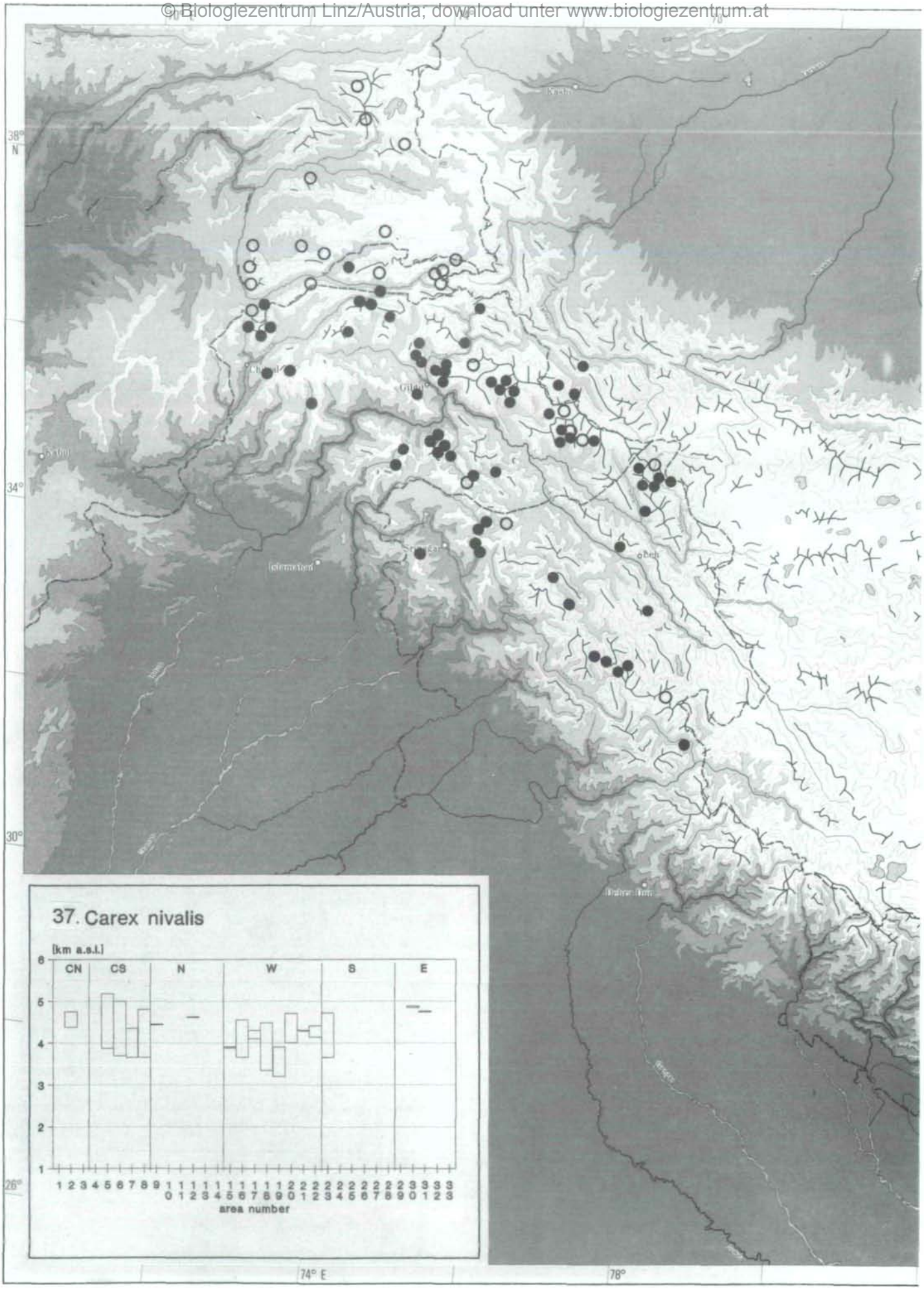

37. Carex nivalis

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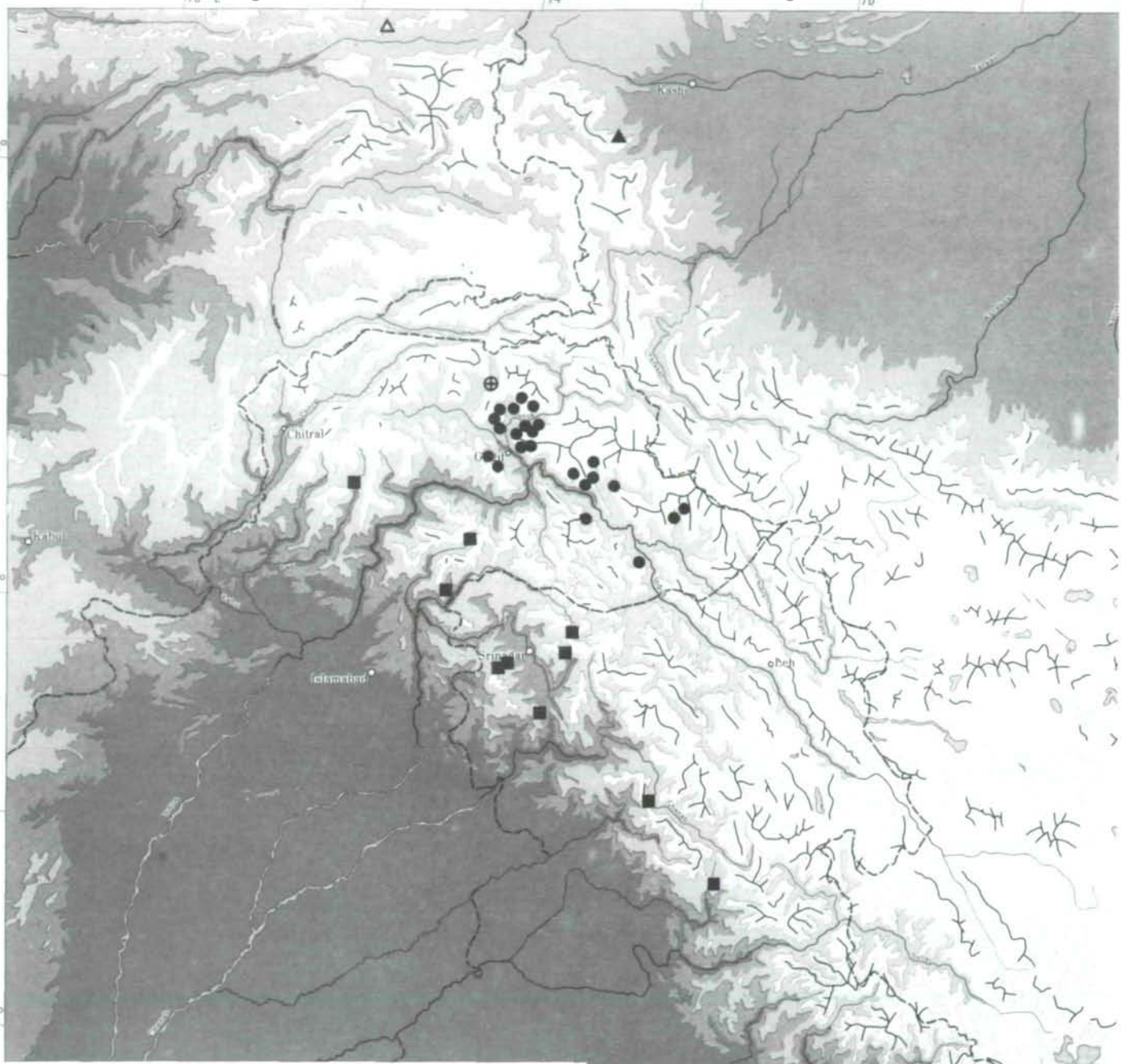
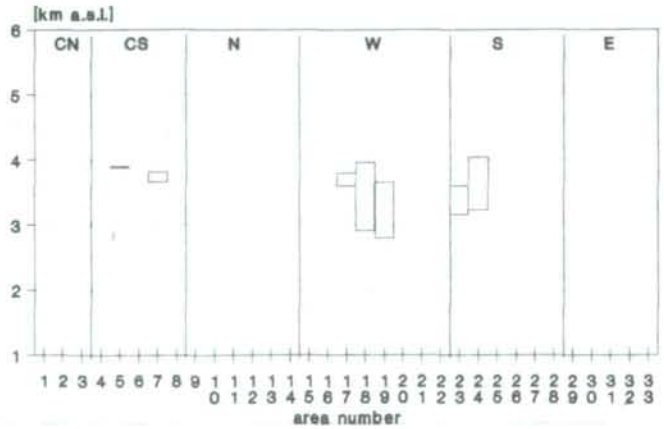


38. Carex oligocarya



▲ Carex alaica
■ Carex kashmirensis

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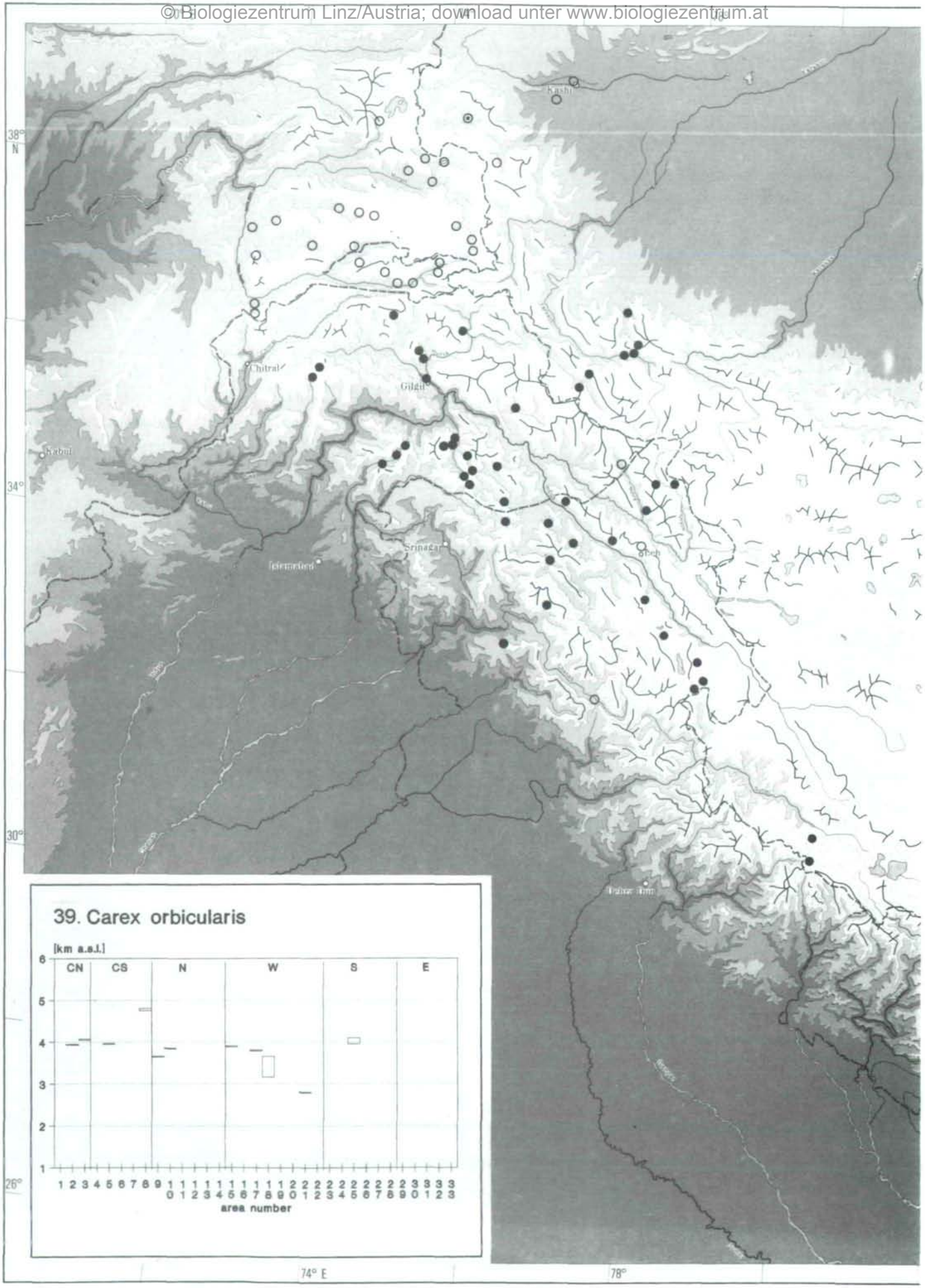

39. Carex orbicularis

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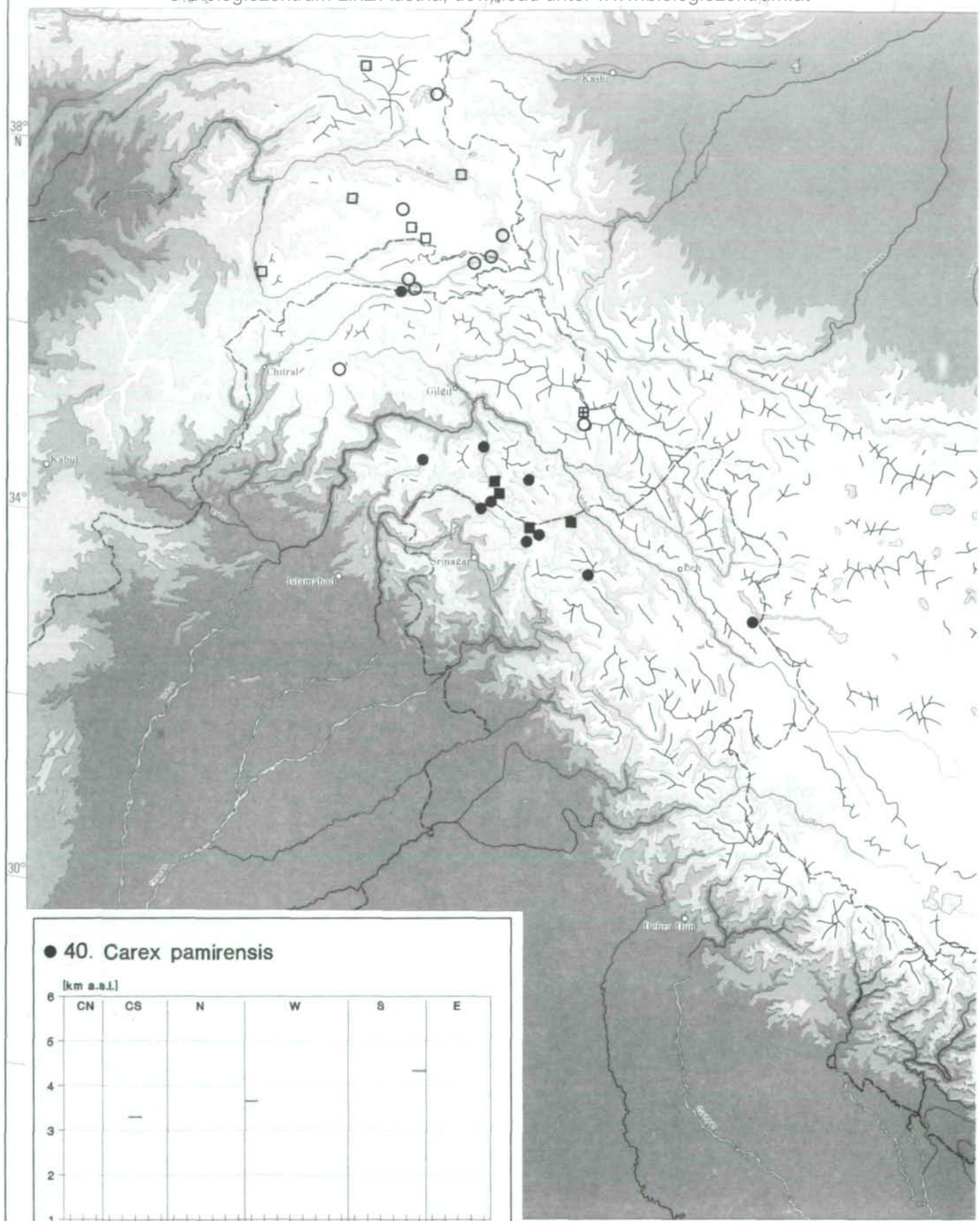
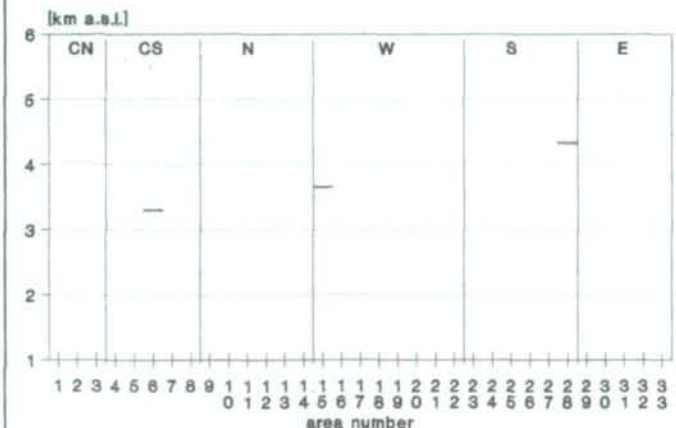


● 40. Carex pamirensis



■ 47. Carex songorica

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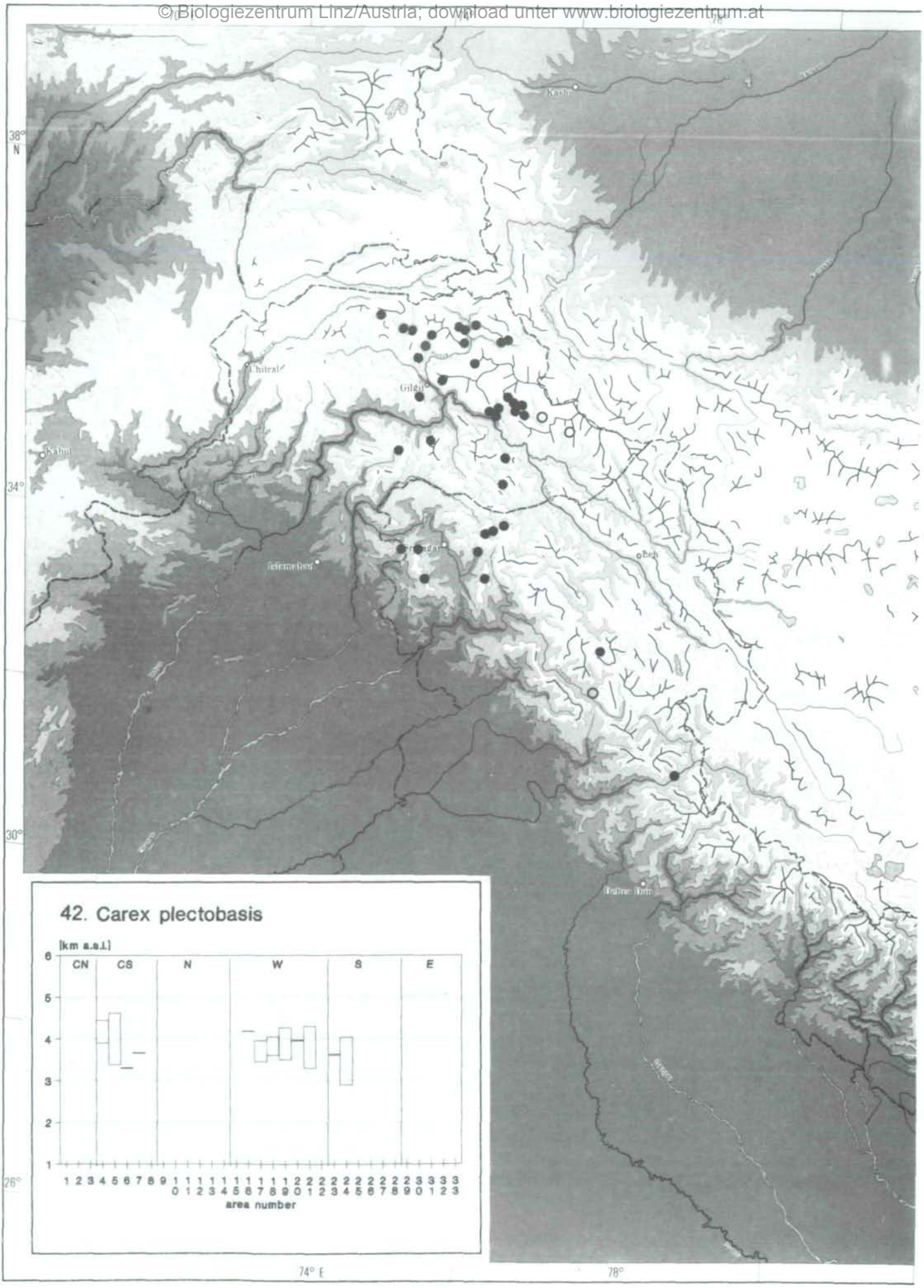

42. Carex plectobasis

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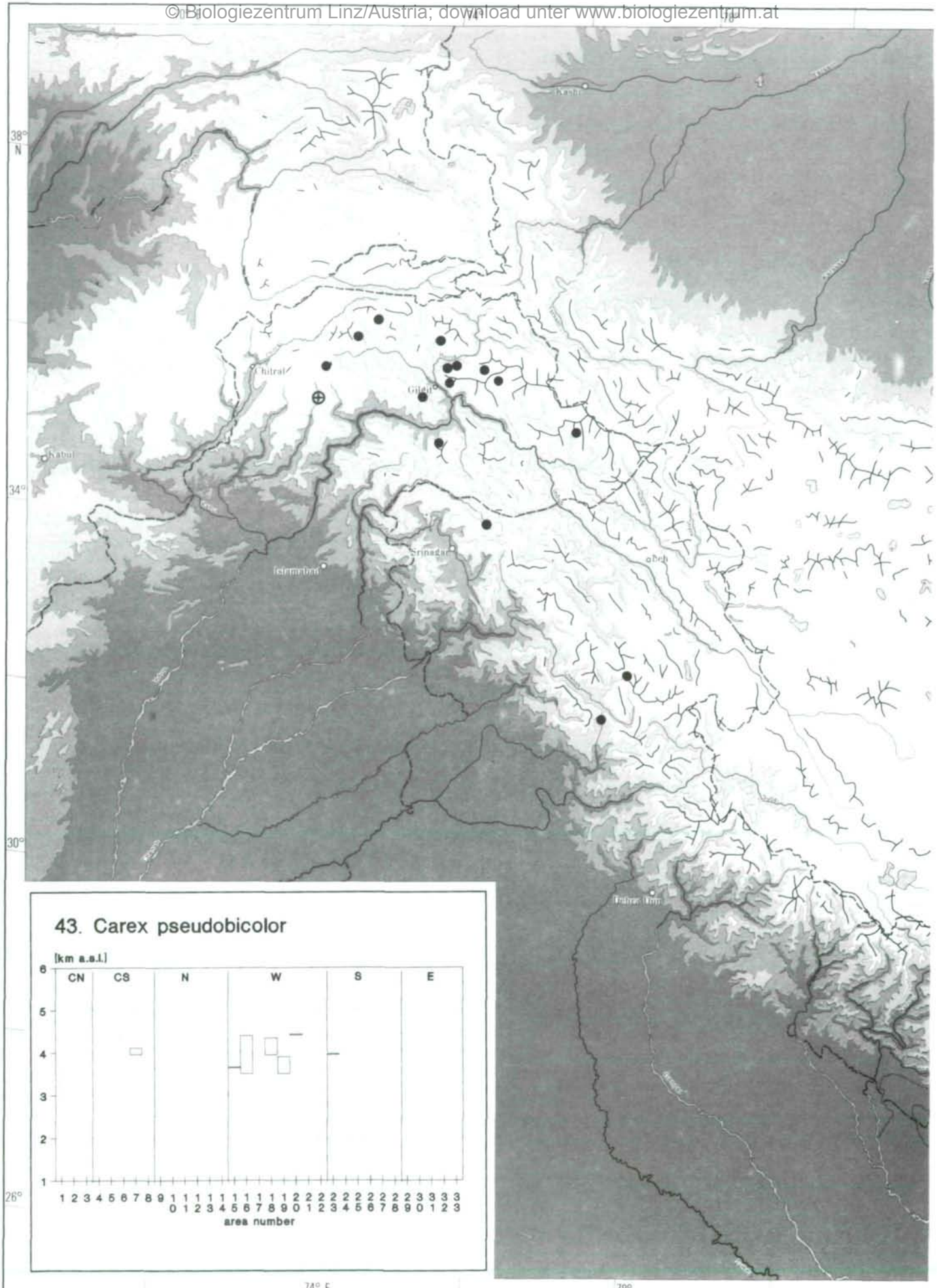

43. Carex pseudobicolor

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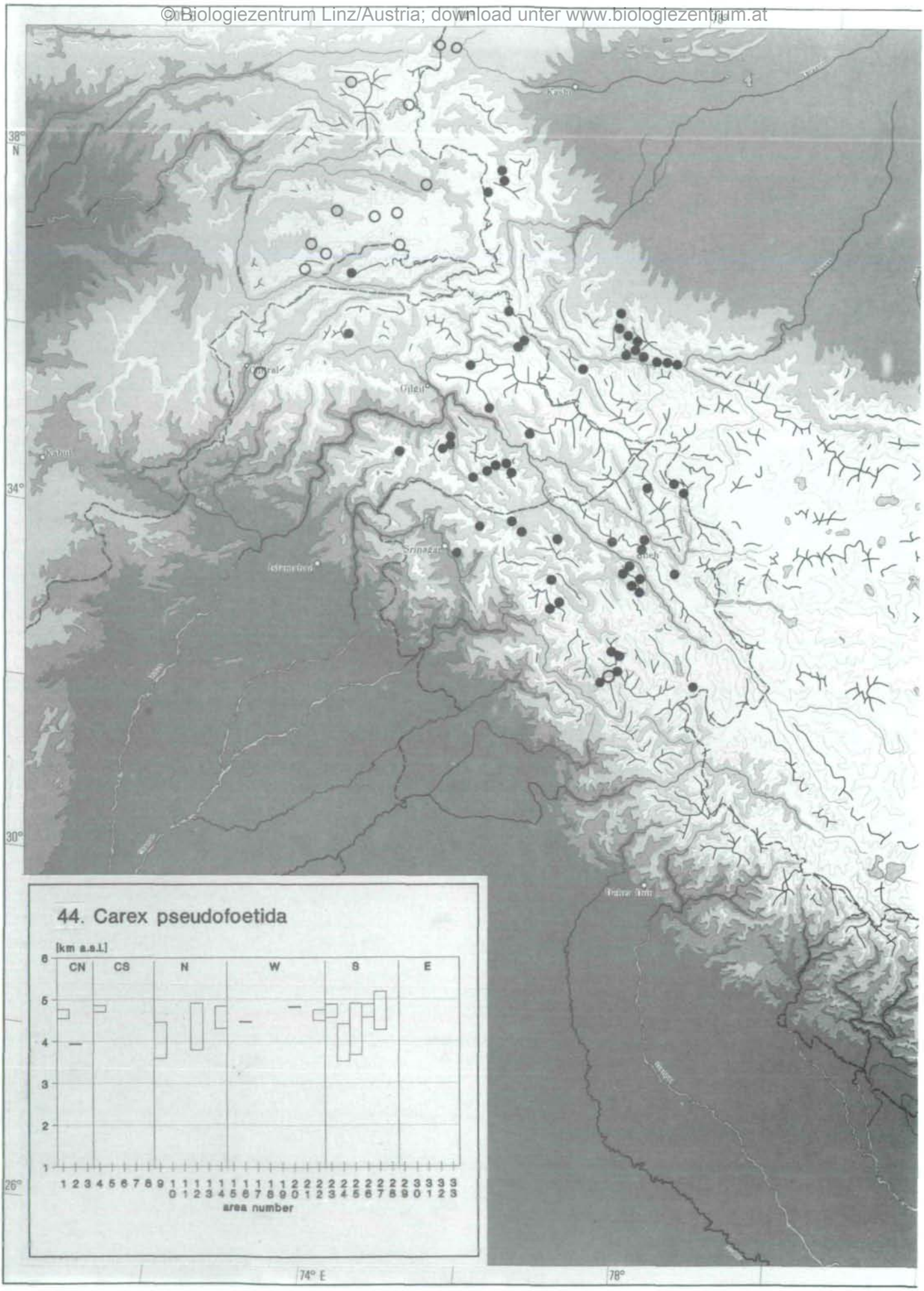

44. Carex pseudofoetida

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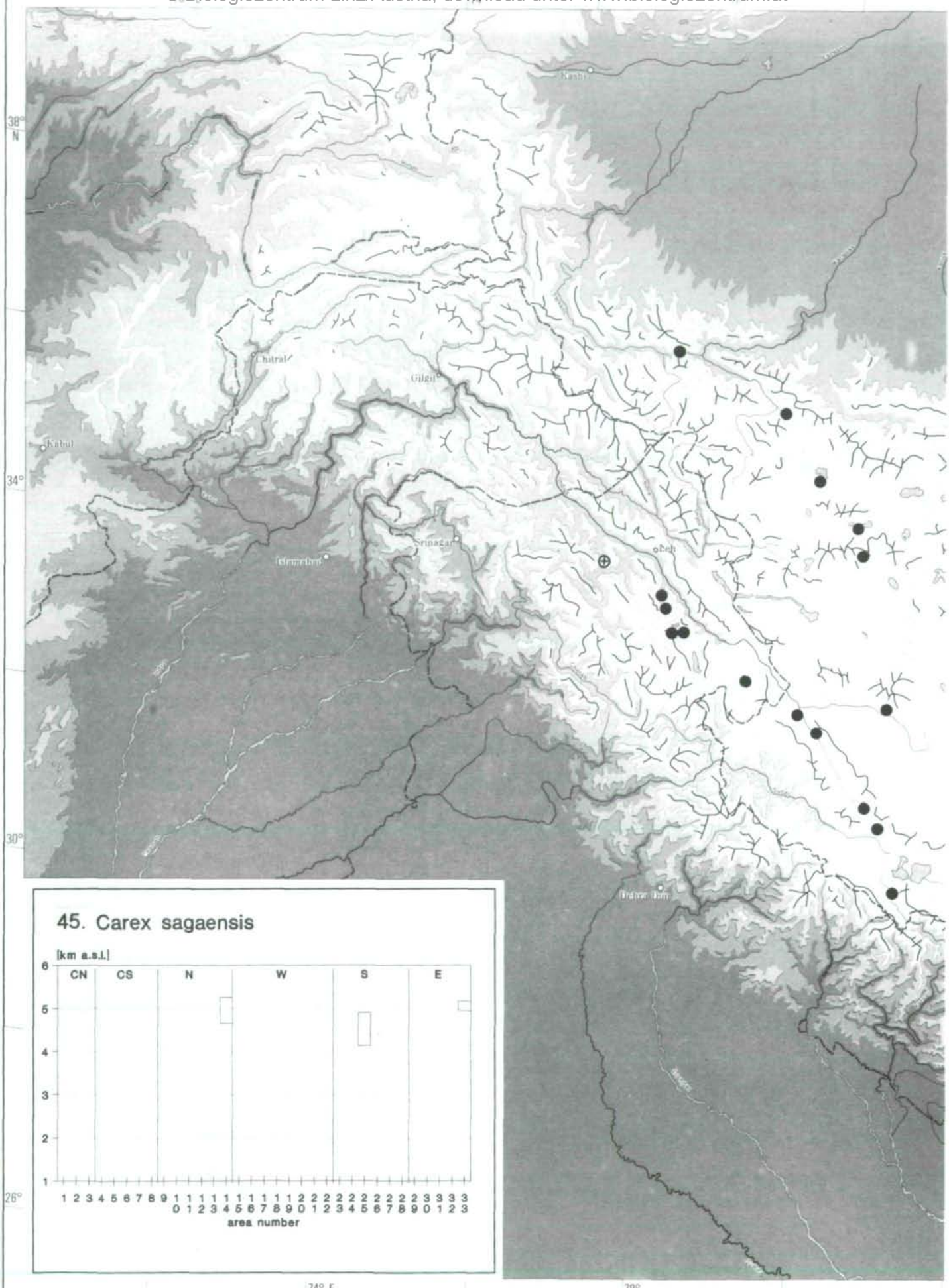

45. Carex sagaensis

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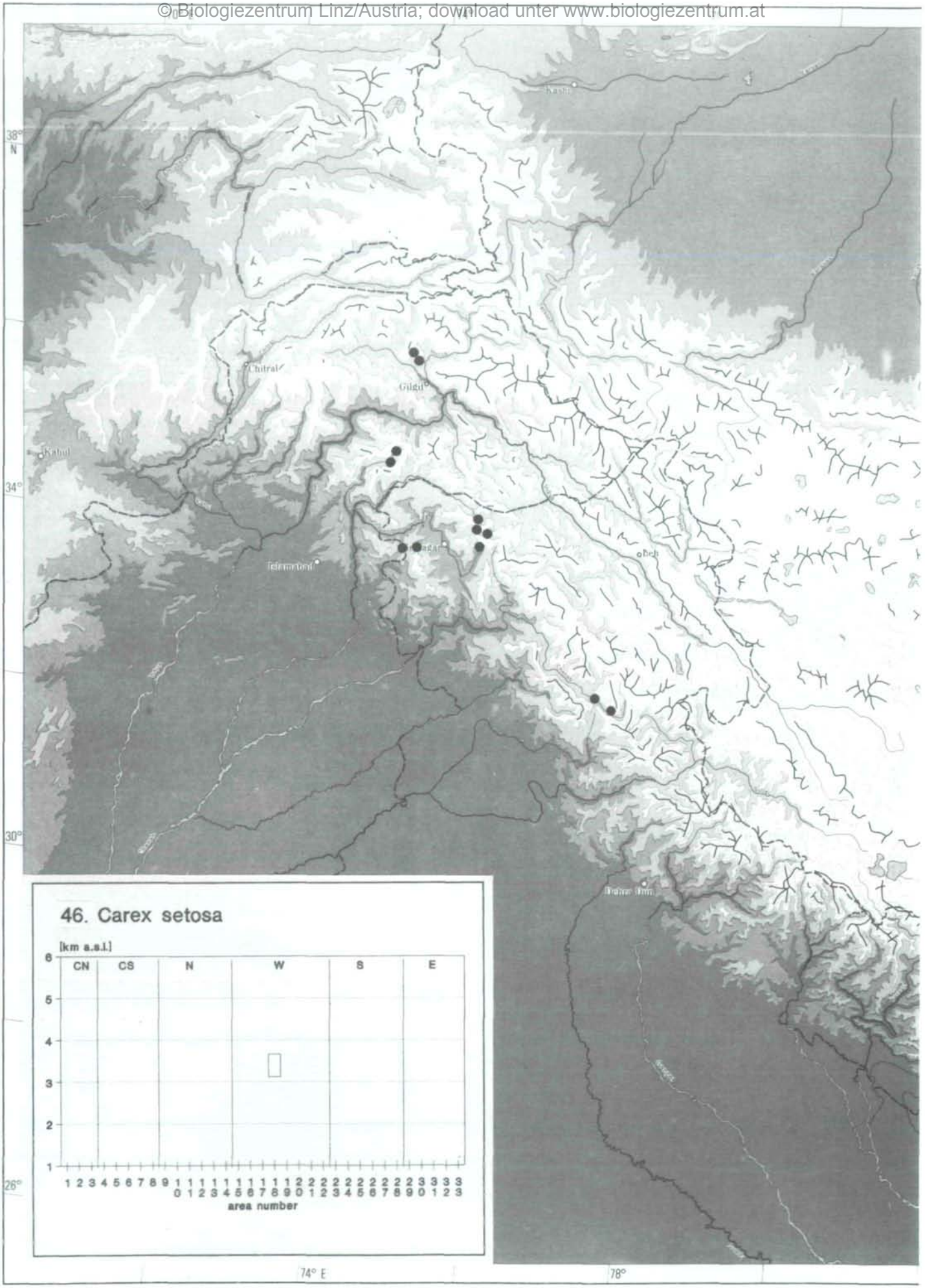

46. Carex setosa

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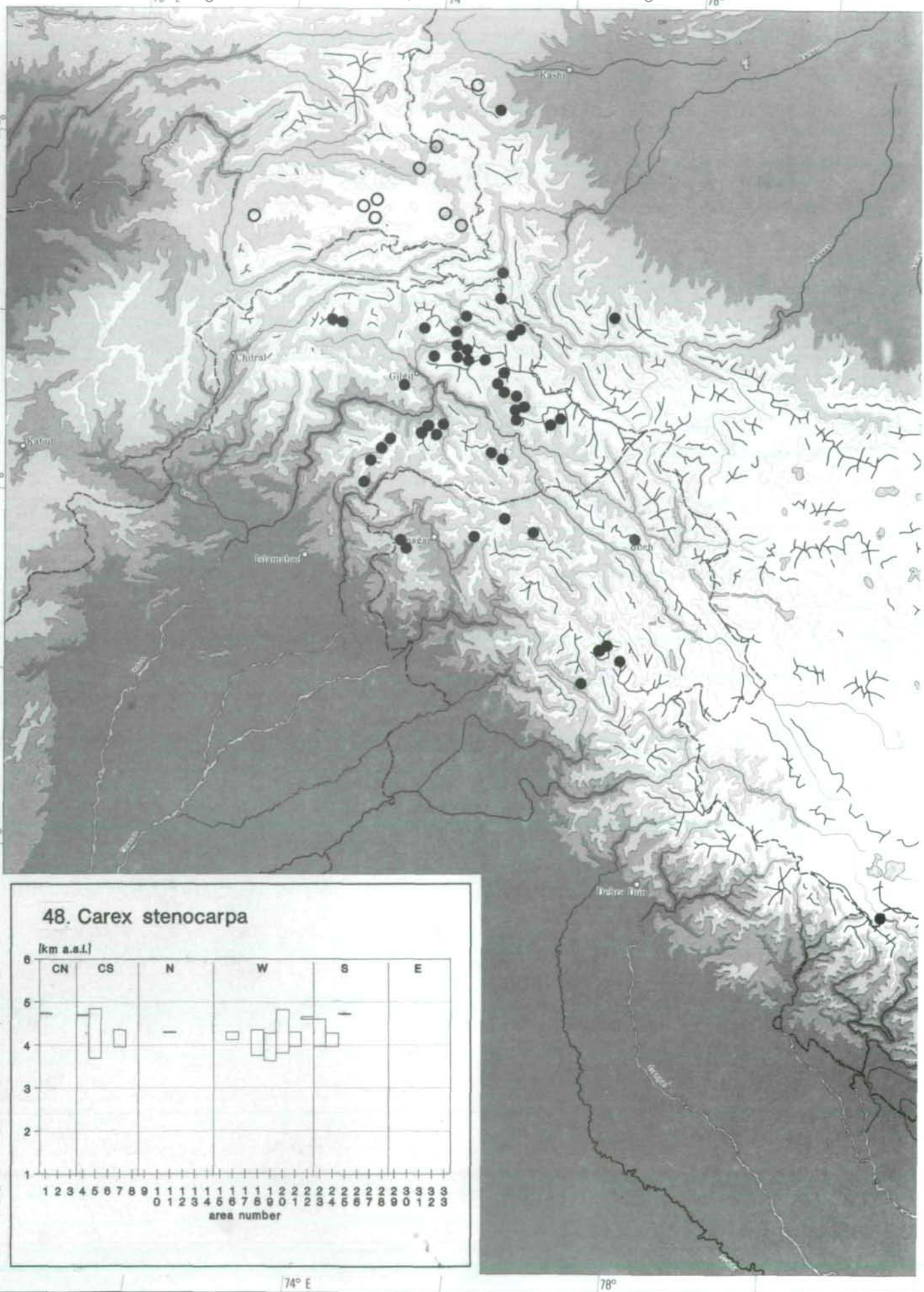

48. Carex stenocarpa

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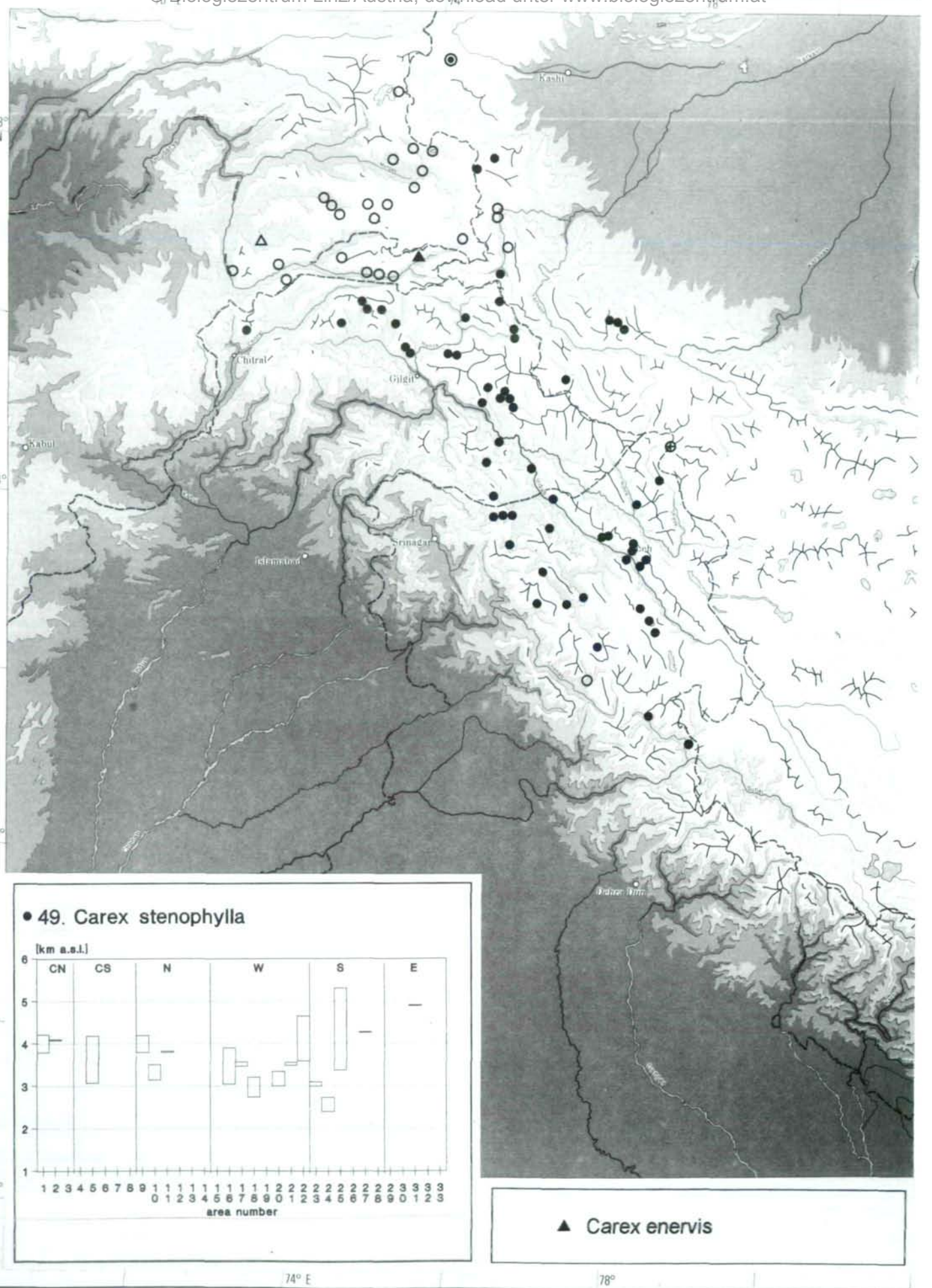

• 49. Carex stenophylla

▲ Carex enervis

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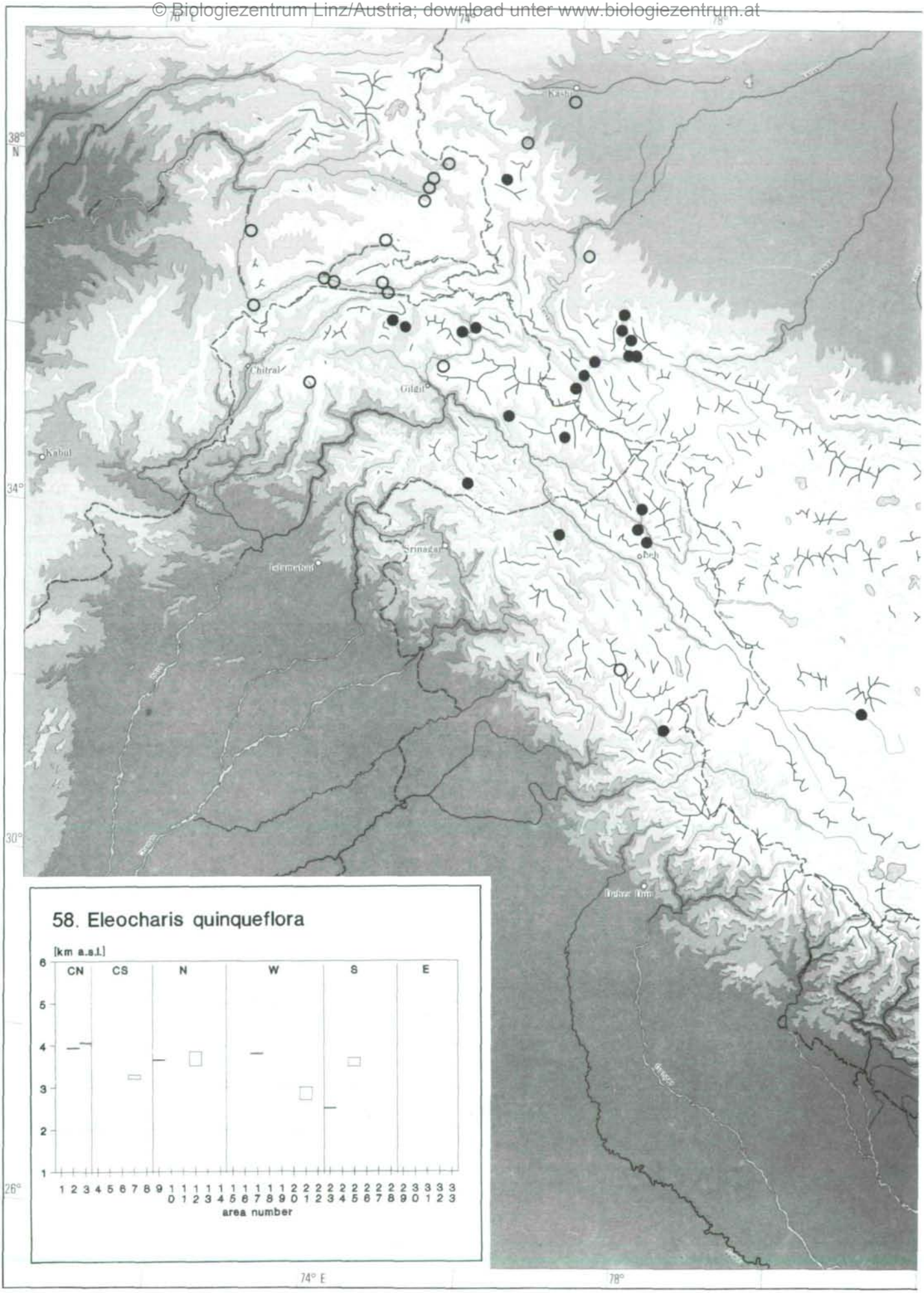

58. Eleocharis quinqueflora

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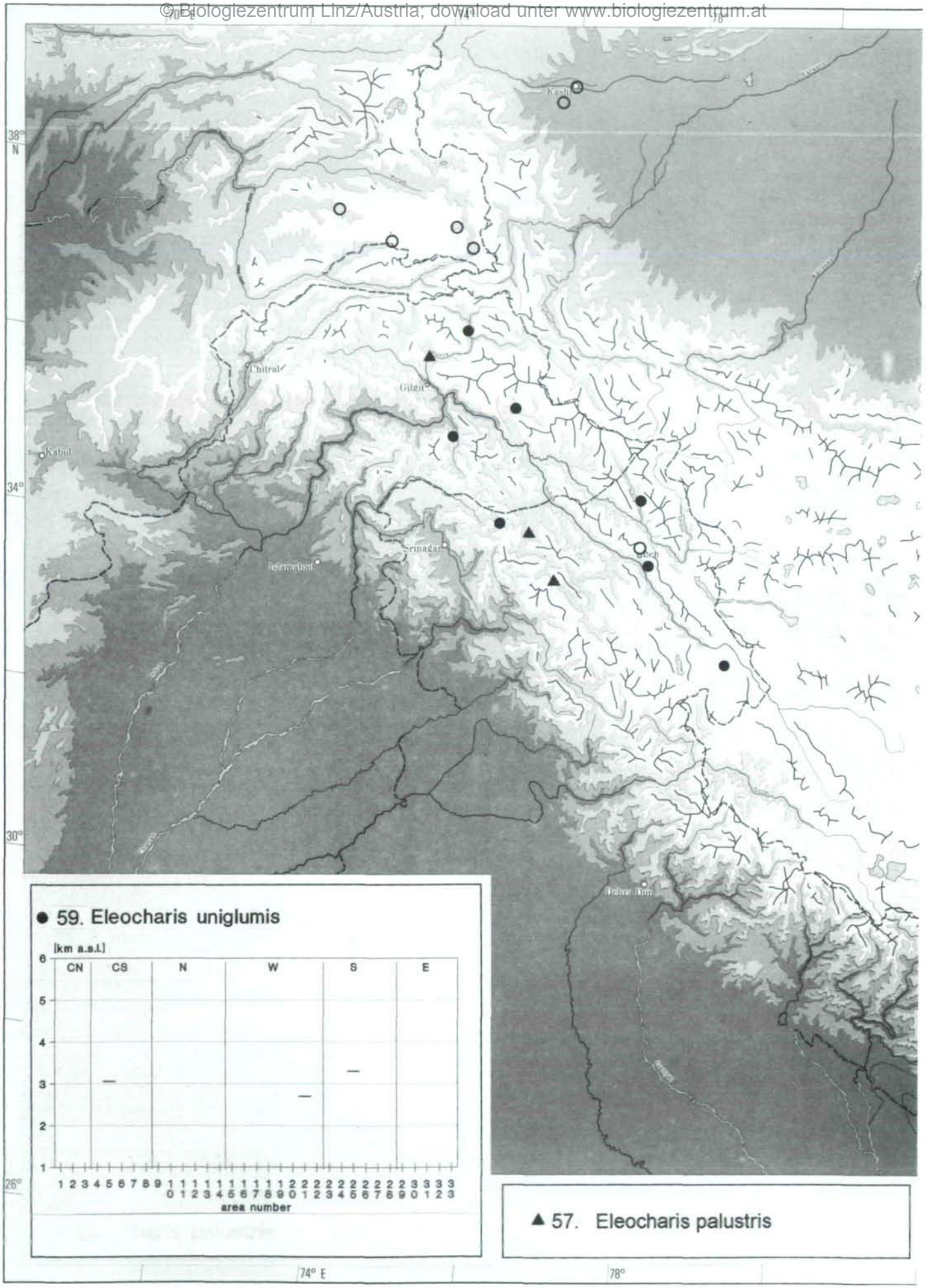

● 59. Eleocharis uniglumis

▲ 57. Eleocharis palustris

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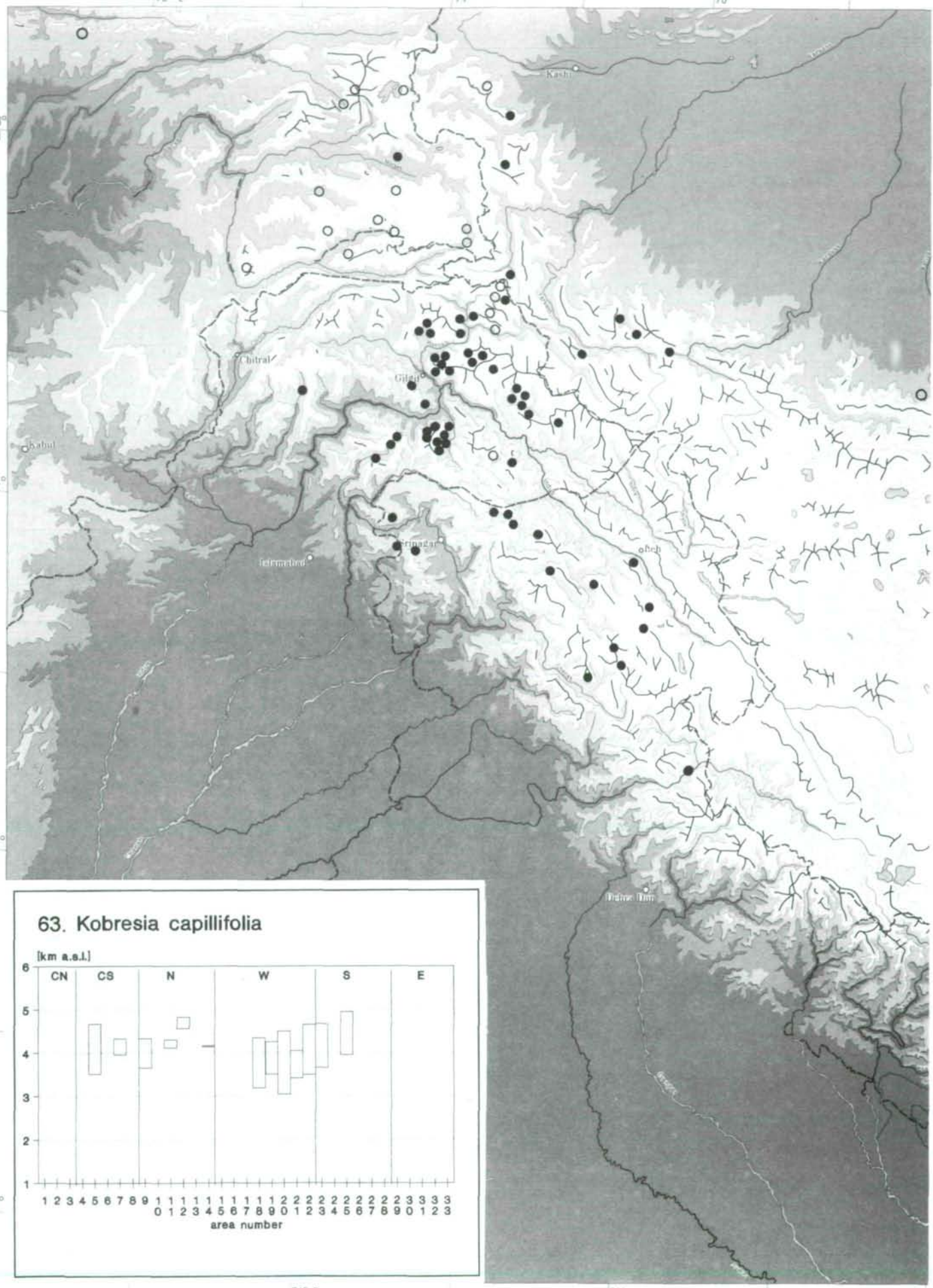

63. Kobresia capillifolia

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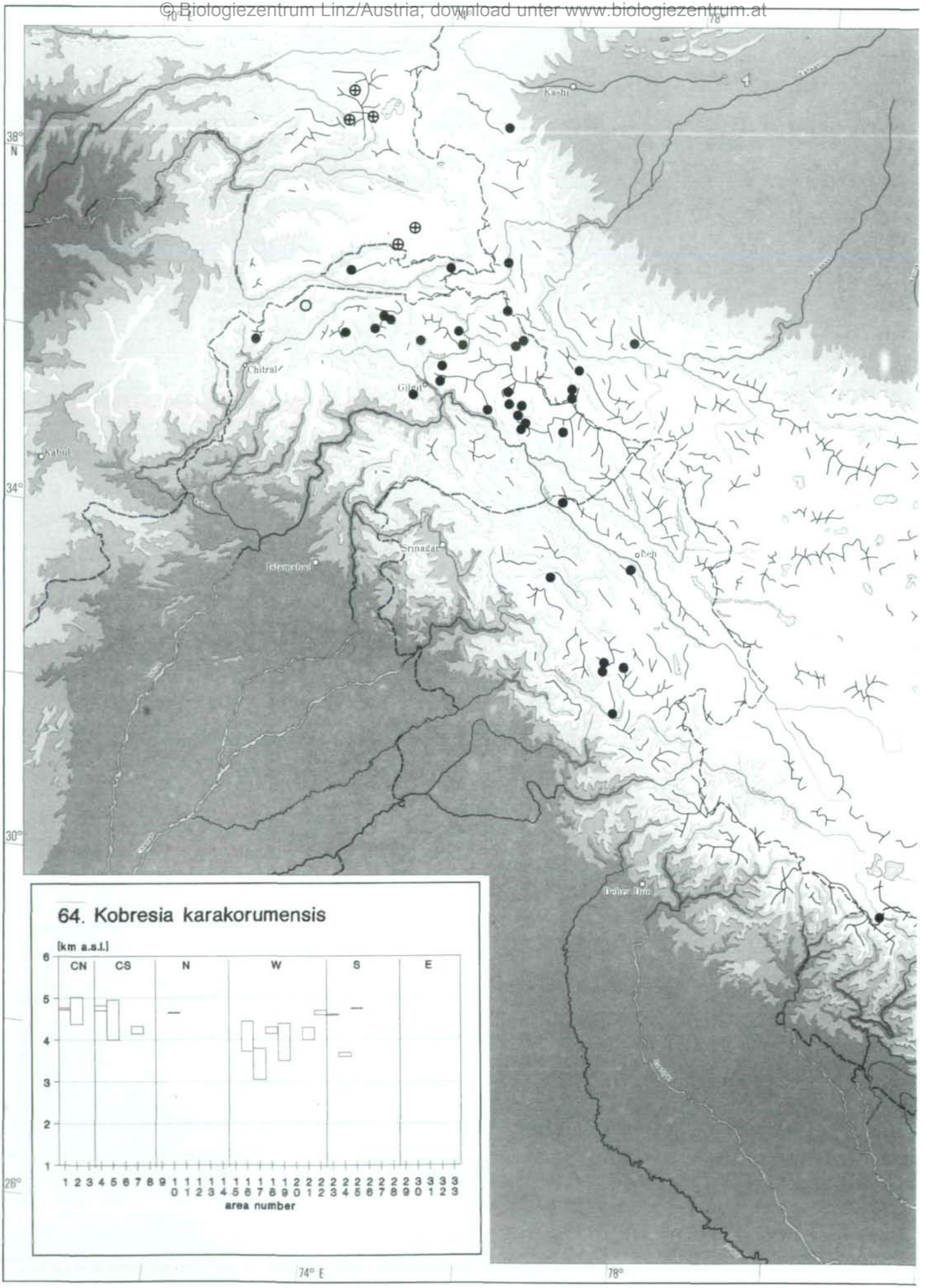

64. Kobresia karakorumensis

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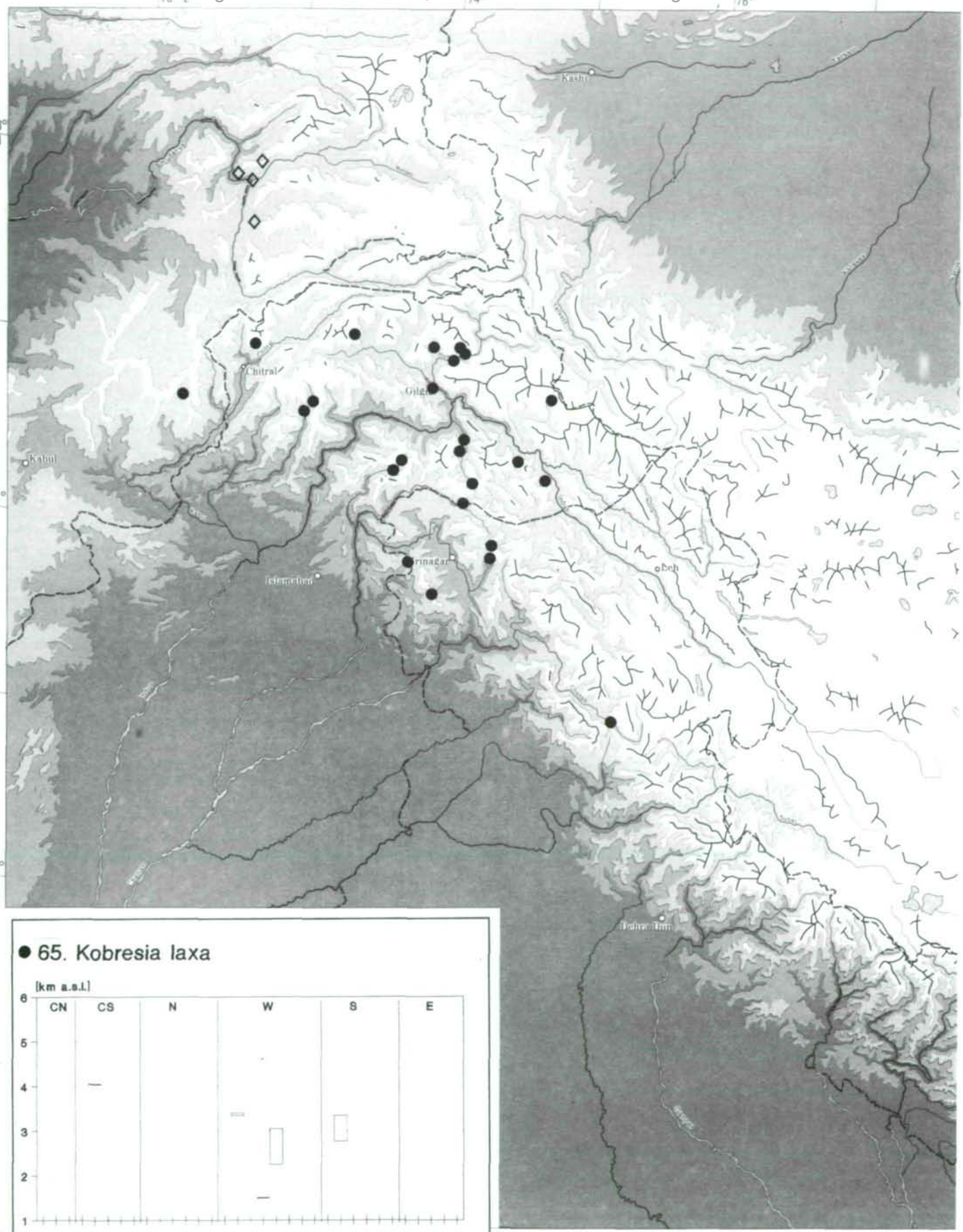
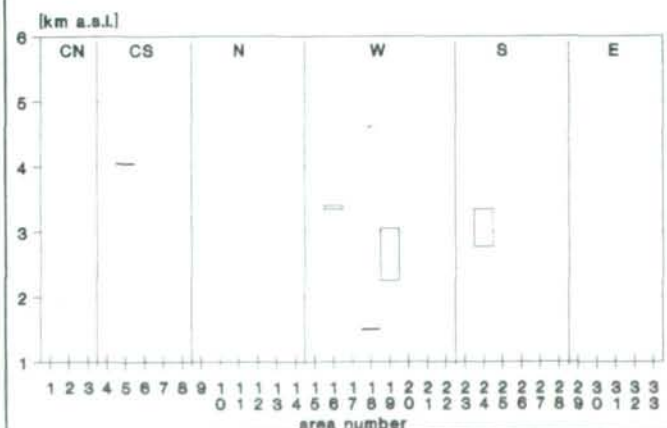


● 65. Kobresia laxa



◇ Kobresia hissarica

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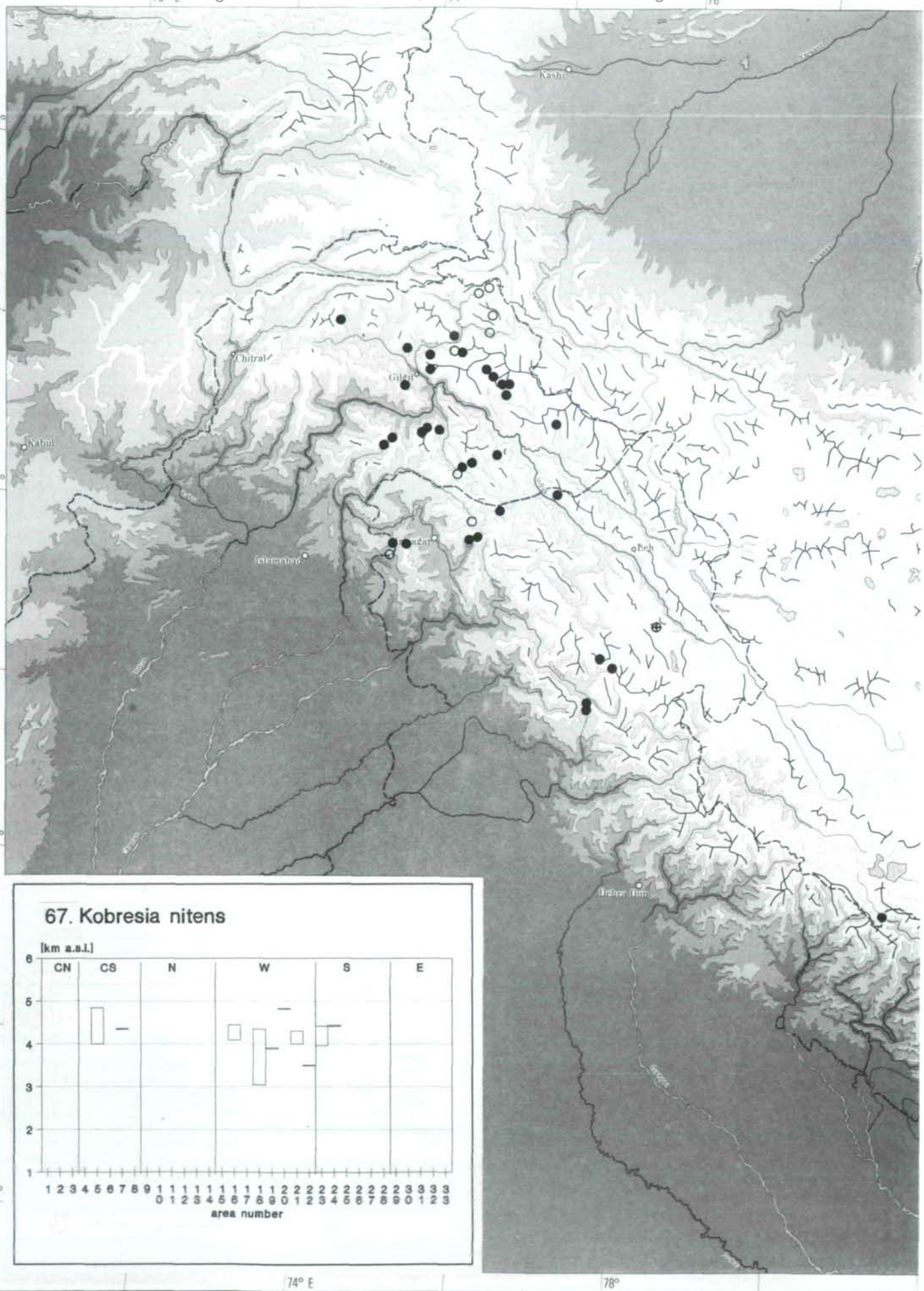

67. Kobresia nitens

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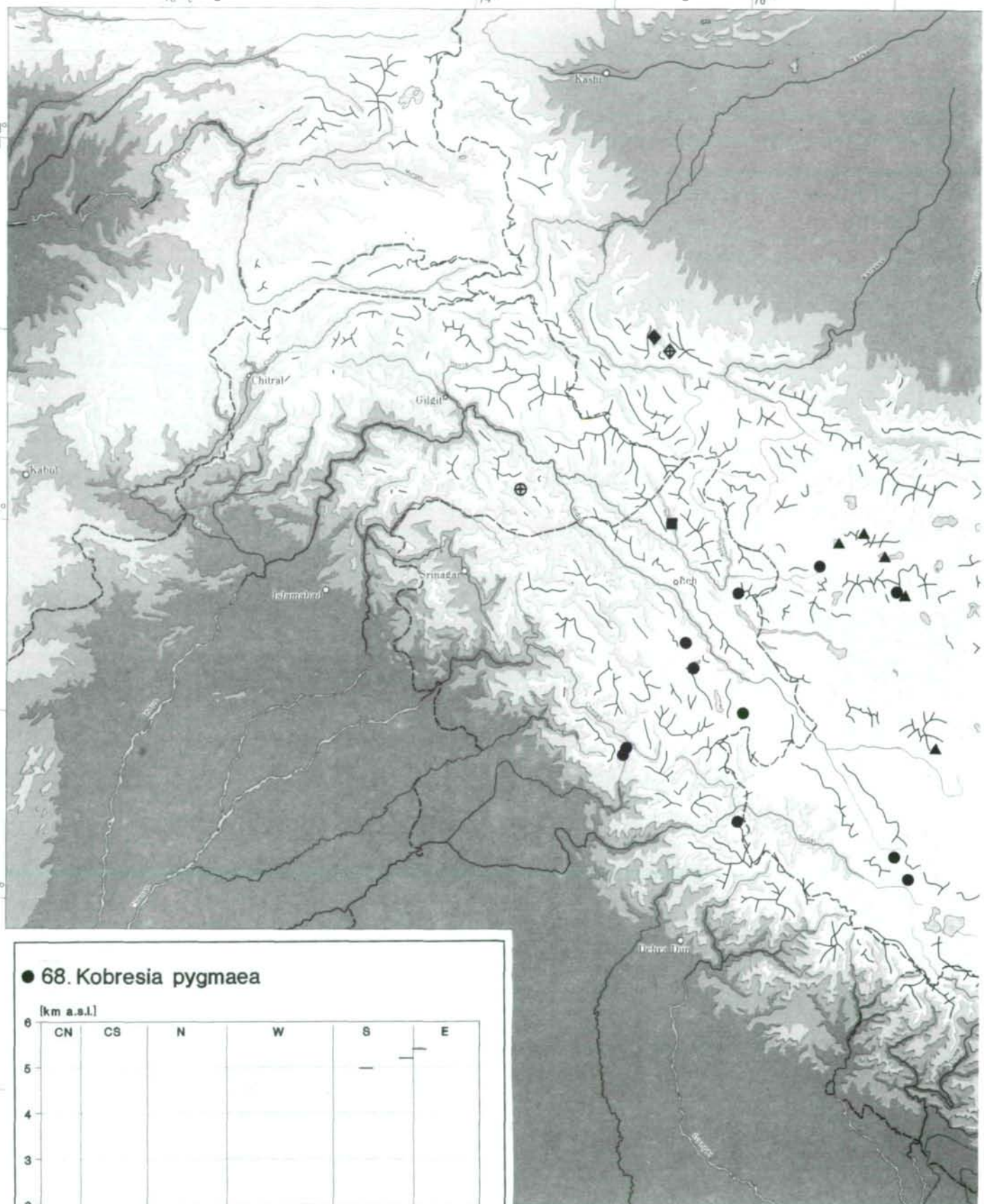
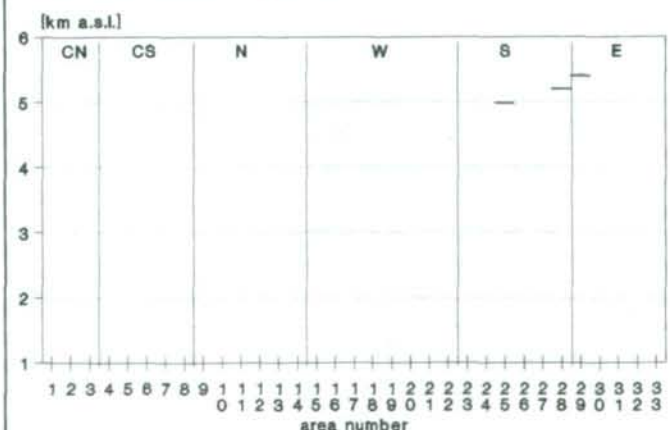


● 68. Kobresia pygmaea



◆ Kobresia kashgarica
■ 66. Kobresia macrantha
▲ 69. Kobresia robusta

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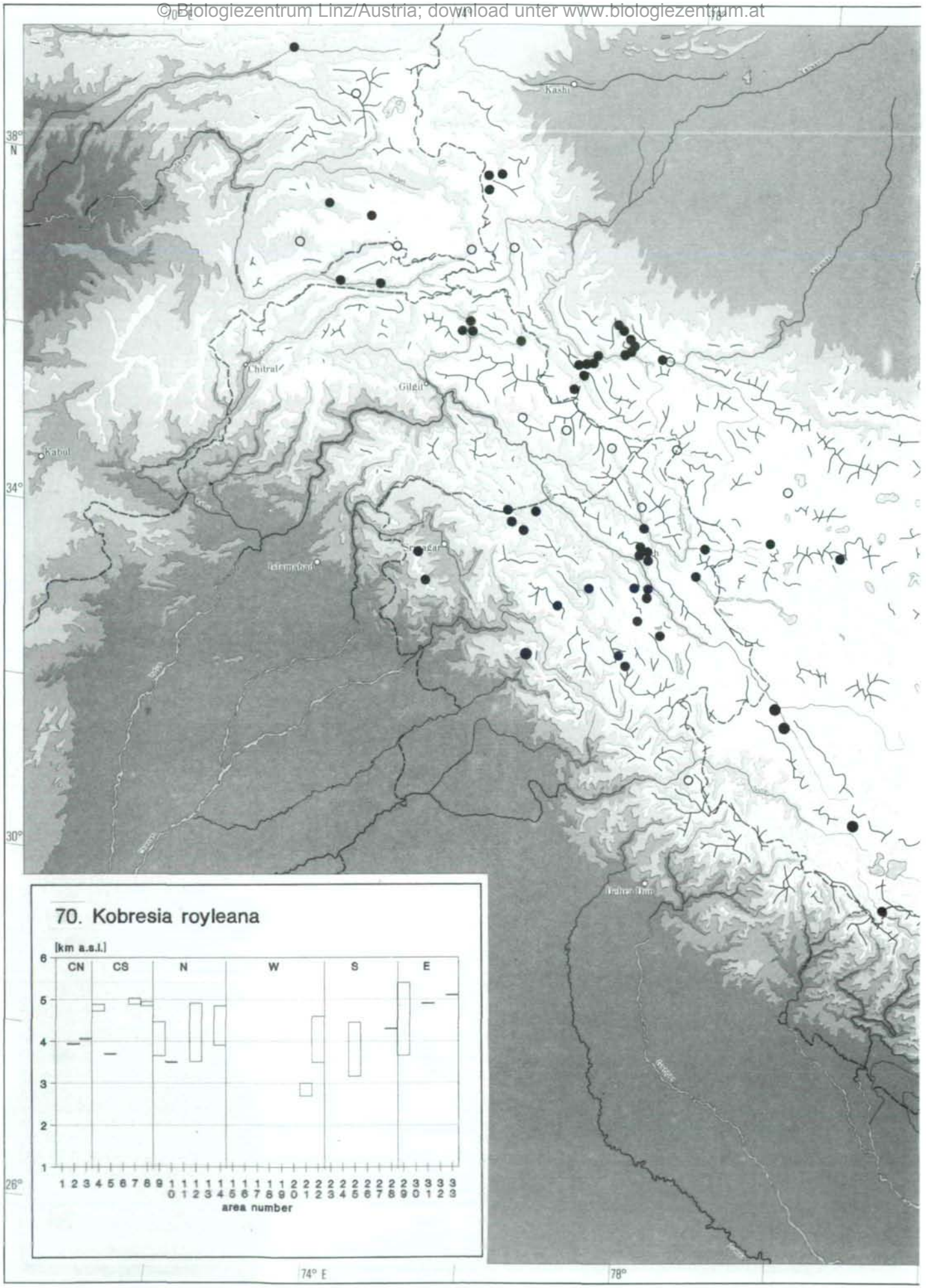

70. Kobresia royleana

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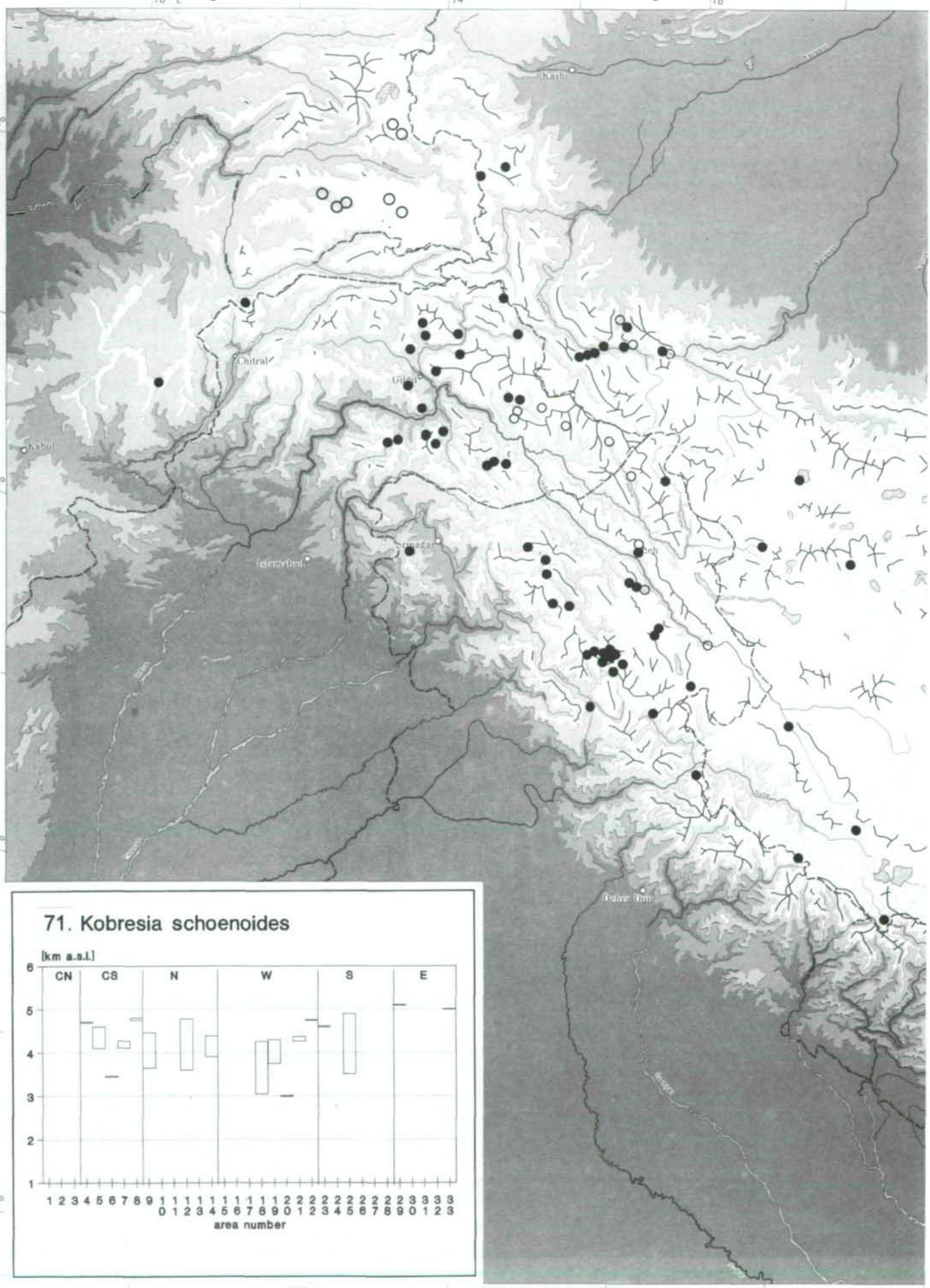

71. Kobresia schoenoides

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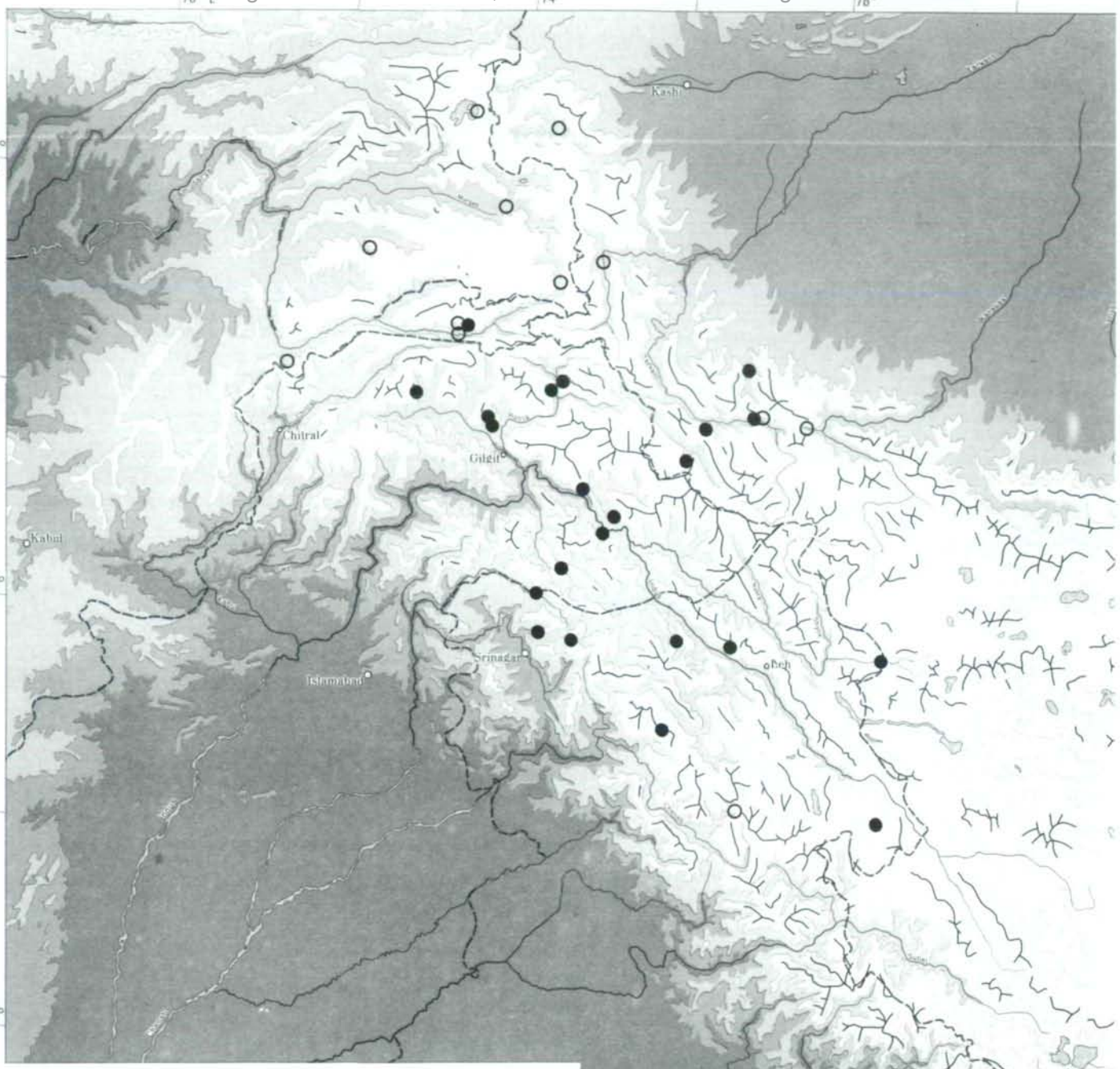
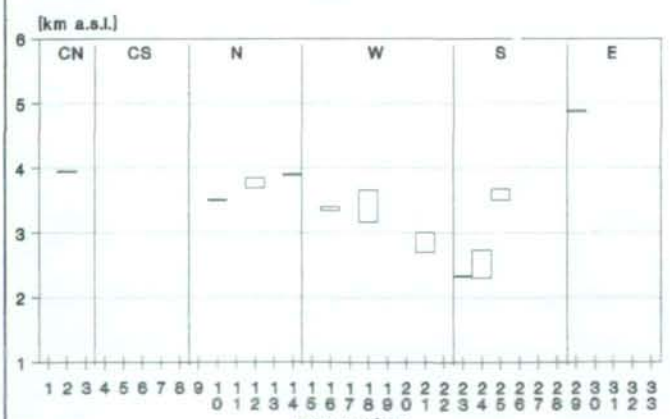


78. Trichophorum pumilum



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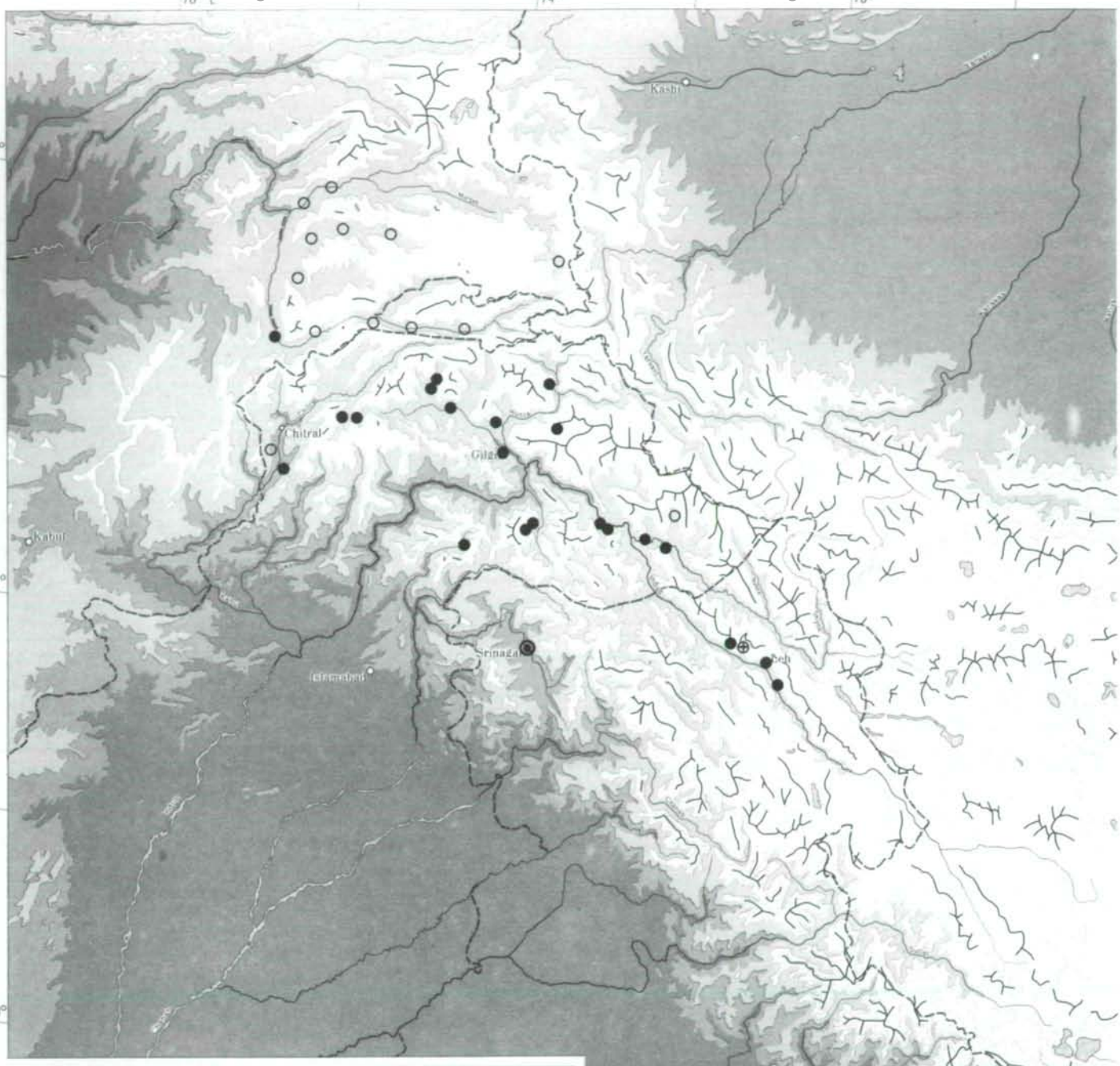
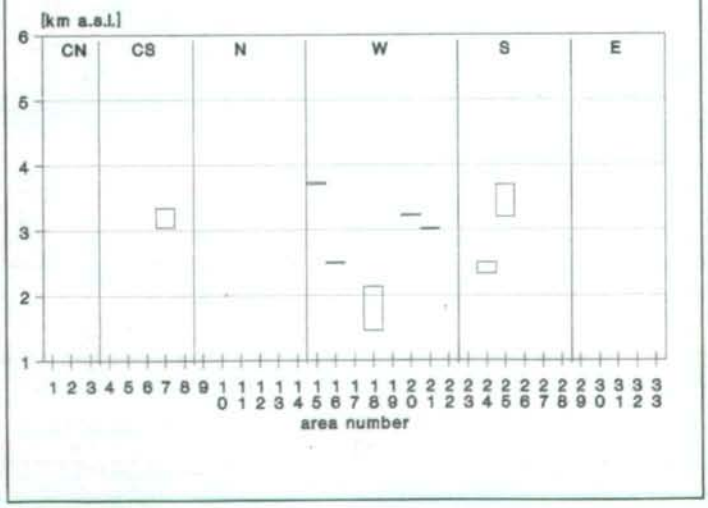


79. Agrostis gigantea



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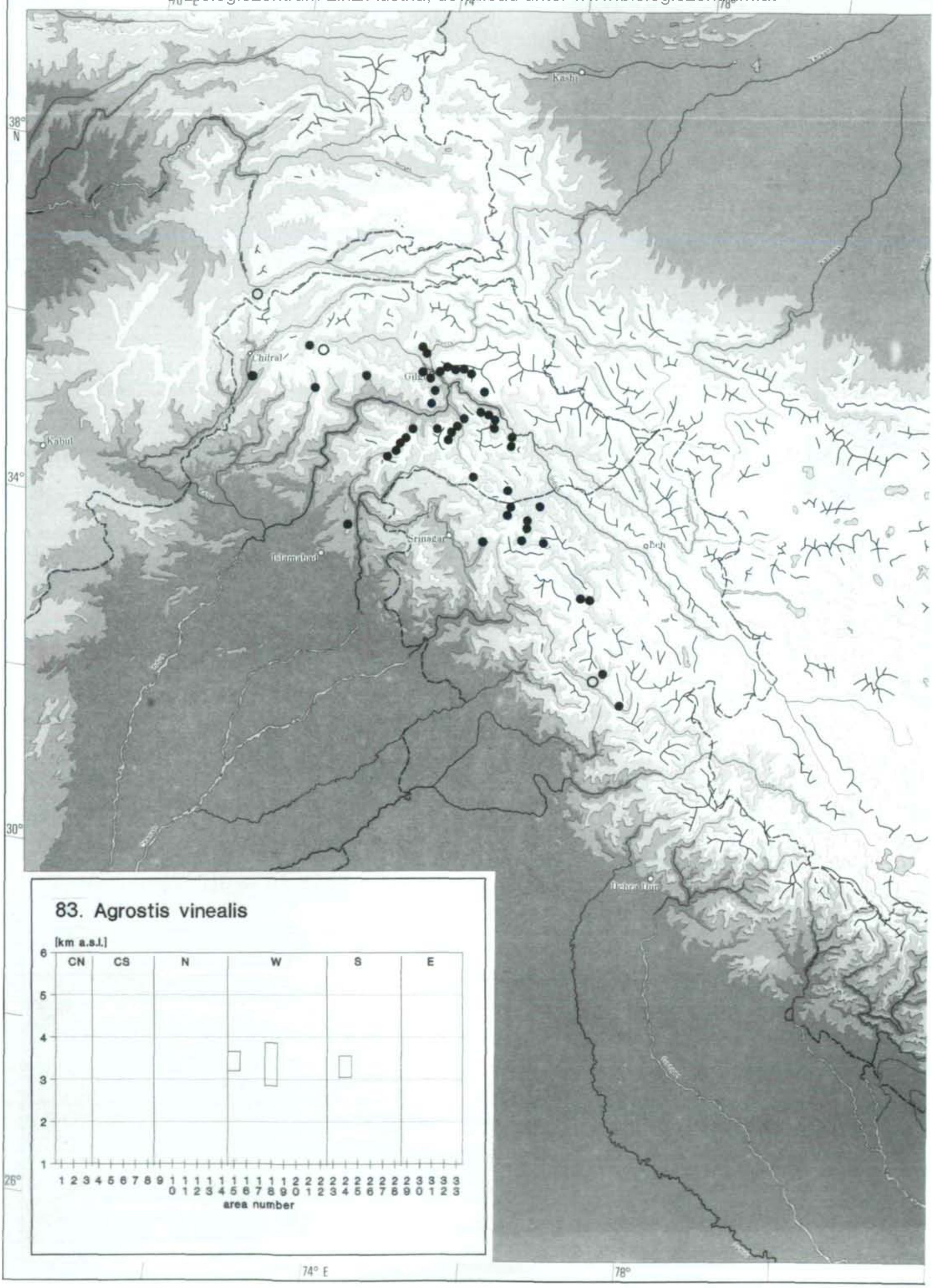

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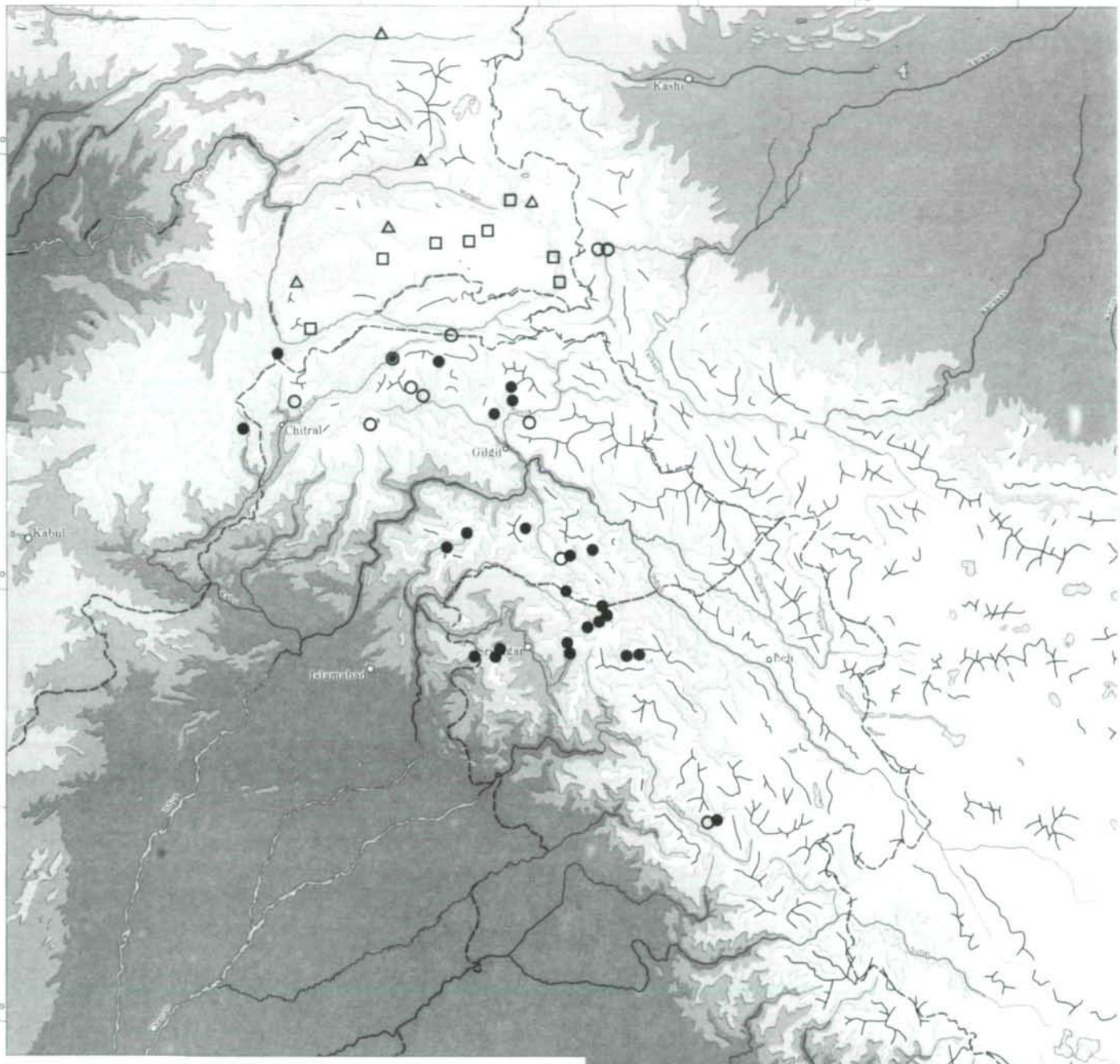
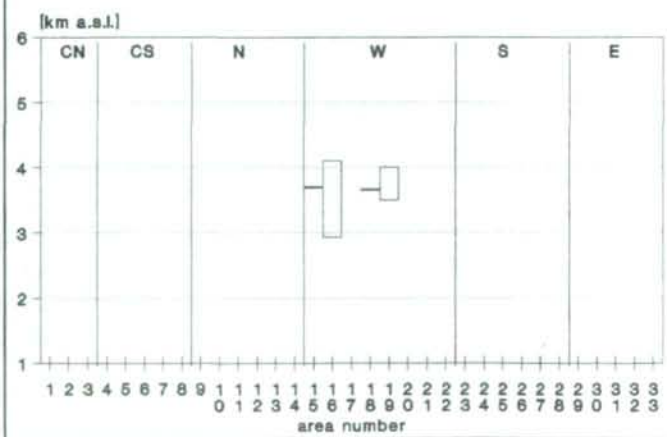


●85. Alopecurus arundinaceus



△ Alopecurus apiatus
□ Alopecurus mucronatus

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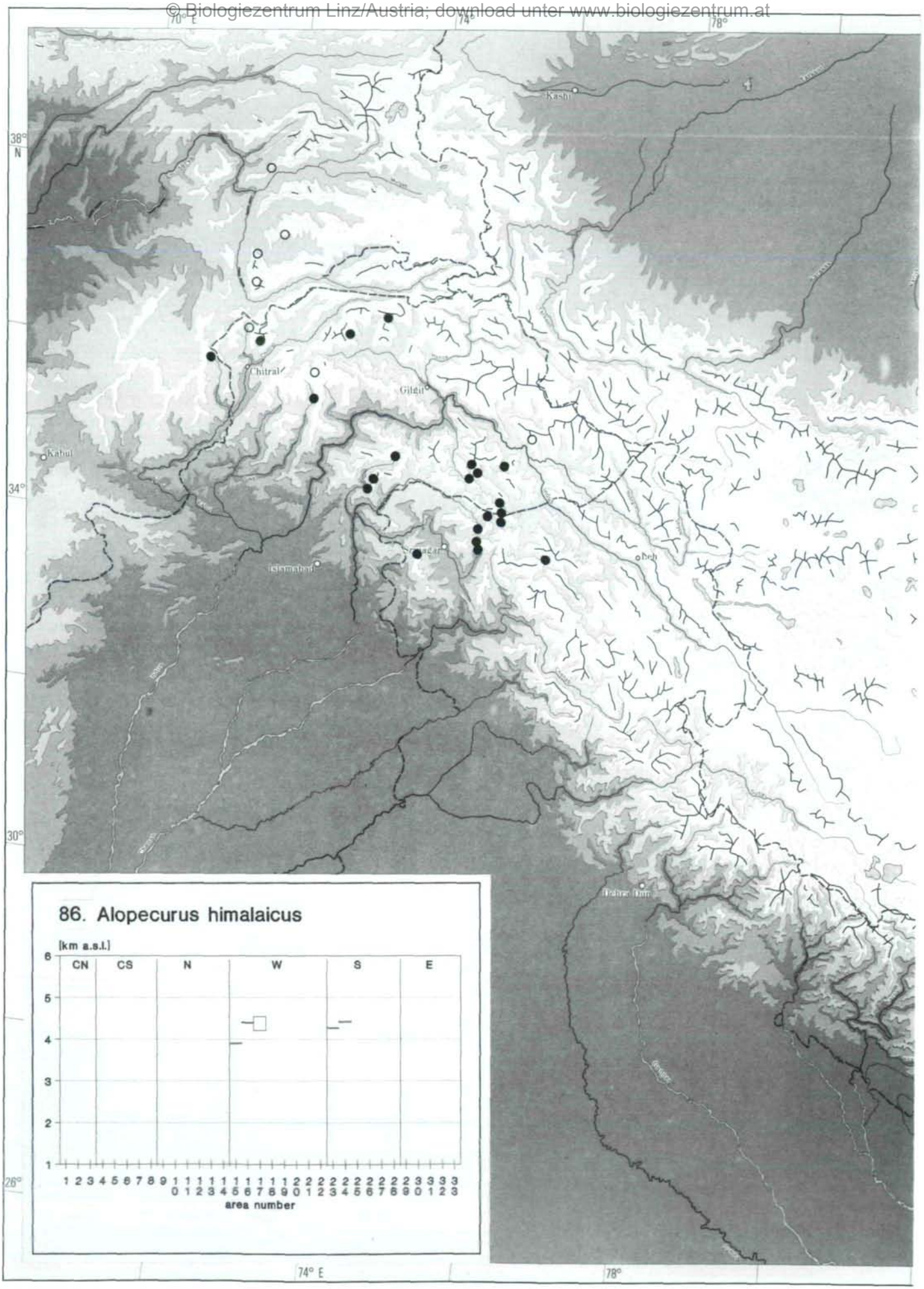

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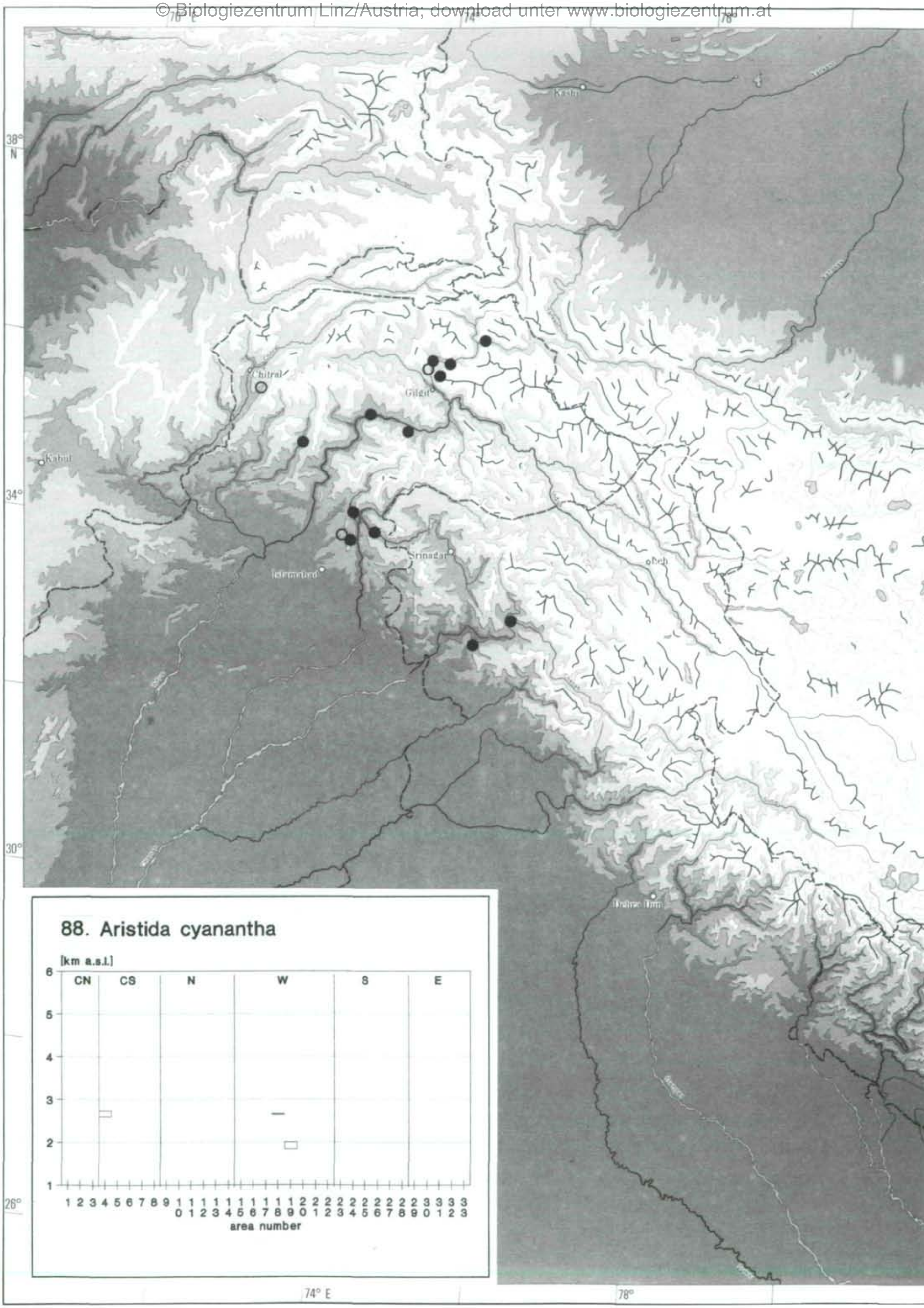

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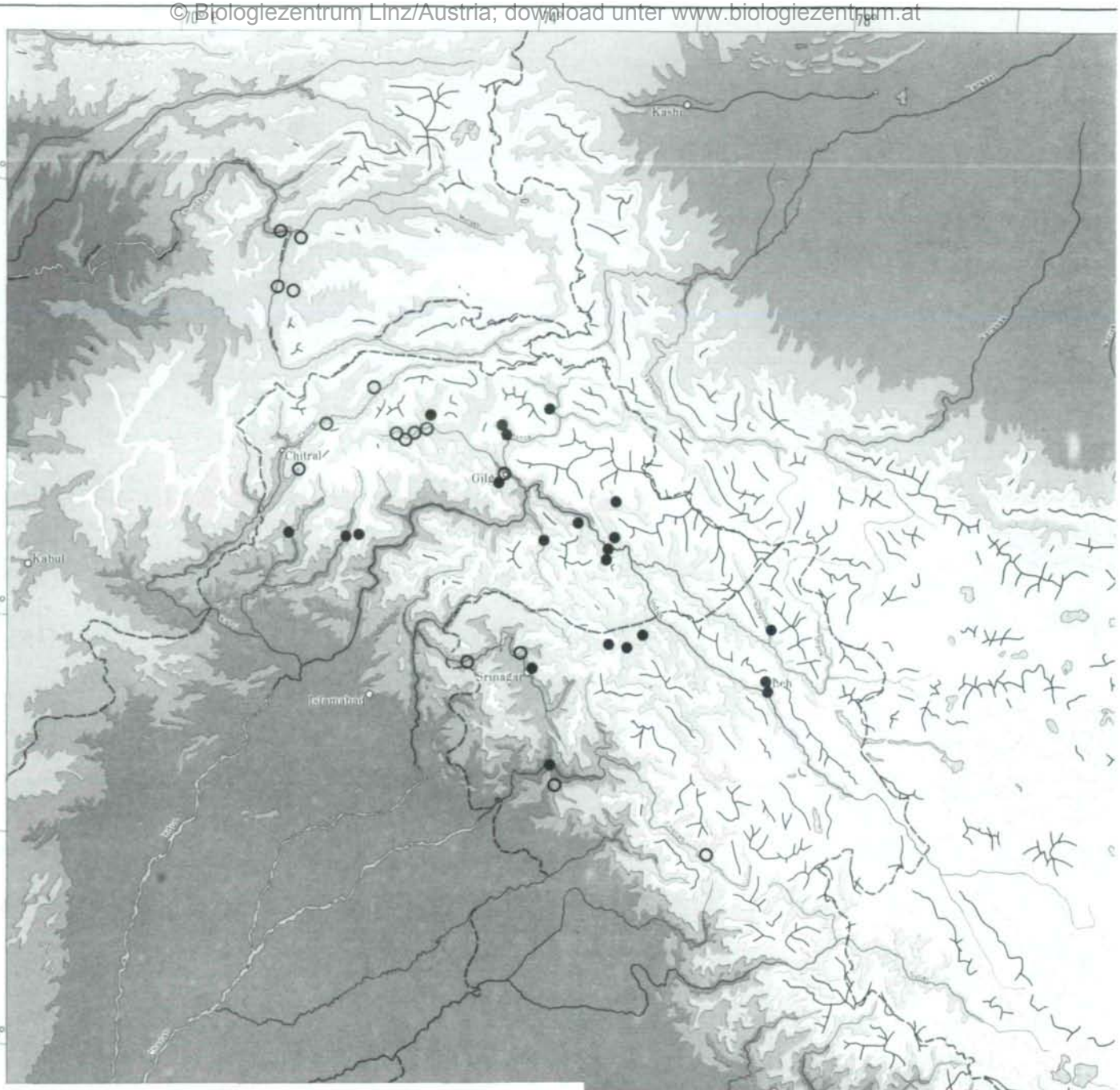
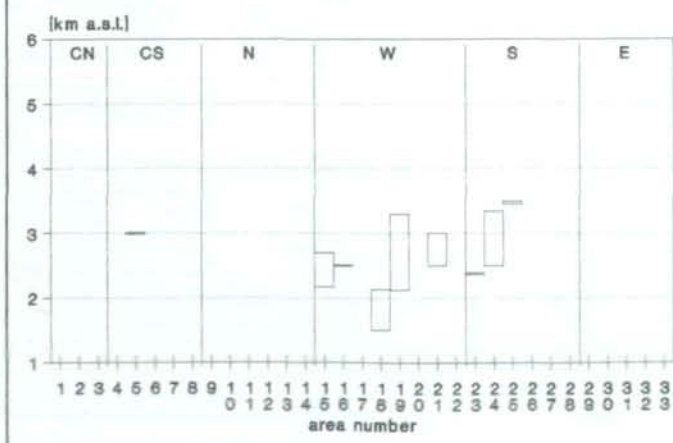


93. Bothriochloa ischaemum



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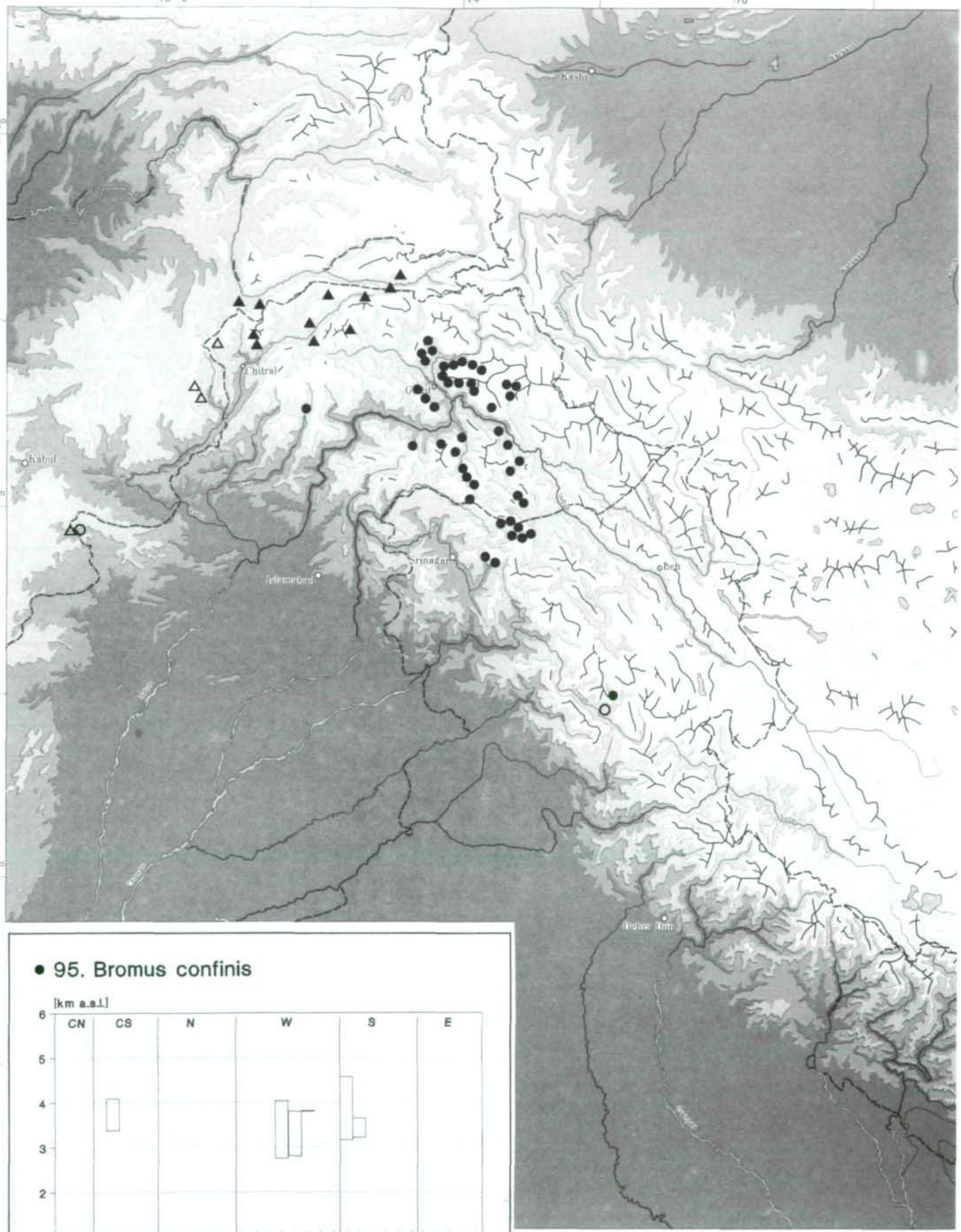
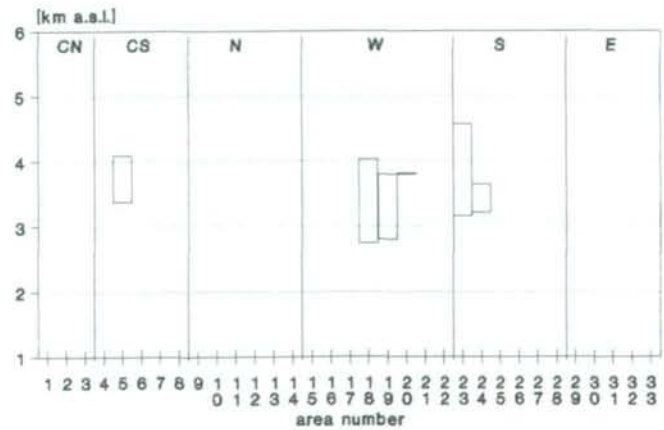


● 95. Bromus confinis



▲ 99. Bromus stenostachyus

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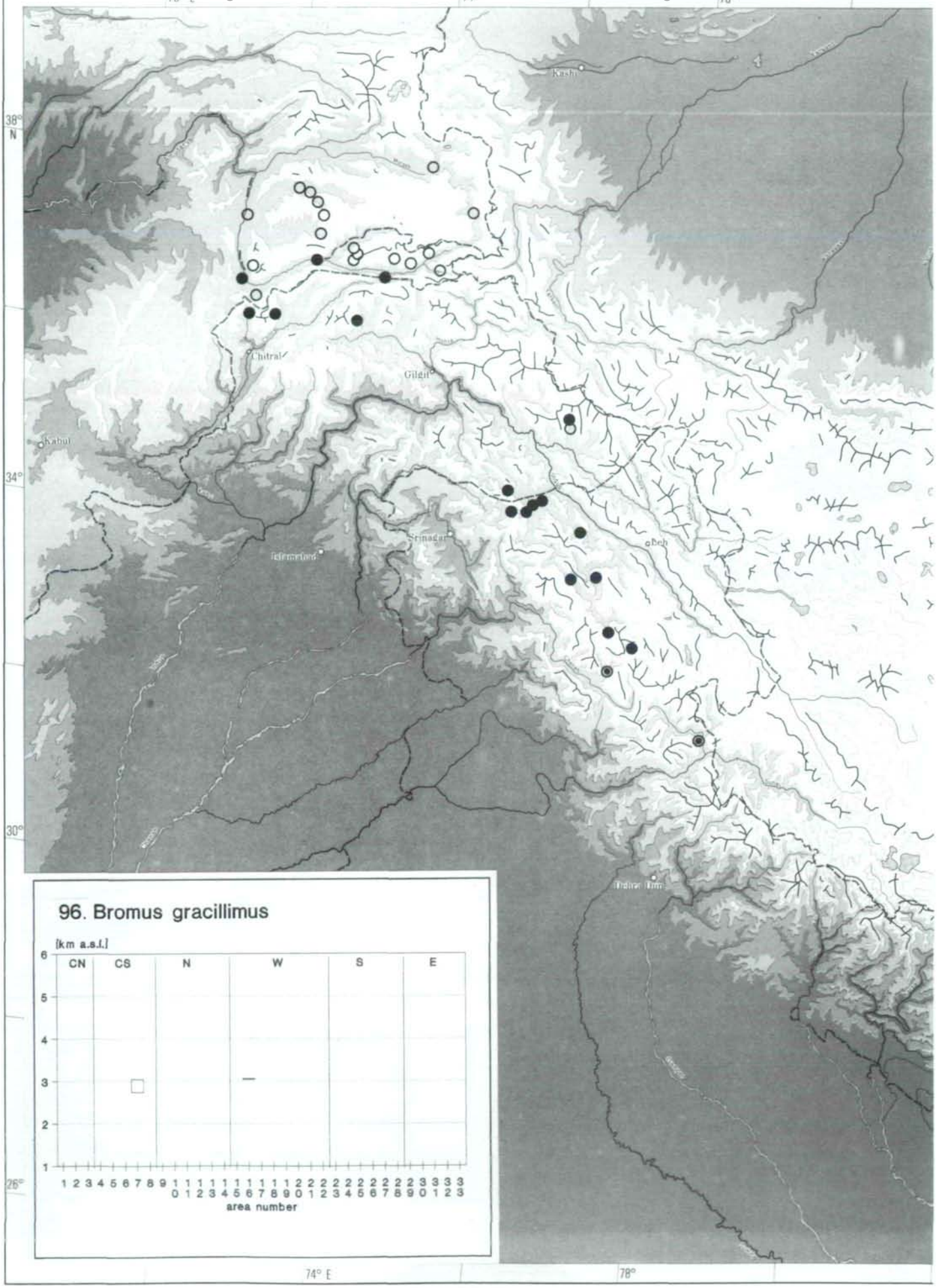

96. Bromus gracillimus

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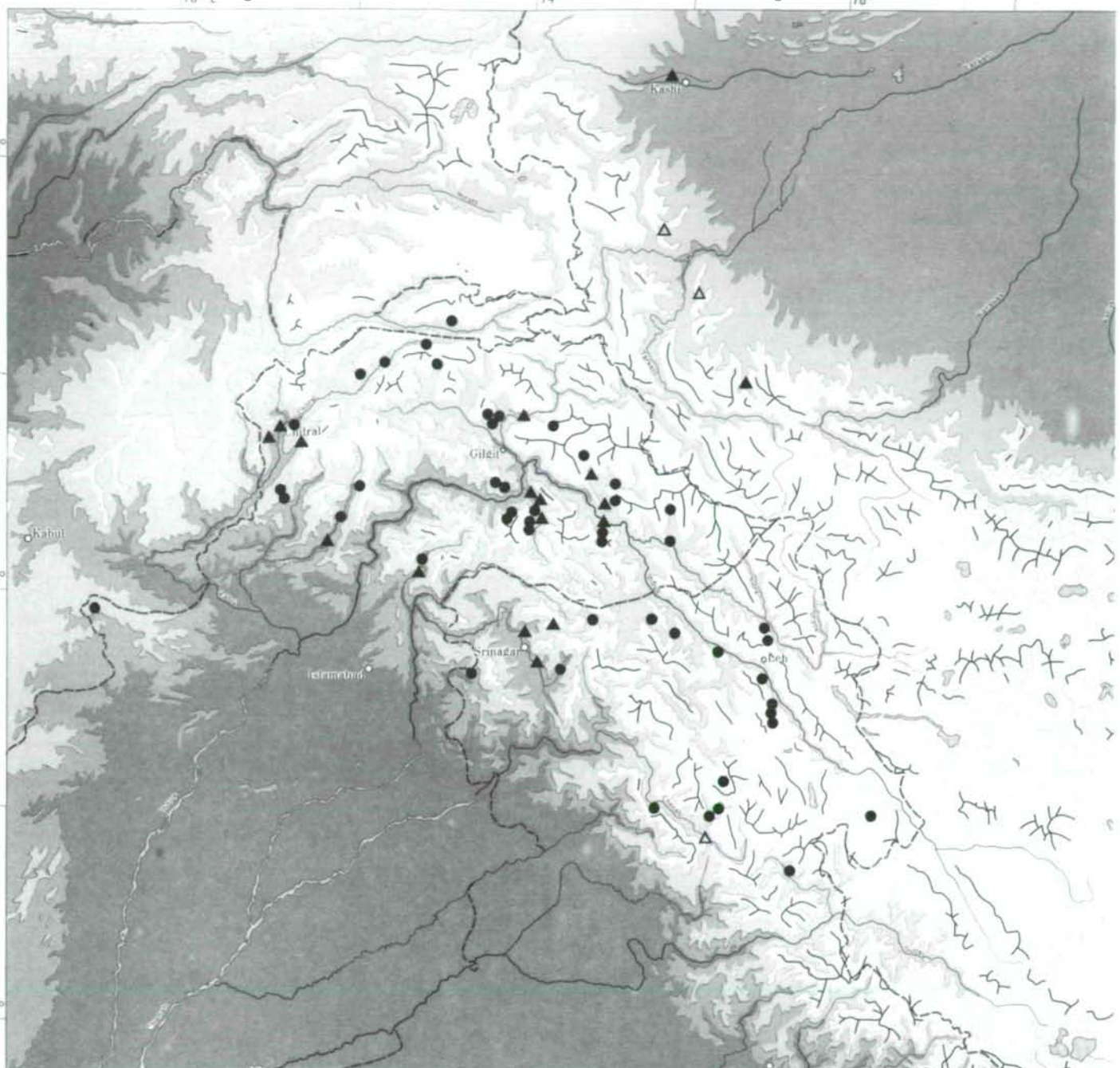
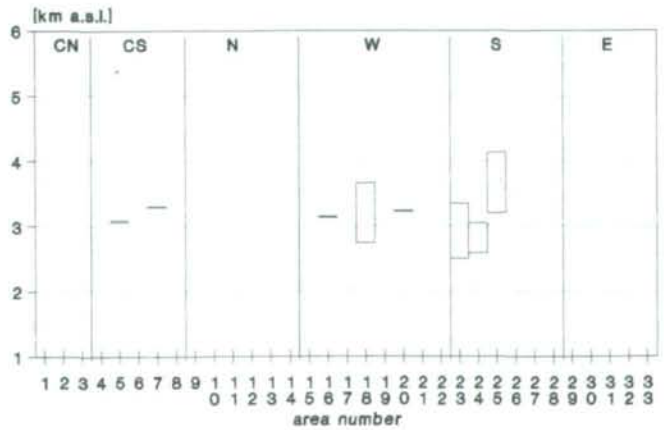


● 98. Bromus pectinatus



▲ 97. Bromus japonicus

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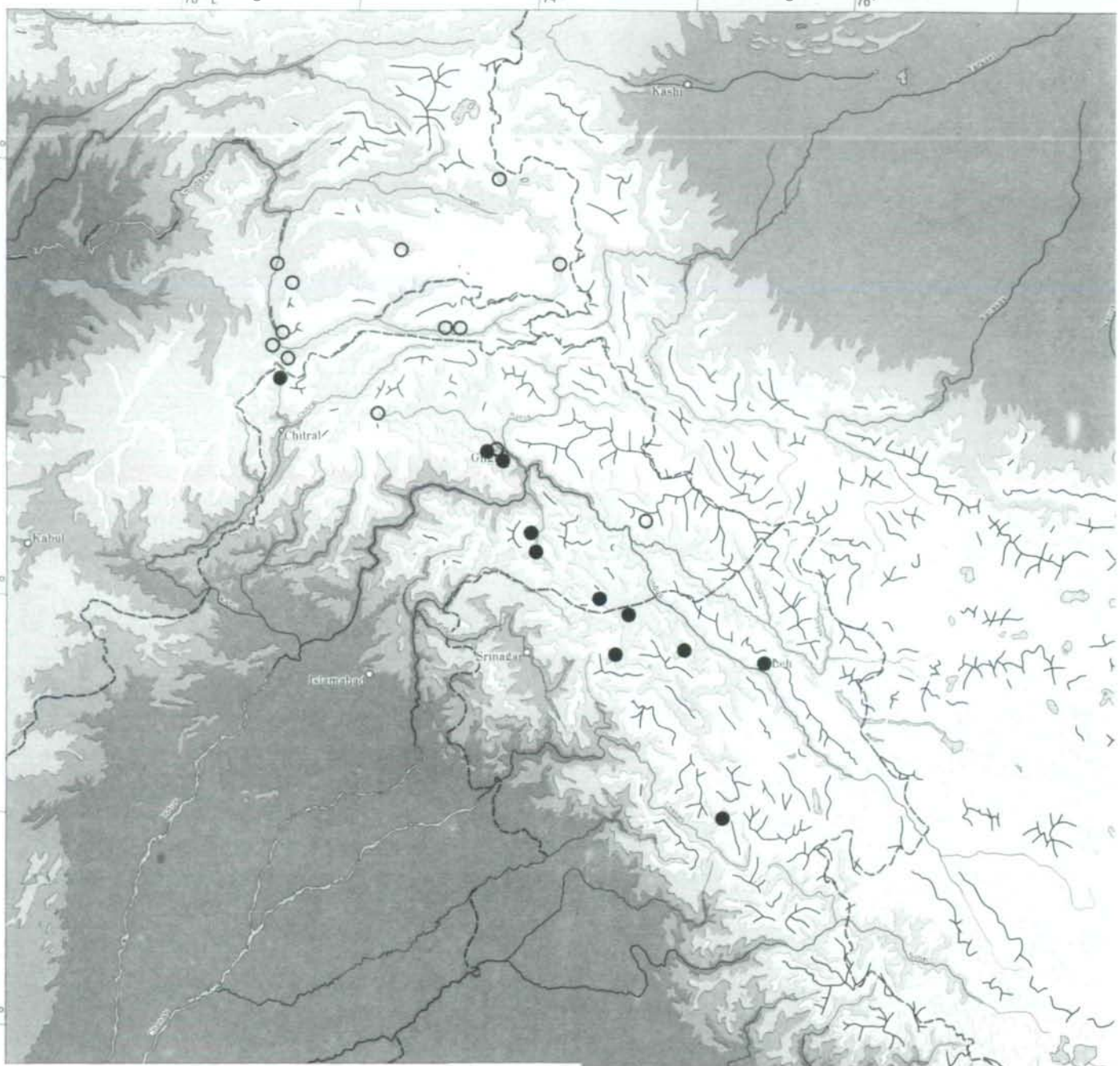
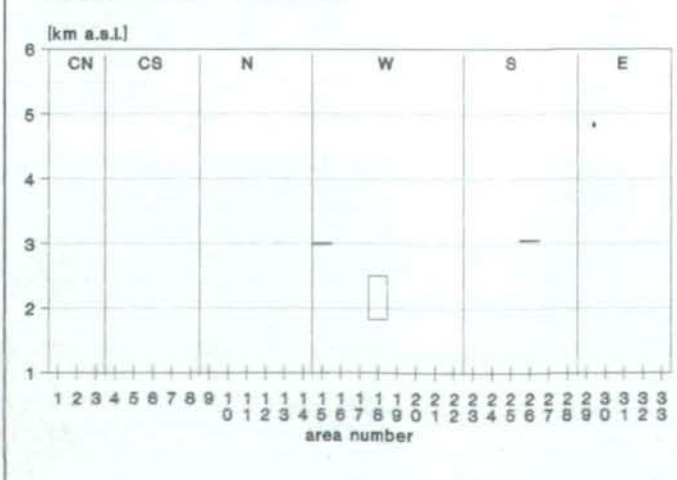


100. Bromus tectorum



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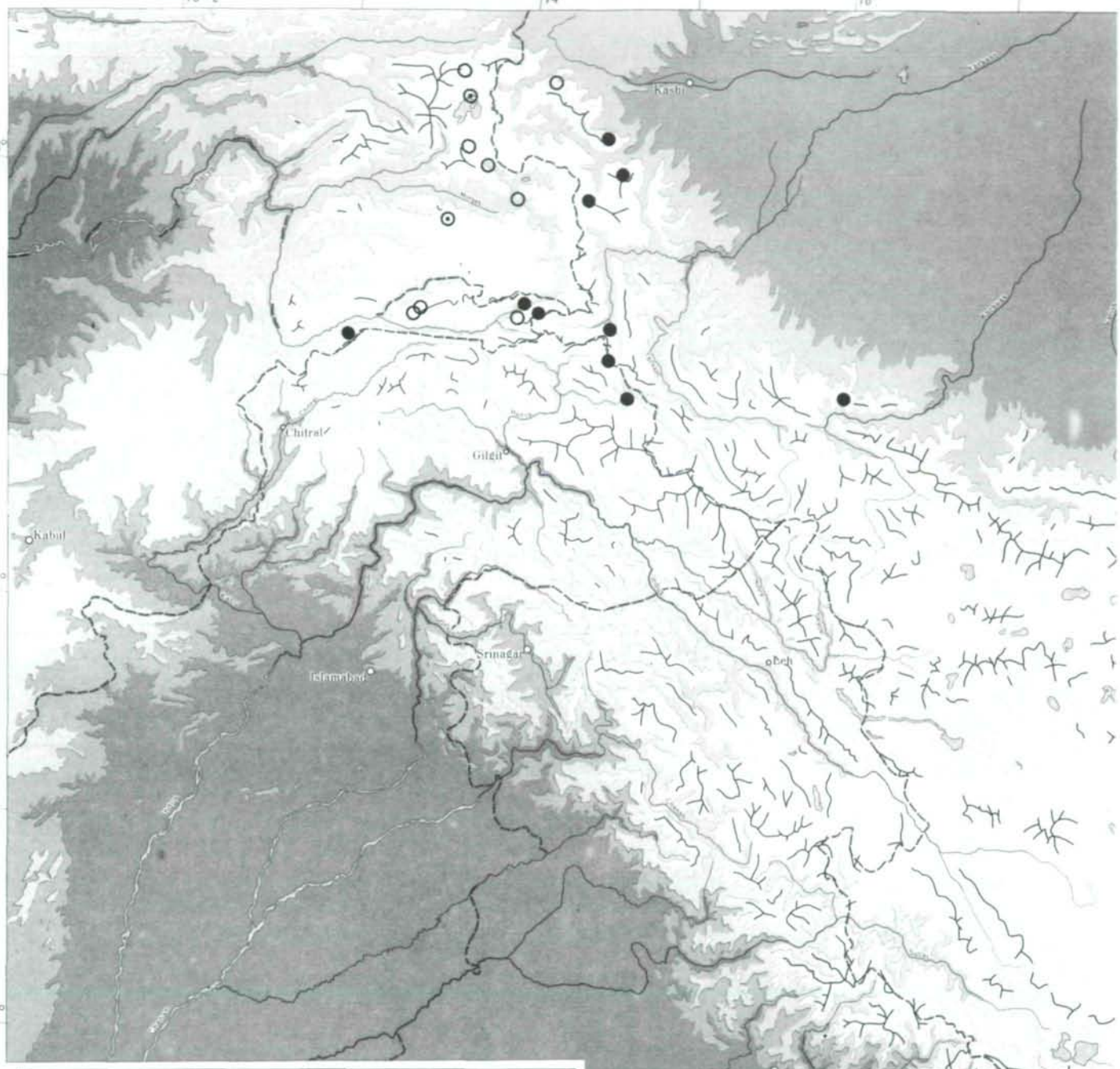
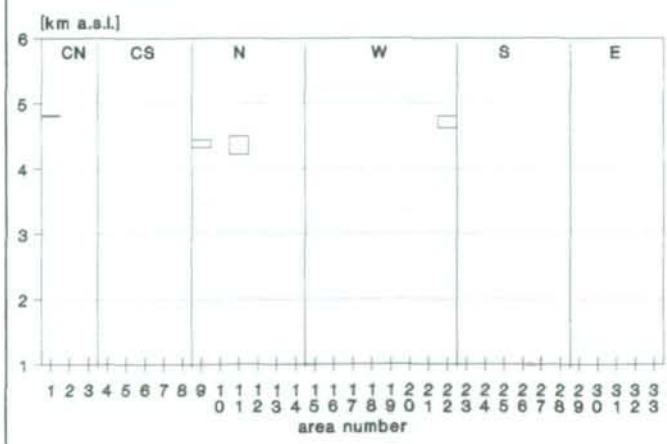


102. Calamagrostis anthoxanthoides



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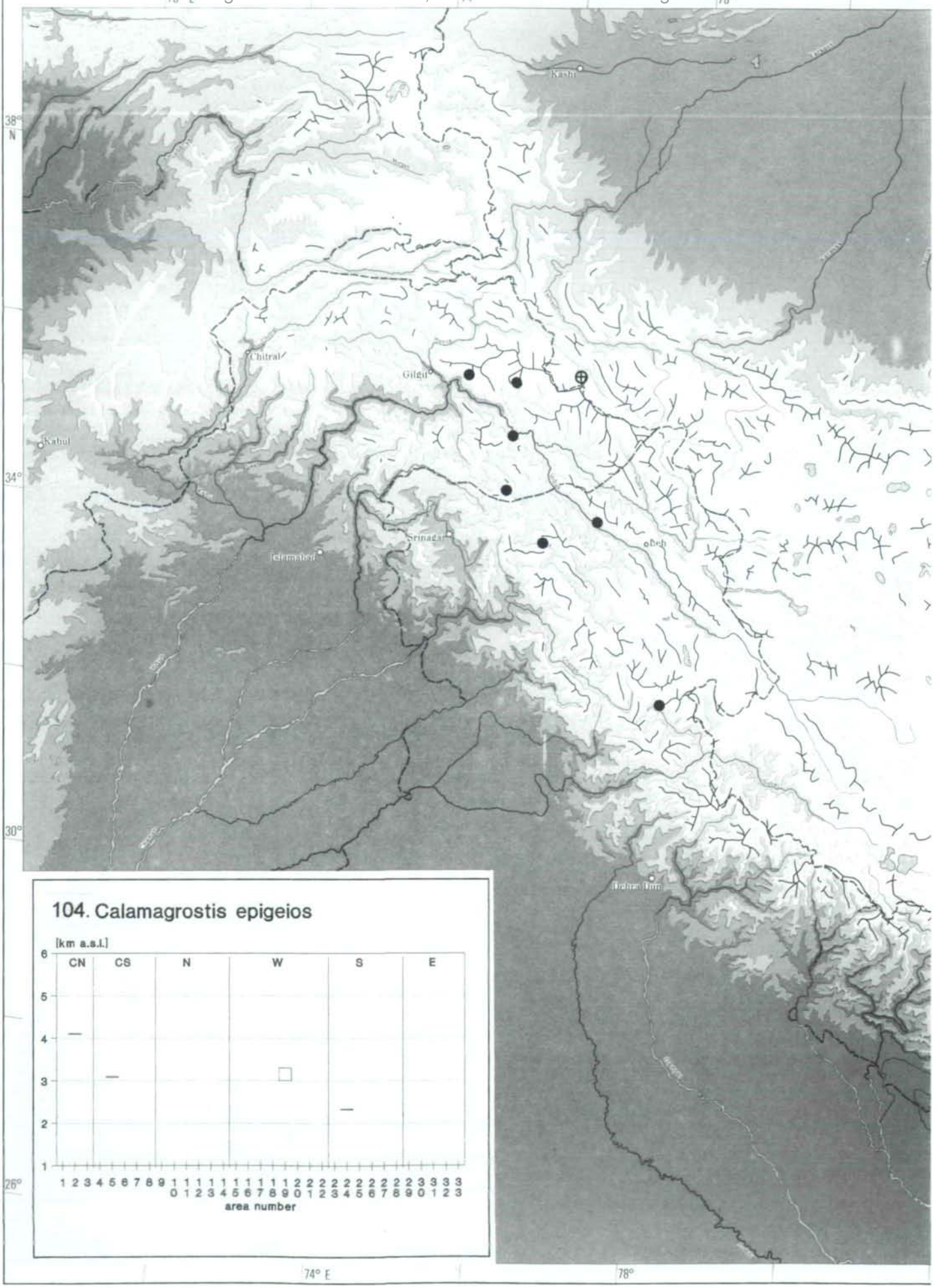

104. Calamagrostis epigeios

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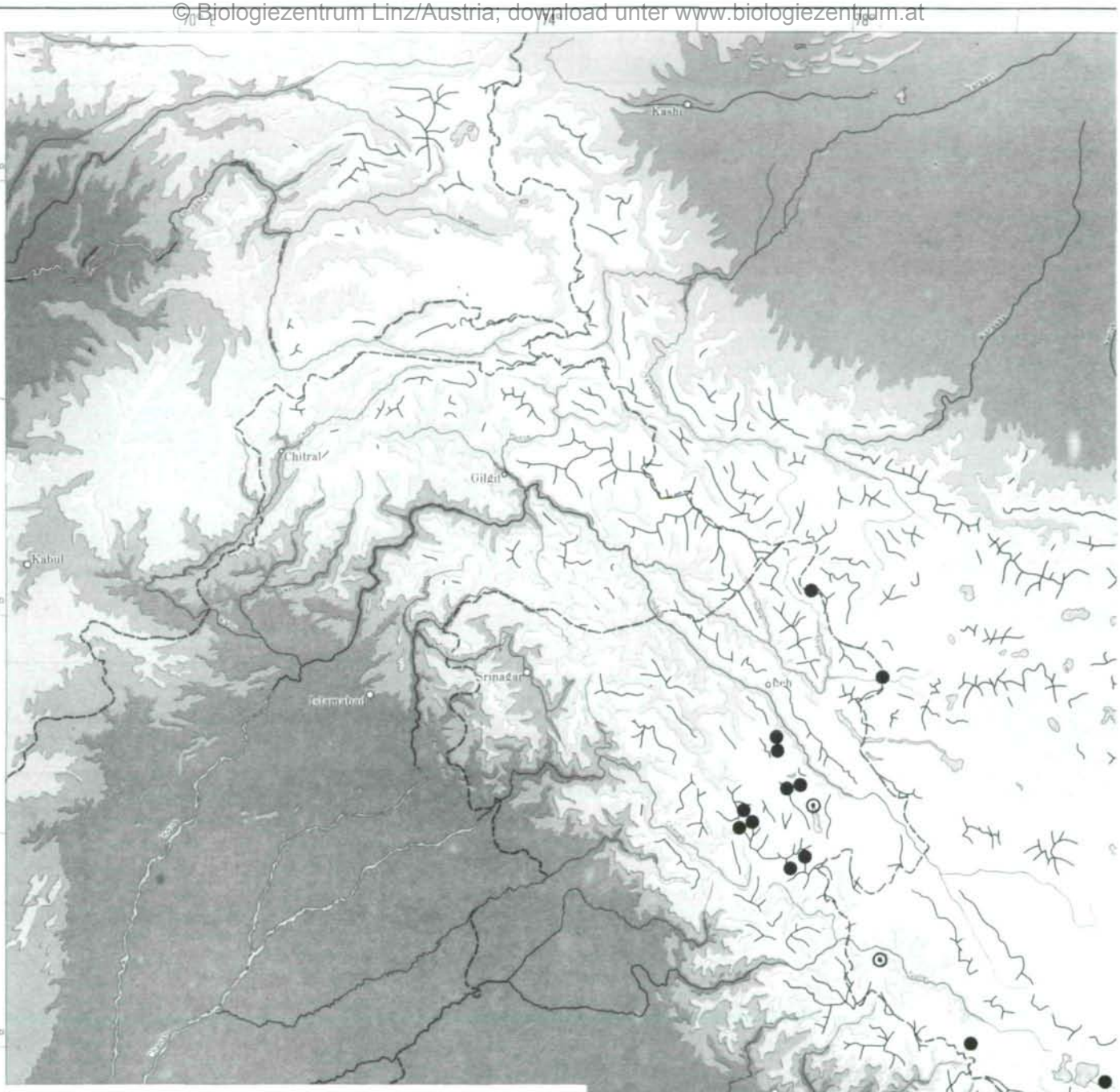
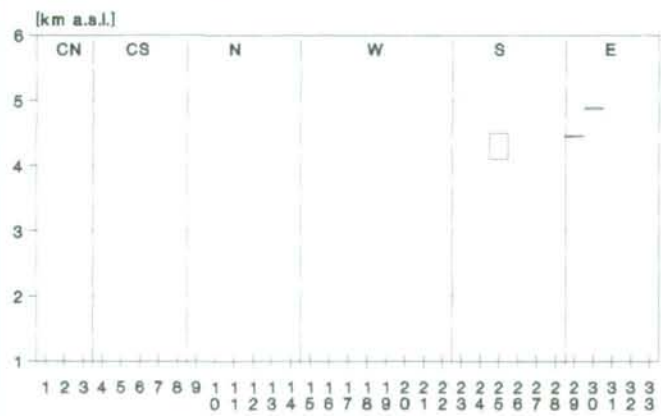


105. Calamagrostis holciformis



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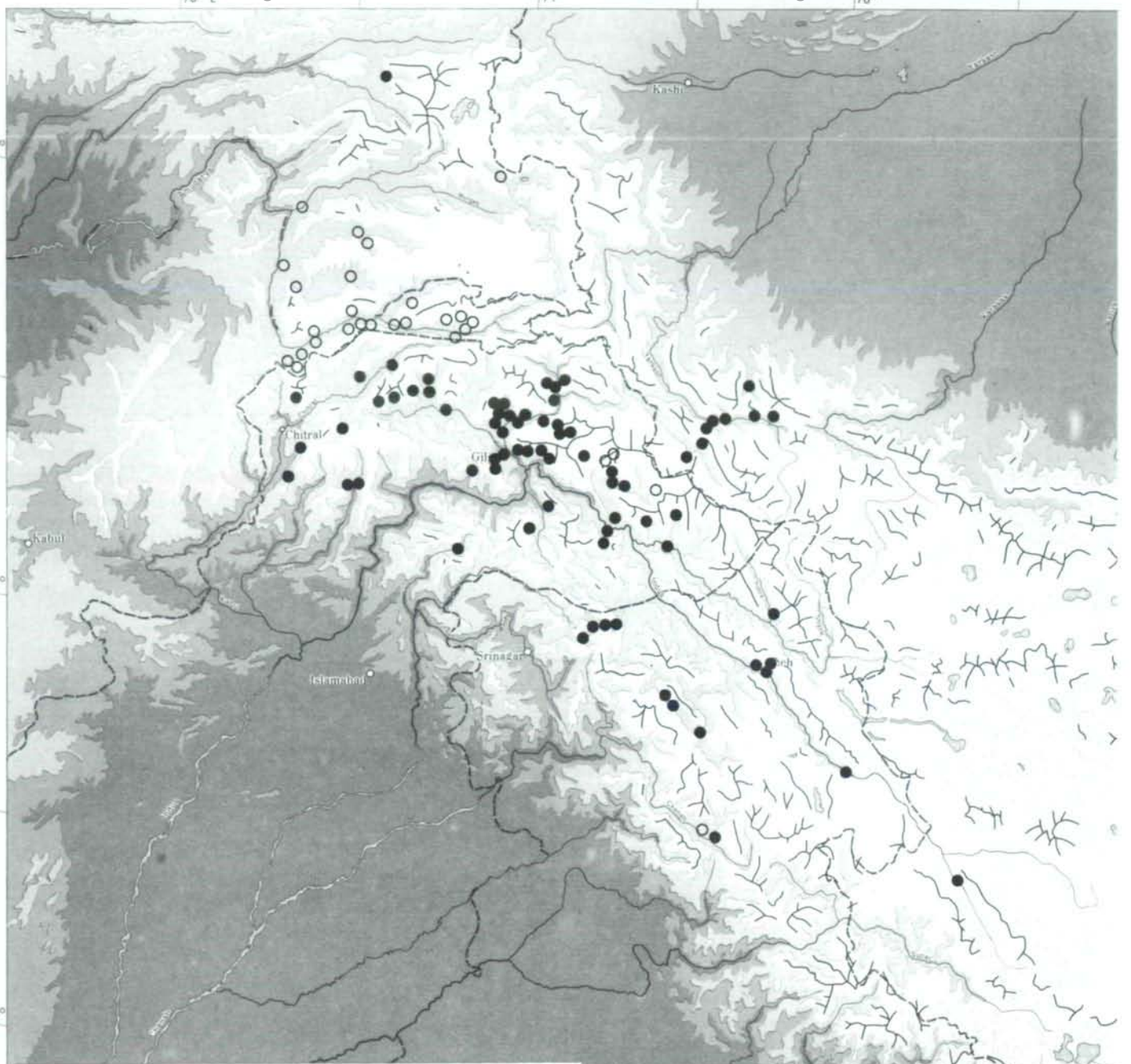
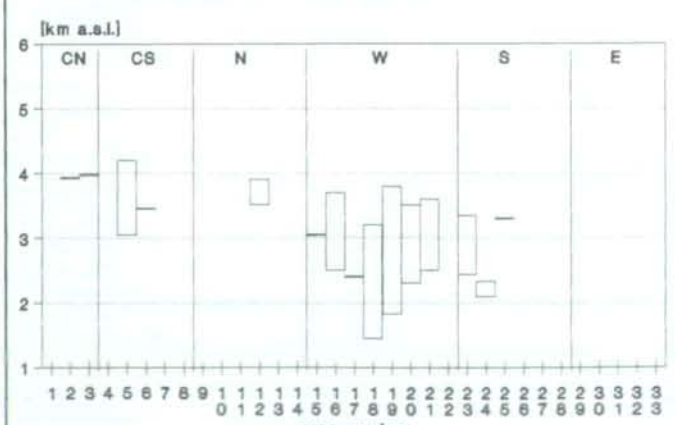


106. Calamagrostis pseudophragmites



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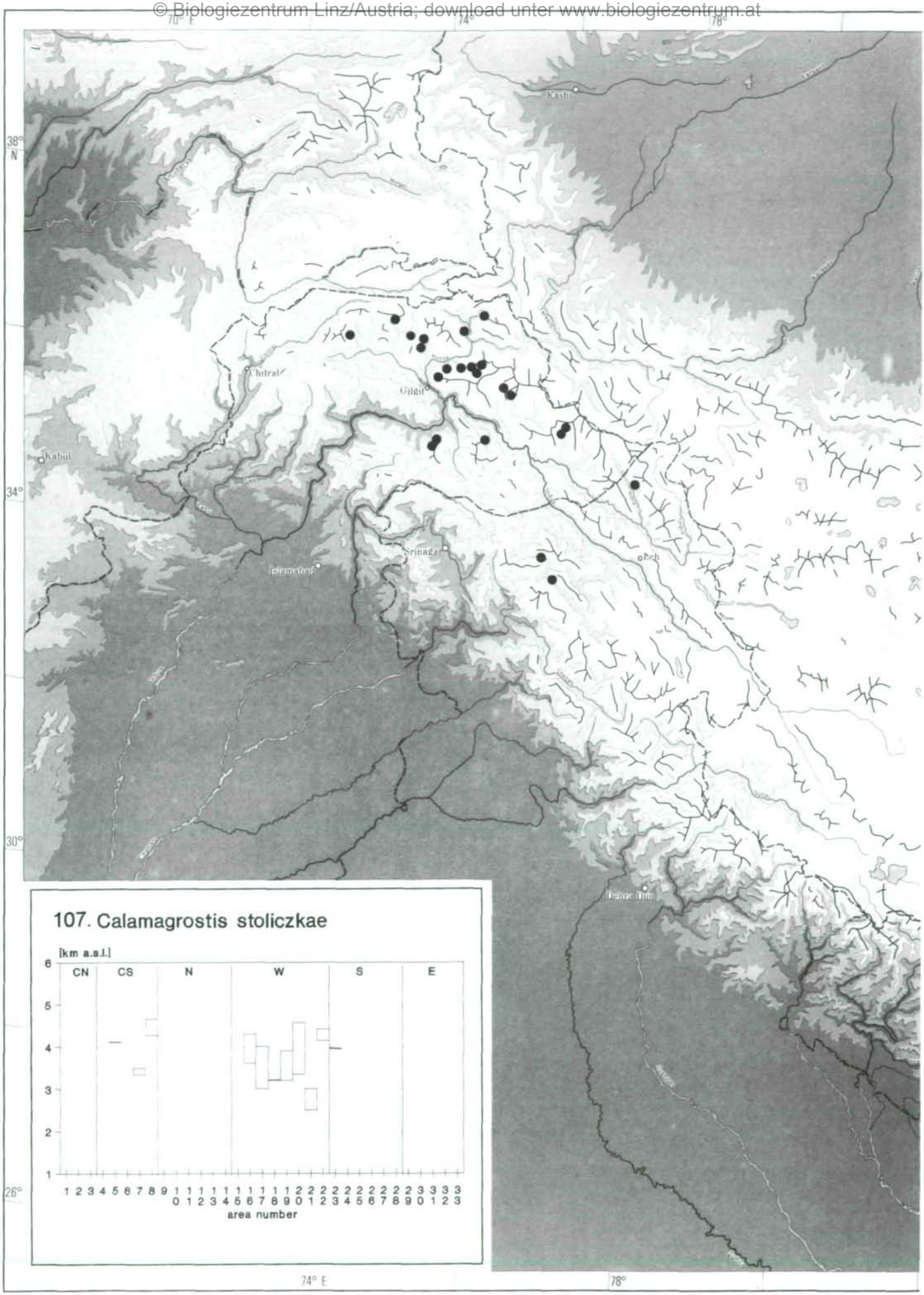

107. Calamagrostis stoliczkae

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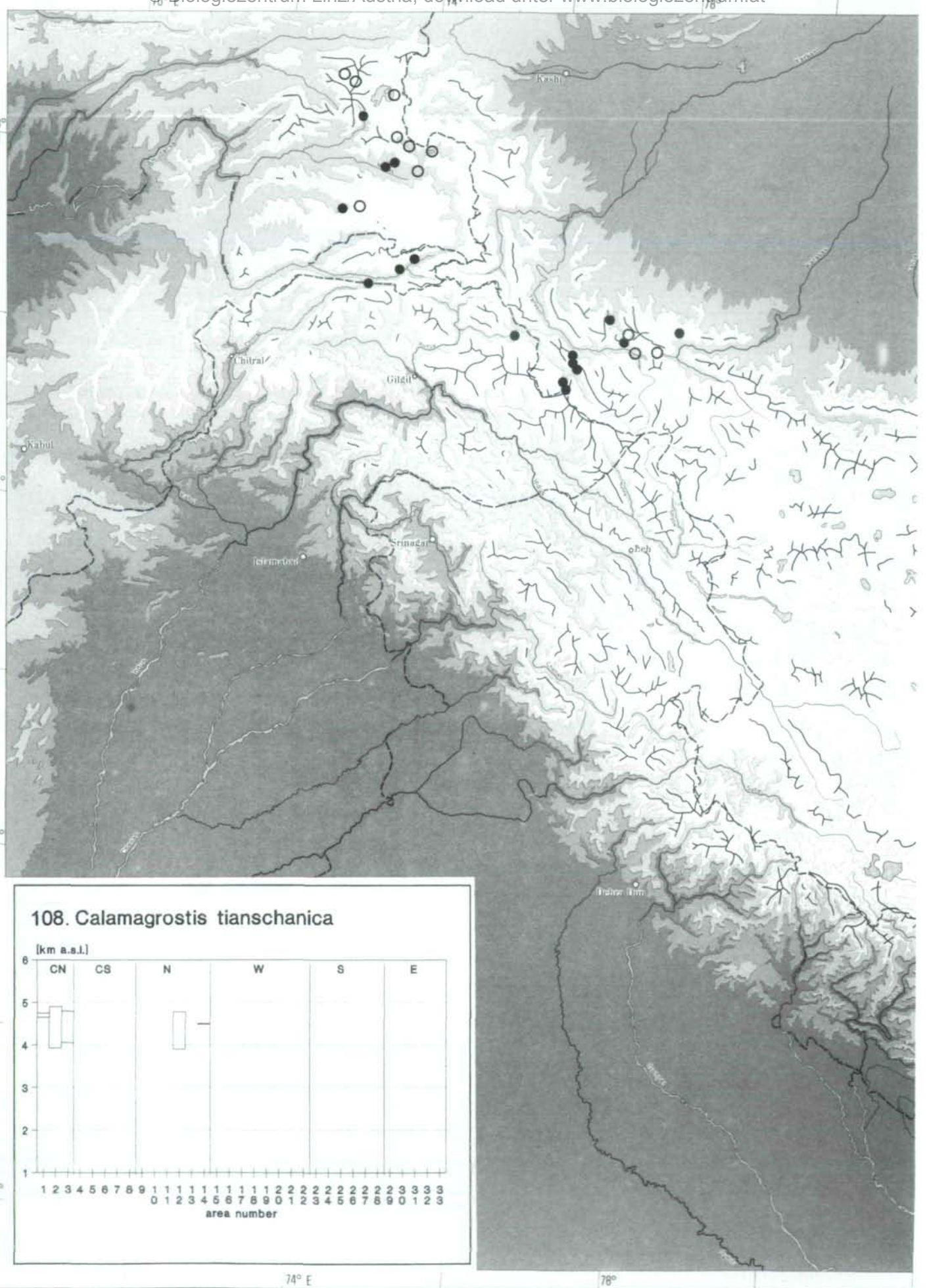

108. Calamagrostis tianschanica

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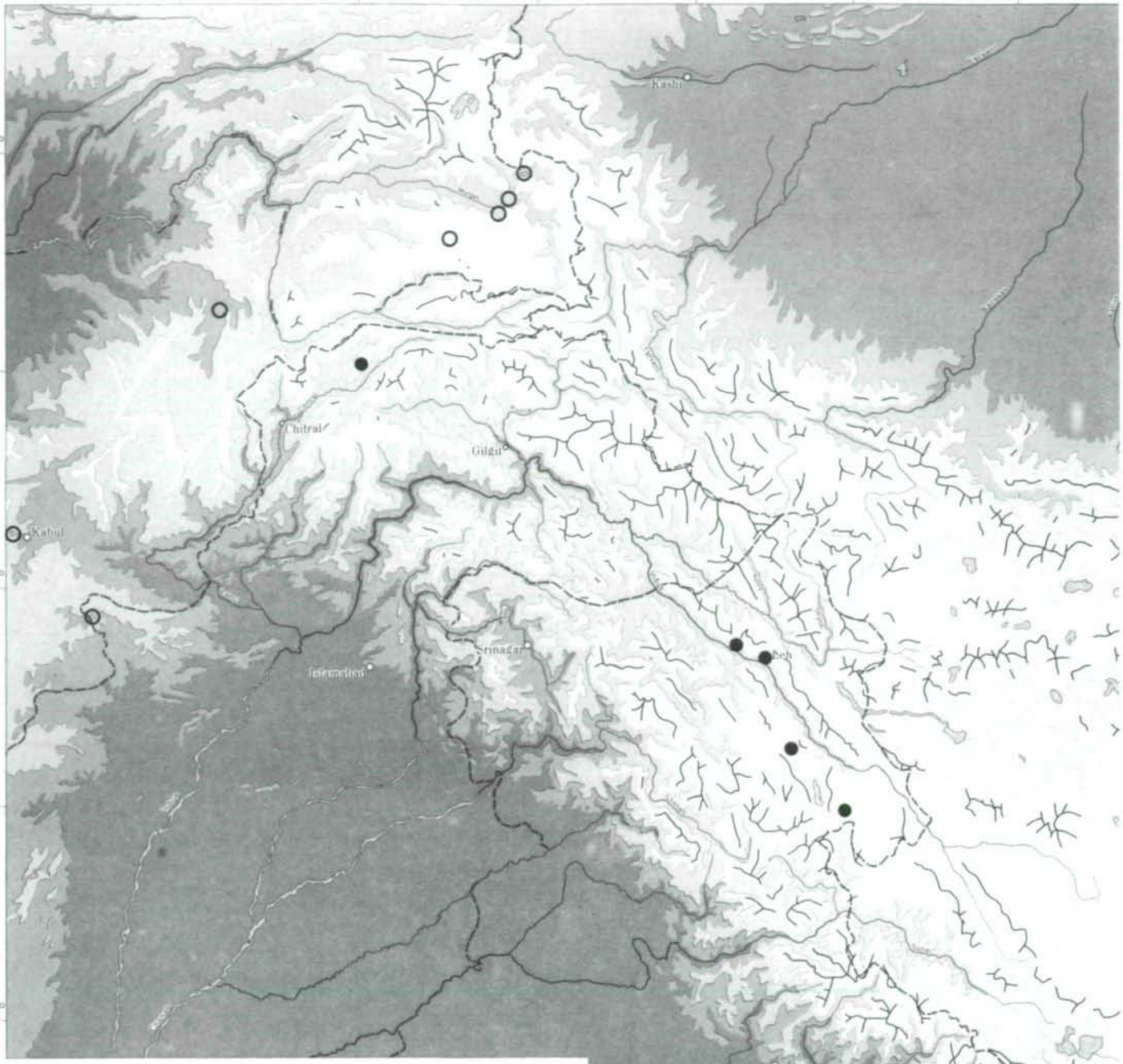
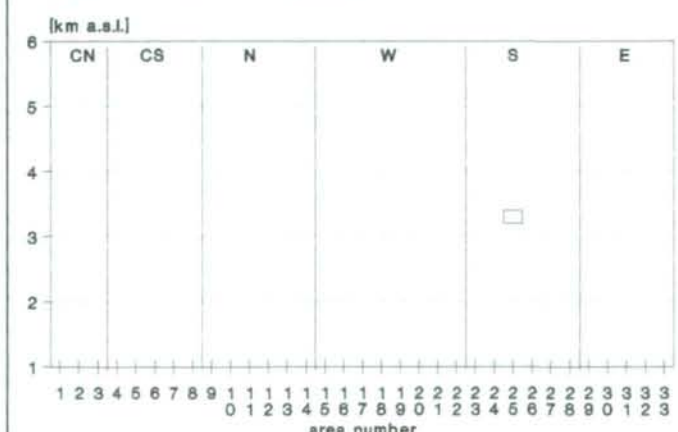


109. Catabrosa aquatica



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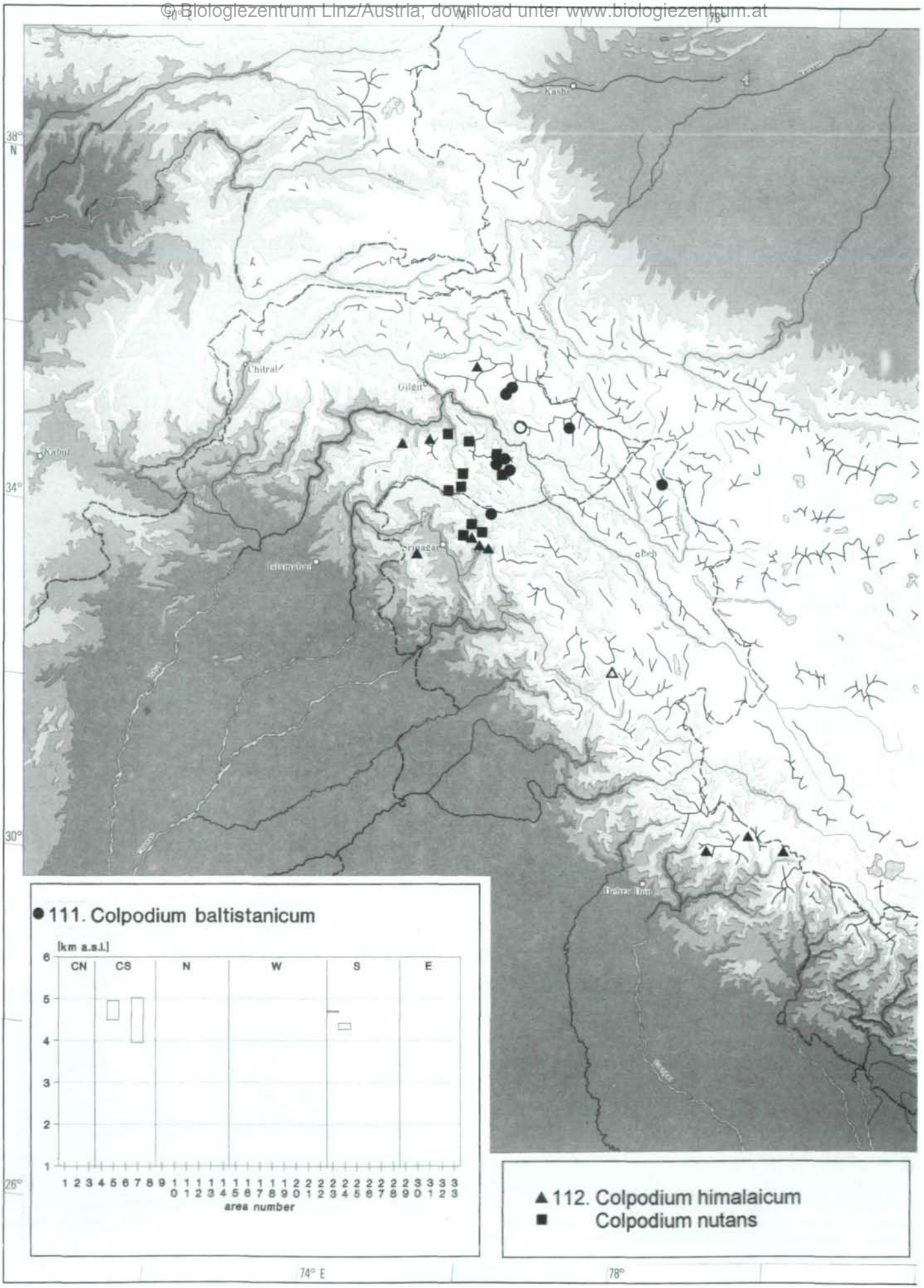

● 111. Colpodium baltistanicum

▲ 112. Colpodium himalaicum
■ Colpodium nutans

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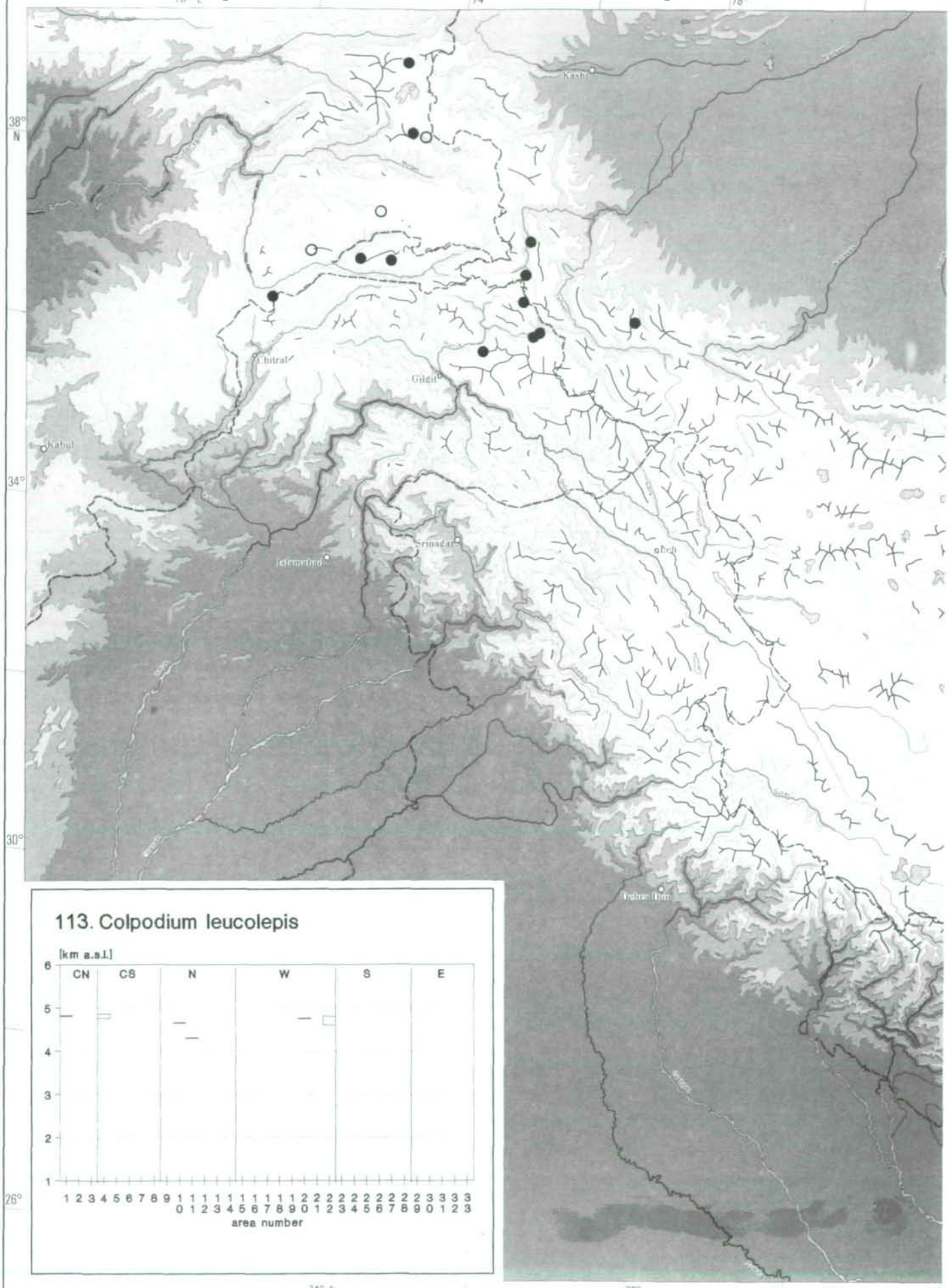

113. Colpodium leucolepis

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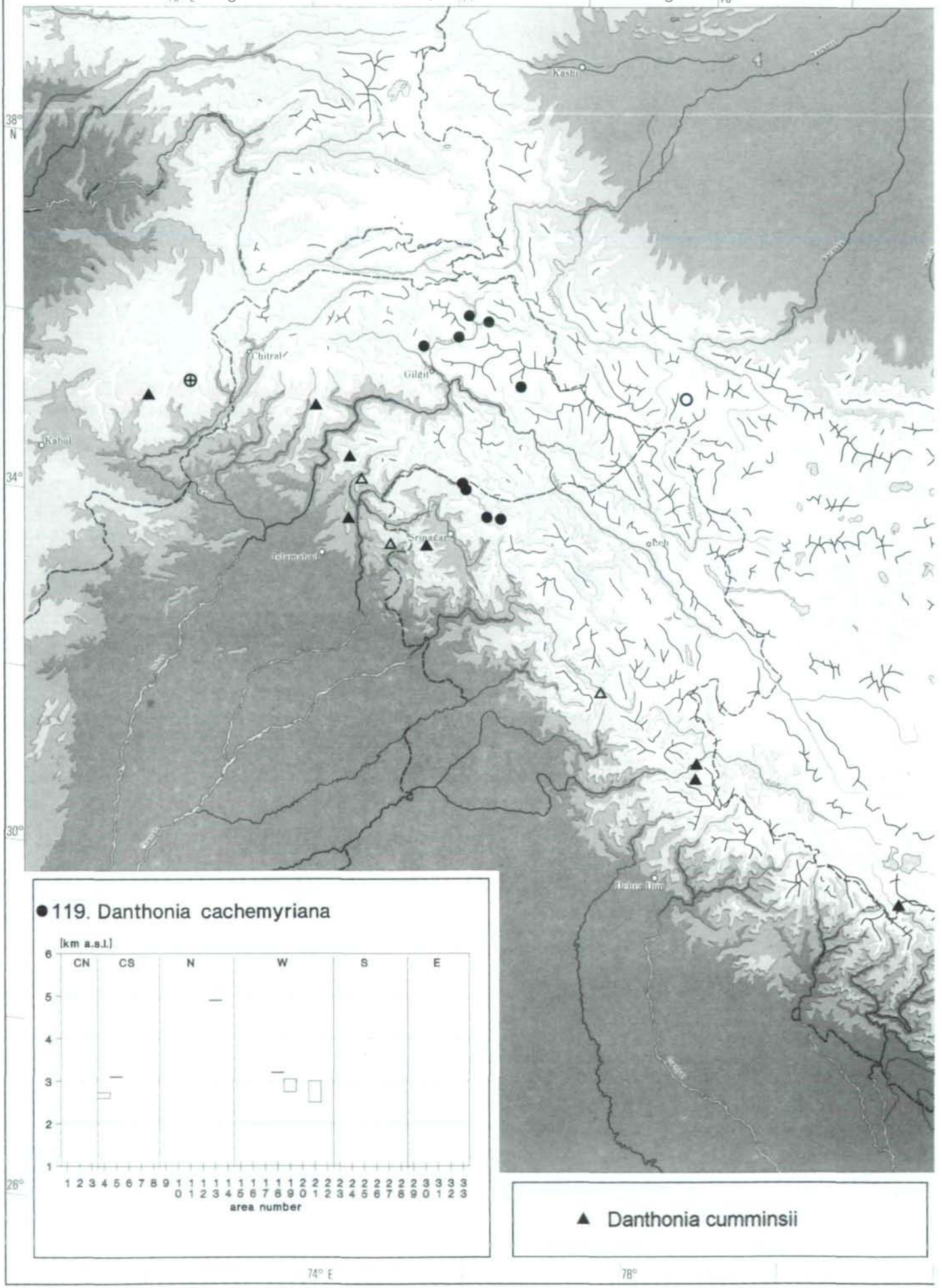

● 119. Danthonia cachemyriana

▲ Danthonia cumminsii

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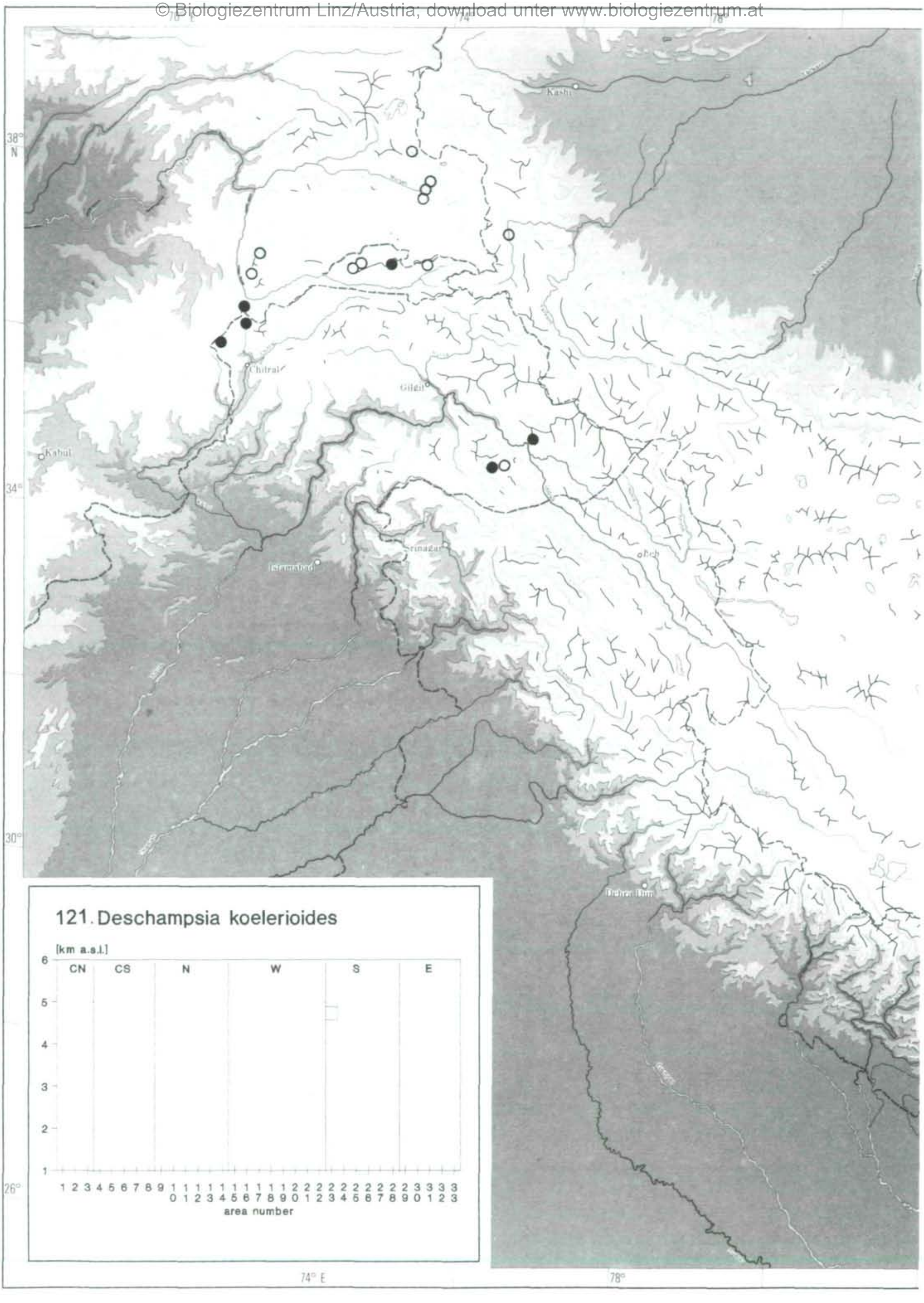

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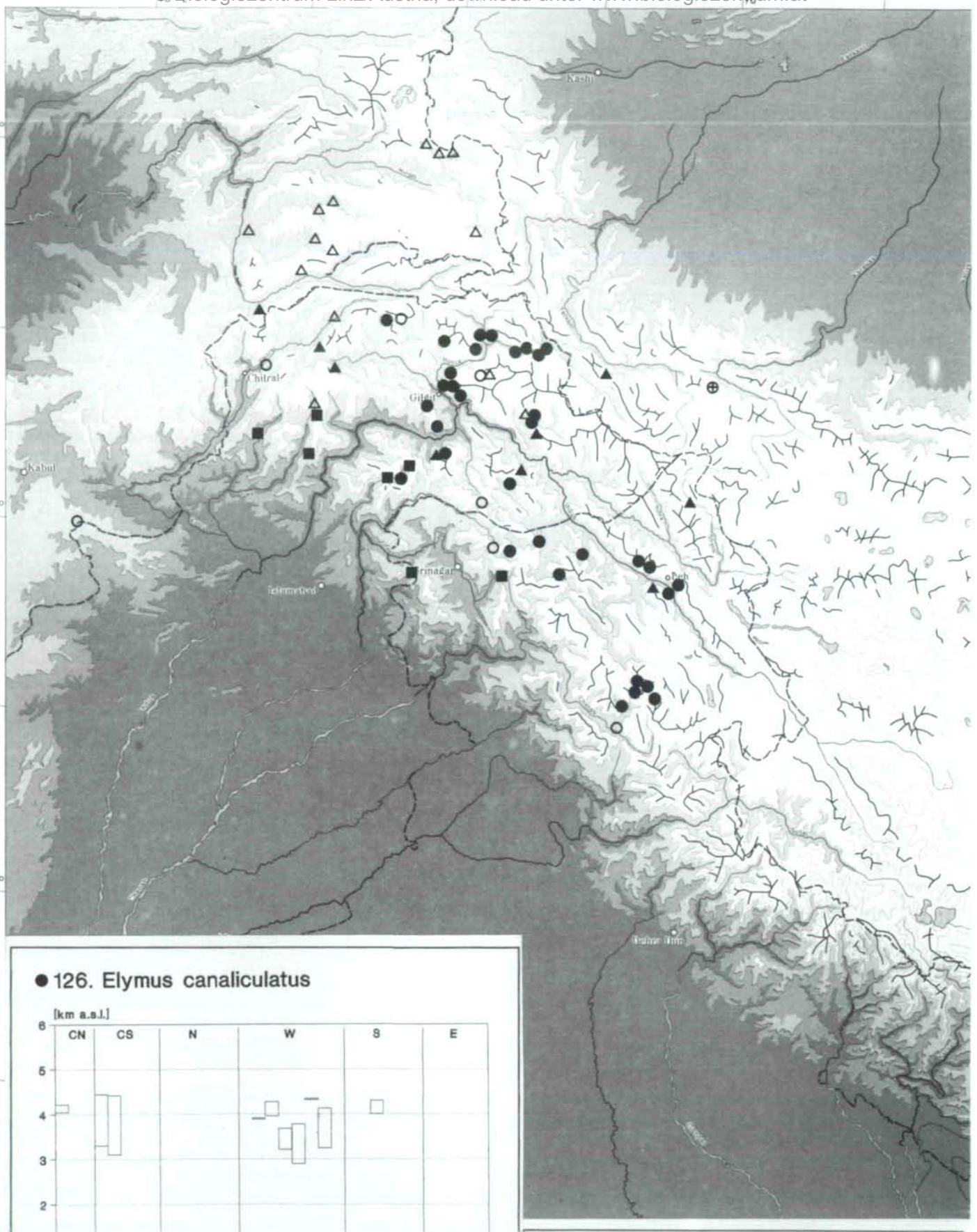
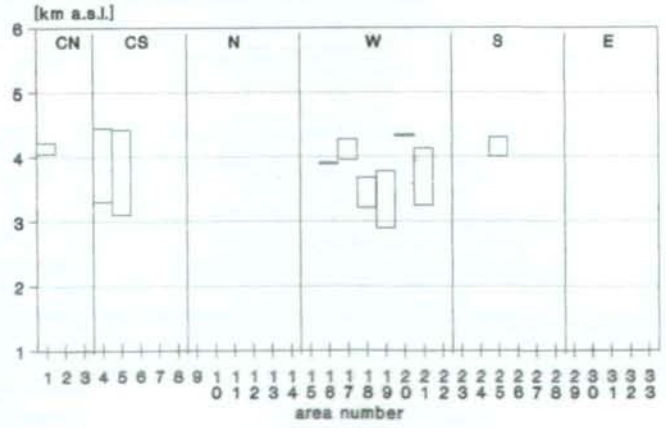


● 126. Elymus canaliculatus



■ Elymus himalayanus

▲138. Elymus schugnanicus

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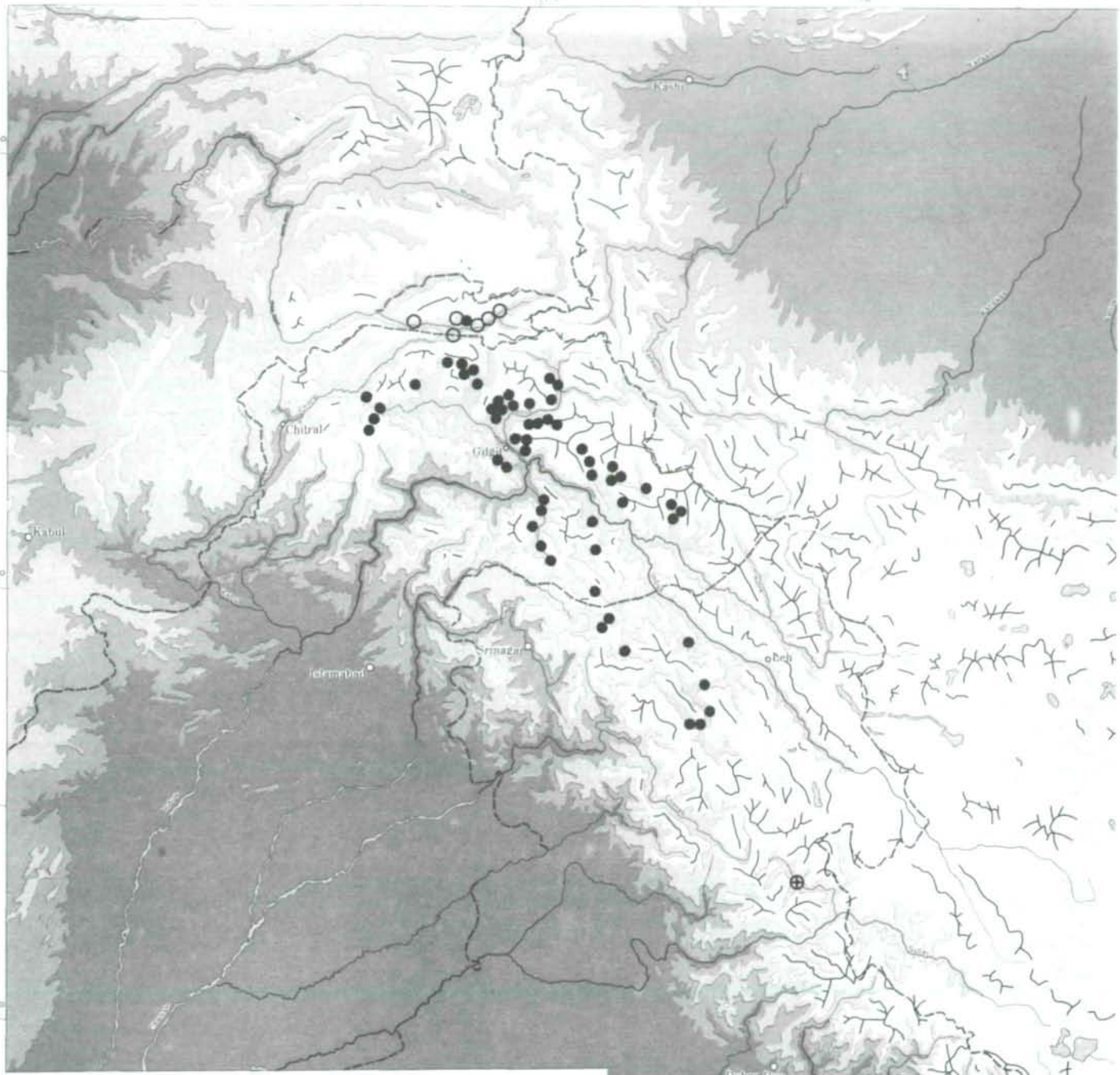
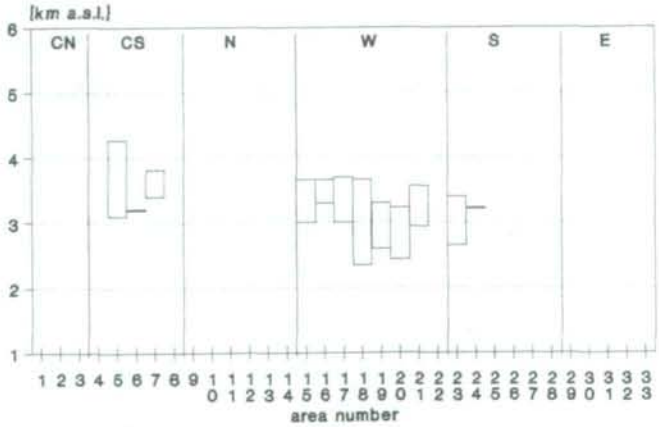


128. Elymus cognatus



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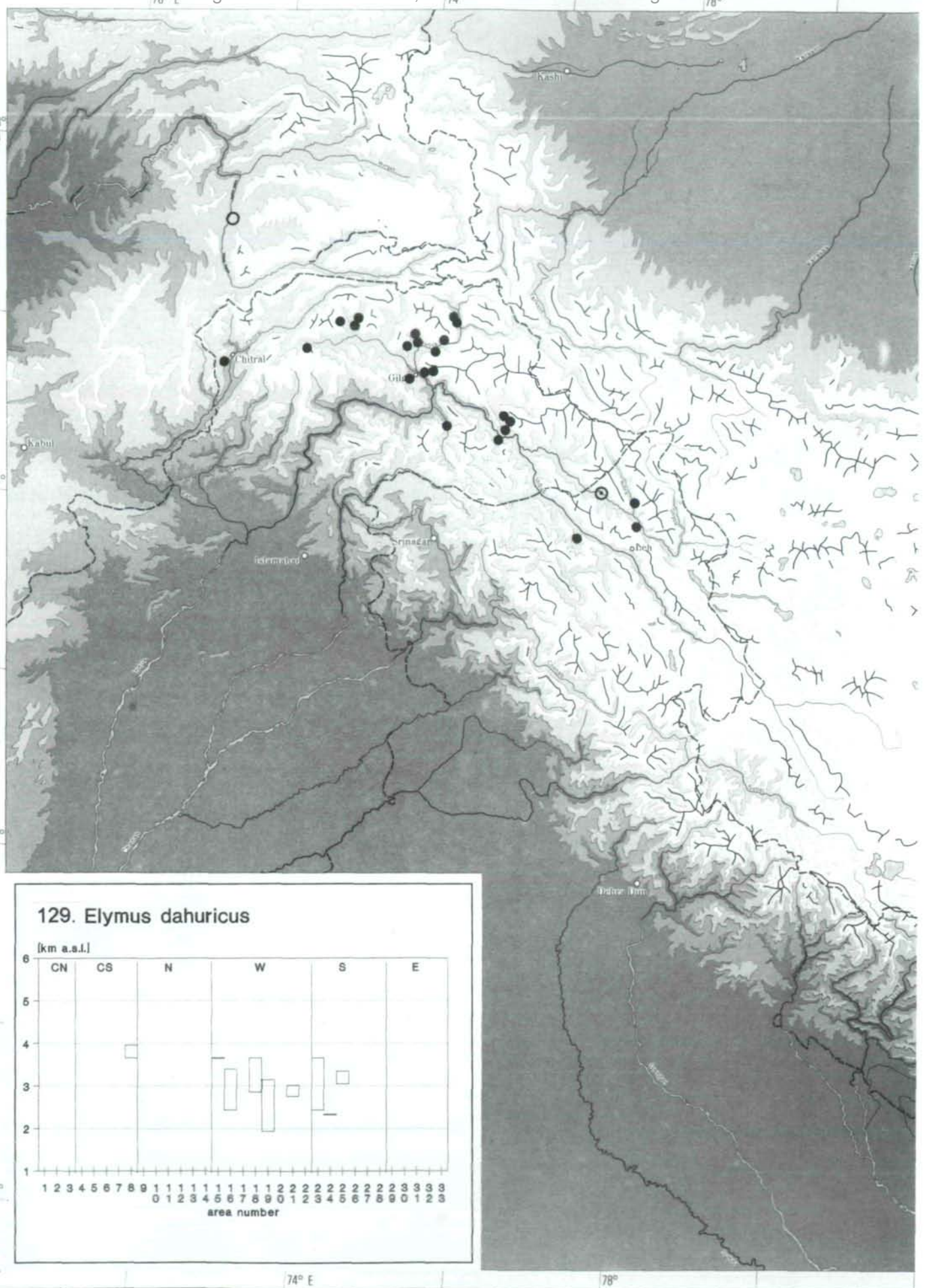

129. Elymus dahuricus

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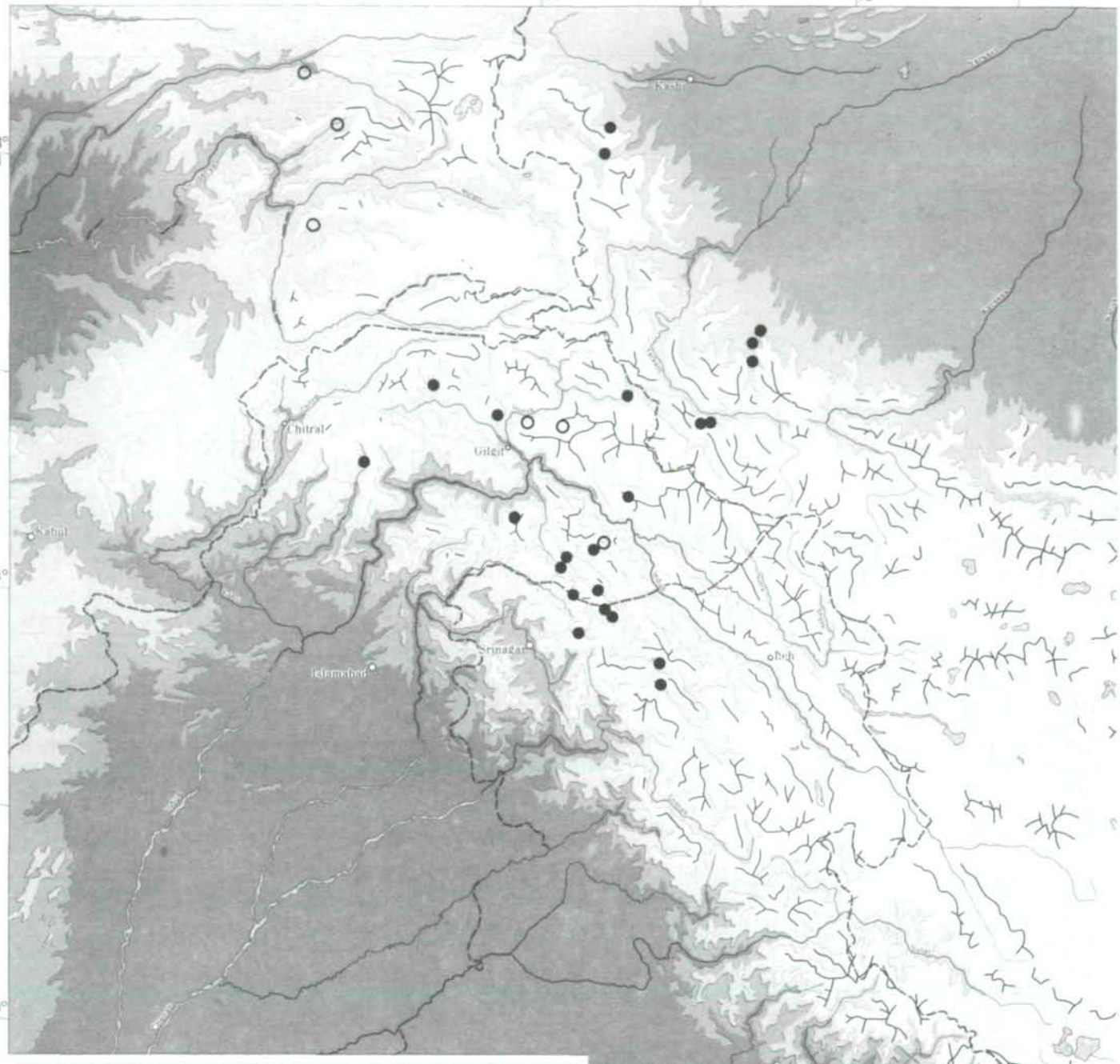
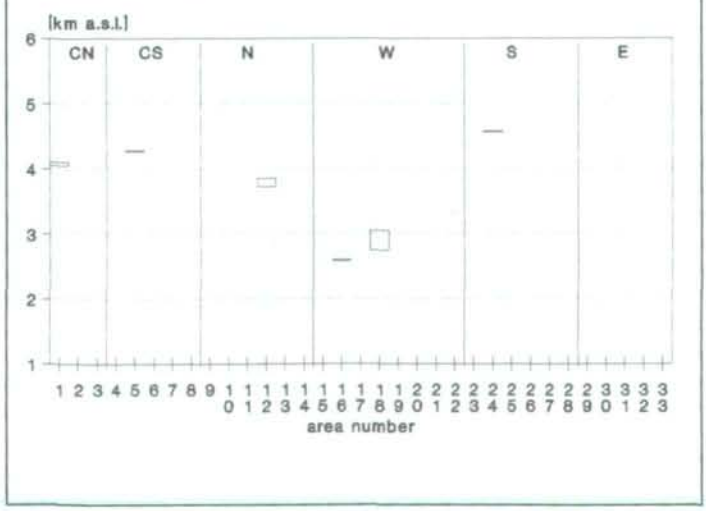


130. Elymus dentatus



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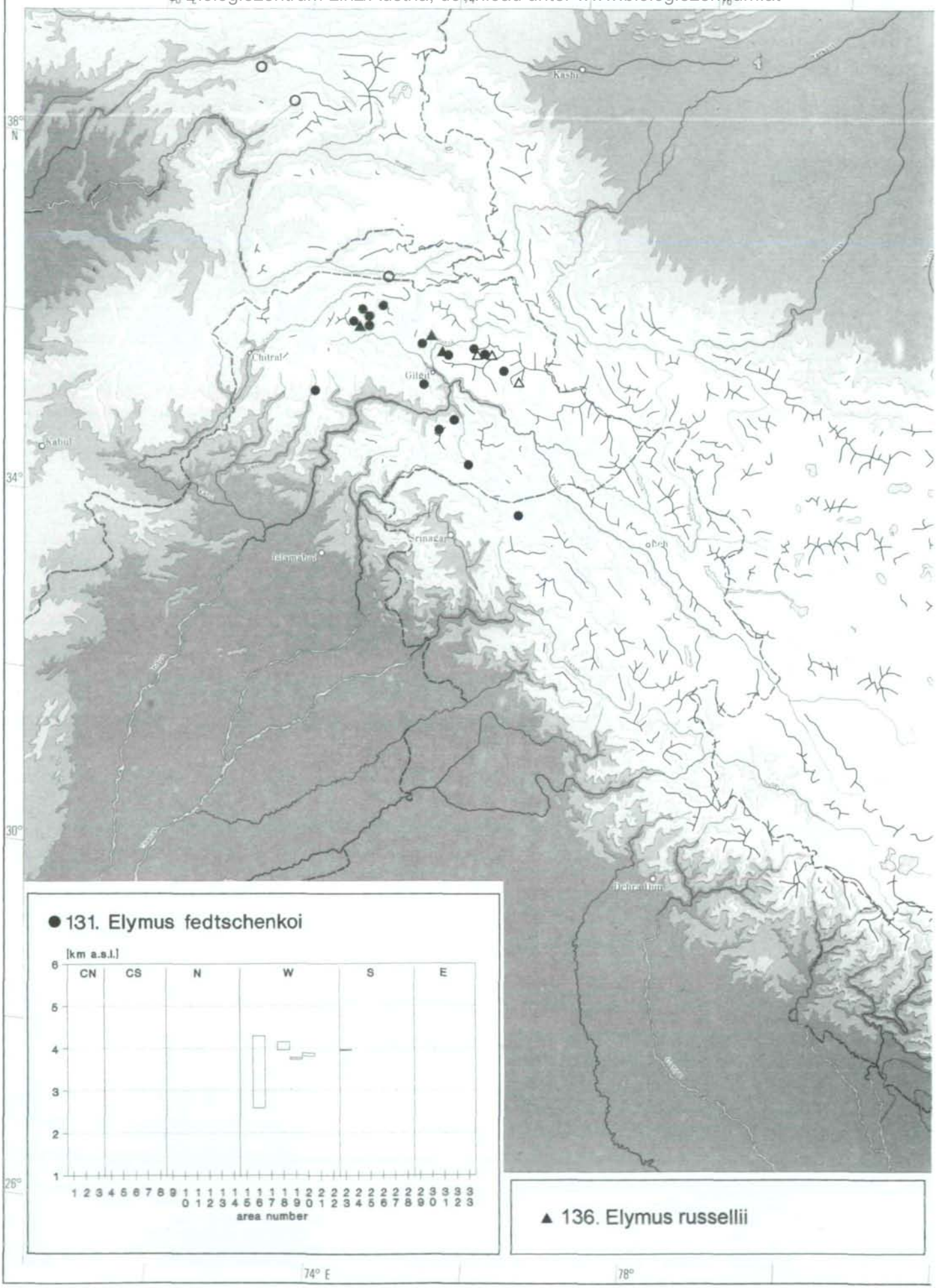

● 131. Elymus fedtschenkoi

▲ 136. Elymus russellii

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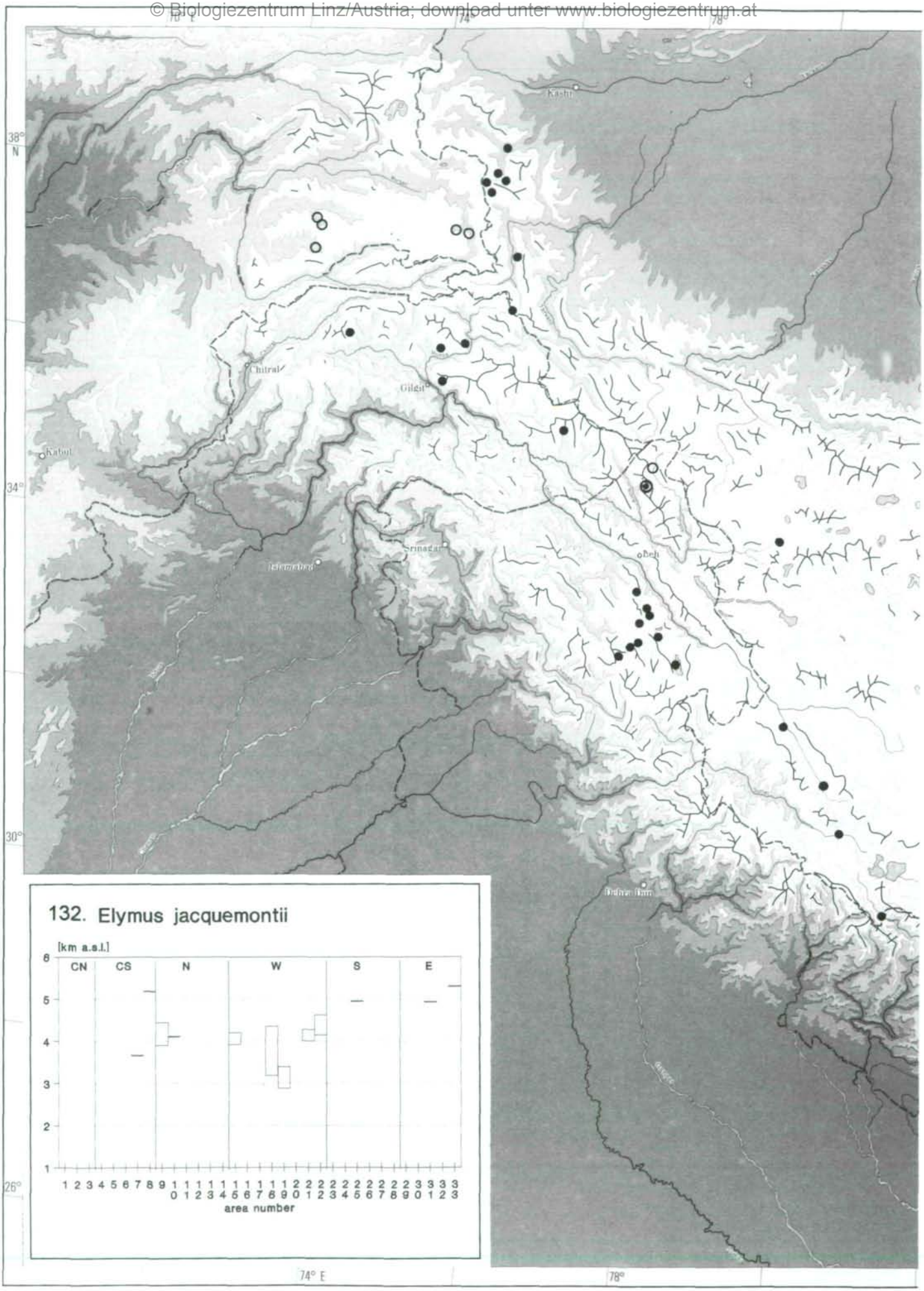

132. Elymus jacquemontii

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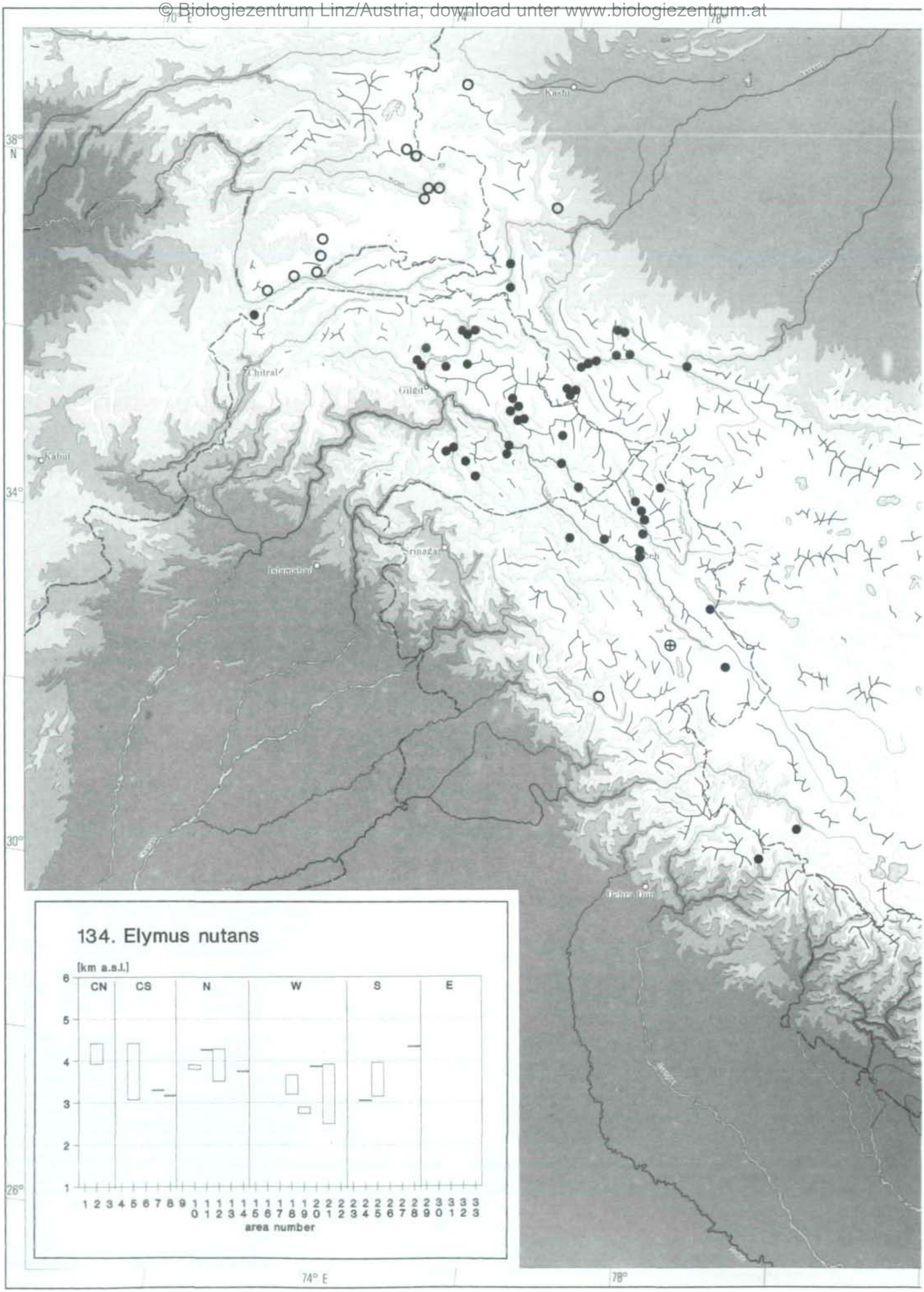

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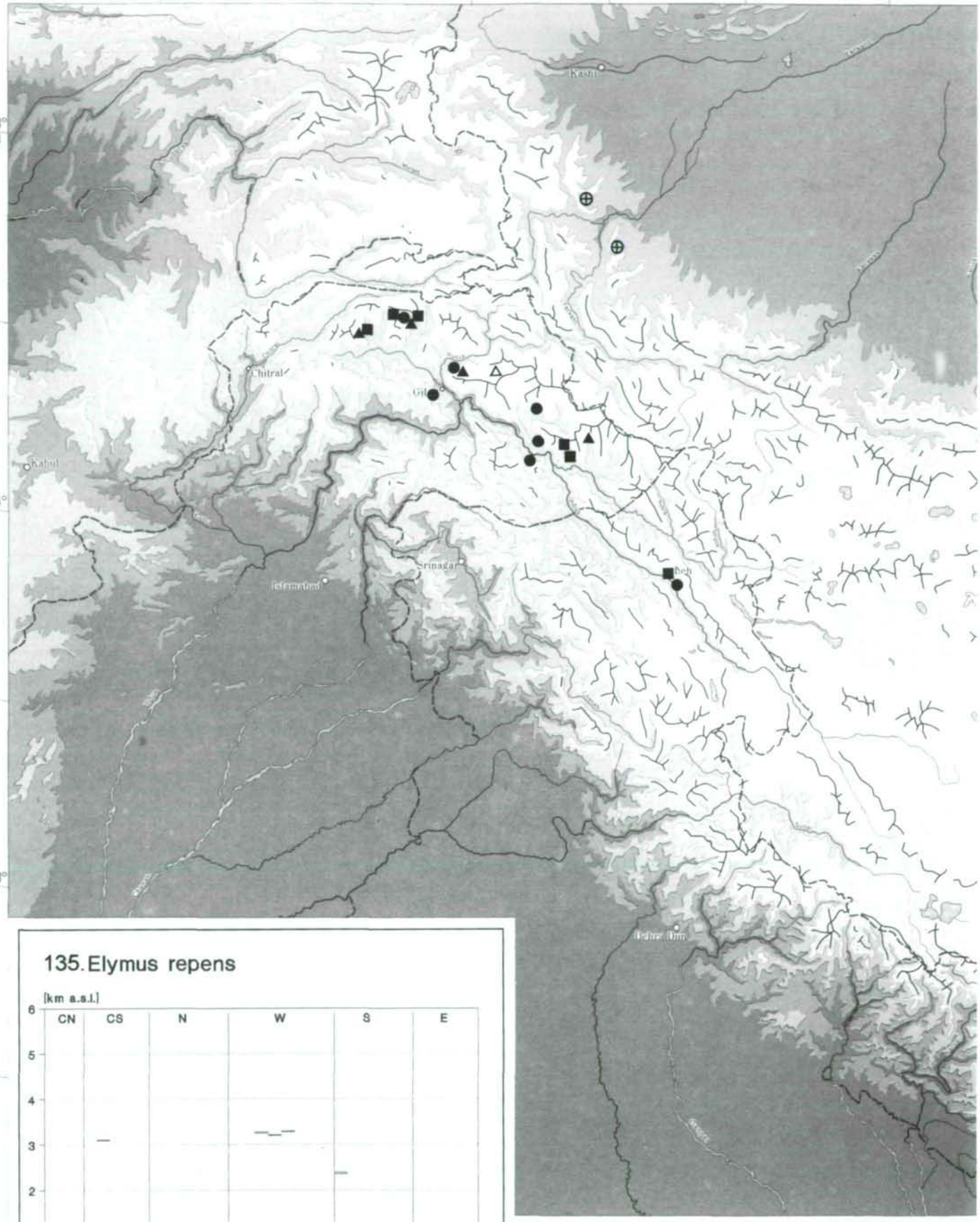
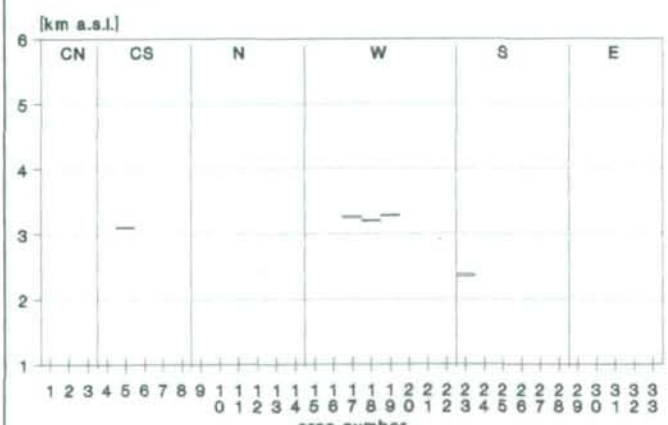


135. Elymus repens



▲ 133. Elymus mutabilis
■ 140. Elymus stewartii

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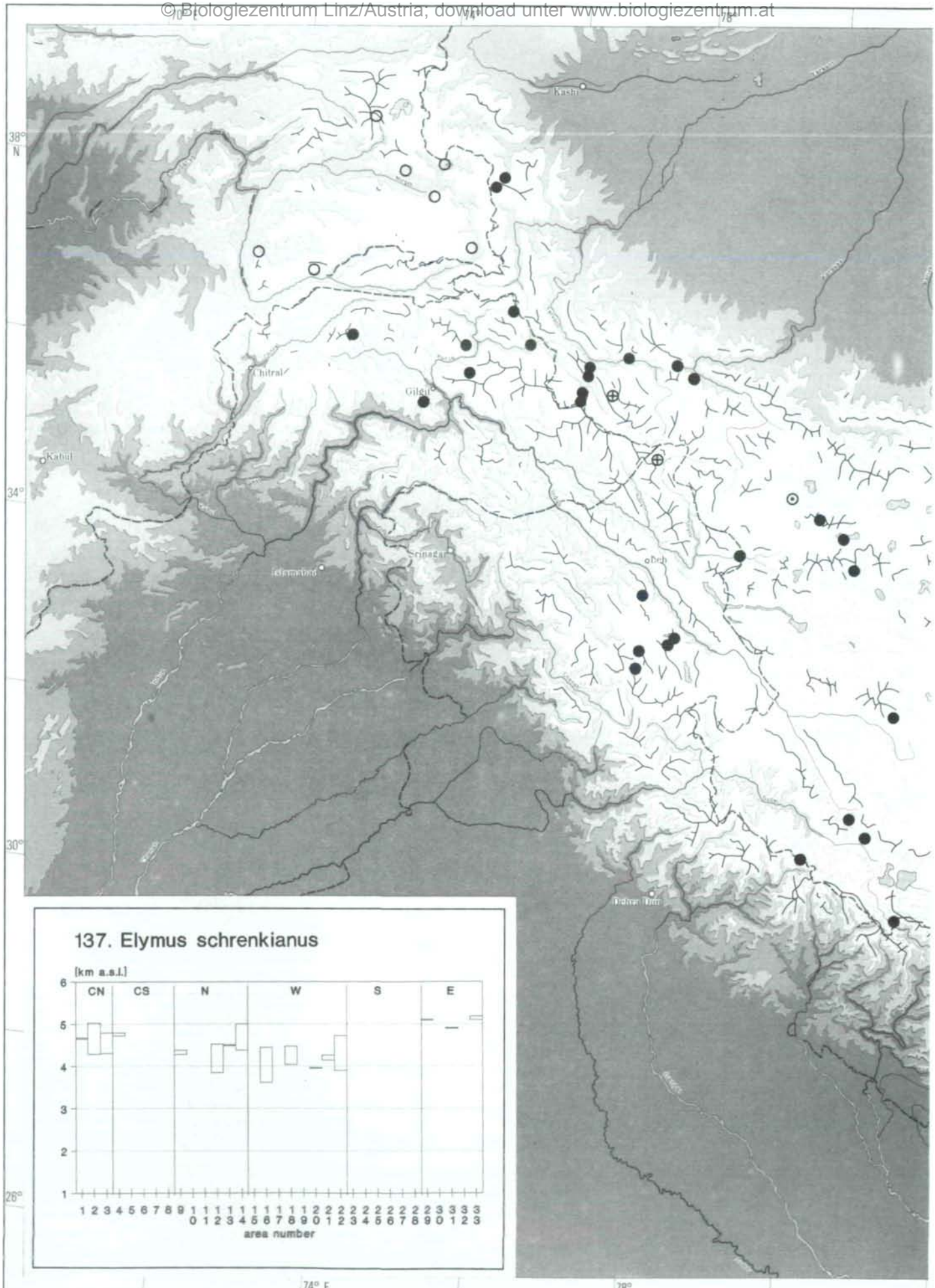

137. Elymus schrenkianus

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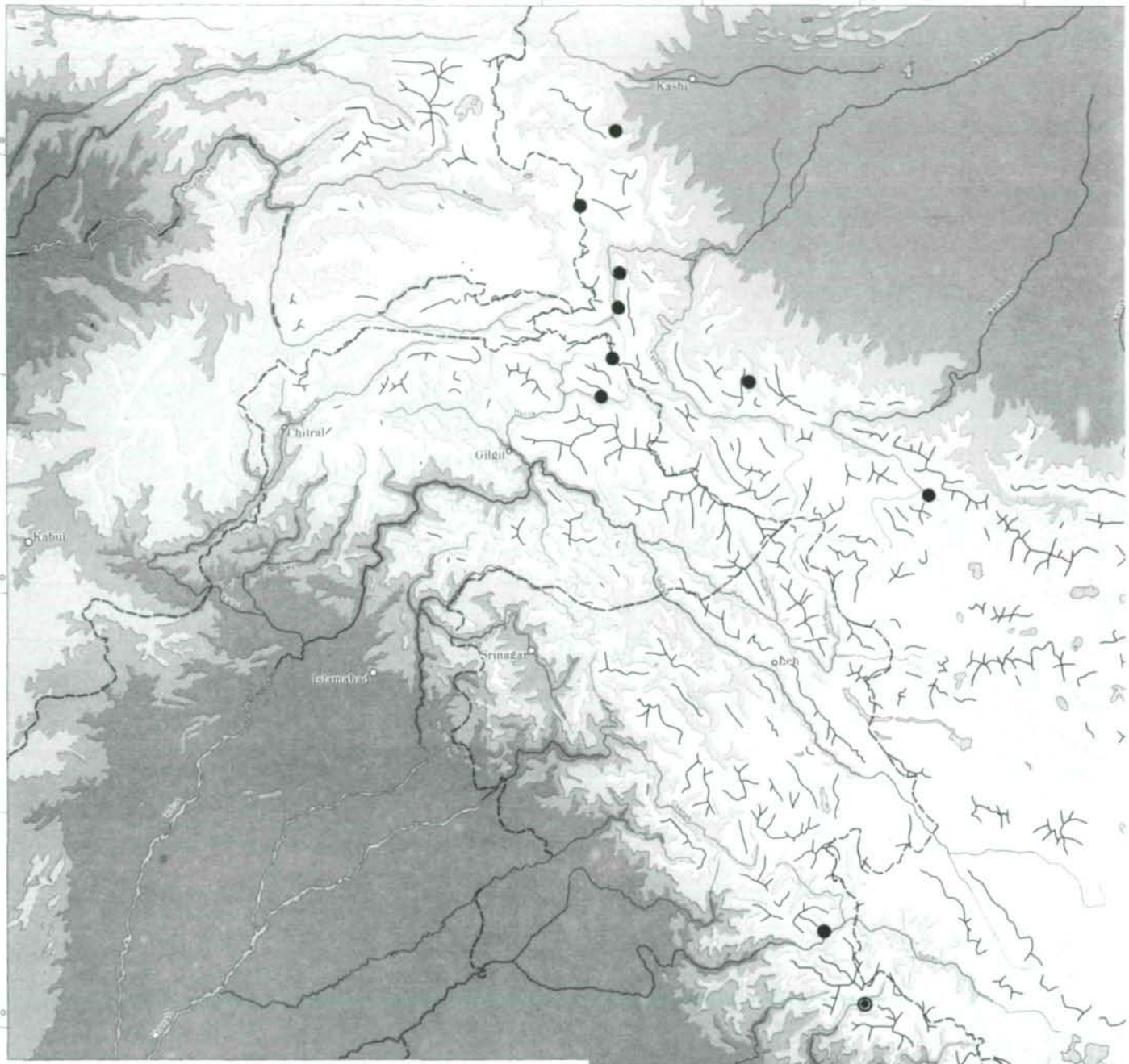
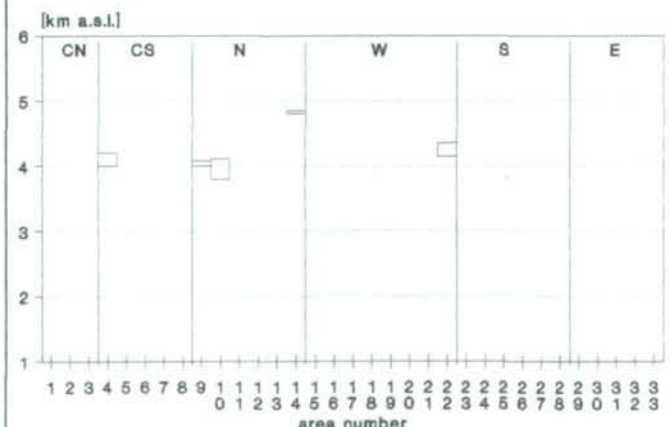


141. Elymus thomsonii



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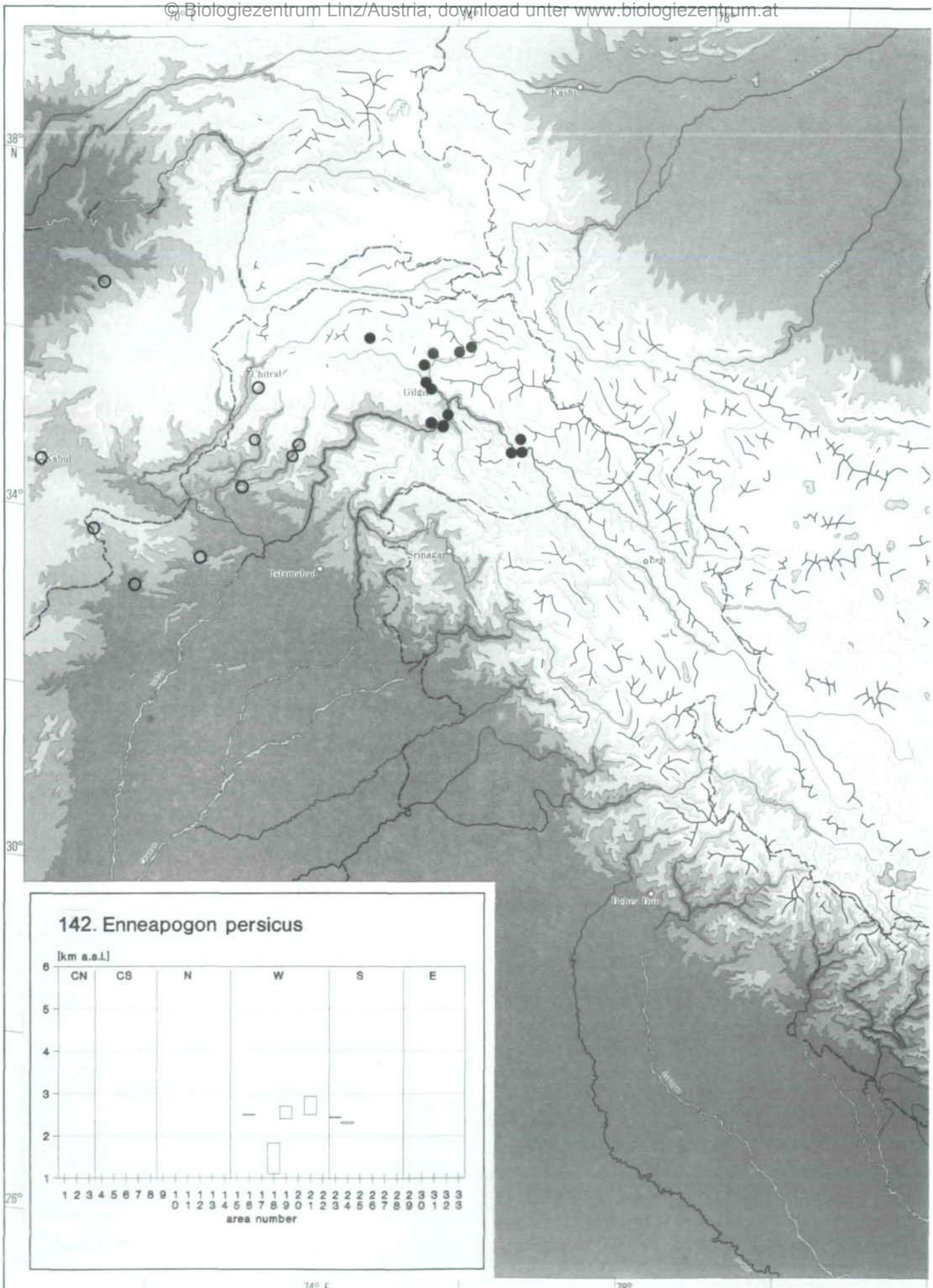

142. Enneapogon persicus

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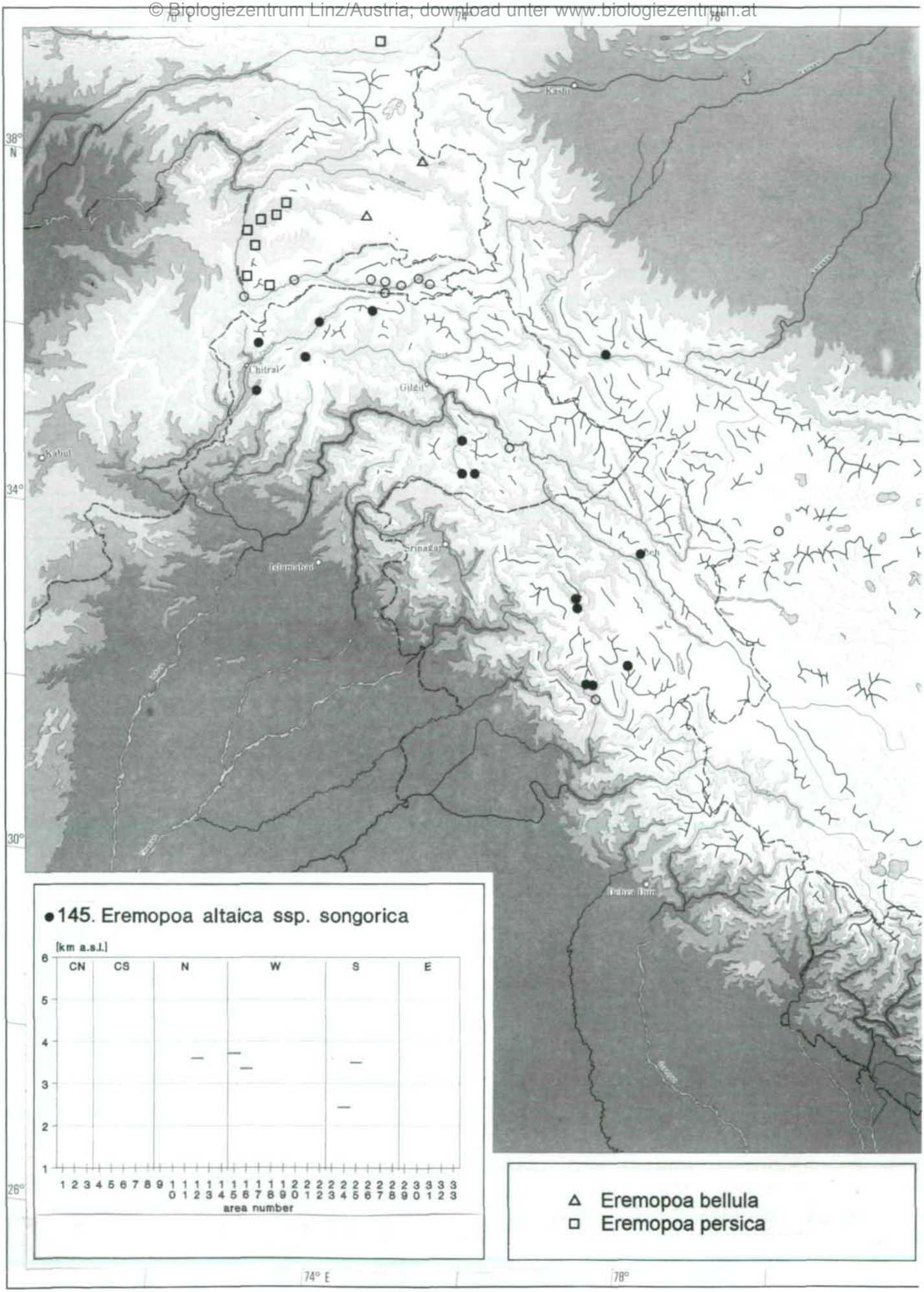

● 145. Eremopoa altaica ssp. songorica

△ Eremopoa bellula
□ Eremopoa persica

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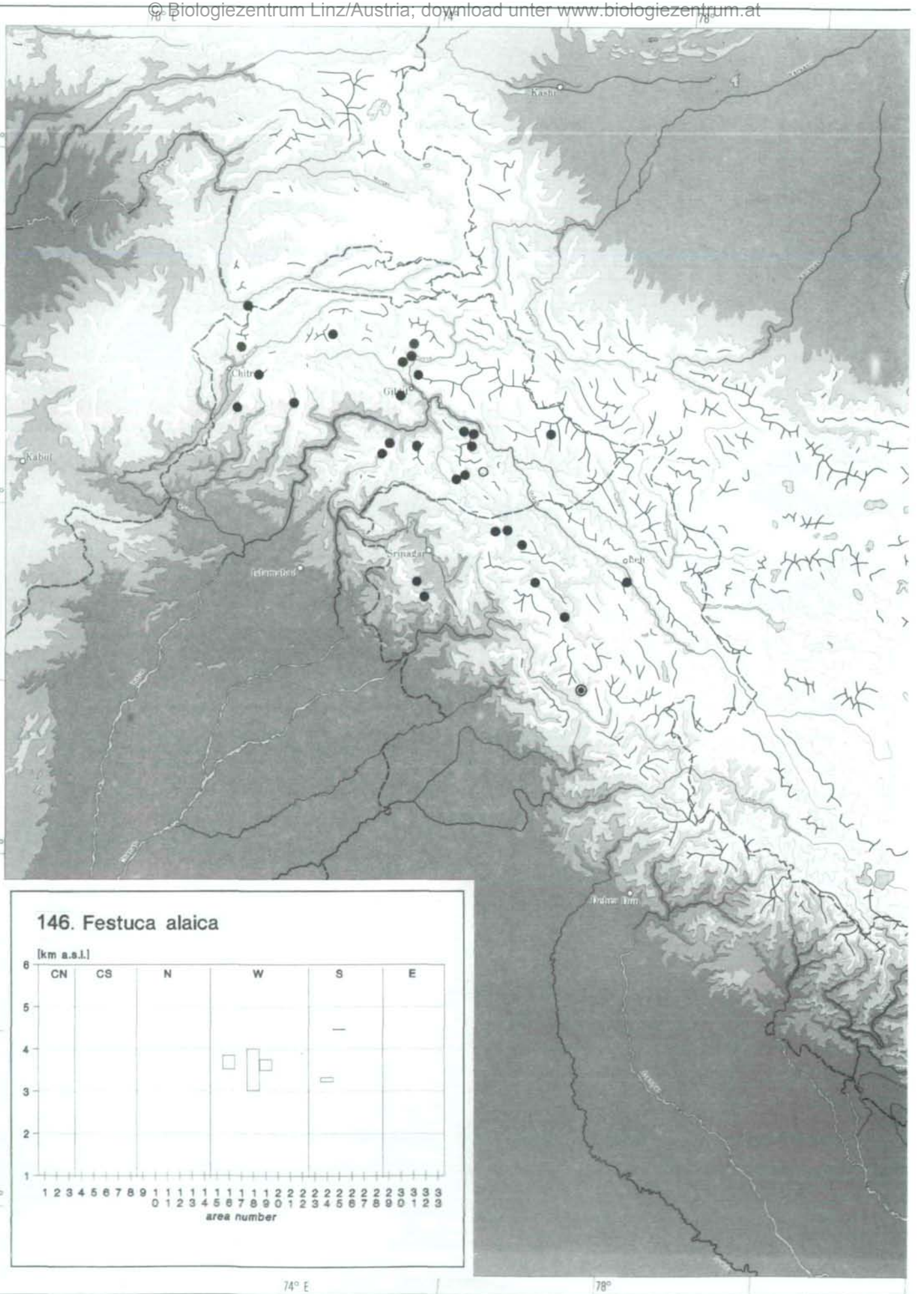

146. Festuca alaica

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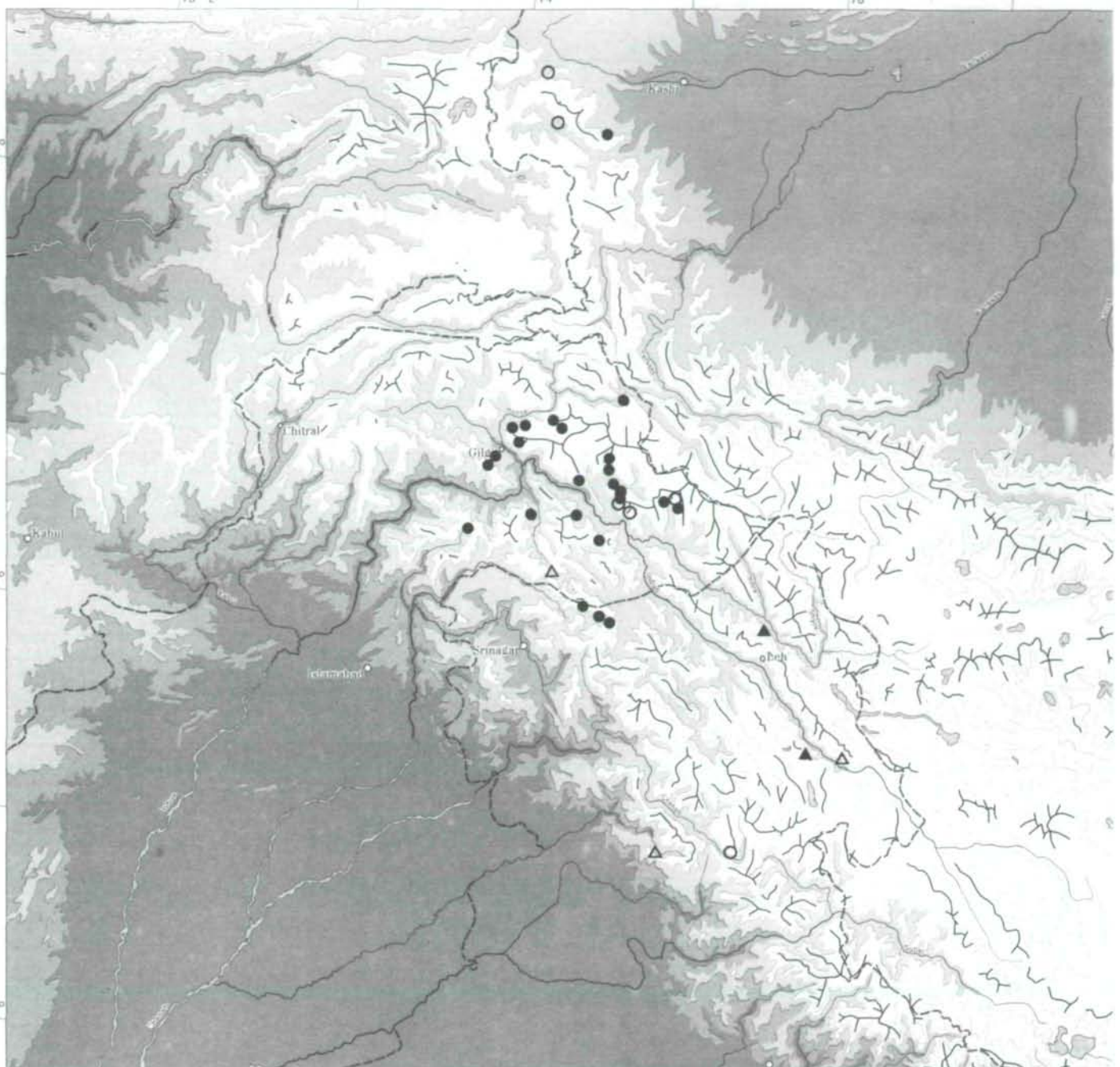
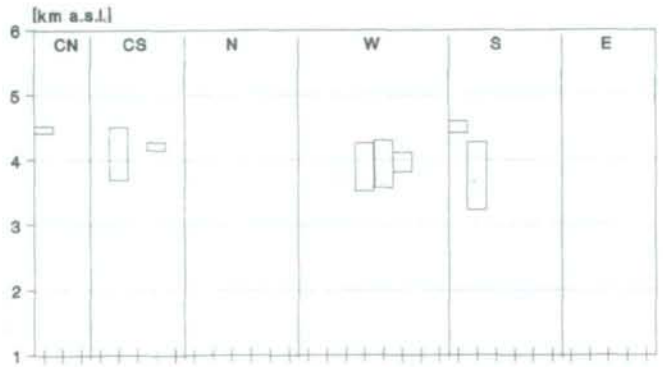


● 147. Festuca alatavica



▲ 152. Festuca nitidula

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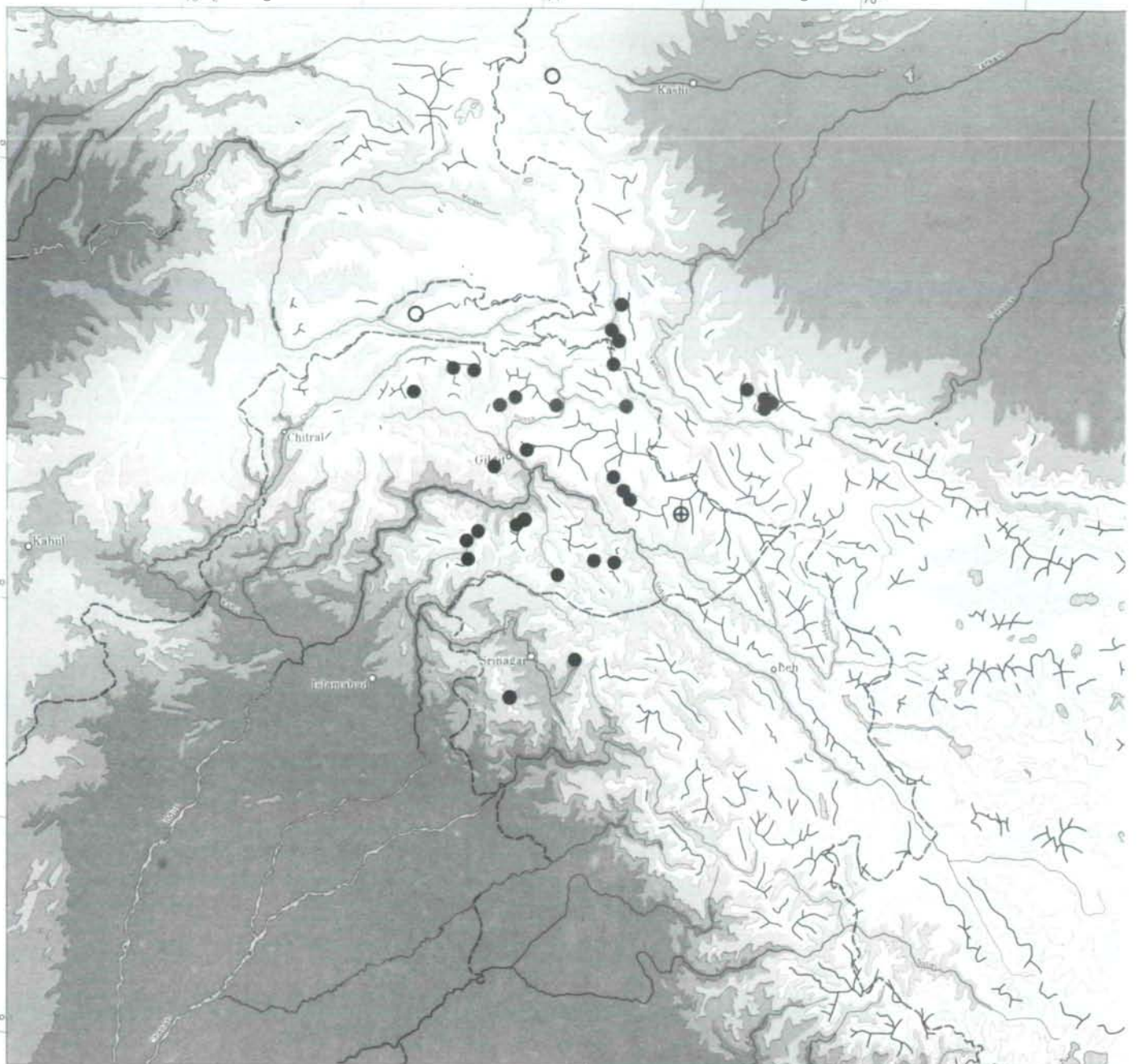
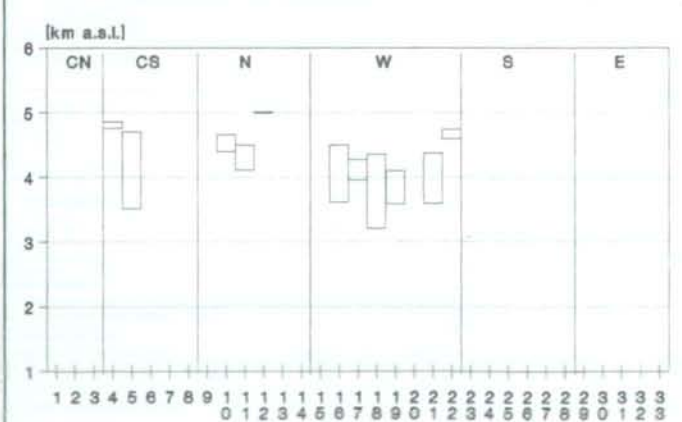


148. Festuca coelestis



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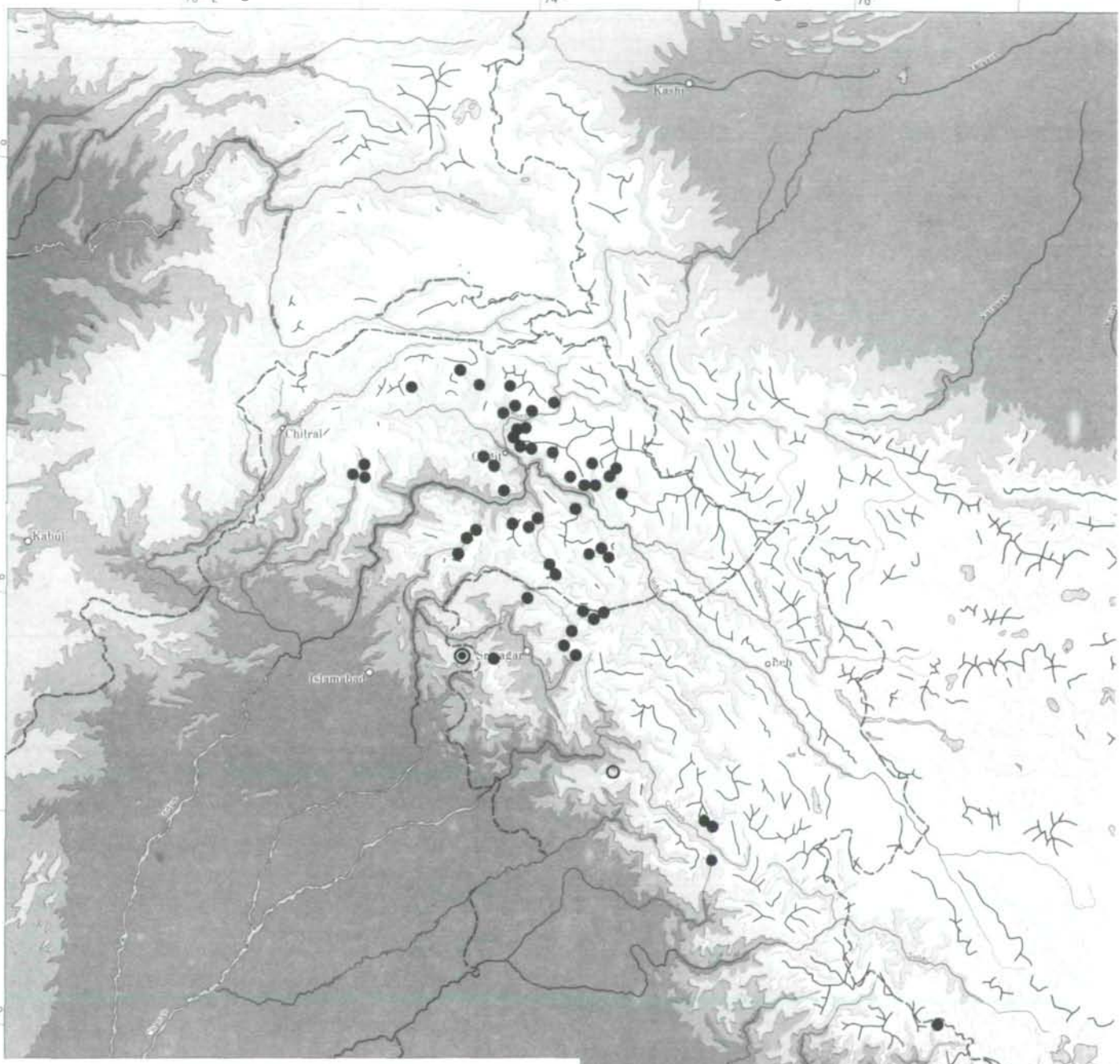
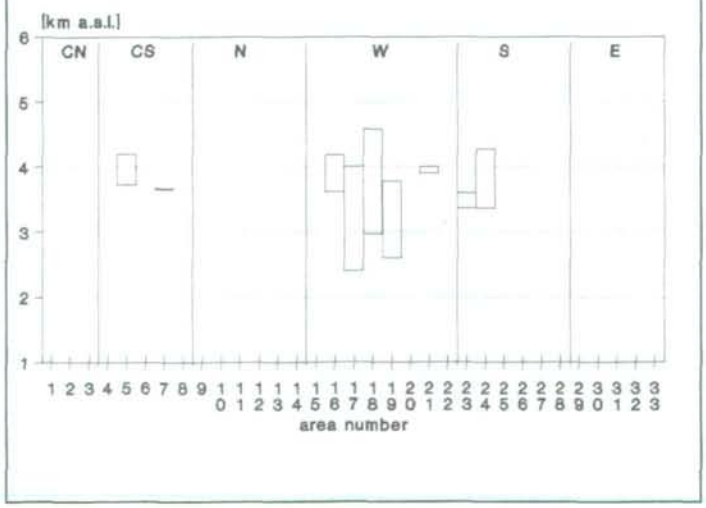


149. Festuca hartmannii



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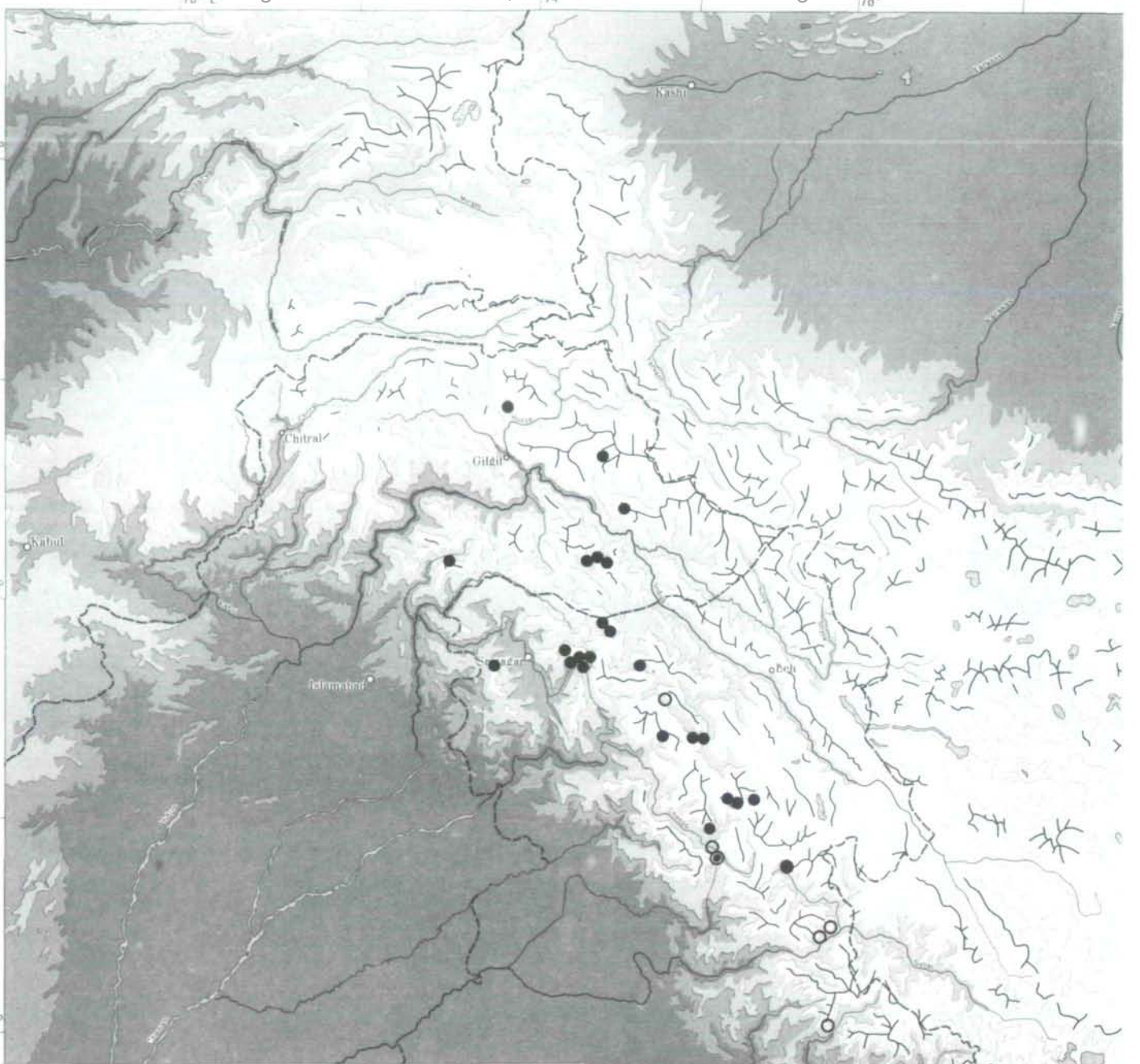
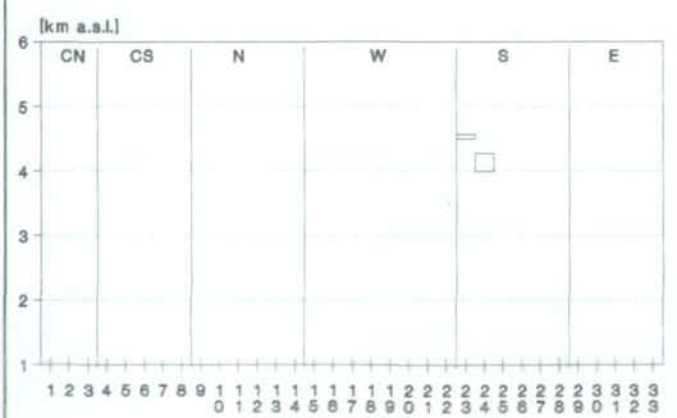


151. Festuca kashmiriana



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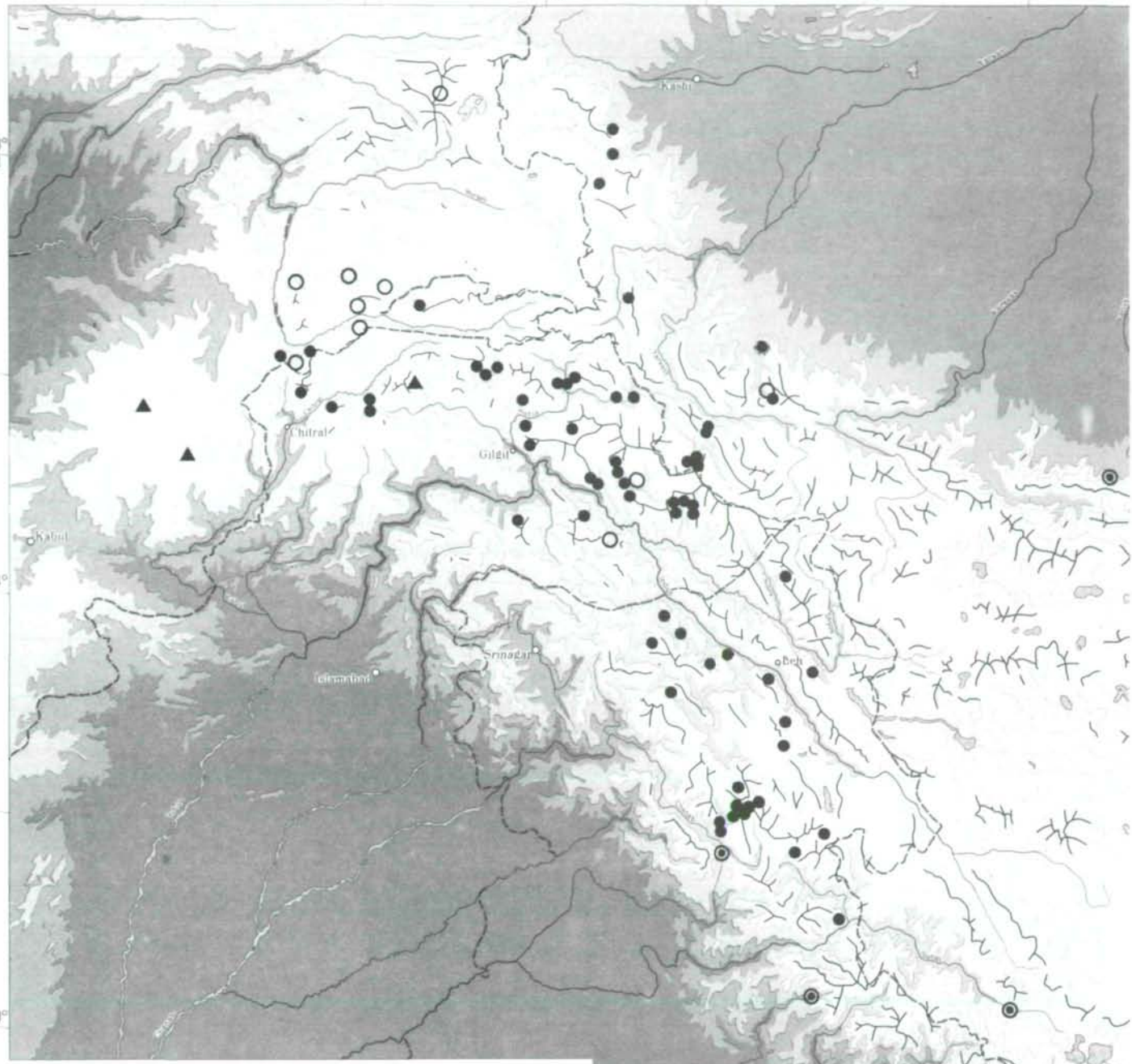
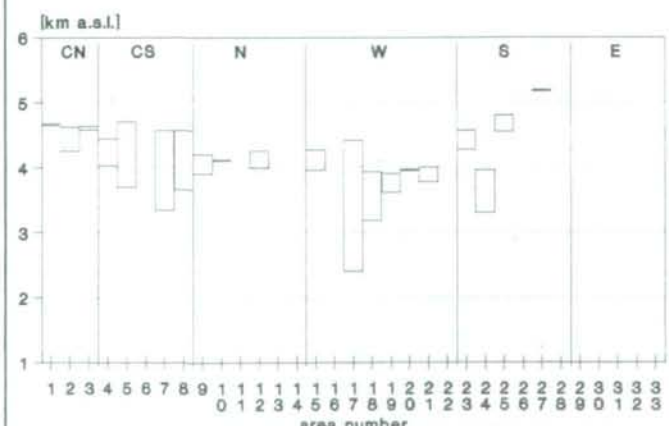


● 153. Festuca olgae



▲ 150. Festuca karatavica

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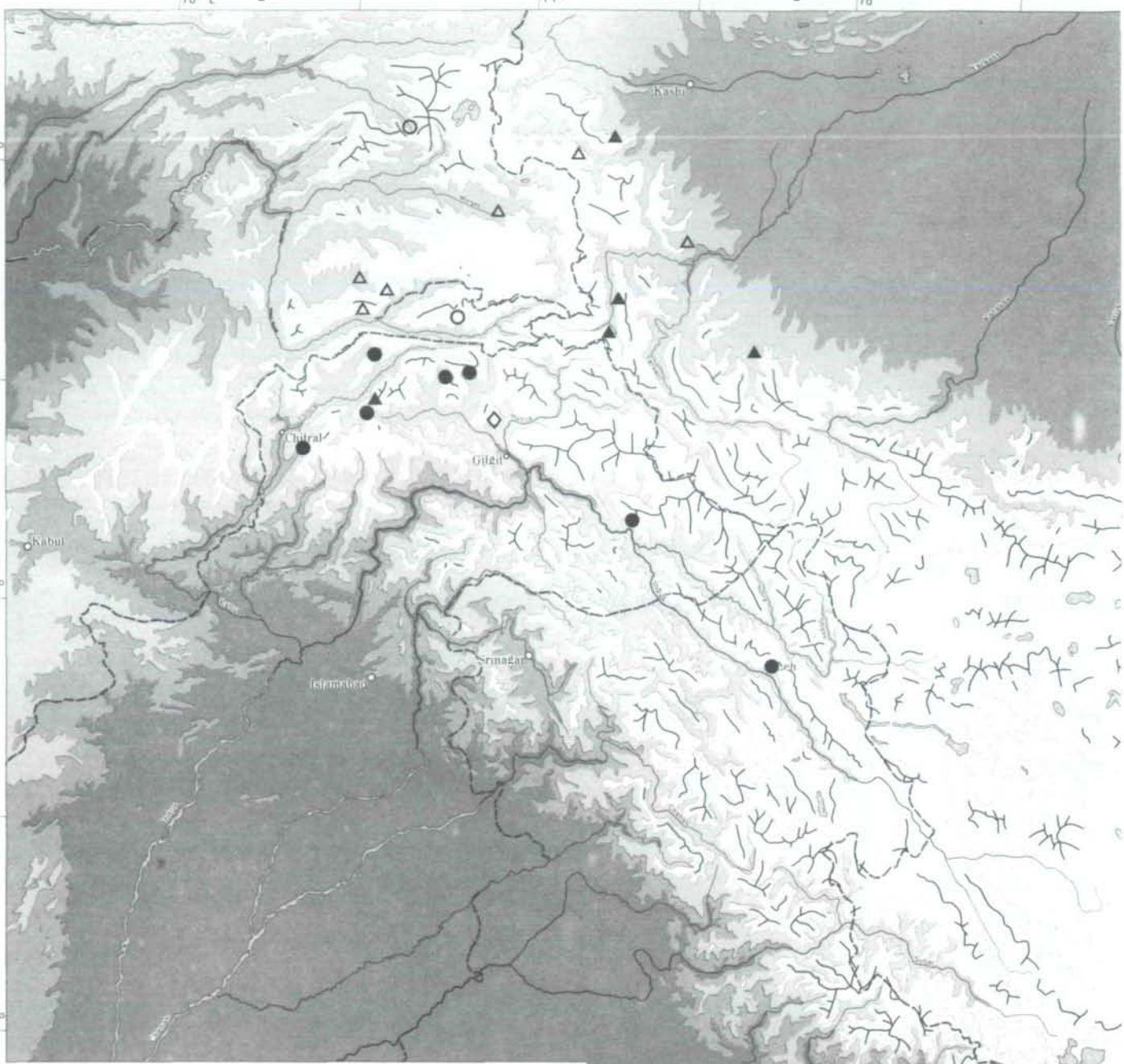
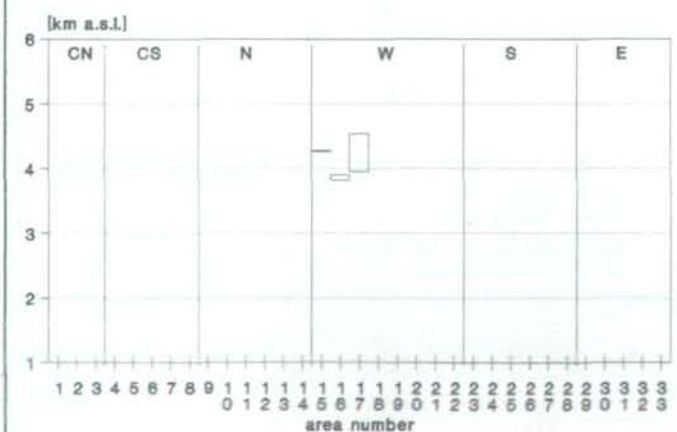


● 154. Festuca pamirica



157. Festuca valesiaca
- ▲ subsp. hypsophila
- ◇ subsp. valesiaca

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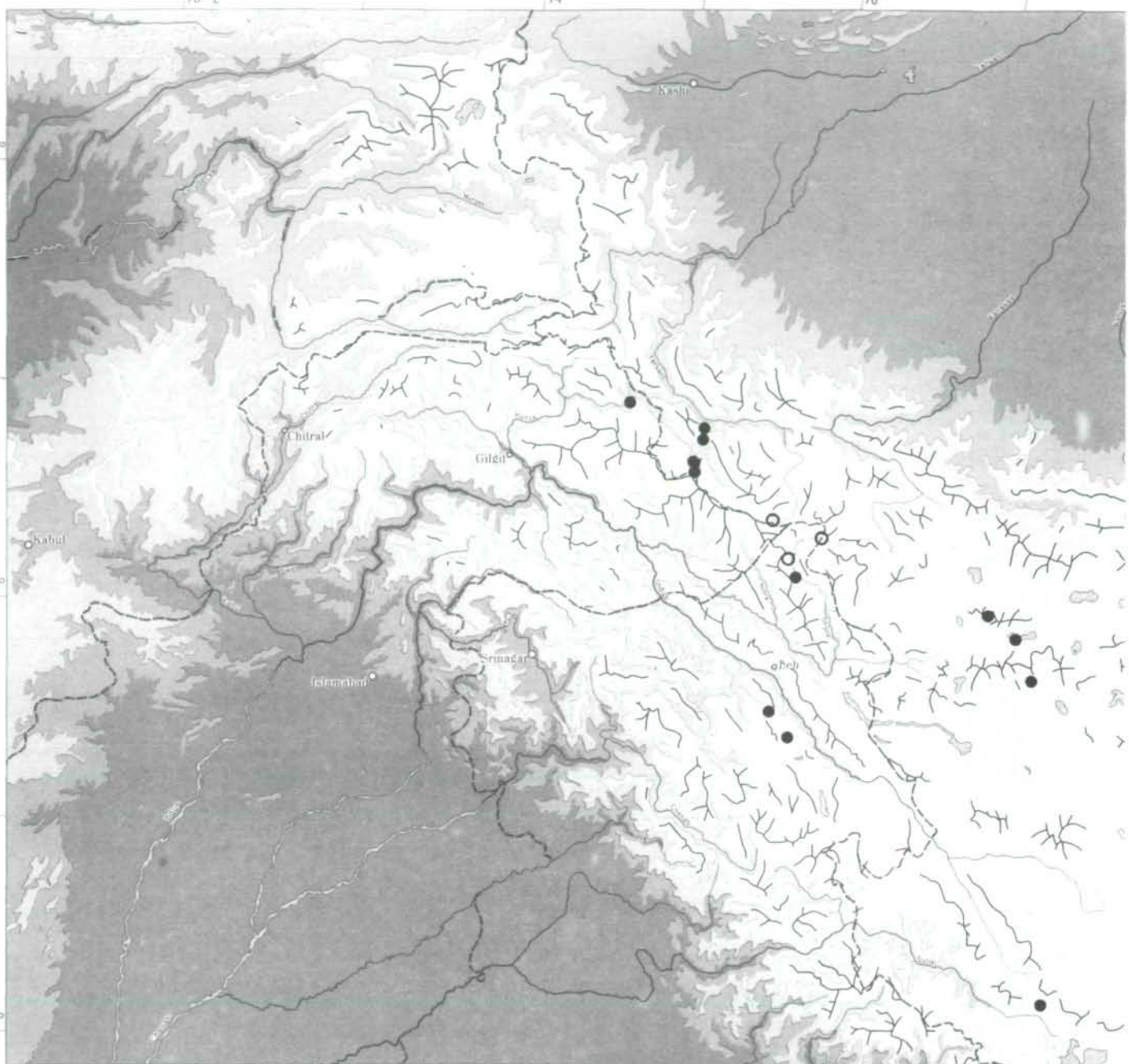
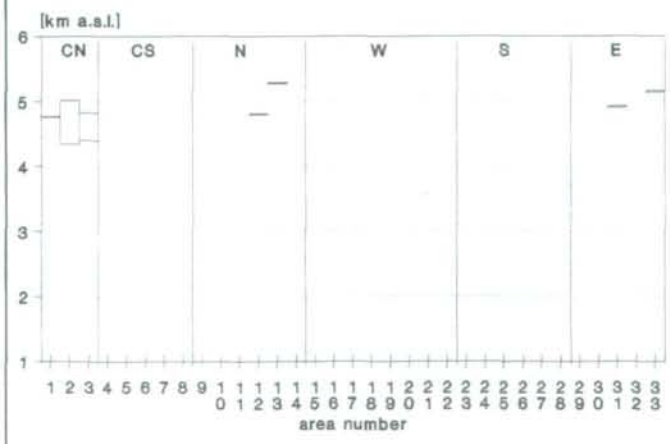


156. Festuca tibetica



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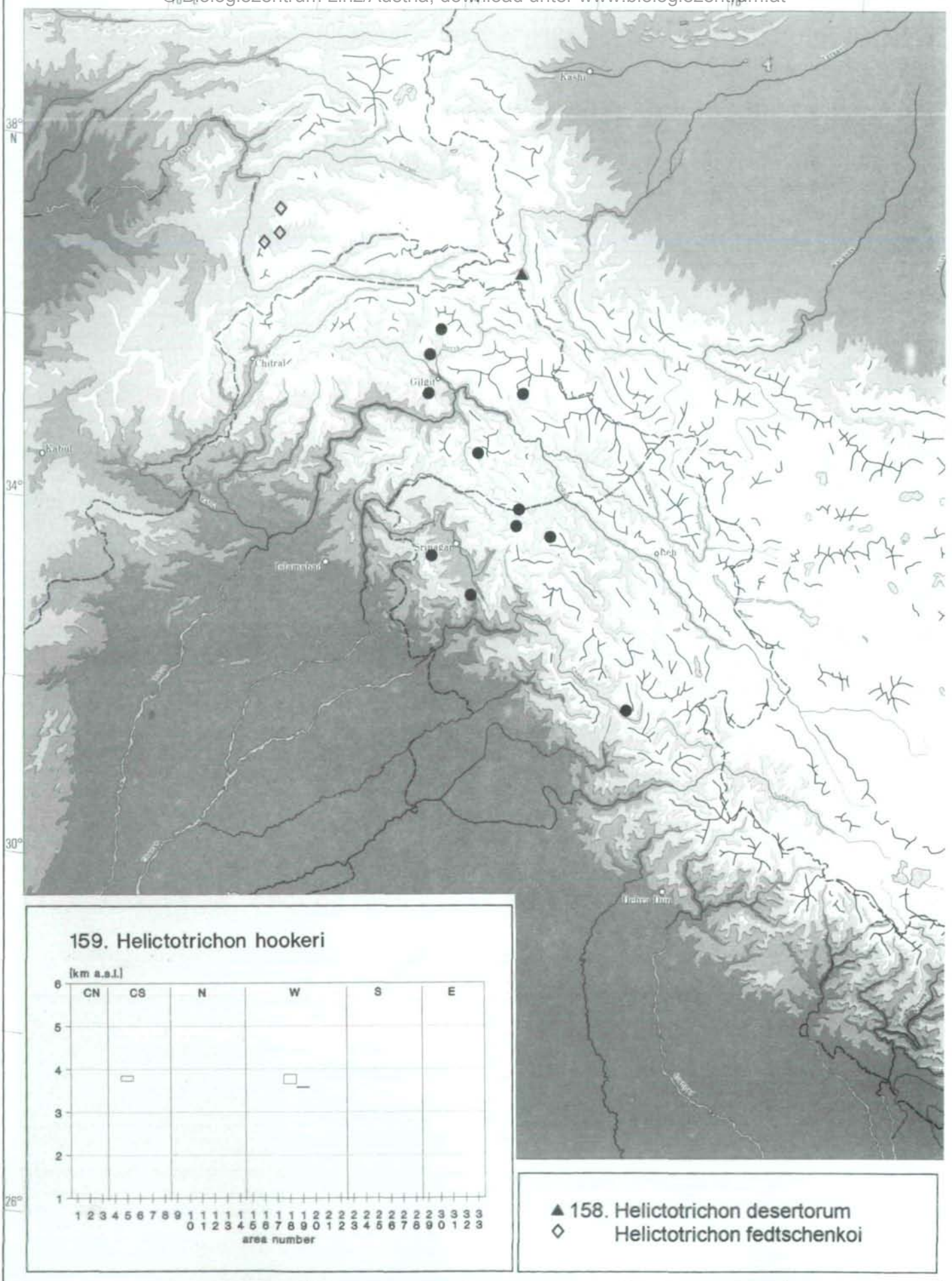

159. Helictotrichon hookeri

▲ 158. Helictotrichon desertorum
◇ Helictotrichon fedtschenkoi

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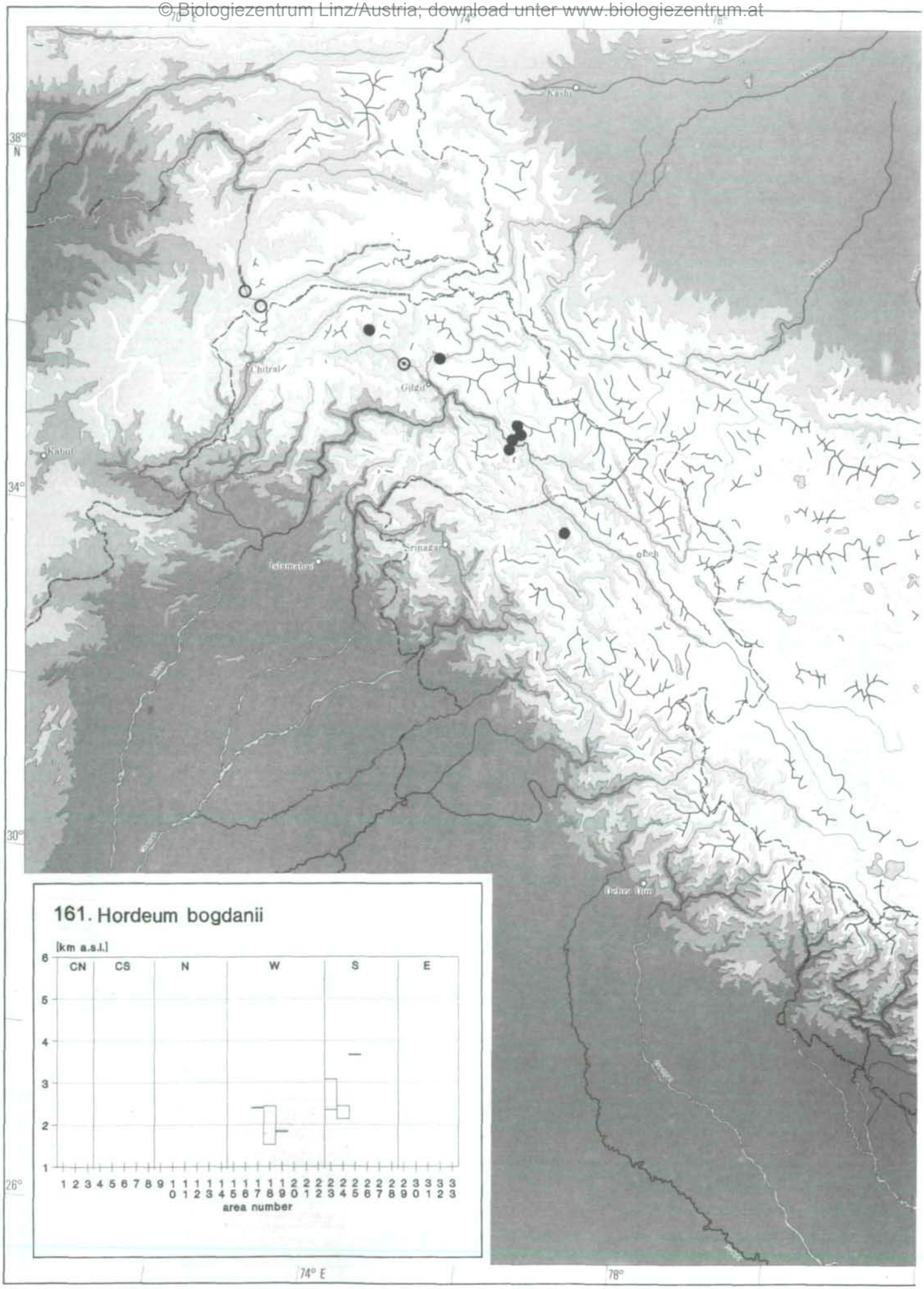

161. Hordeum bogdanii

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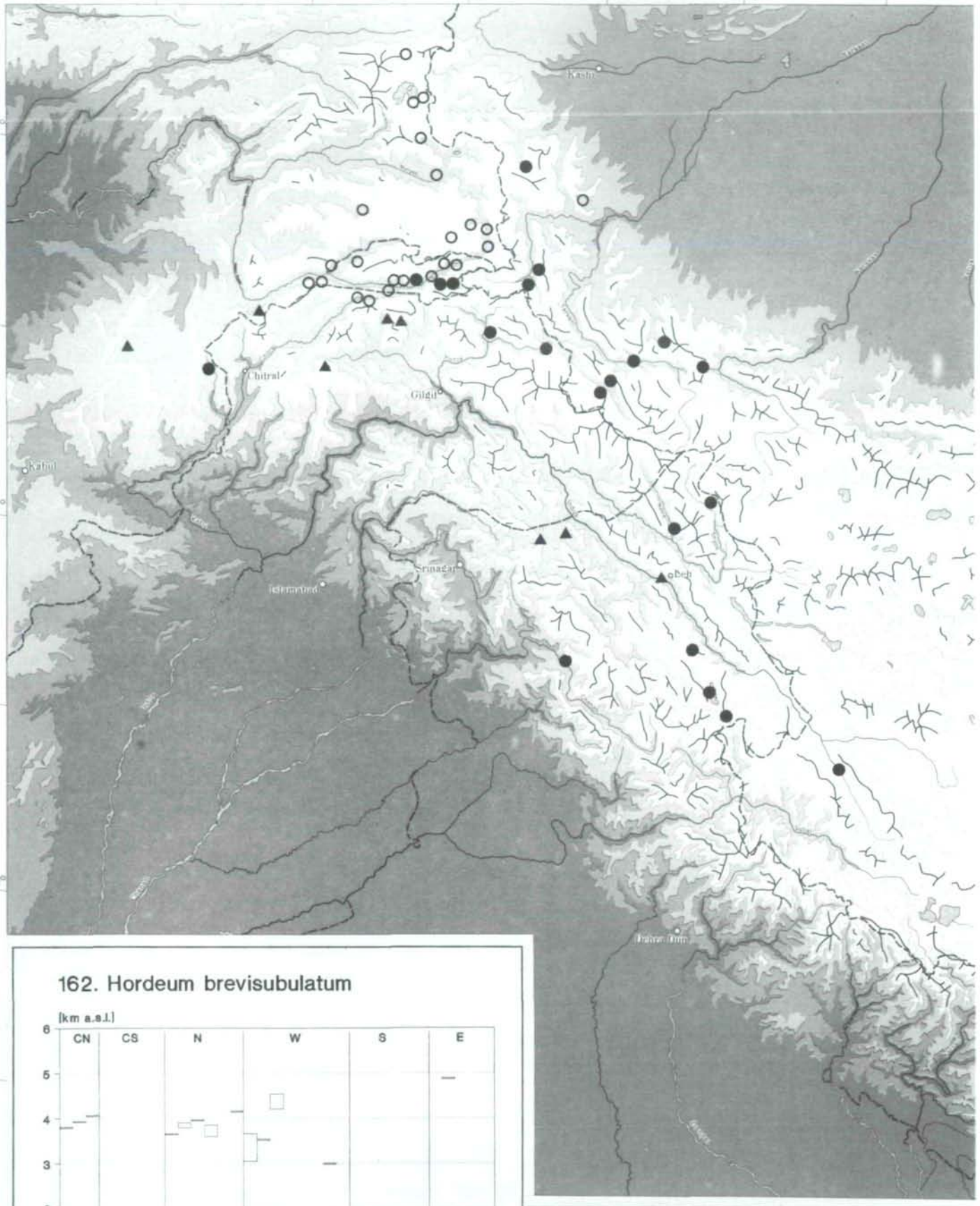
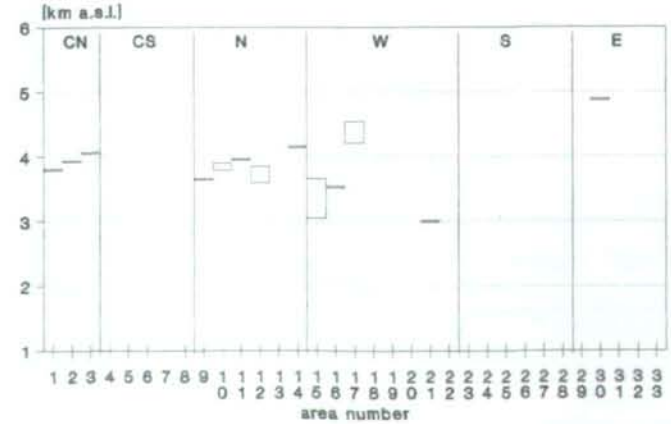


162. Hordeum brevisubulatum



Hordeum brevisubulatum
- ▲ subsp. nevskianum
- ● subsp. turkestanicum

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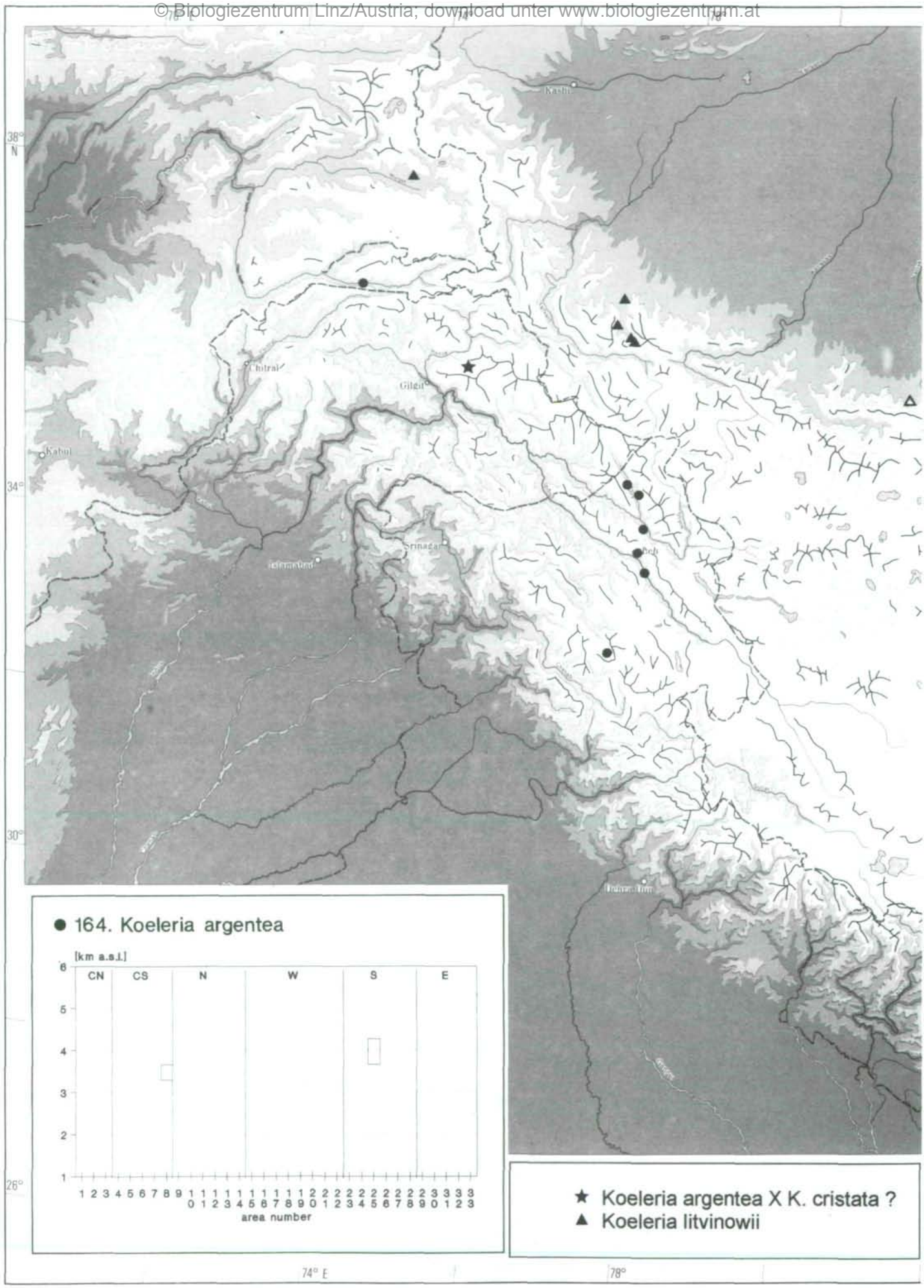

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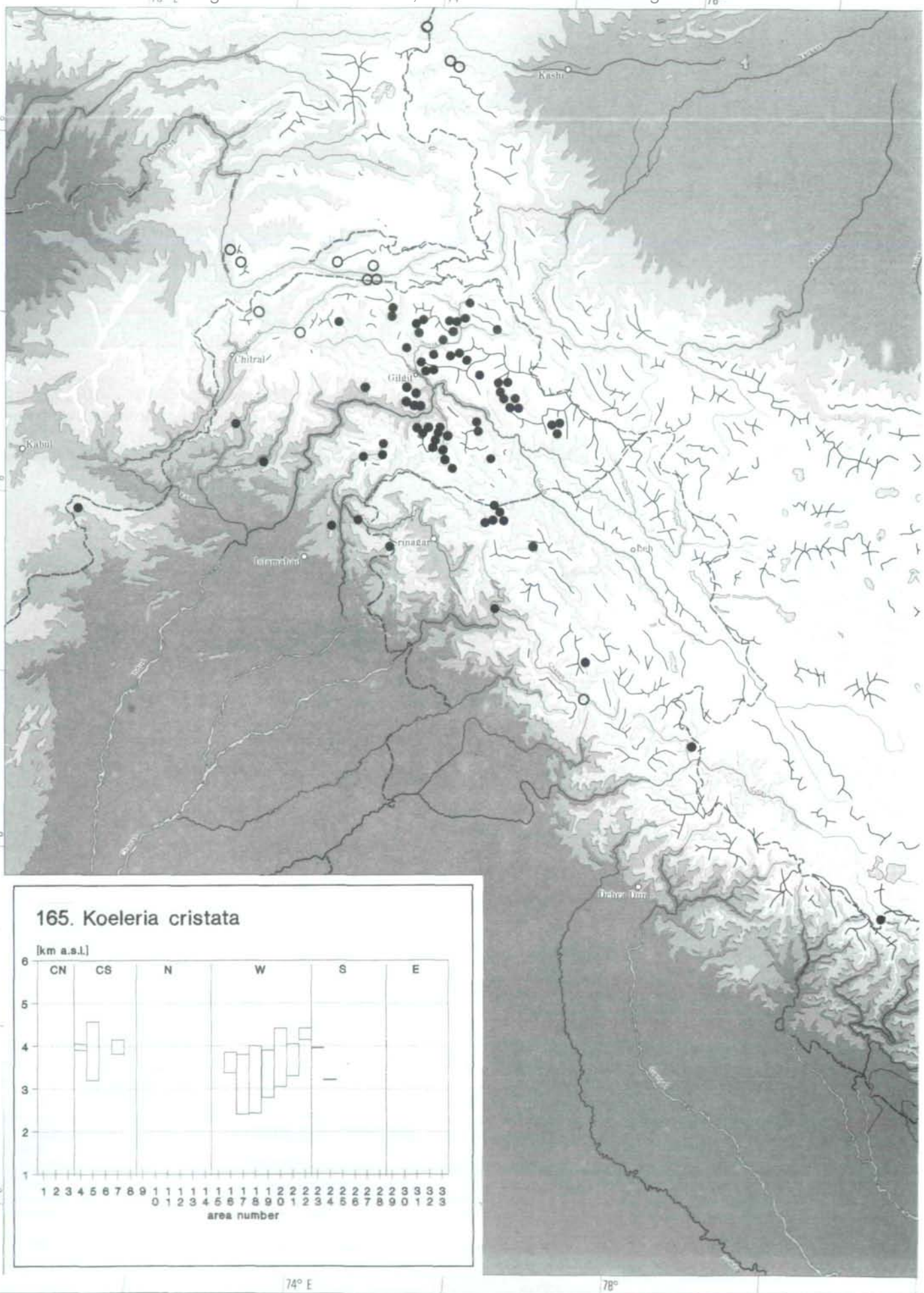

165. Koeleria cristata

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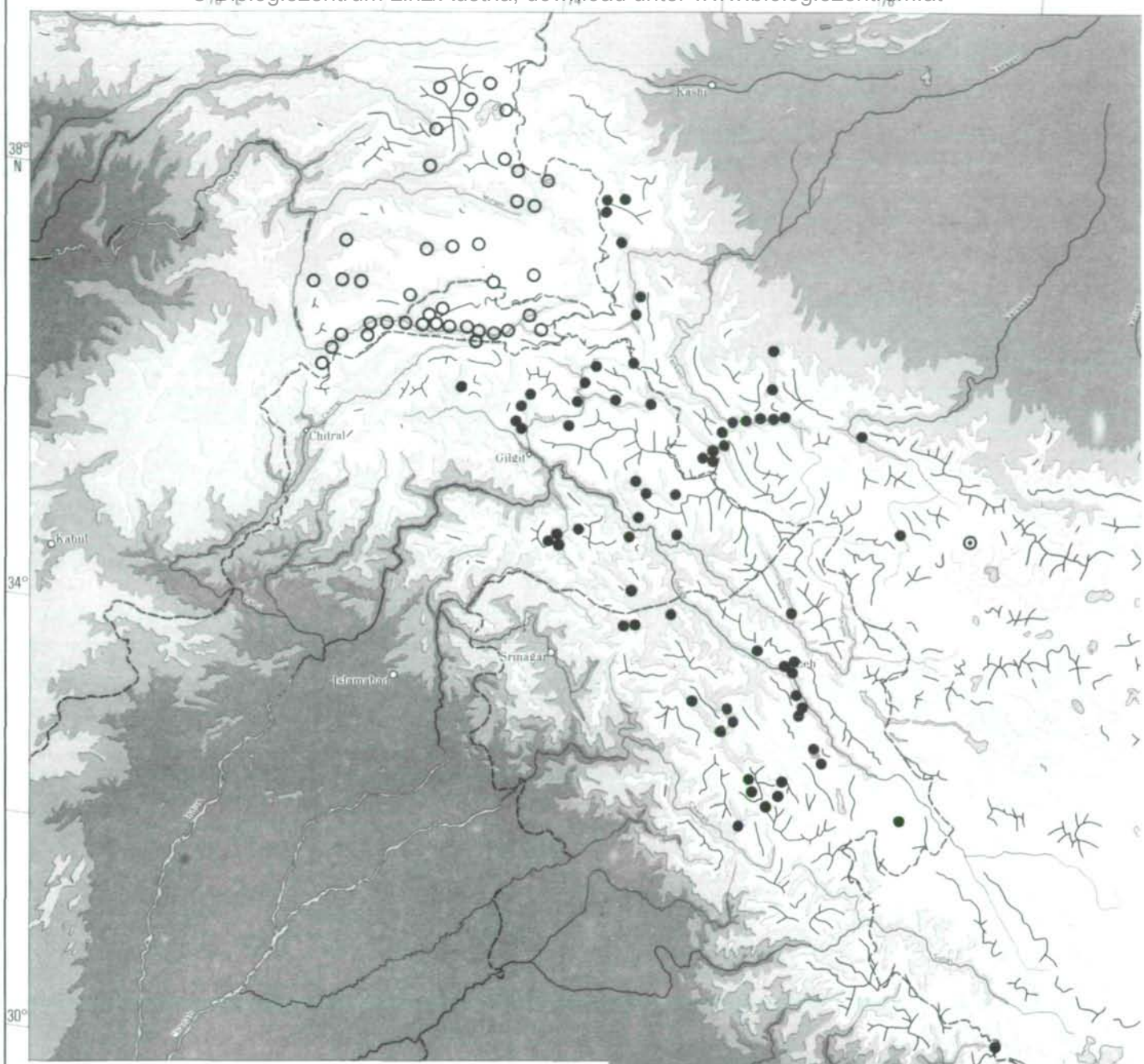
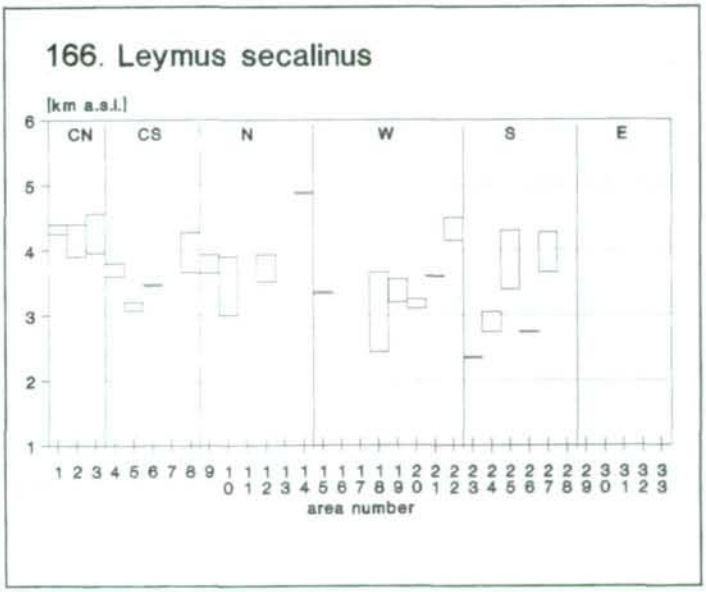


166. Leymus secalinus



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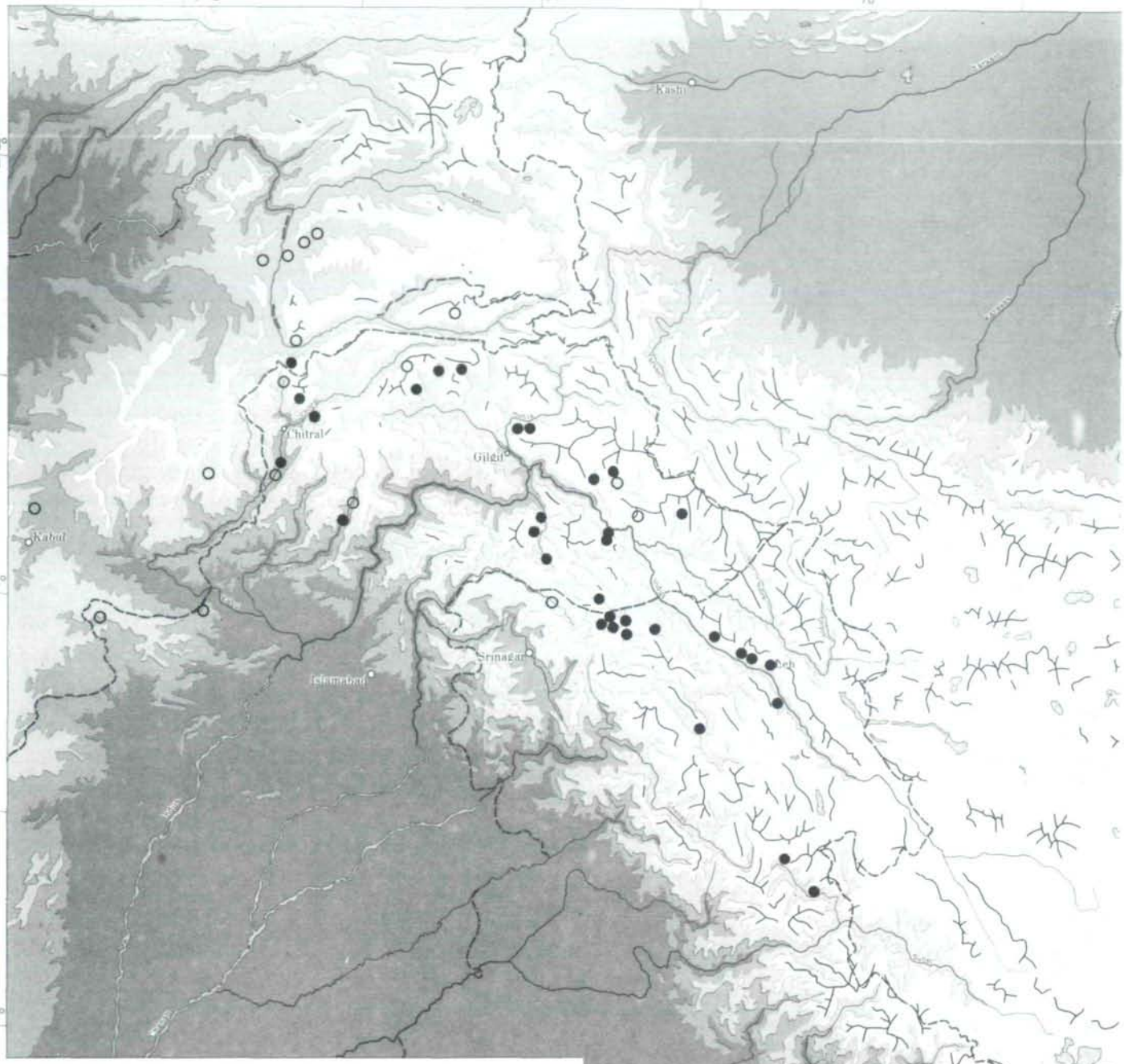
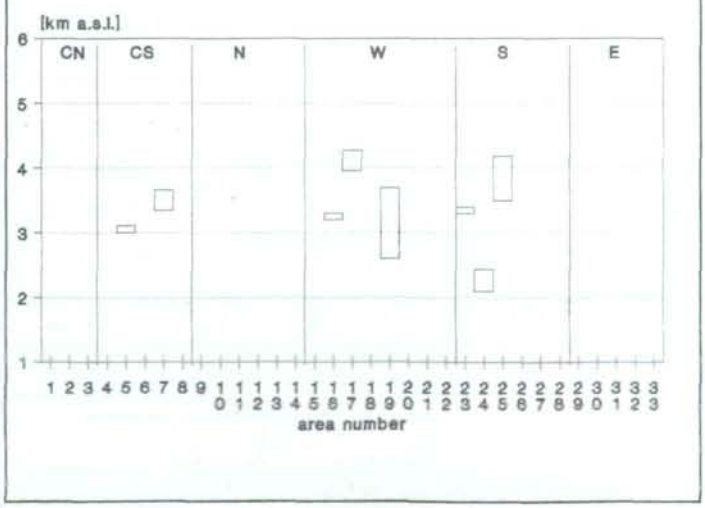


167. Melica persica



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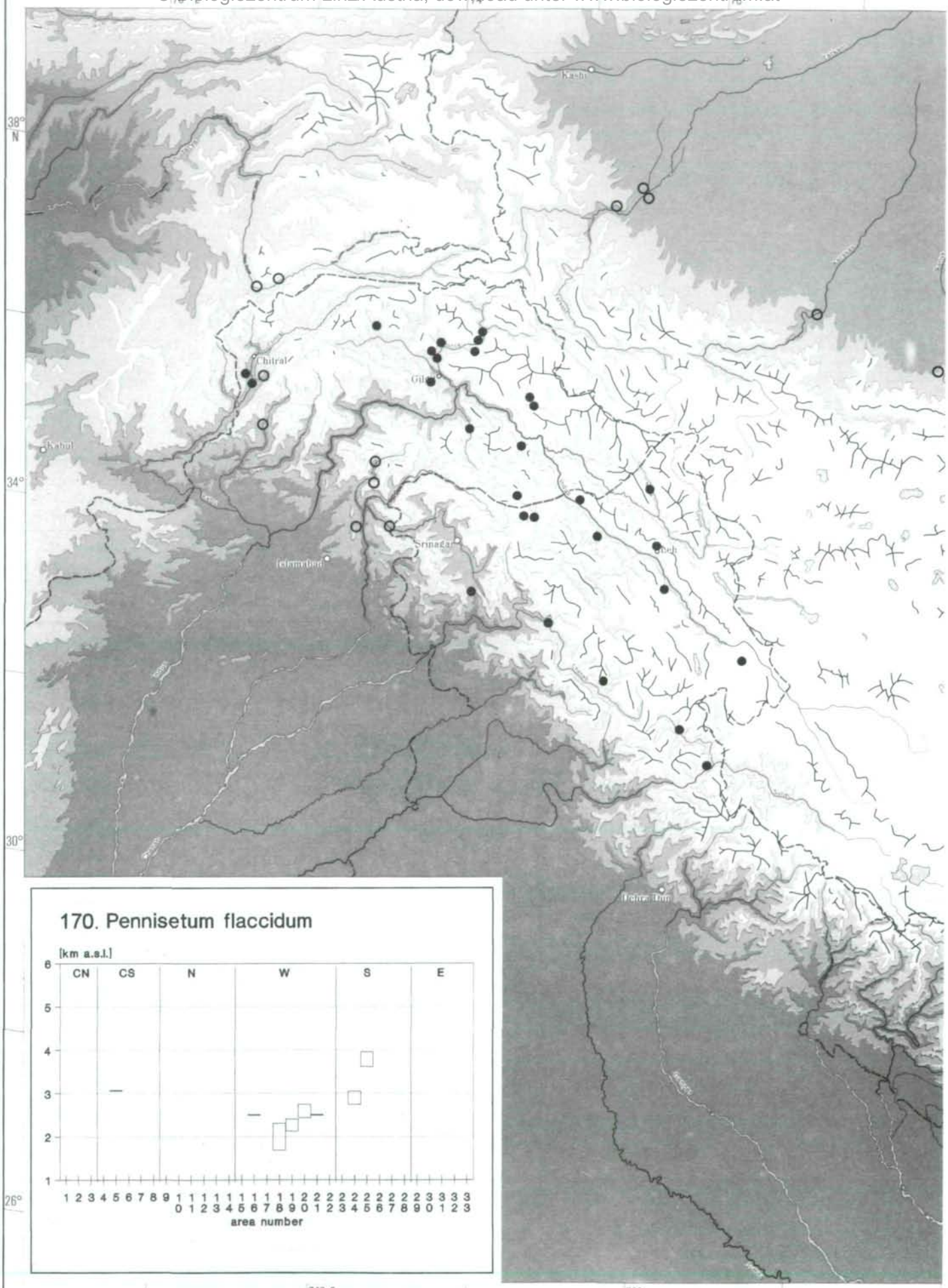

170. Pennisetum flaccidum

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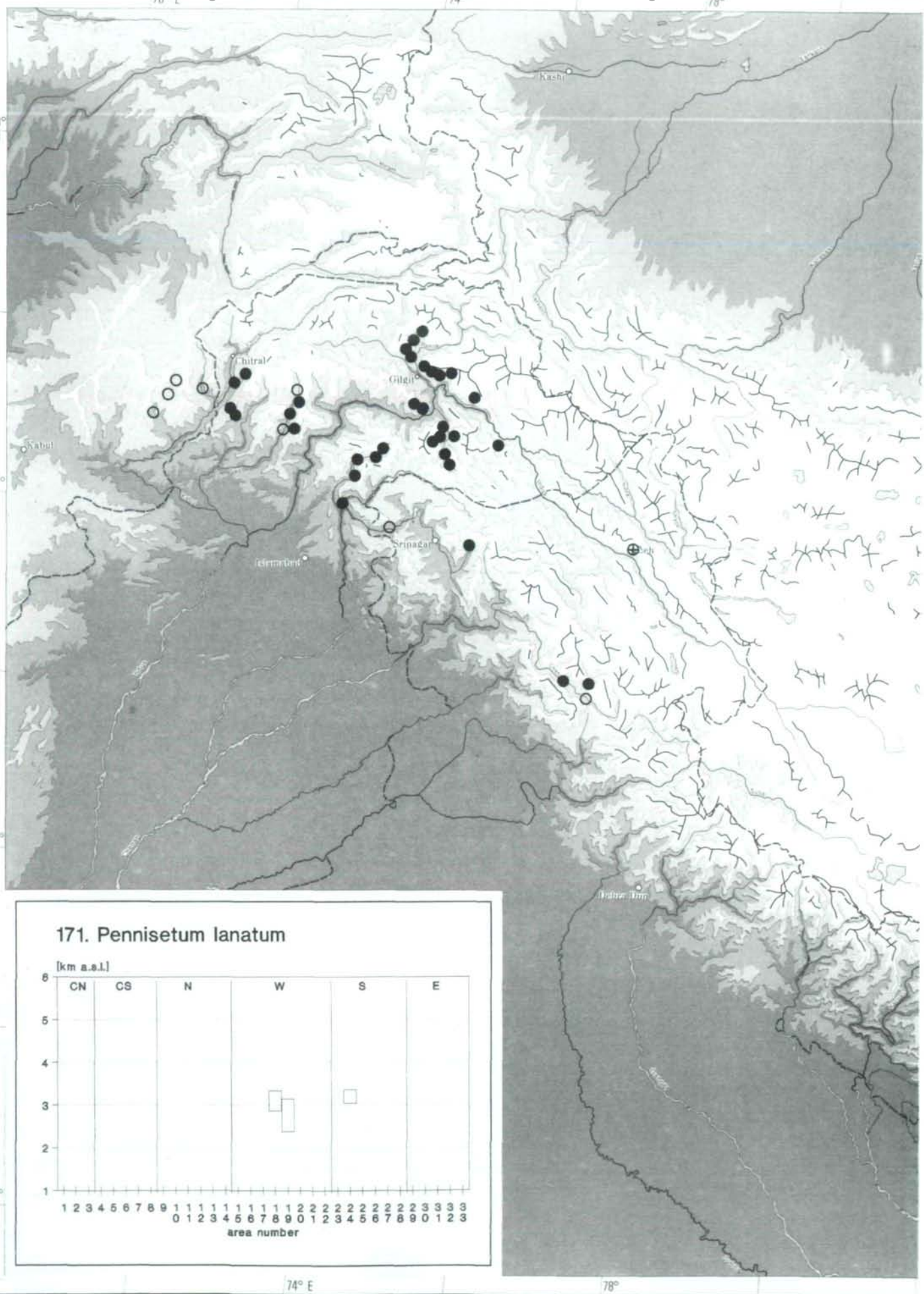

171. Pennisetum lanatum

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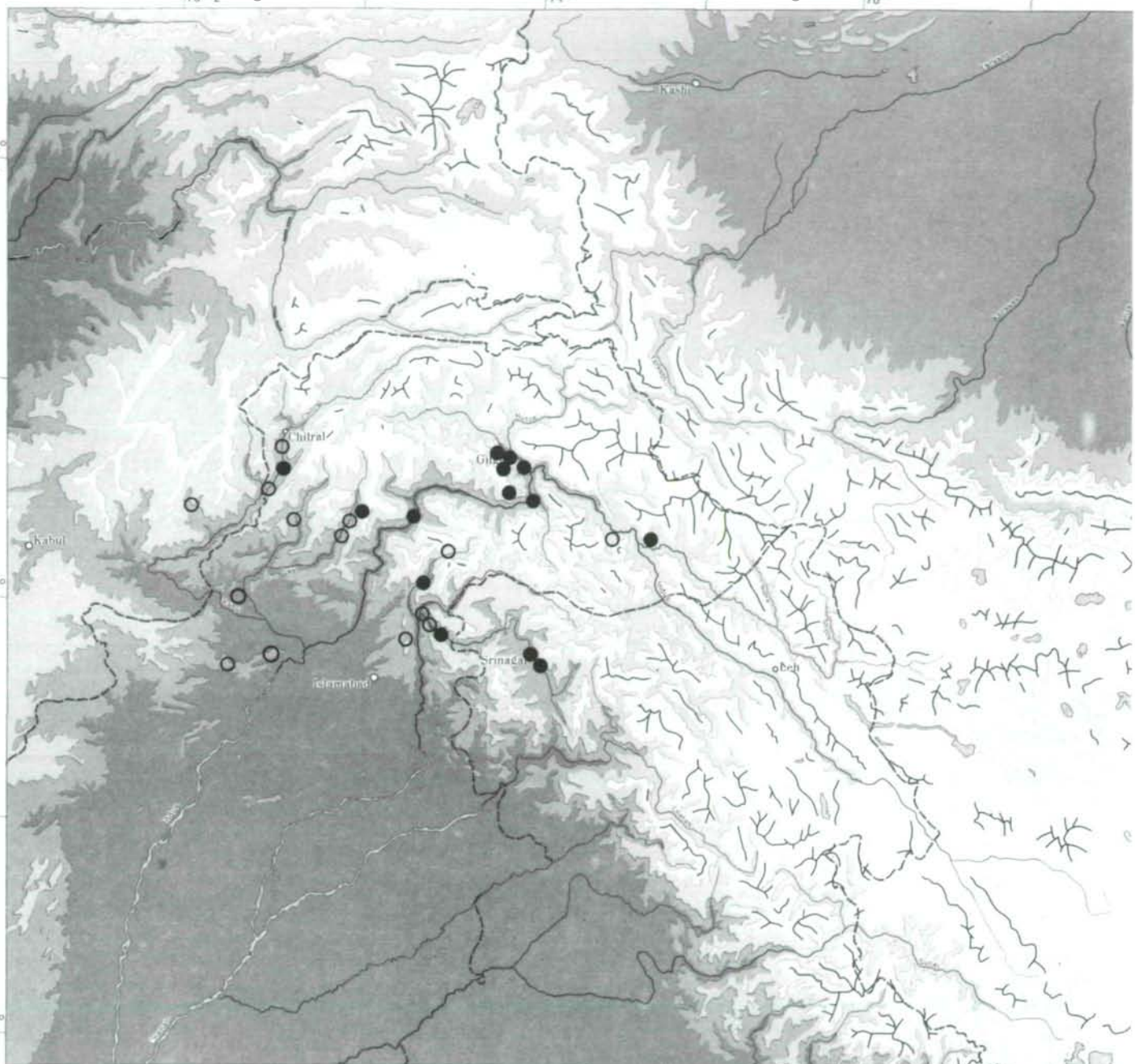
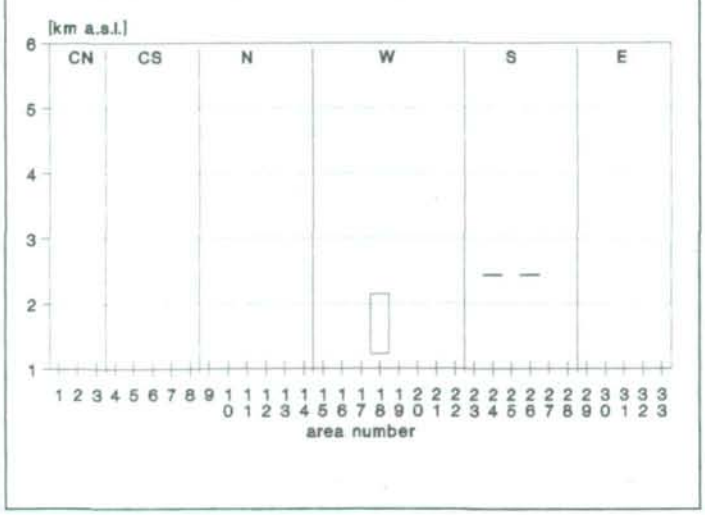


172. Pennisetum orientale



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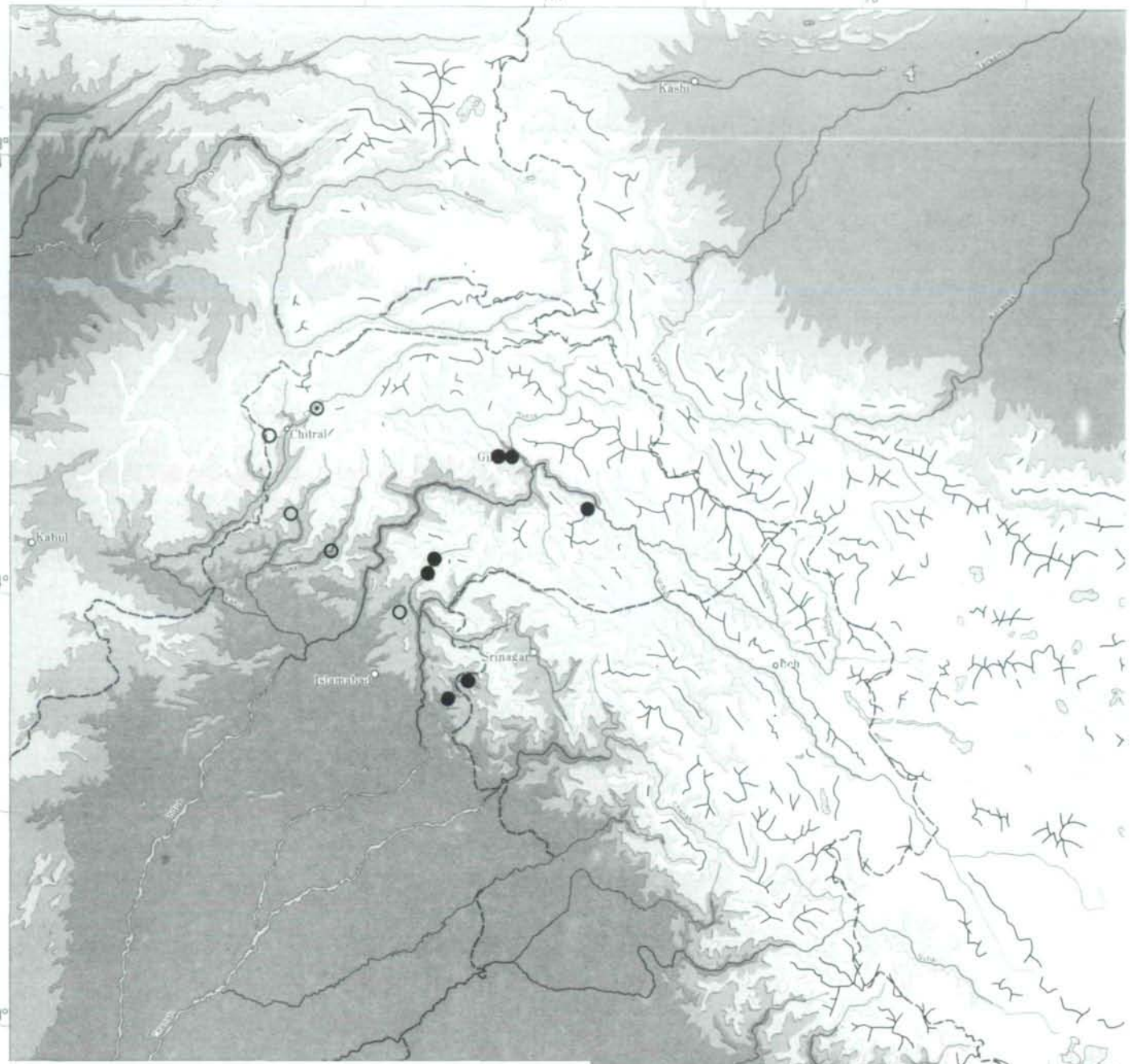
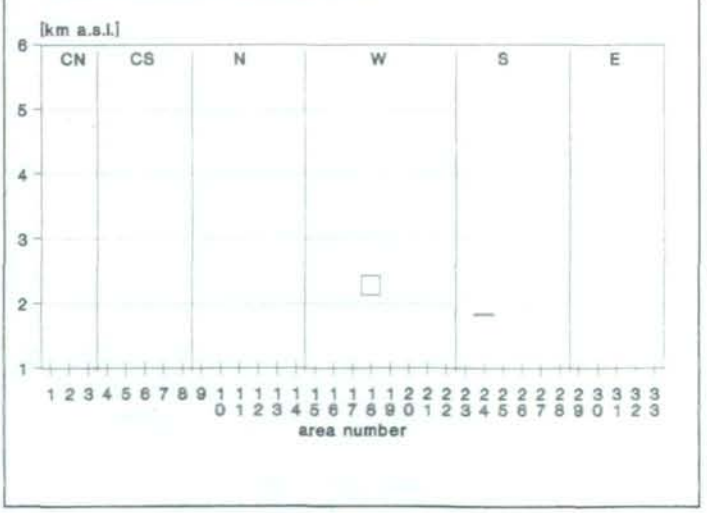


175. Phleum himalaicum



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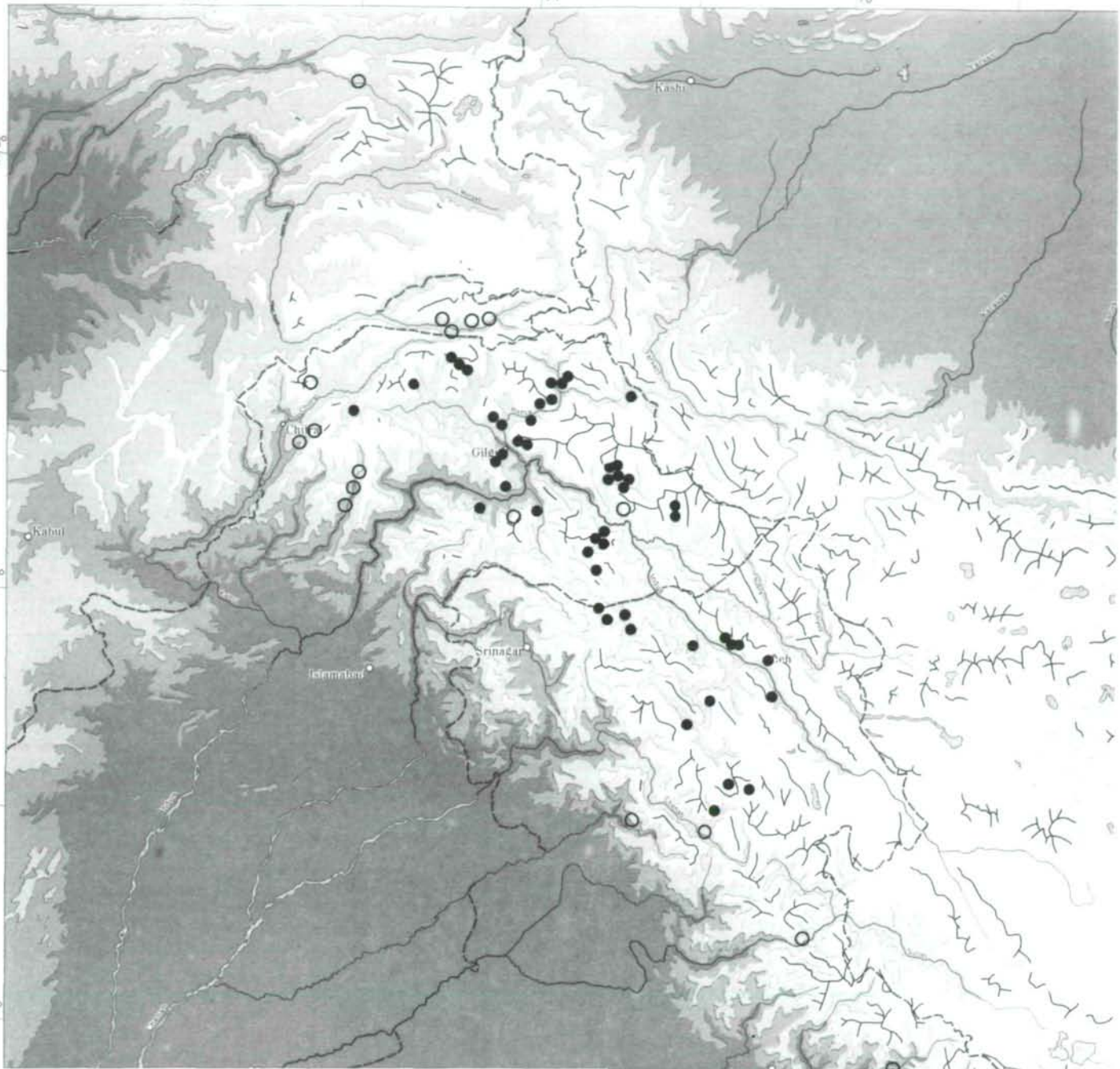
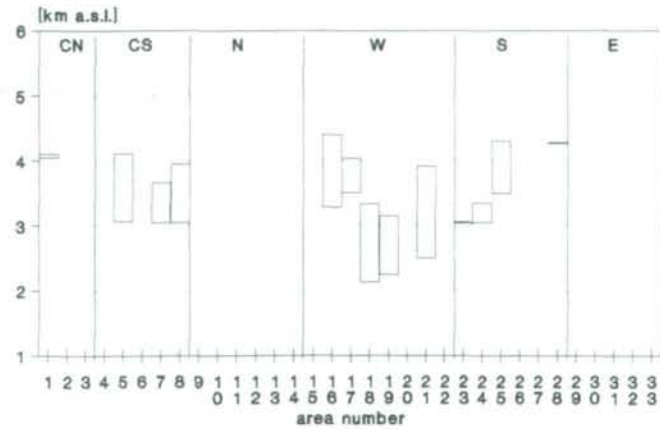


179. Piptaterum gracile



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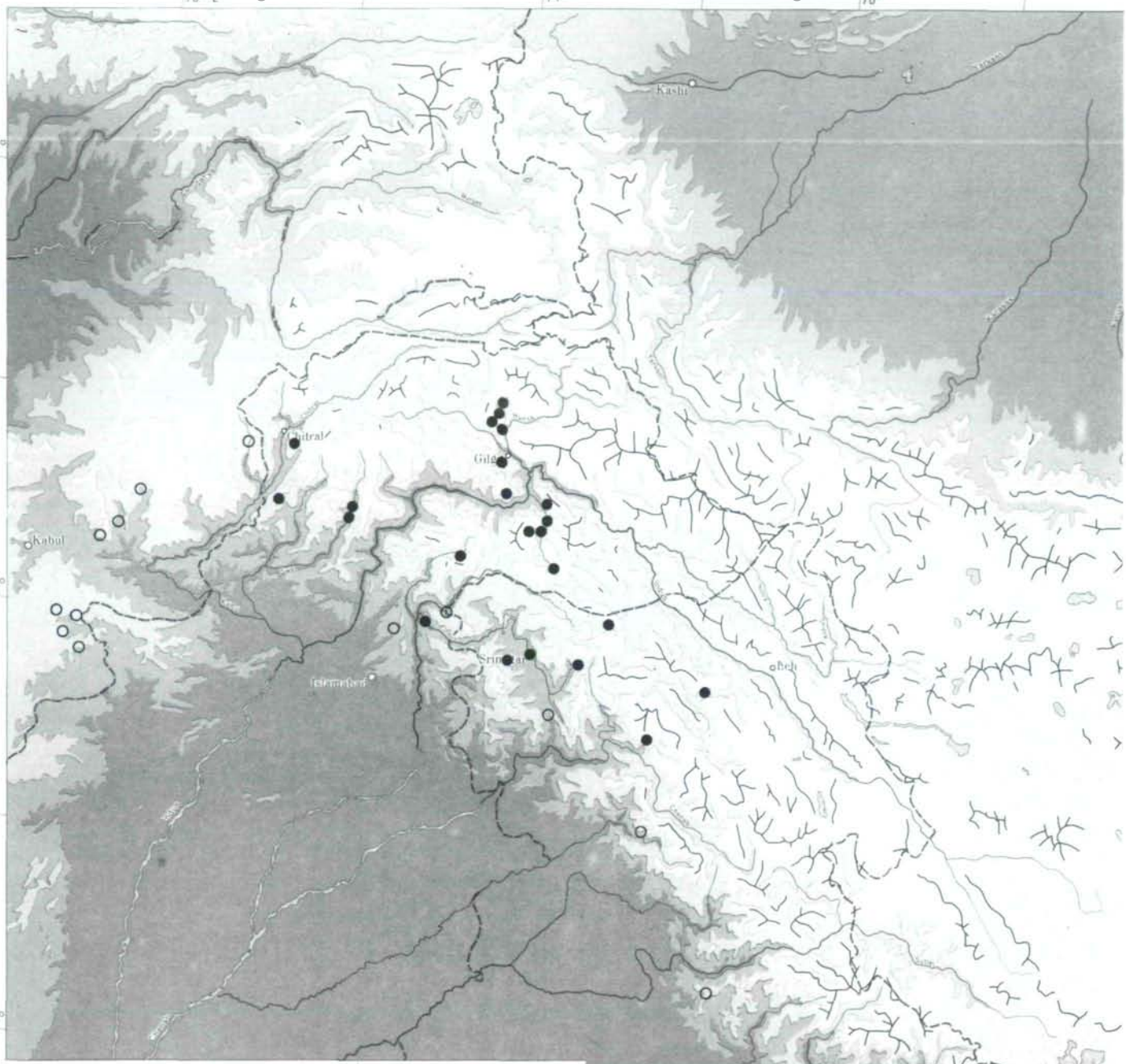
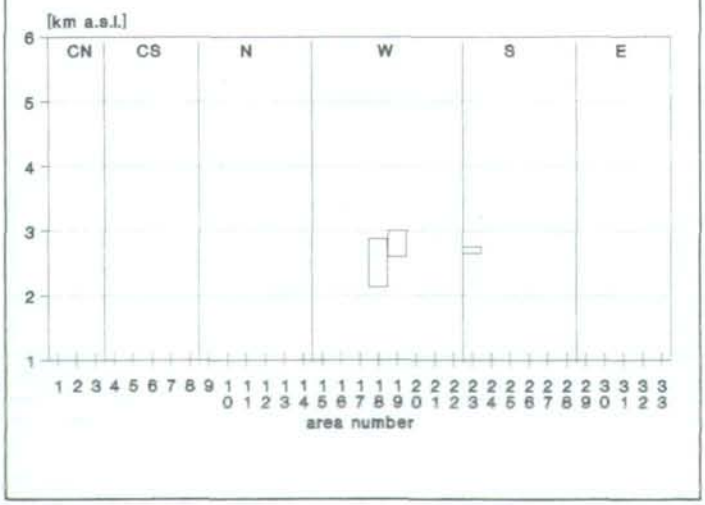


181. Piptatherum munroi



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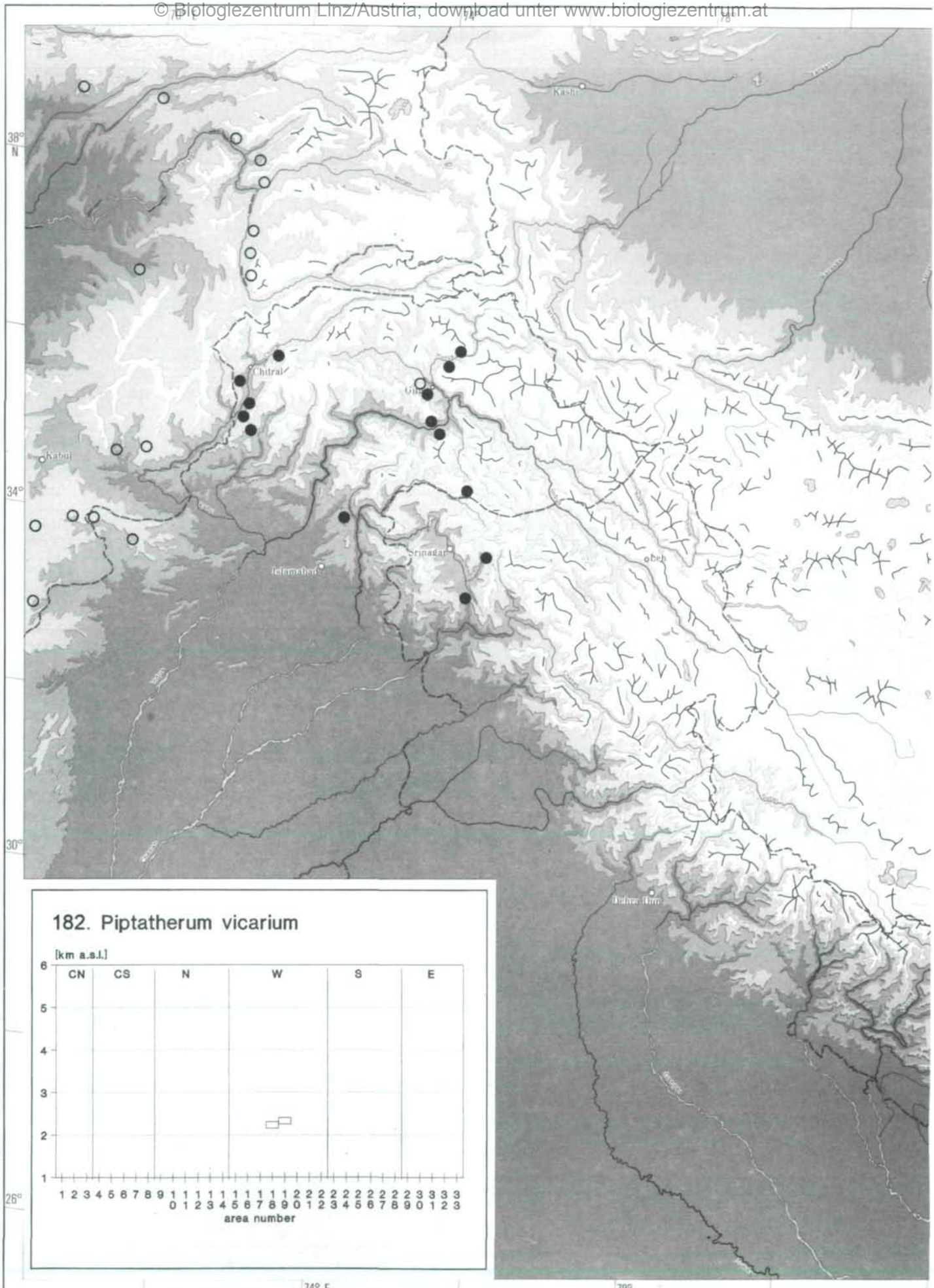

182. Piptatherum vicarium

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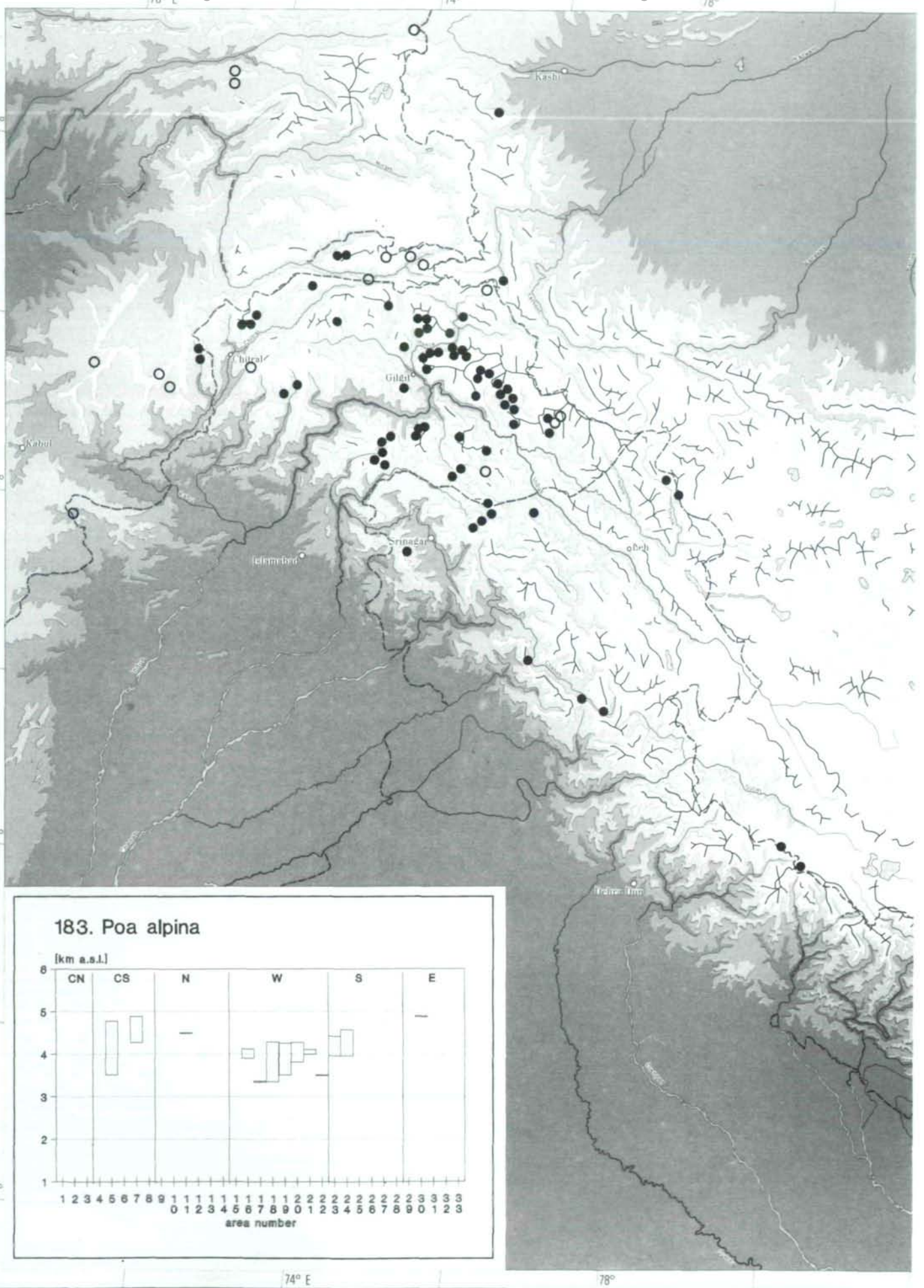

183. Poa alpina

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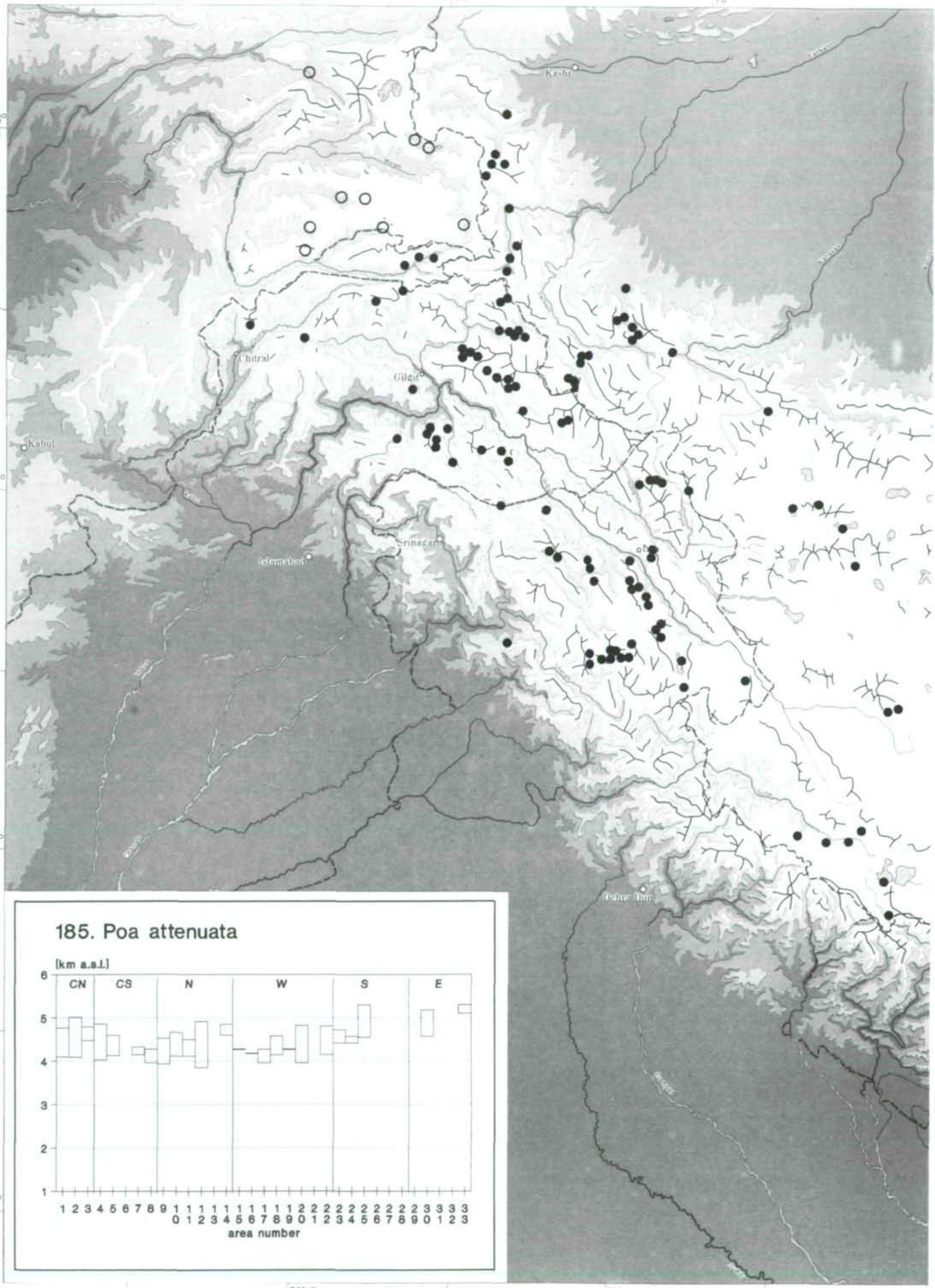

185. Poa attenuata

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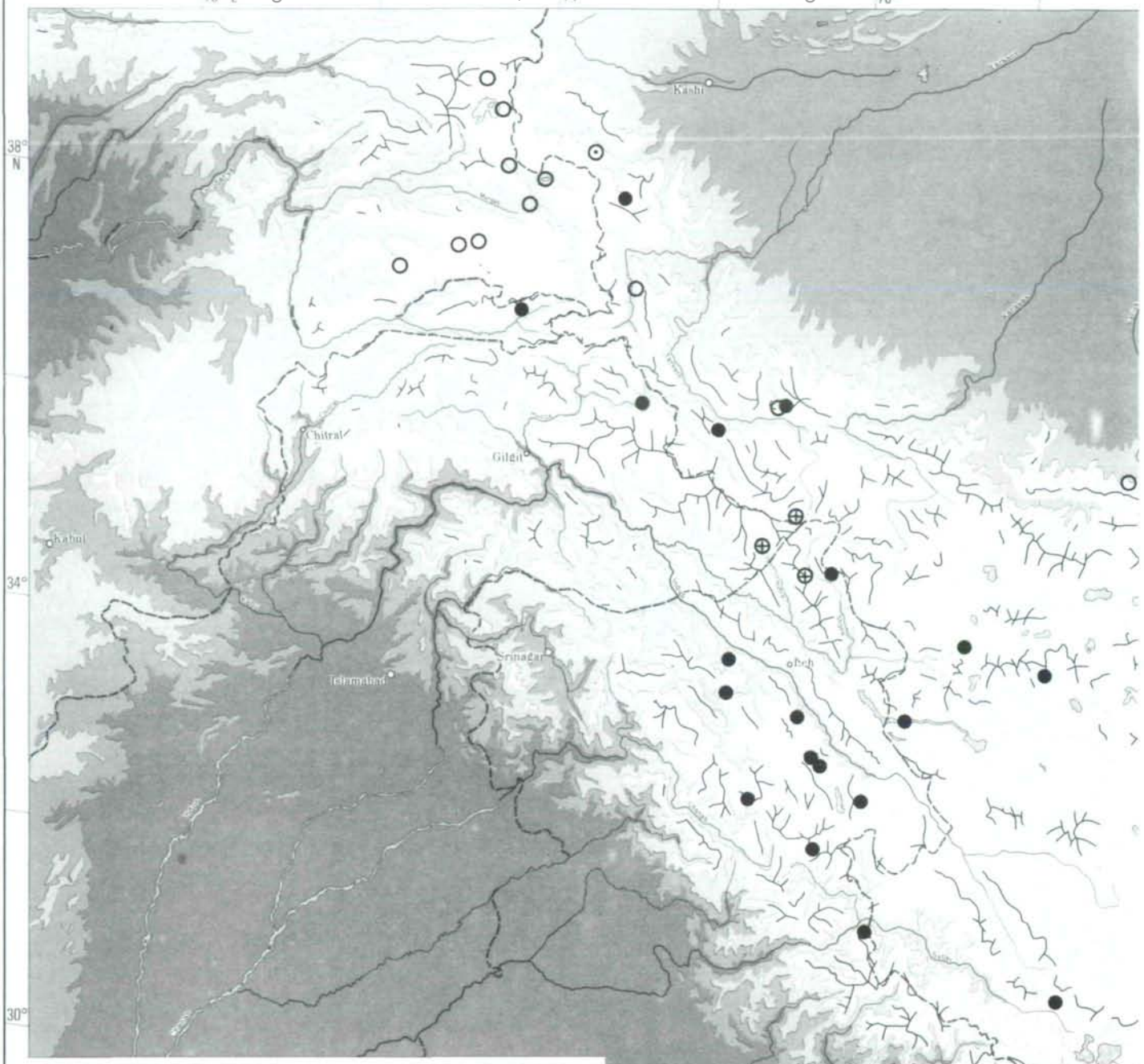
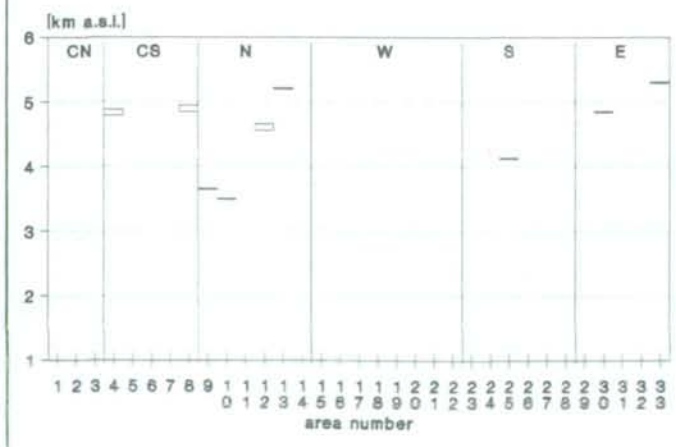


187. Poa calliopsis



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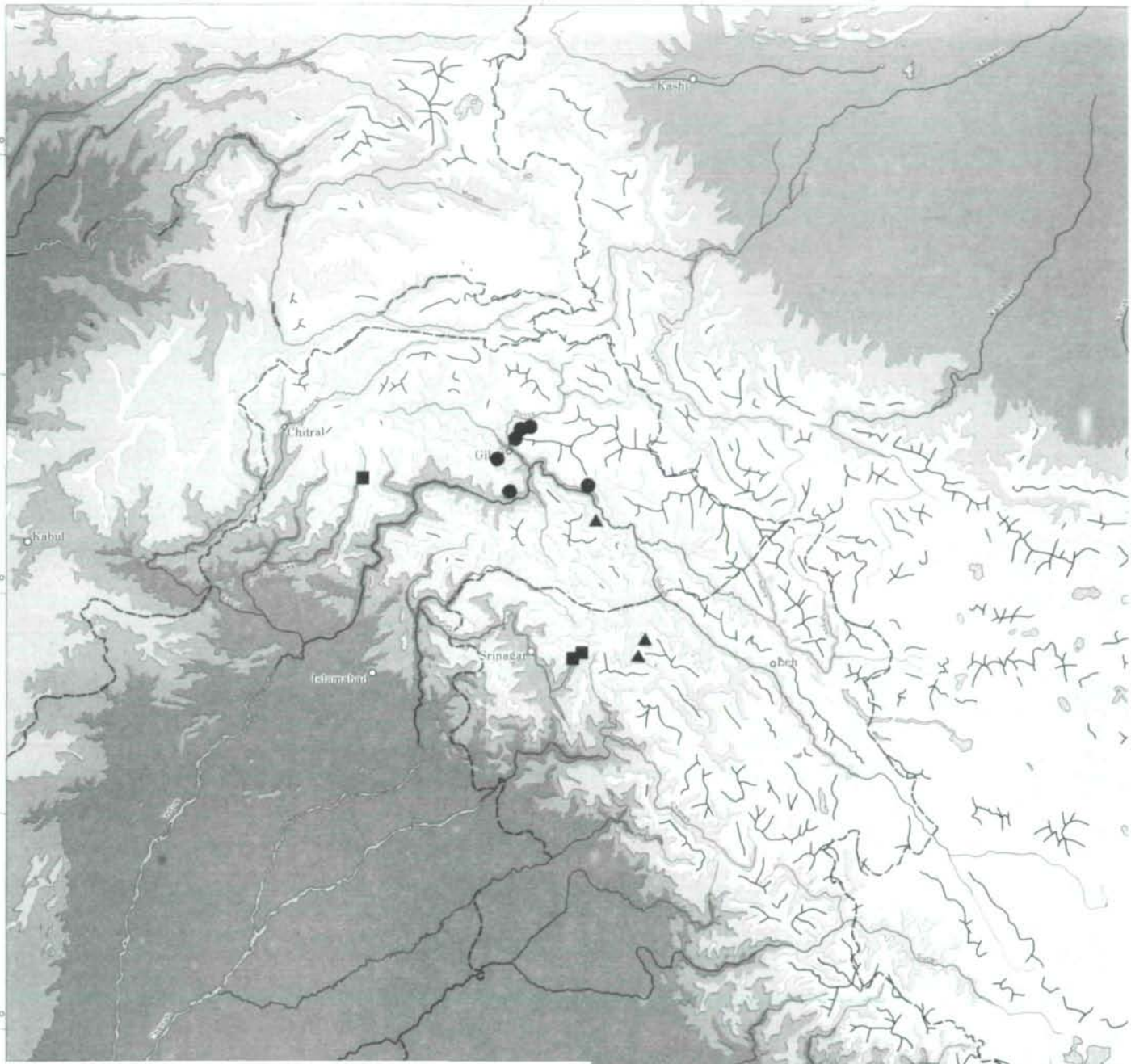
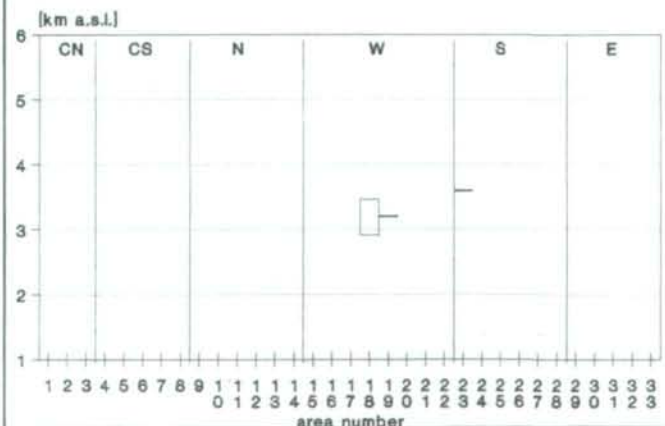


● 188. Poa gilgitica



■ Poa falconeri

▲ 195. Poa suruana

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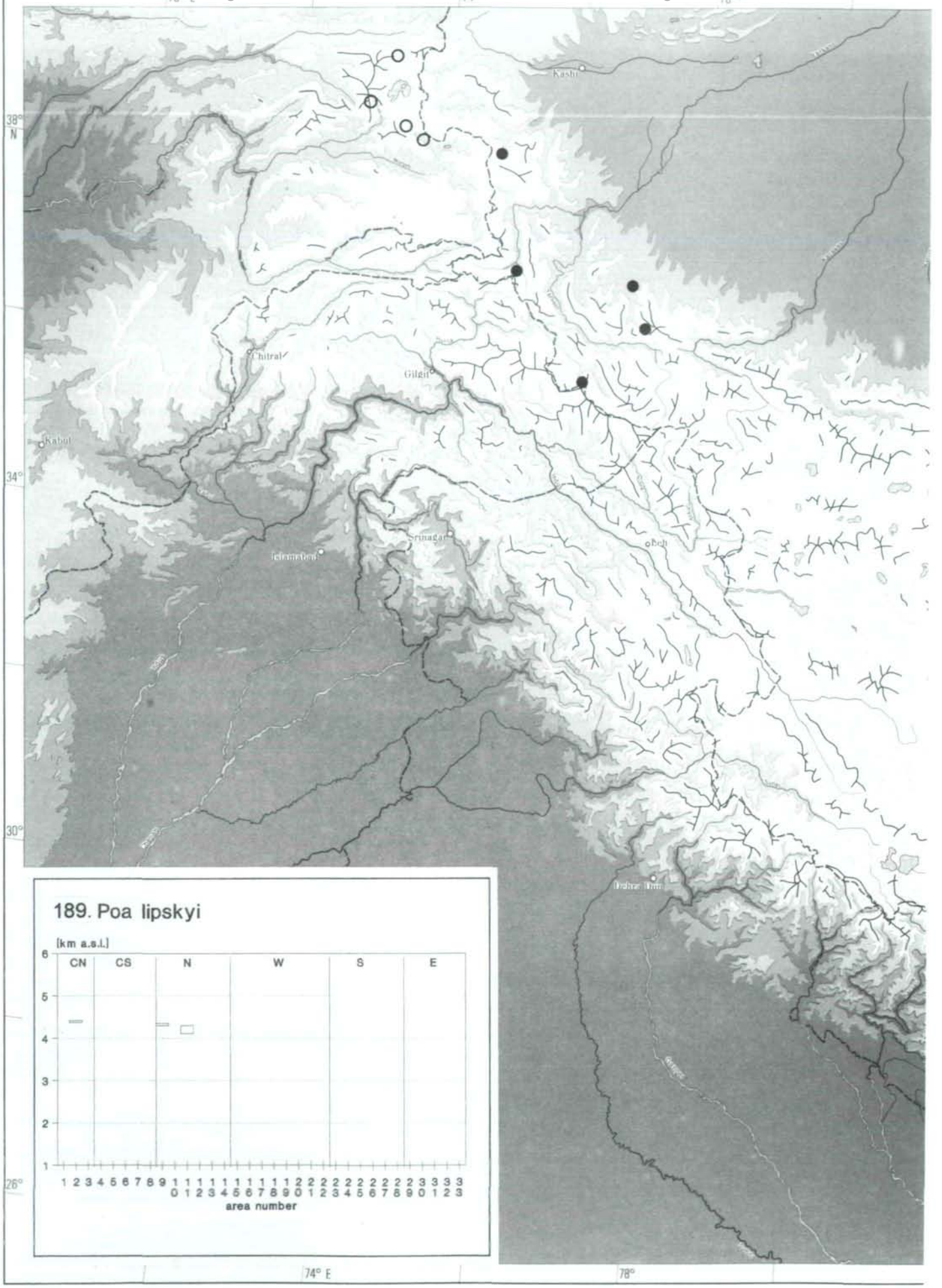

189. Poa lipskyi

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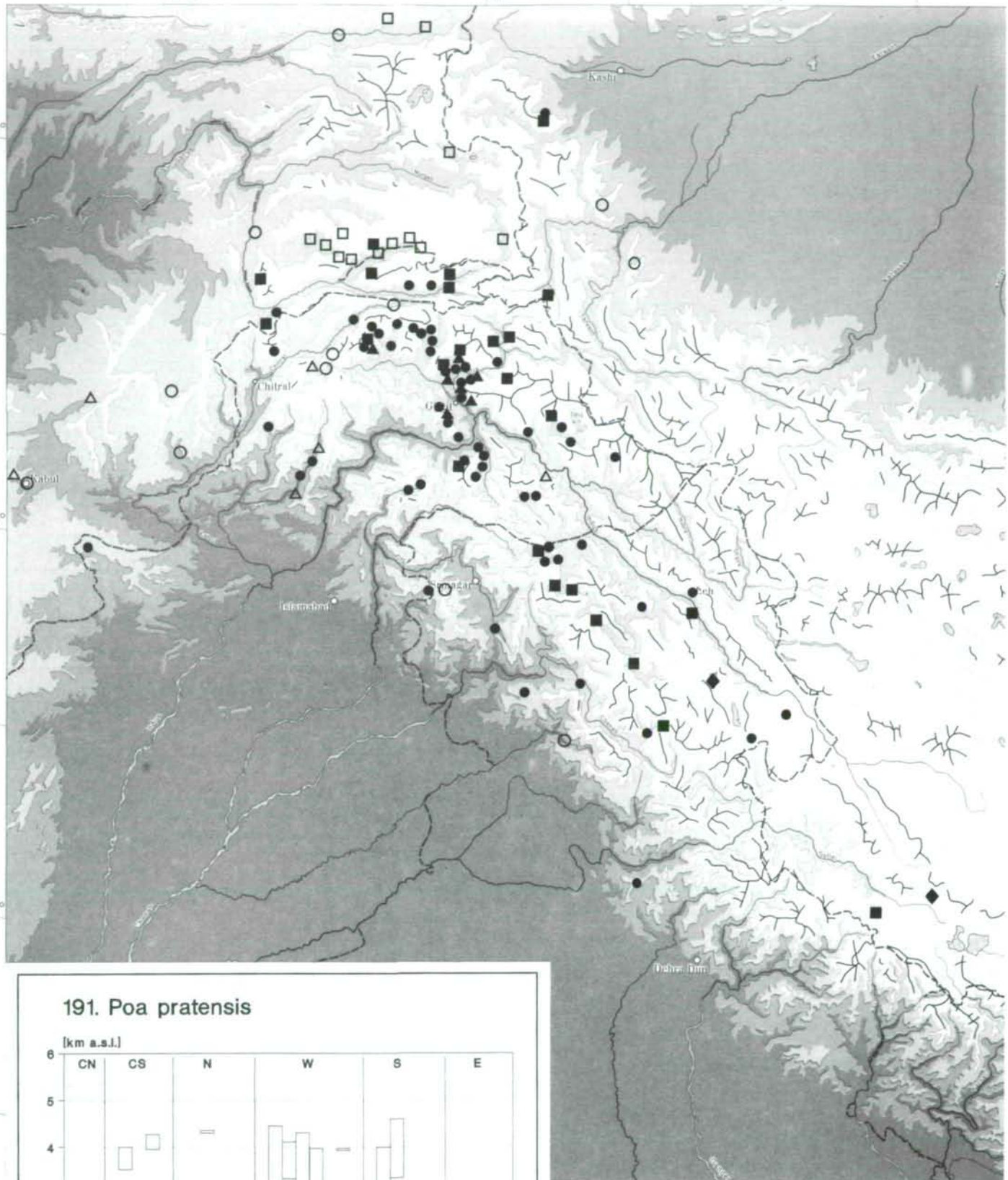
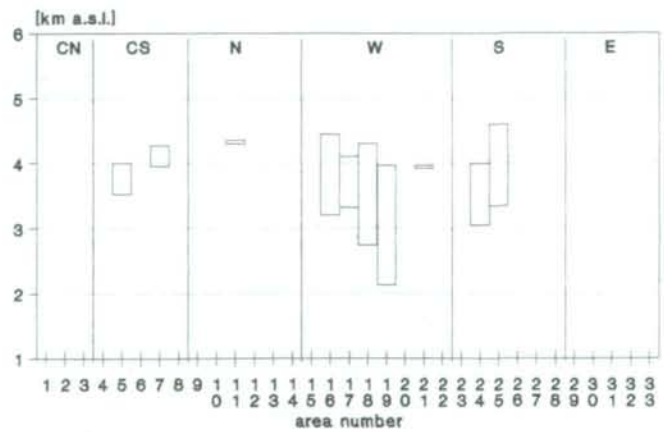


191. Poa pratensis



Poa pratensis
- ▲ subsp. angustifolia
- ● subsp. pratensis
- ■ subsp. pruinosa
- ◆ subsp. staintonii

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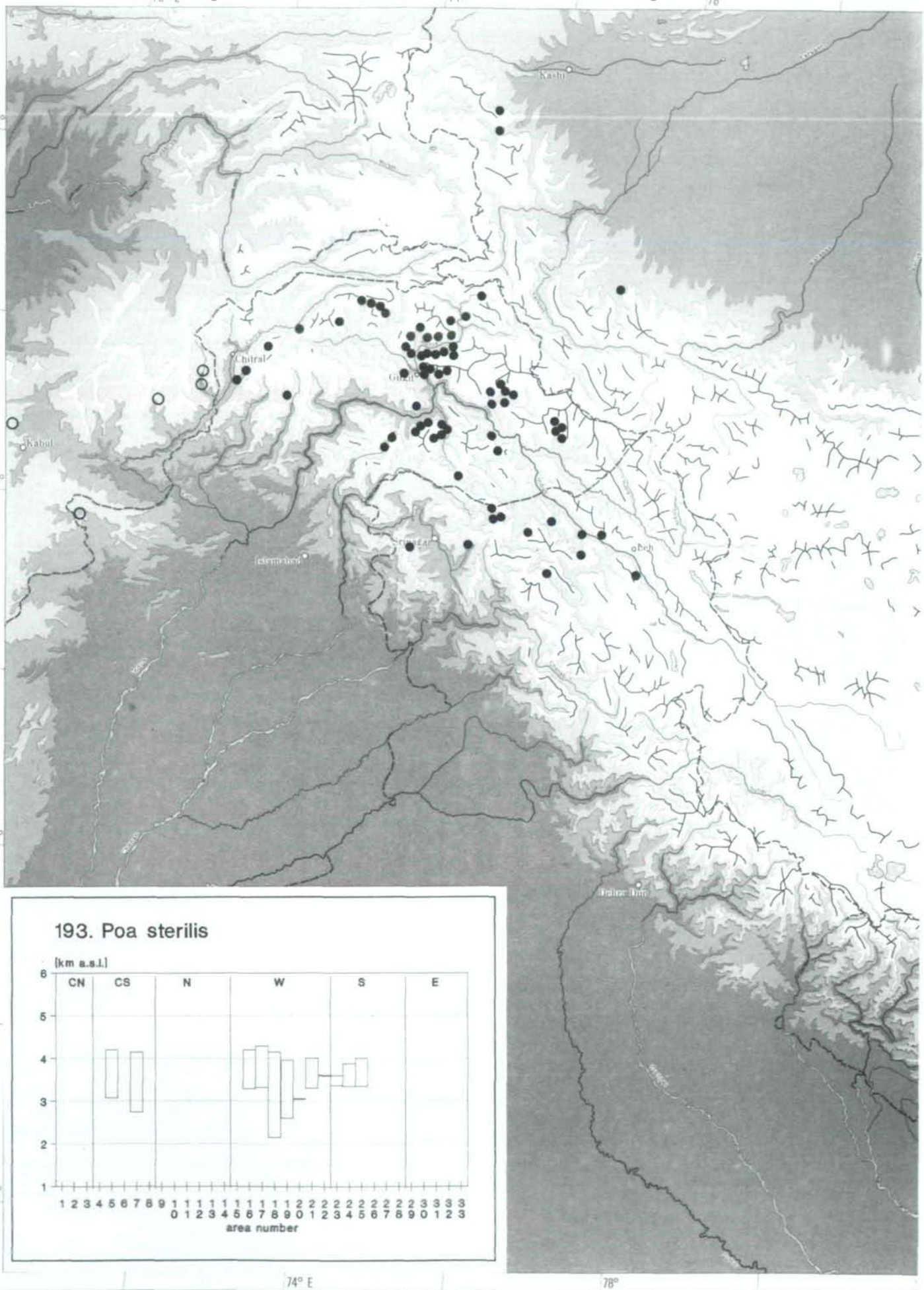

193. Poa sterilis

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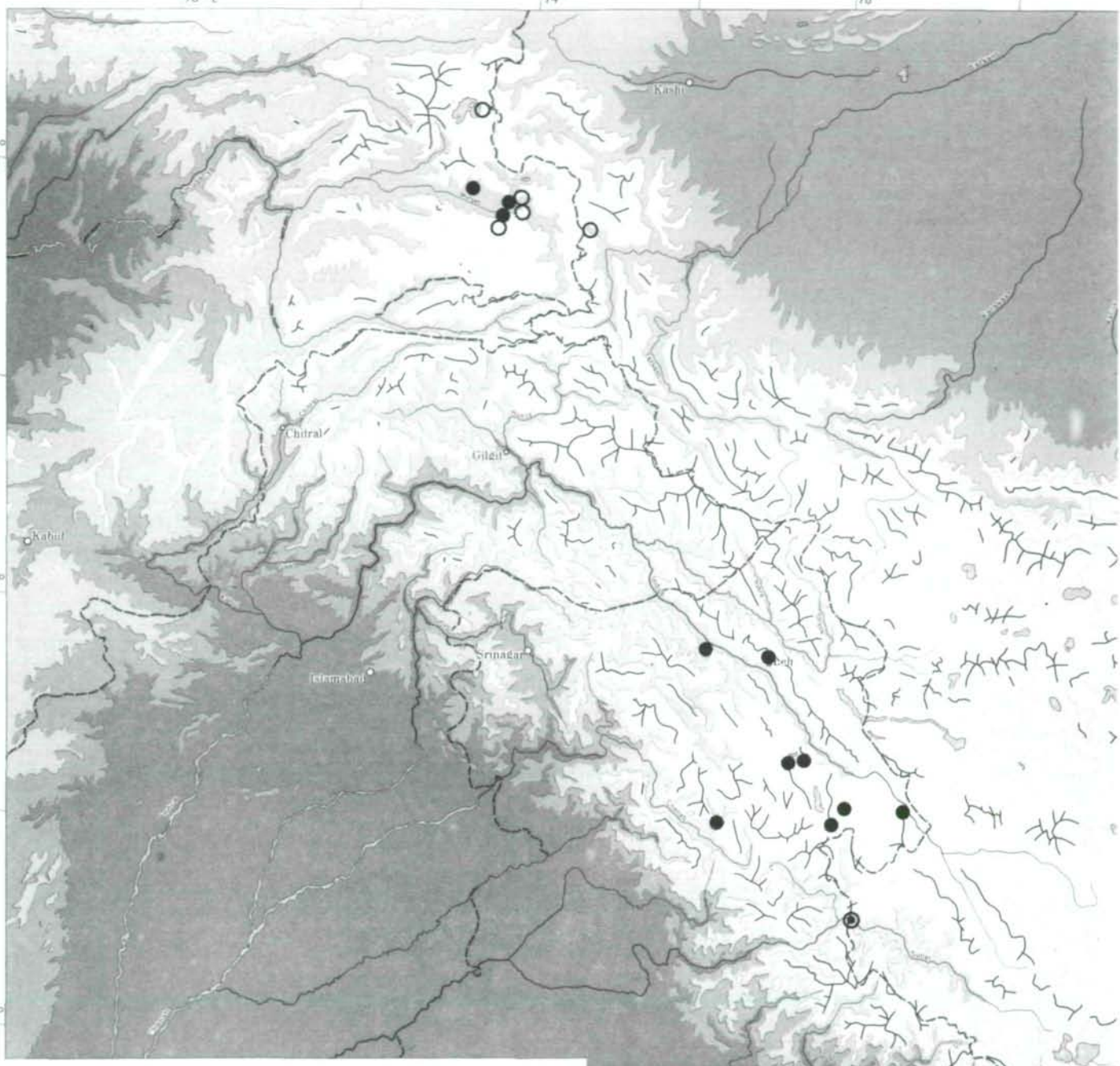
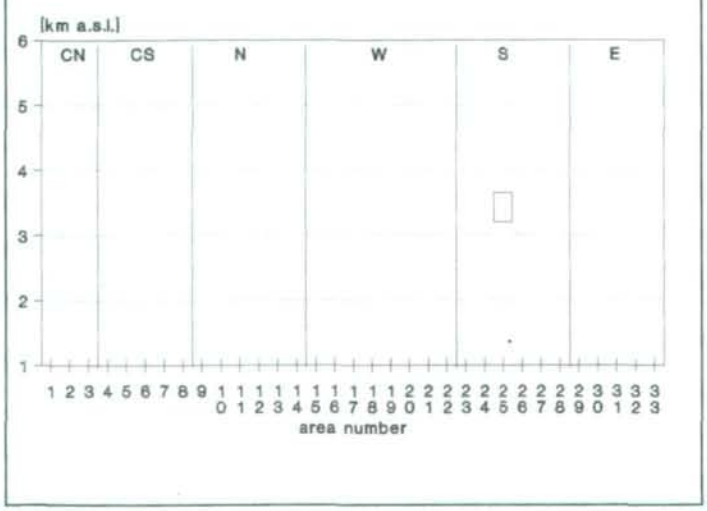


196. Poa tibetica



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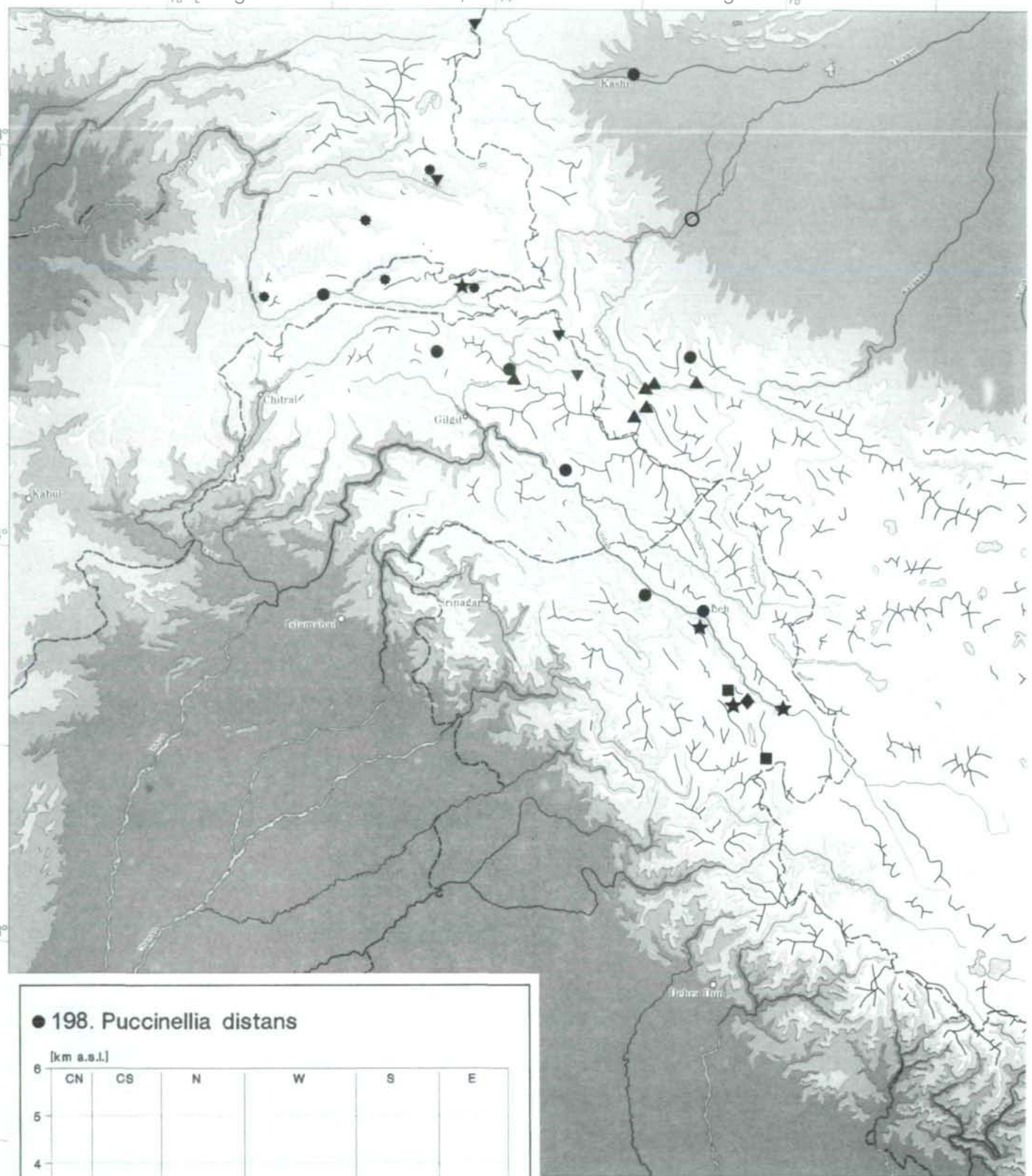
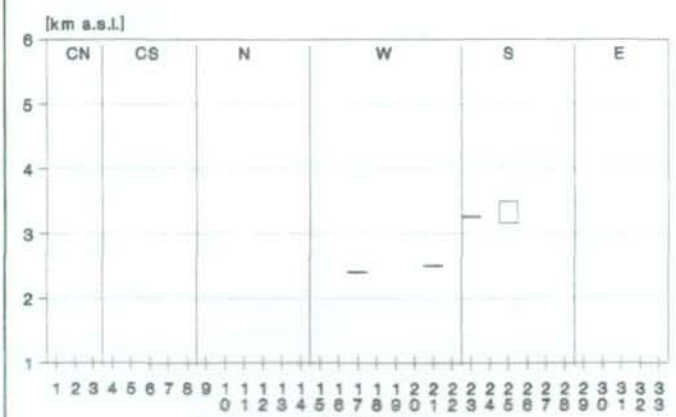


● 198. Puccinellia distans



▼ 201. Puccinellia humilis
★ 202. Puccinellia ladakhensis
● Puccinellia pamirica
■ Puccinellia stapfiana
▲ 204. Puccinellia tenuiflora
◆ 205. Puccinellia thomsonii

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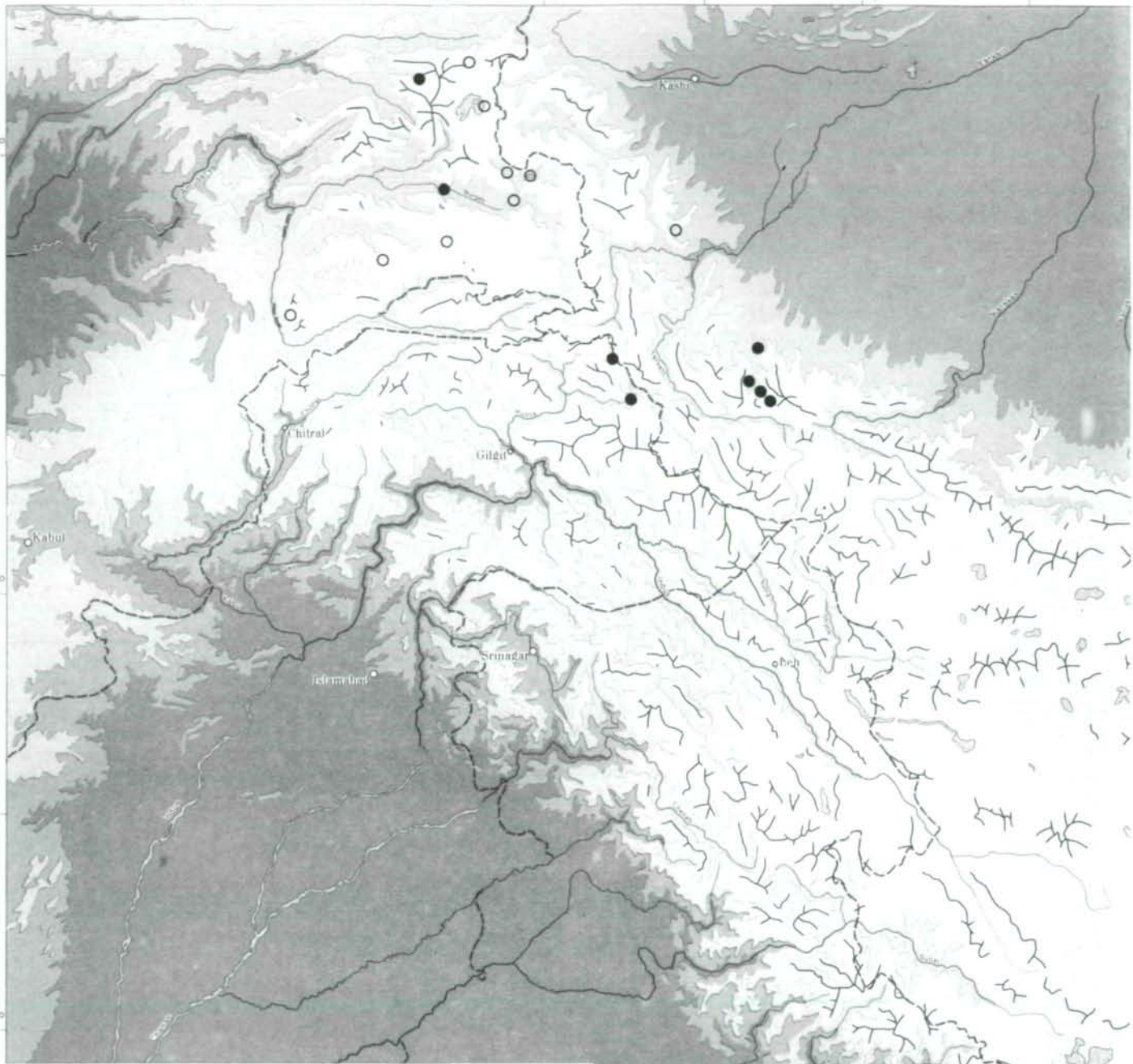
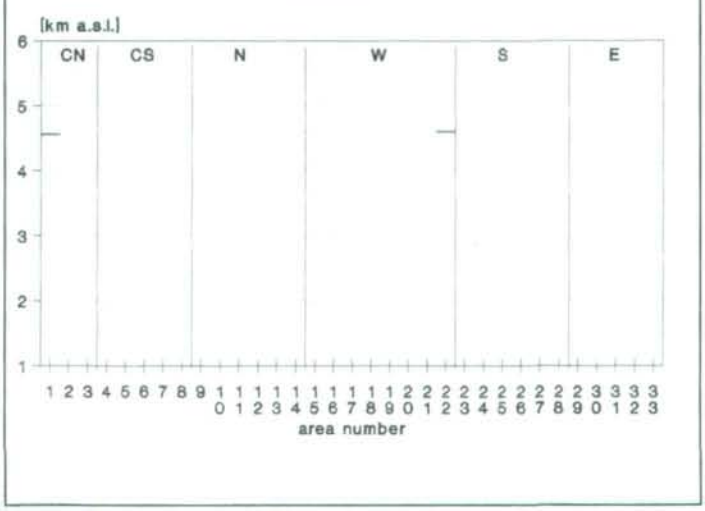


199. Puccinellia hackeliana



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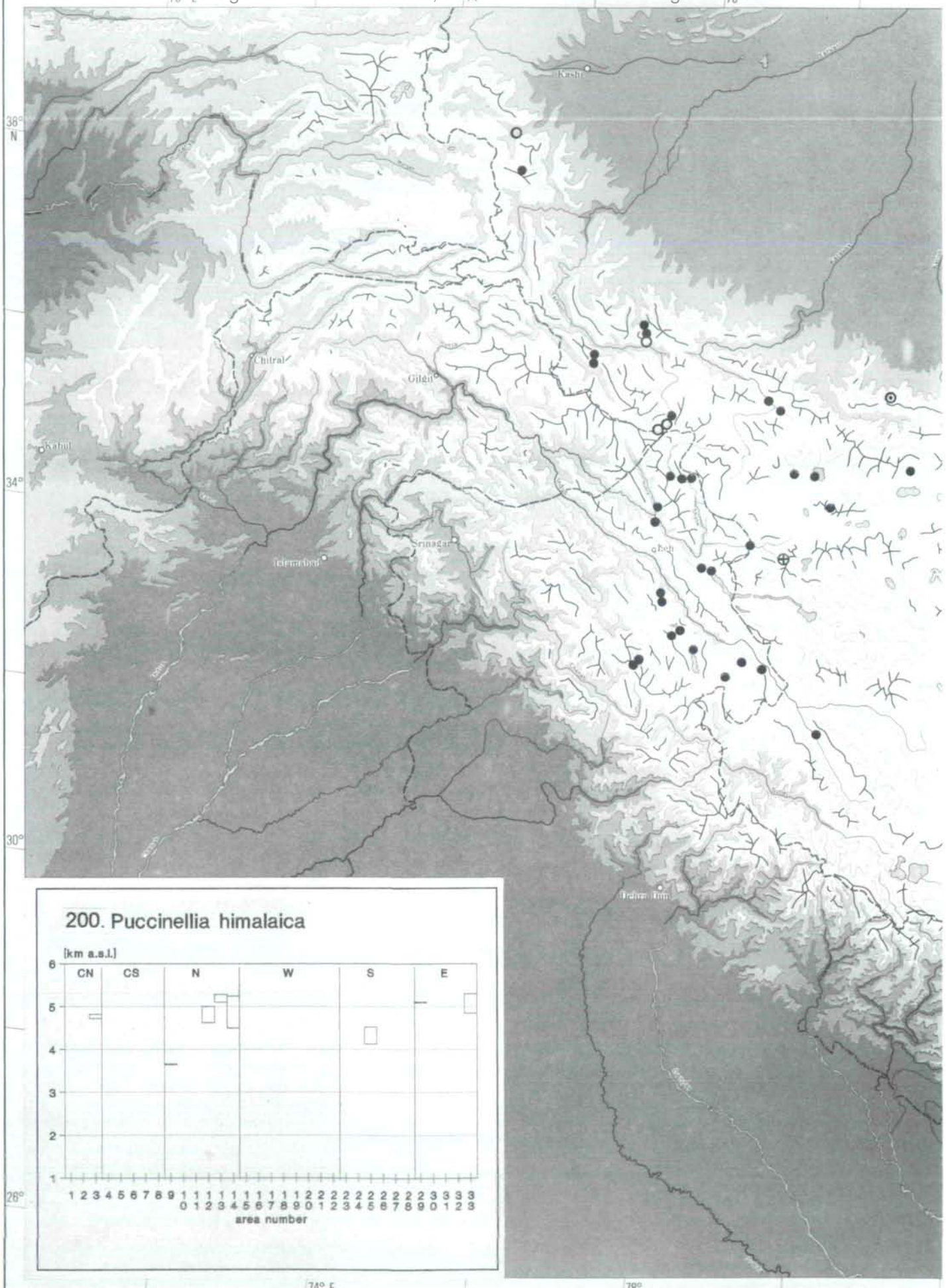

200. Puccinellia himalaica

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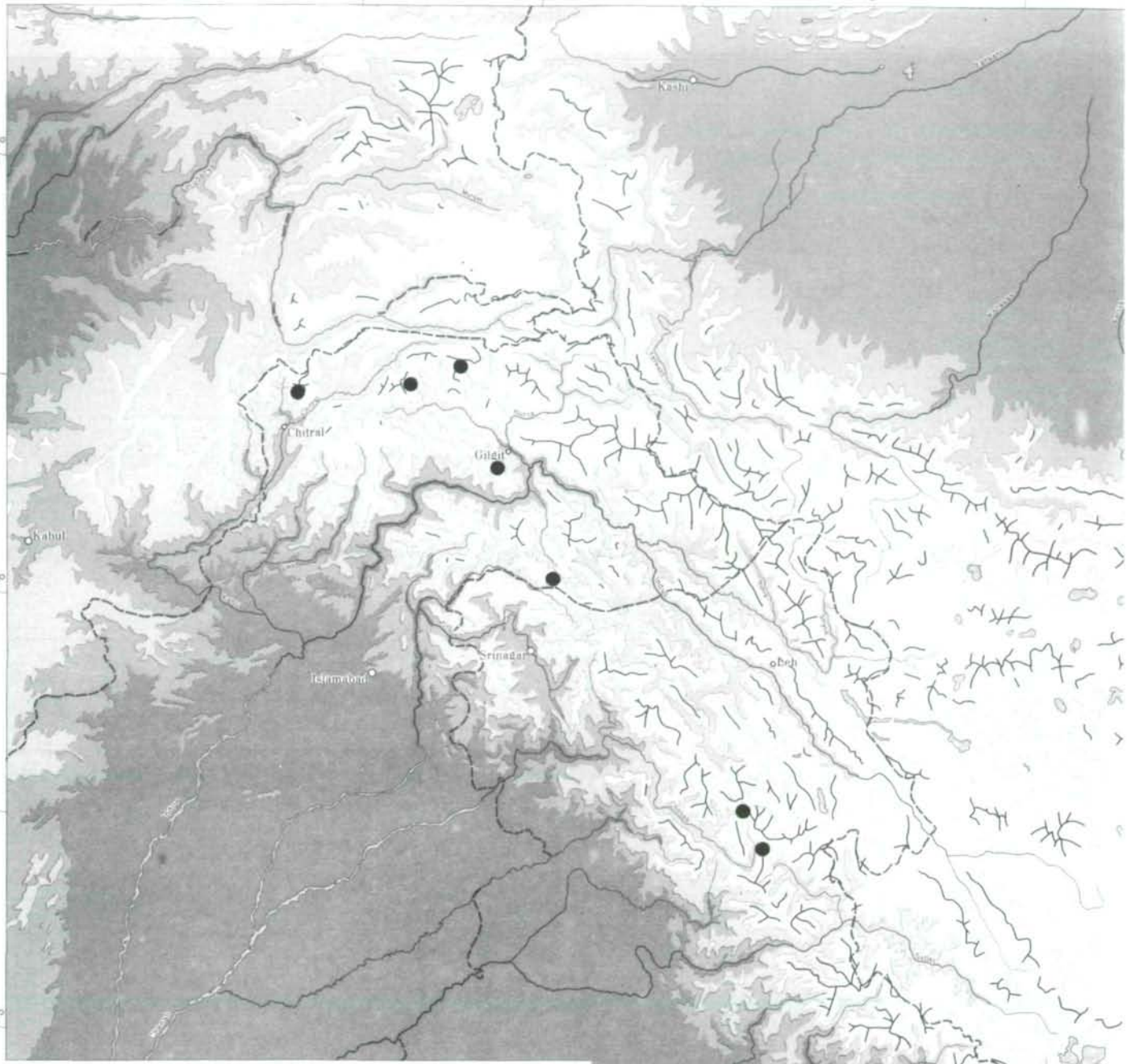
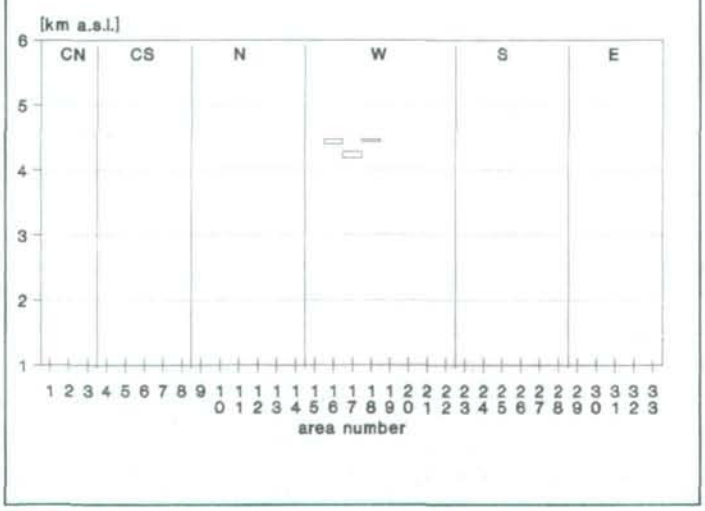


203. Puccinellia minuta



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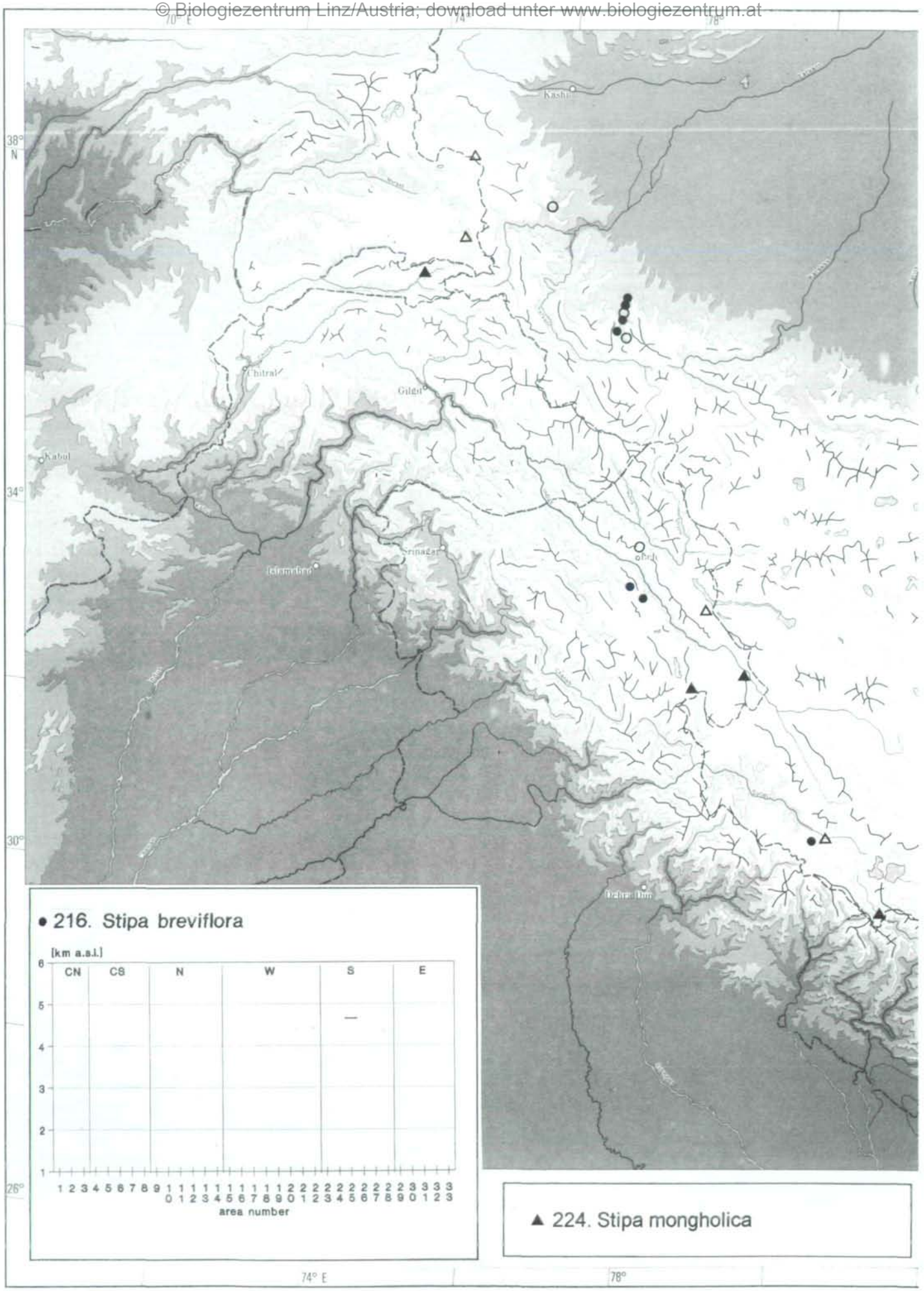

• 216. Stipa breviflora

▲ 224. Stipa mongholica

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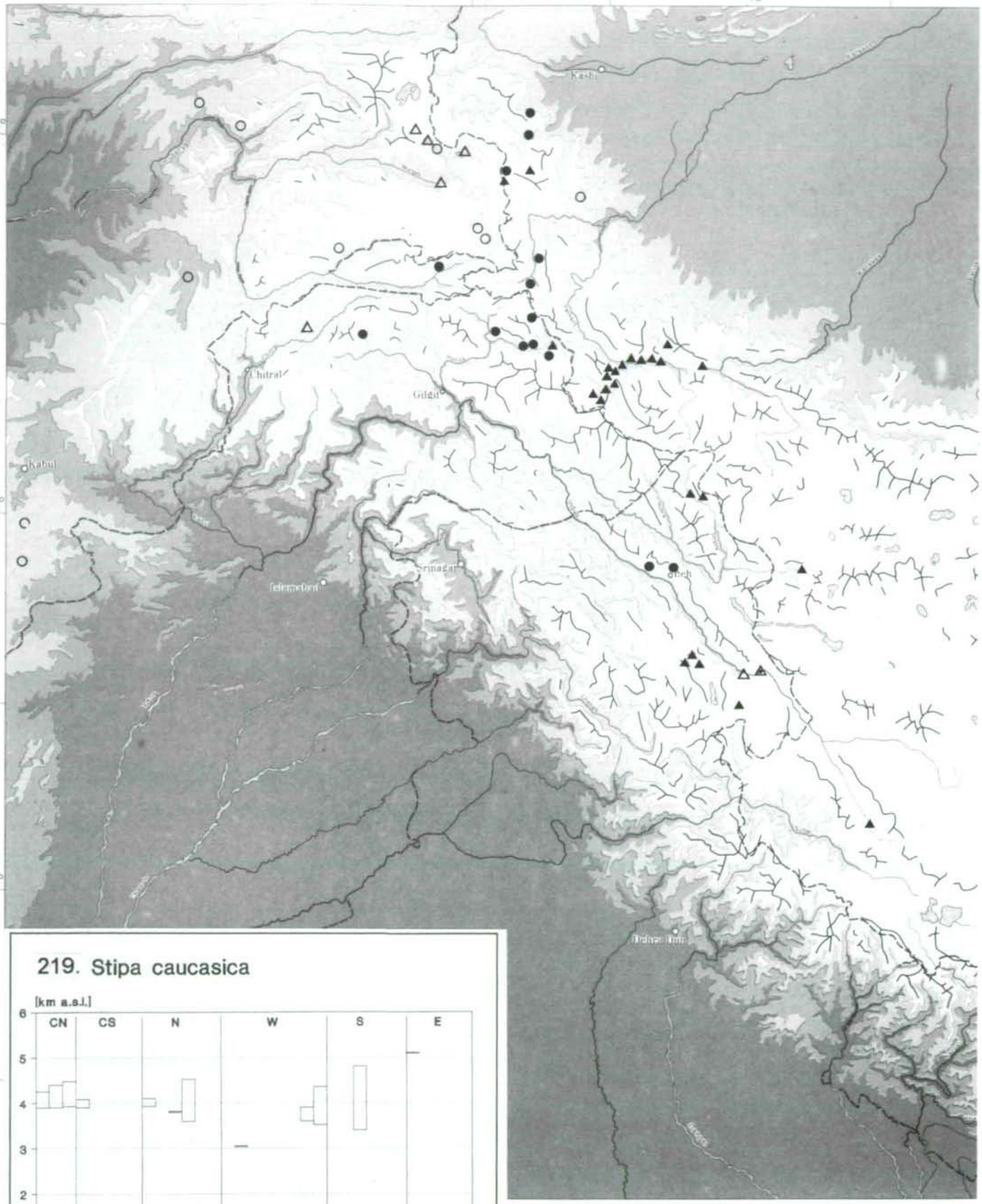
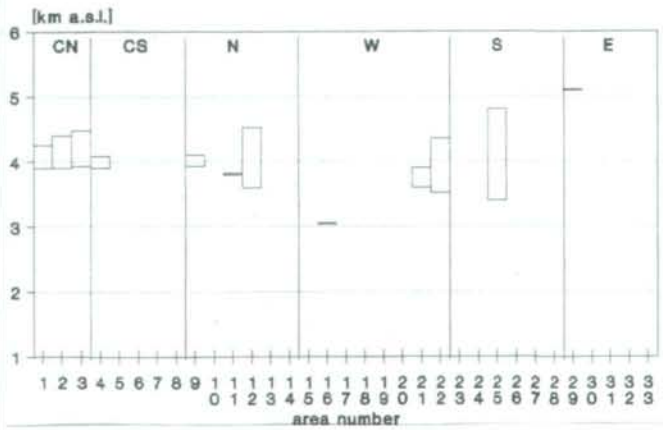


219. Stipa caucasica



Stipa caucasica
- ● subsp. caucasica
- ▲ subsp. glareosa

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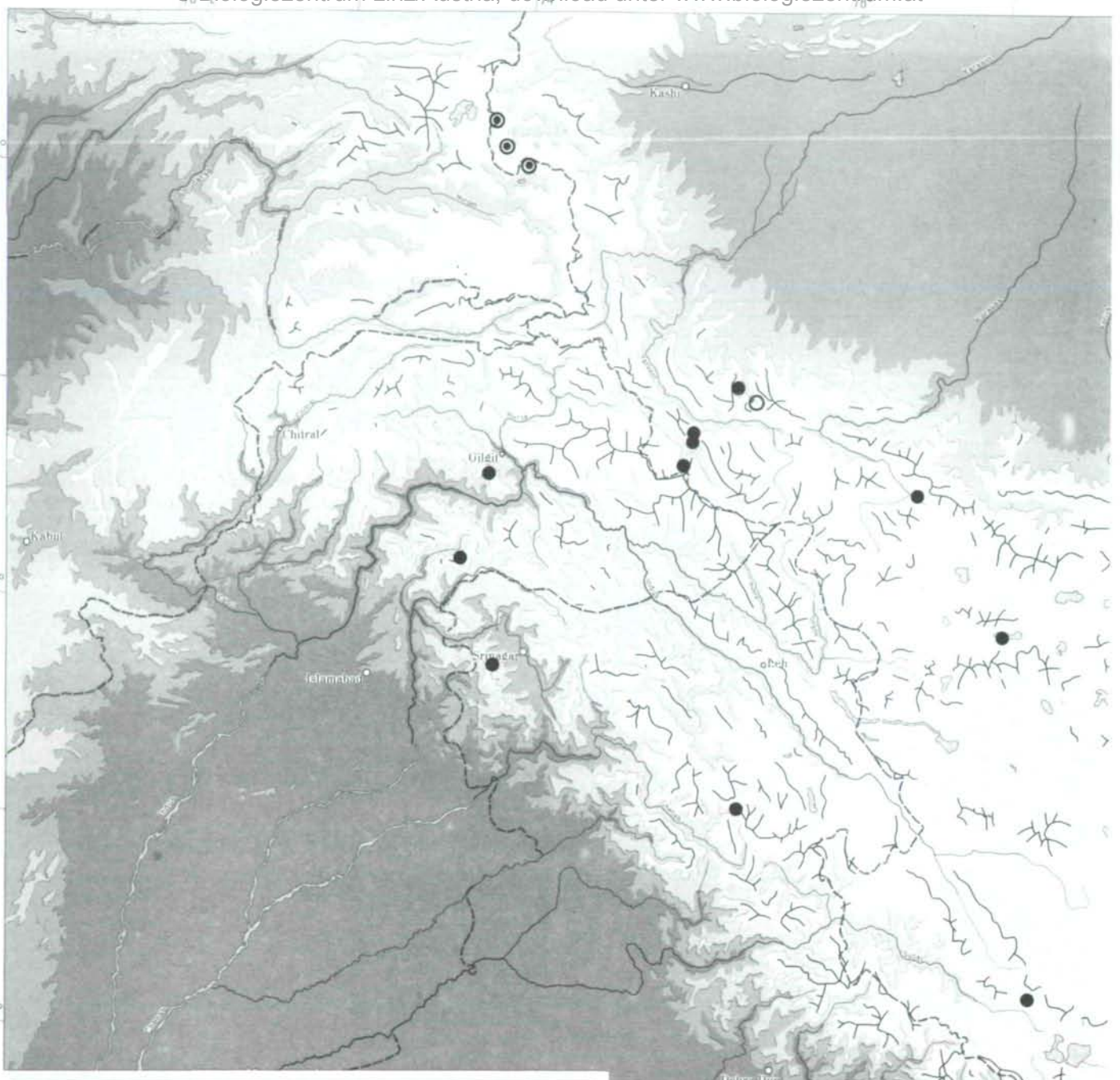
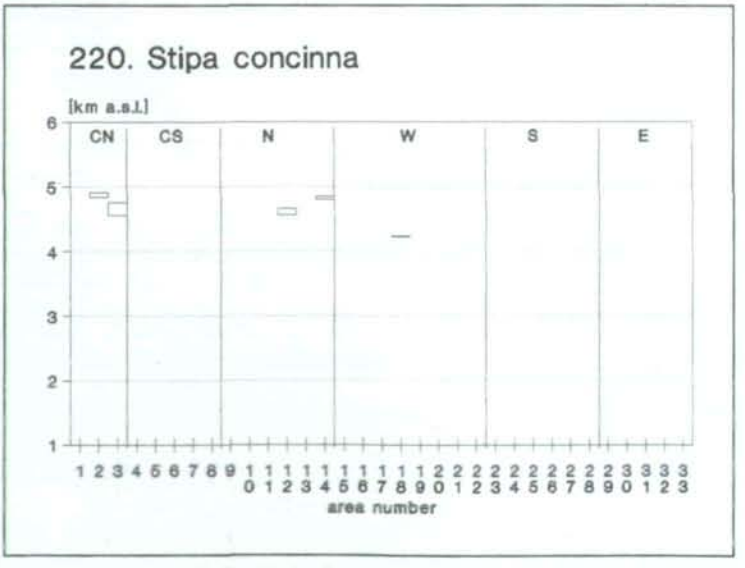


220. Stipa concinna



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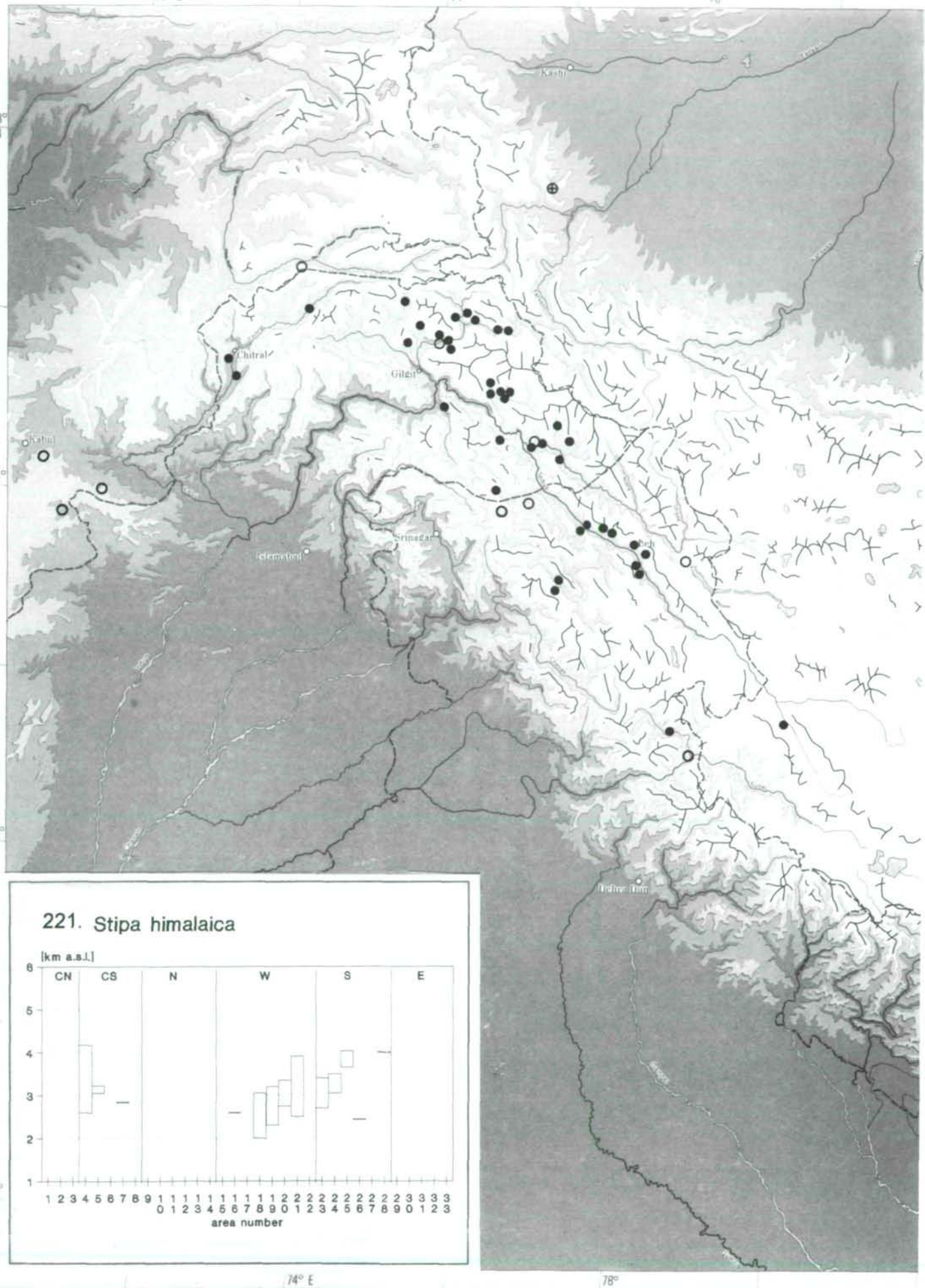

221. Stipa himalaica

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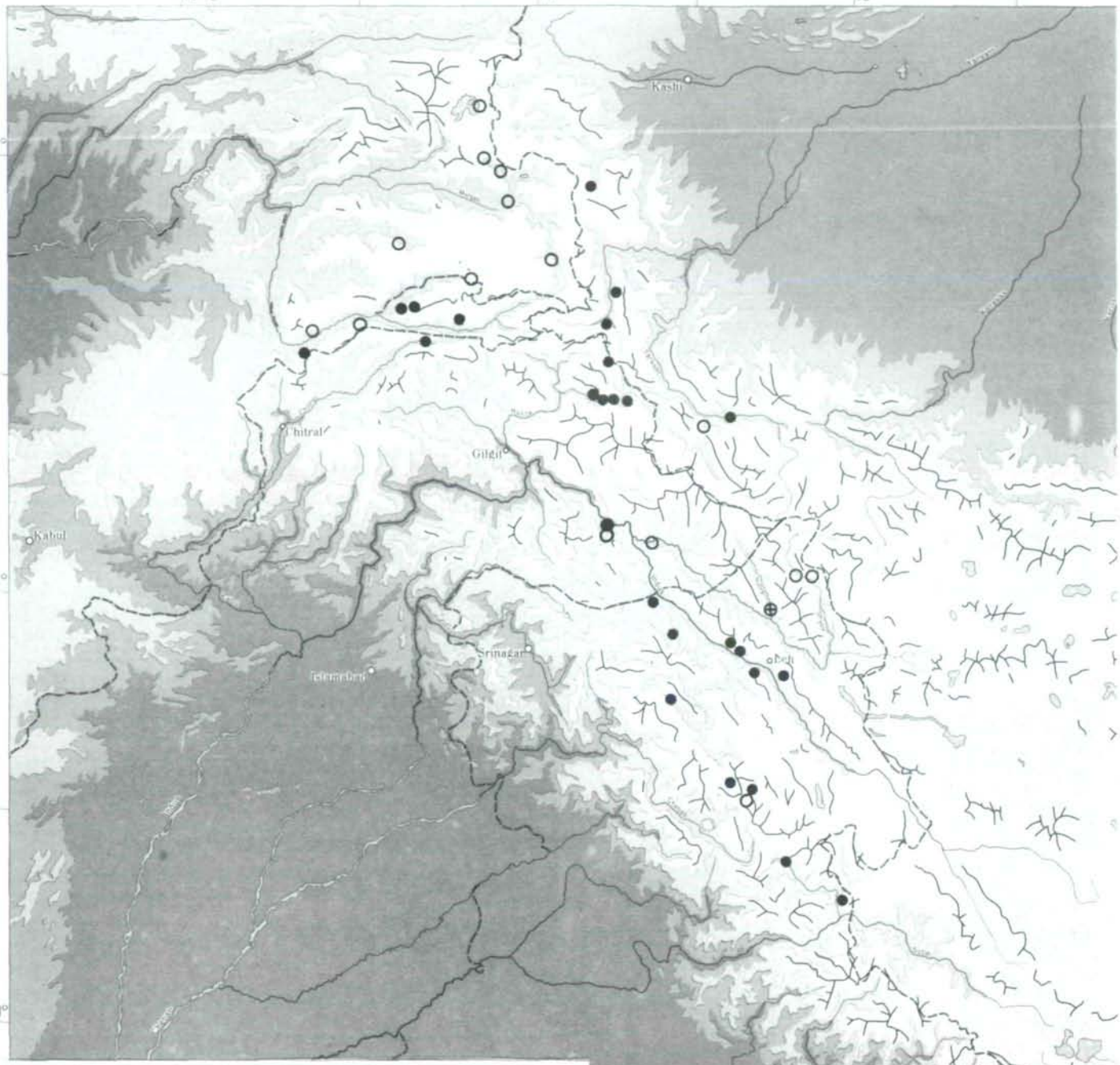
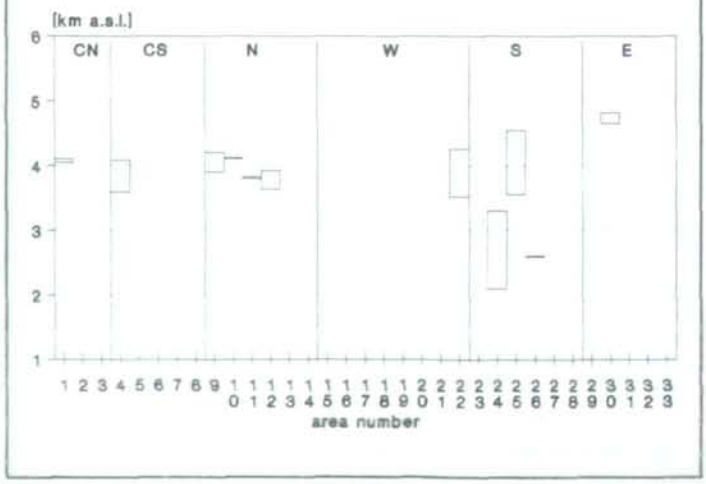


225. Stipa orientalis



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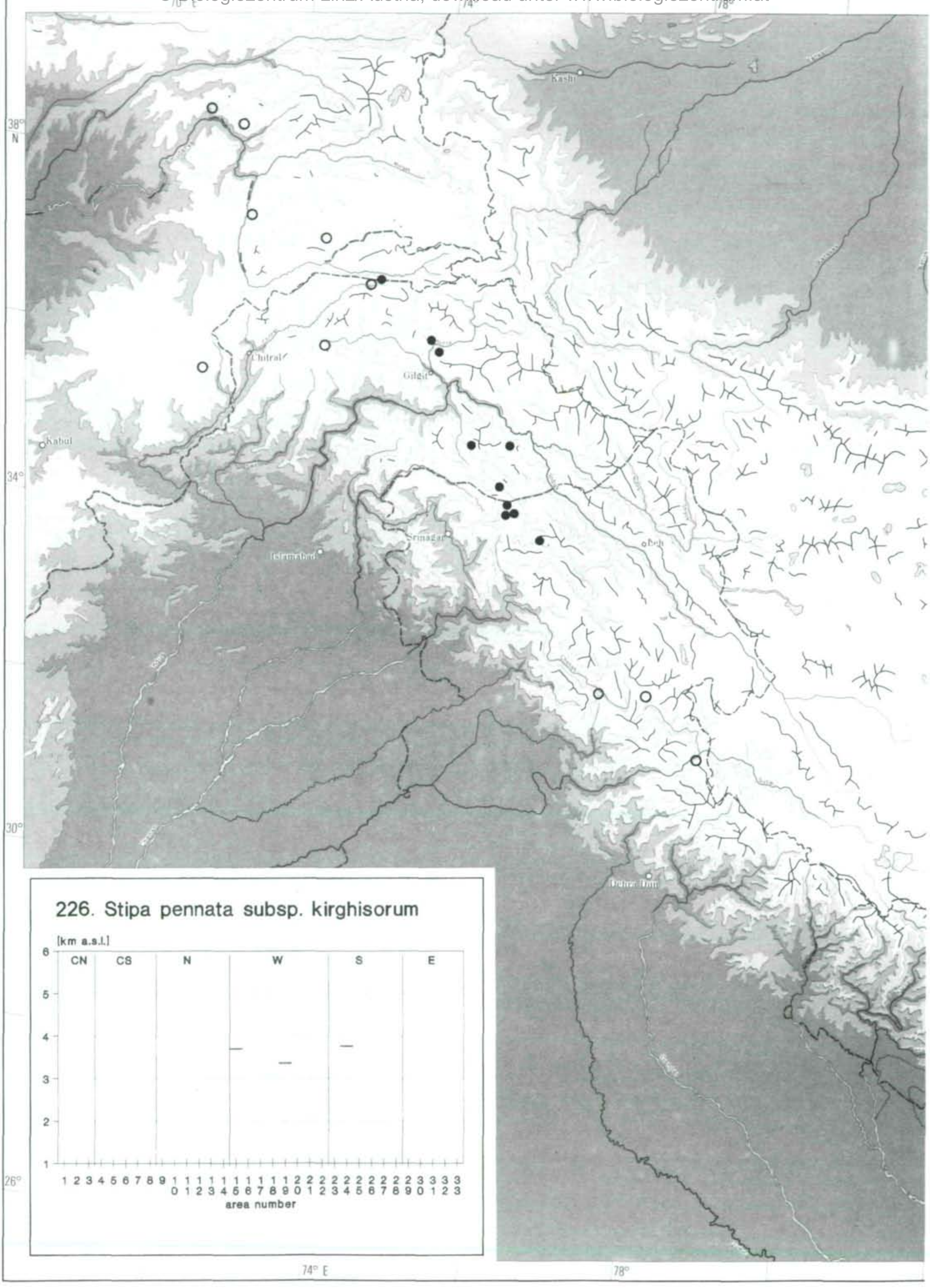

226. Stipa pennata subsp. kirghisorum

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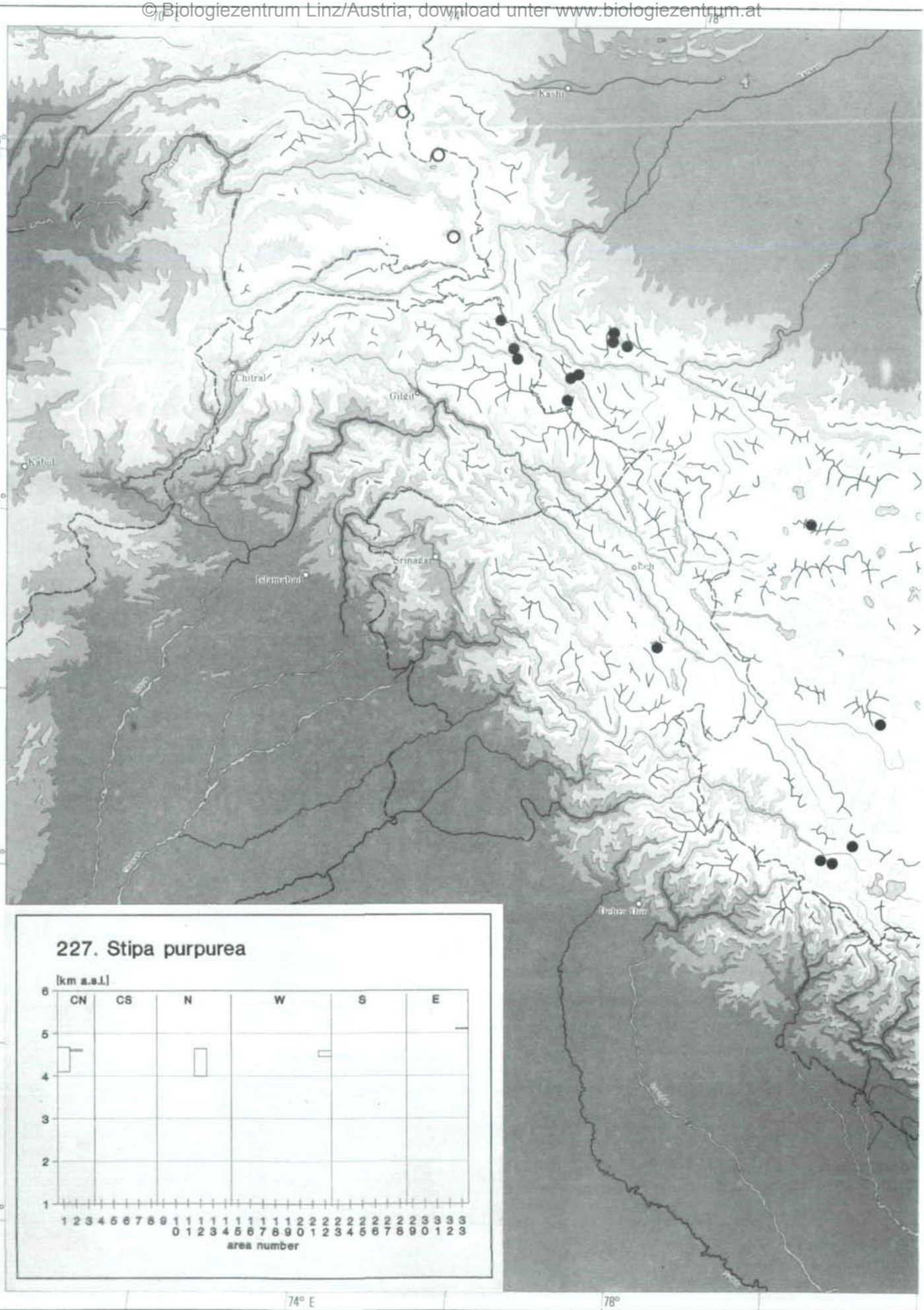

227. Stipa purpurea

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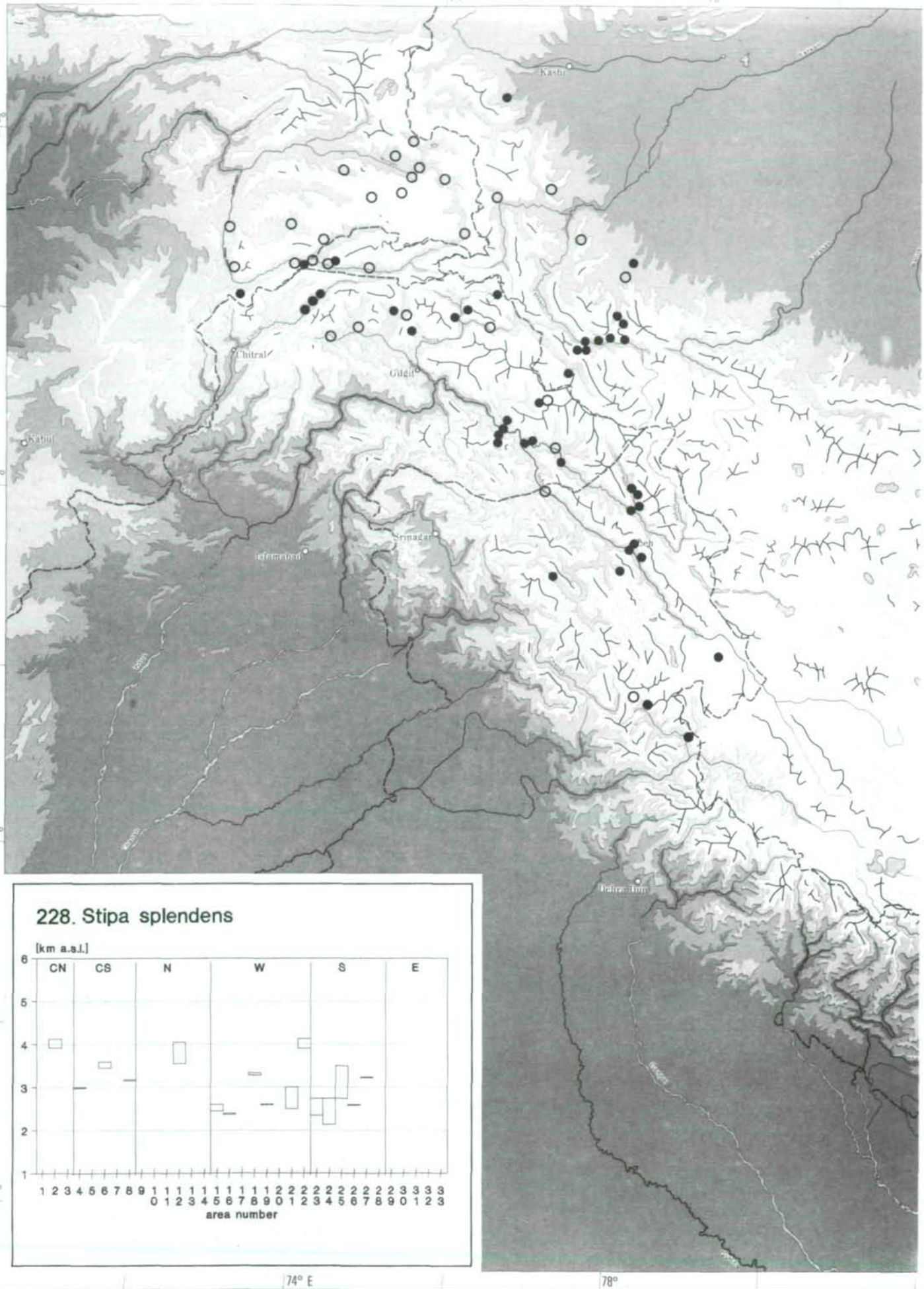

228. Stipa splendens

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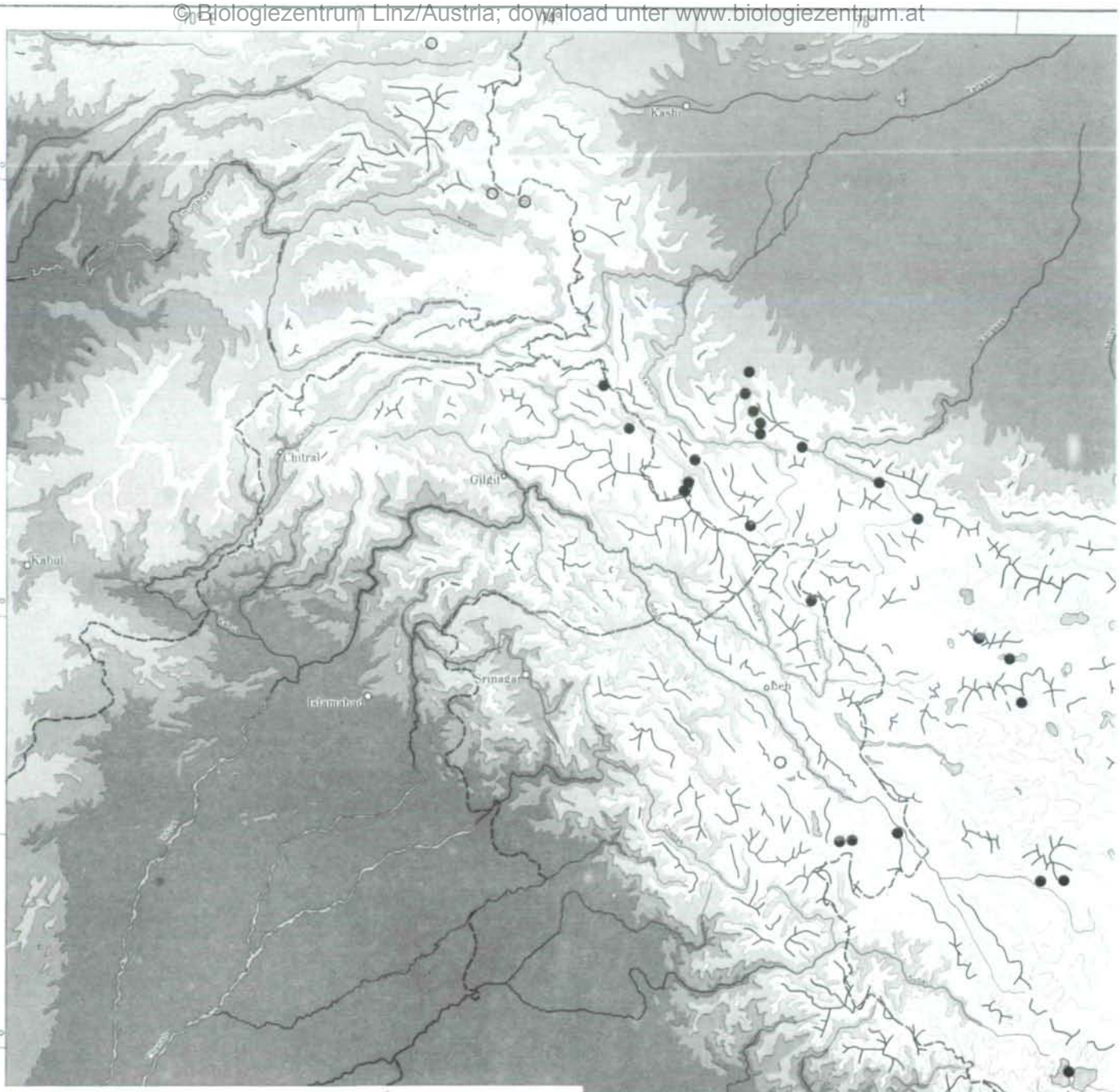
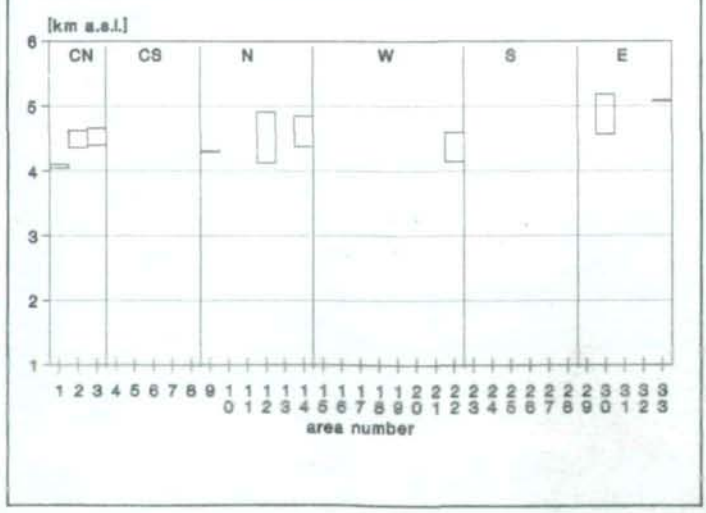


229. Stipa subsessiliflora



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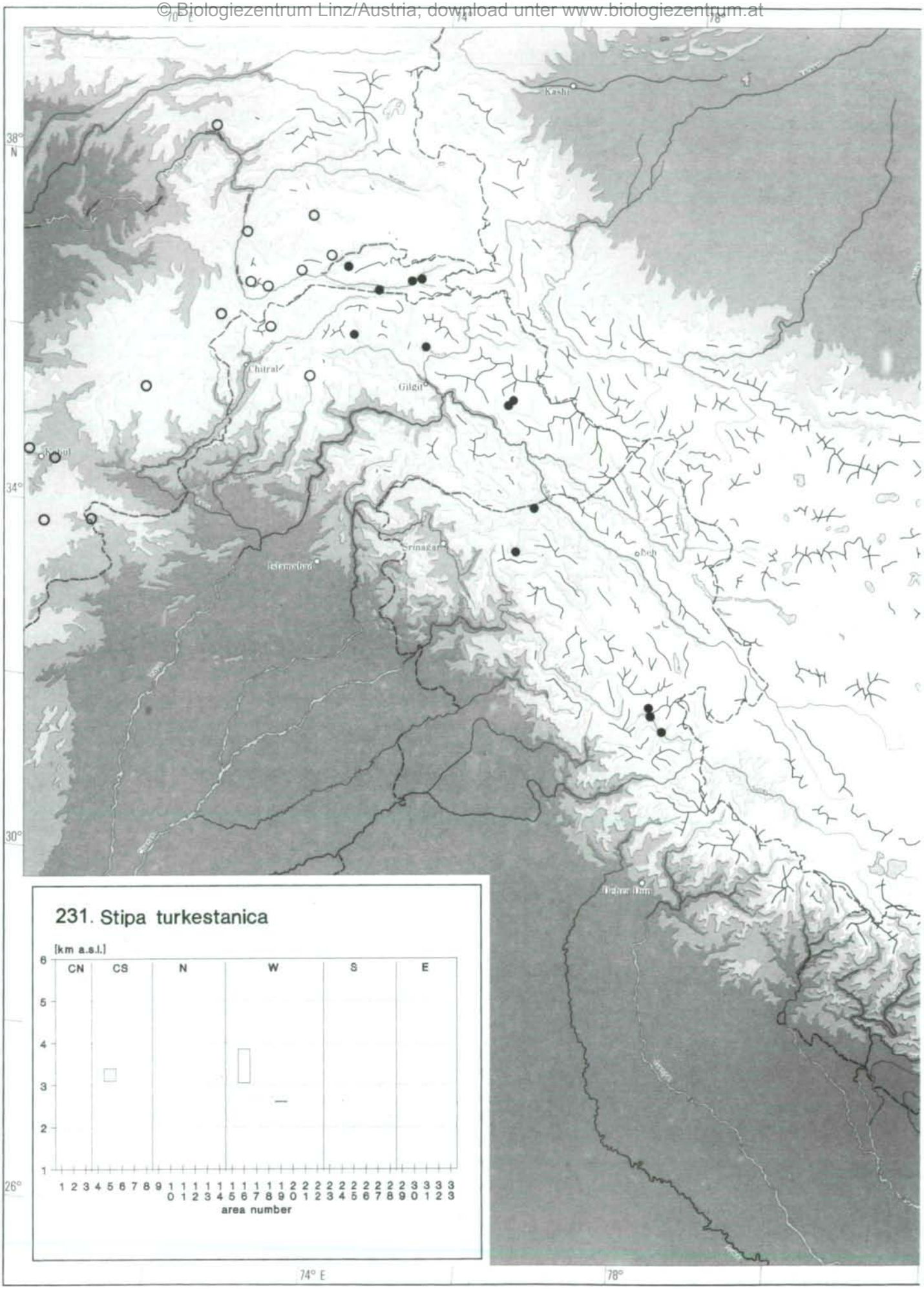

231. Stipa turkestanica

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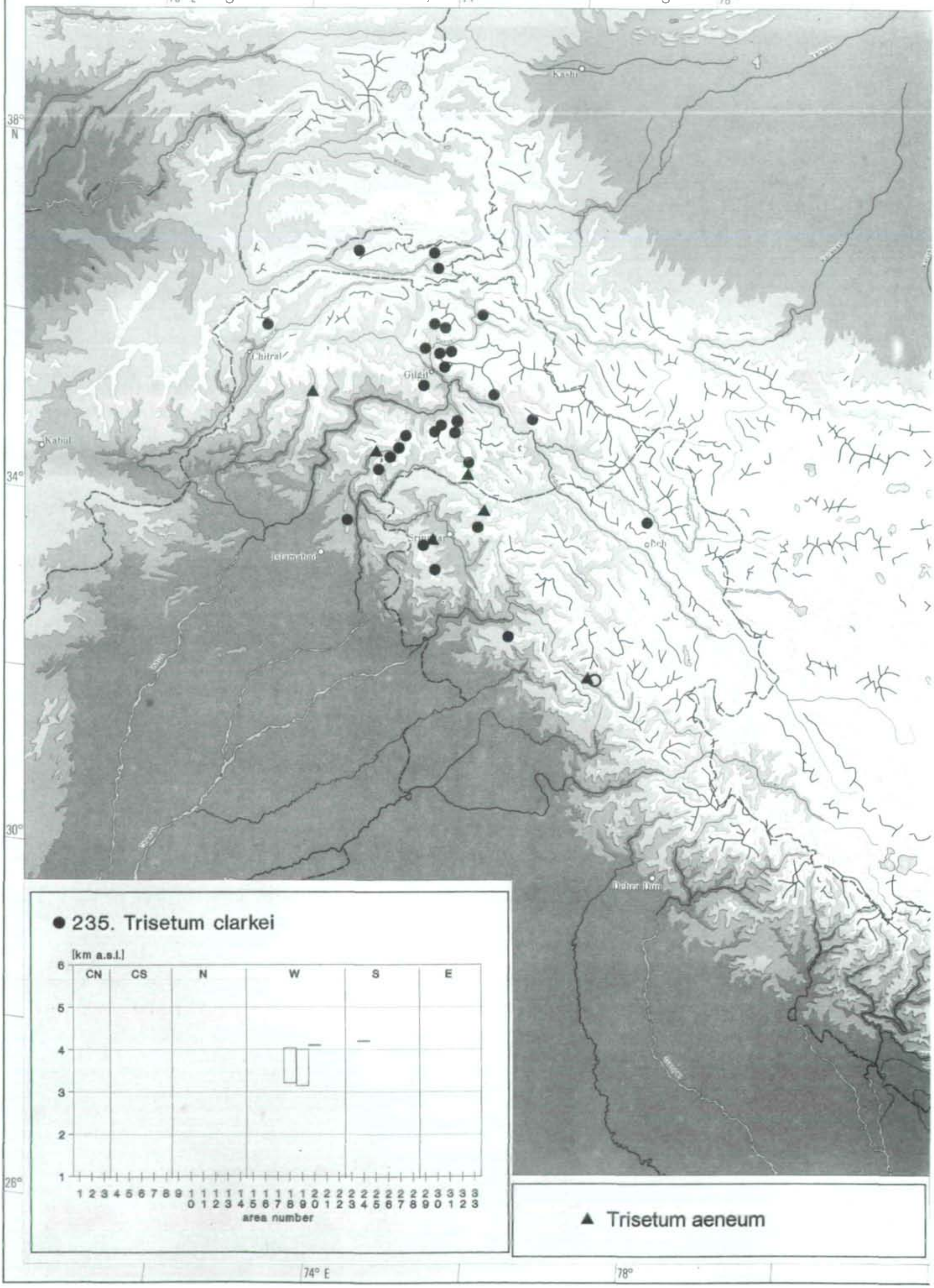

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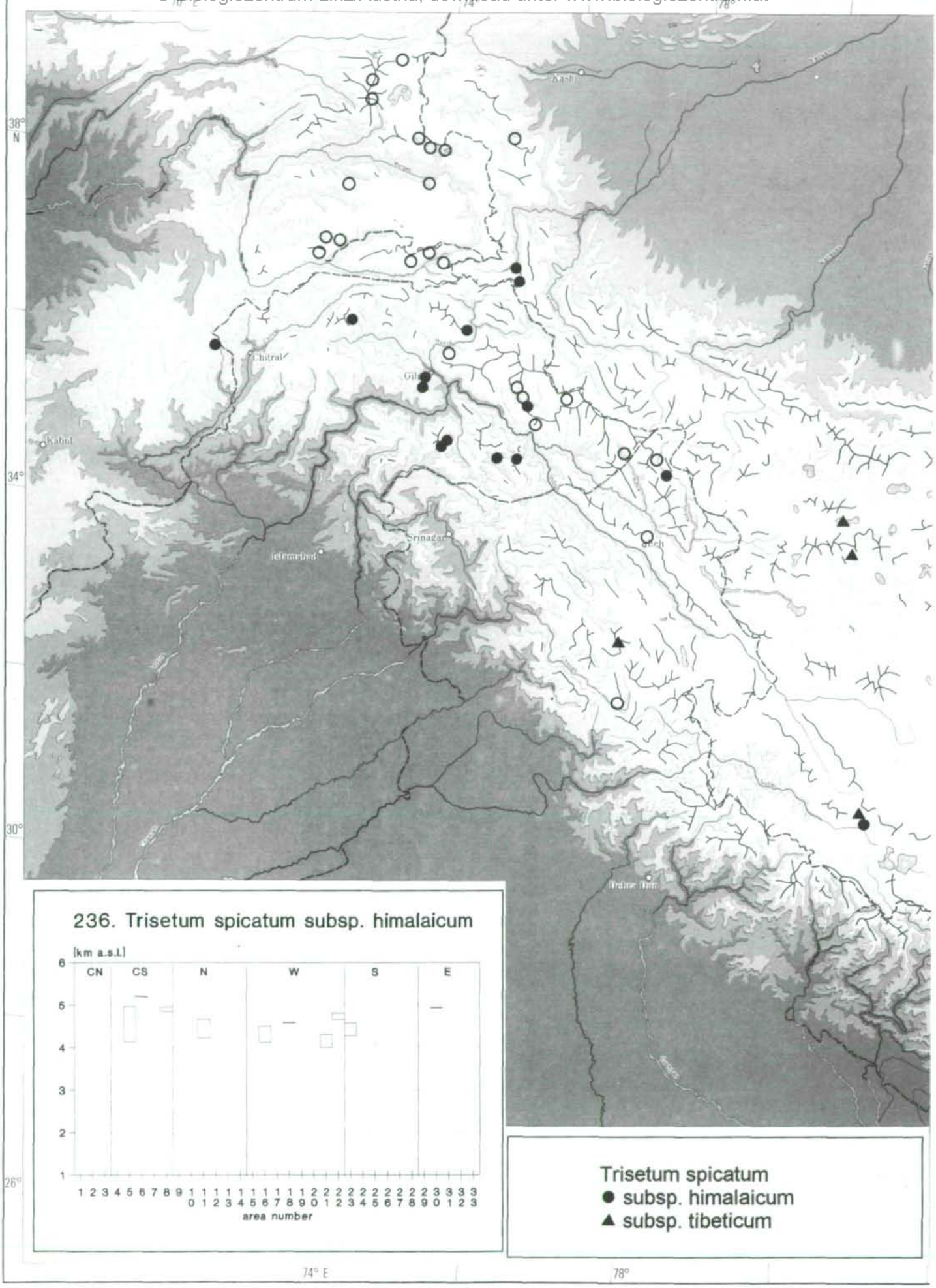

236. Trisetum spicatum subsp. himalaicum

Trisetum spicatum
● subsp. himalaicum
▲ subsp. tibeticum

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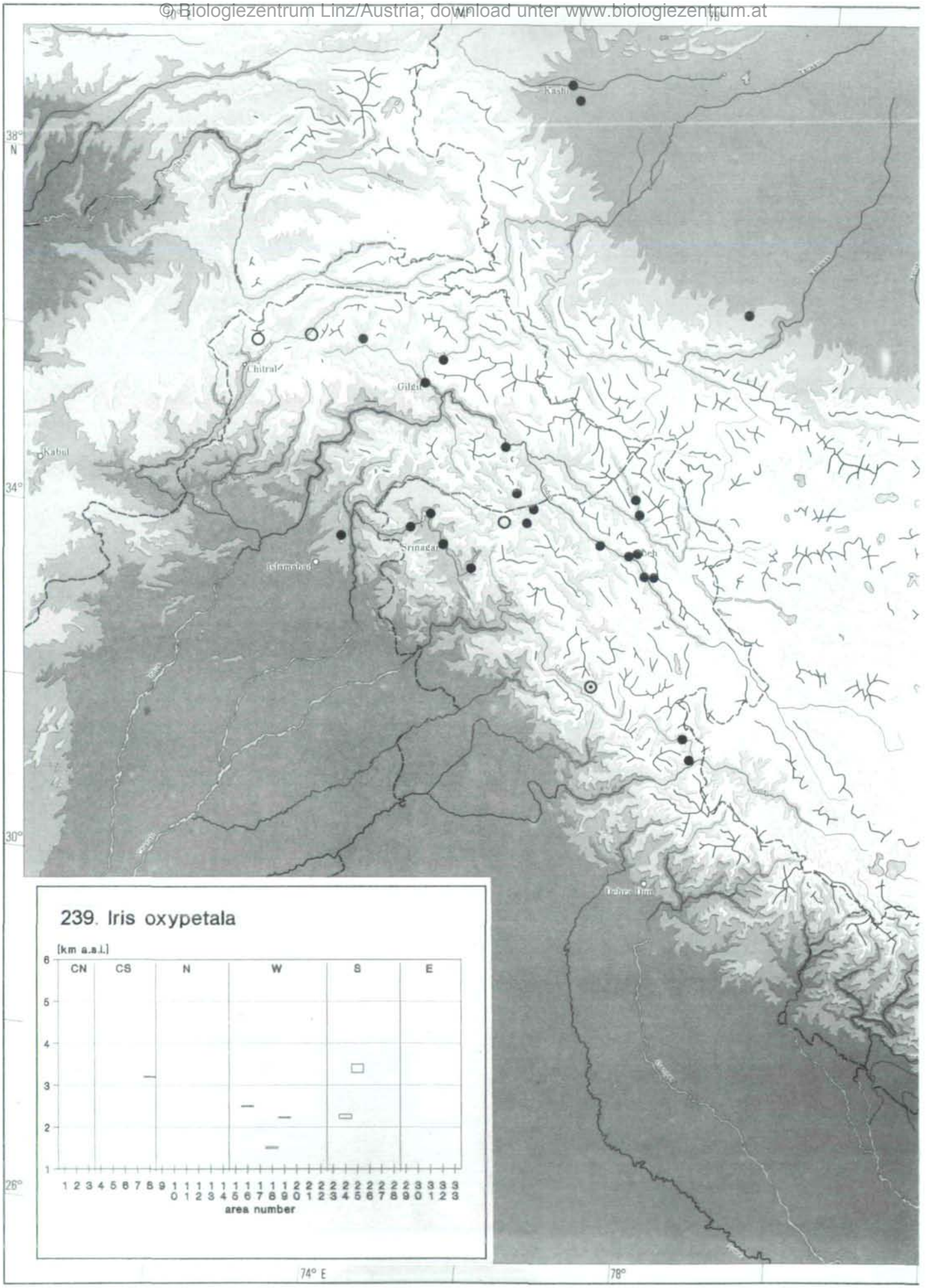

239. Iris oxypetala

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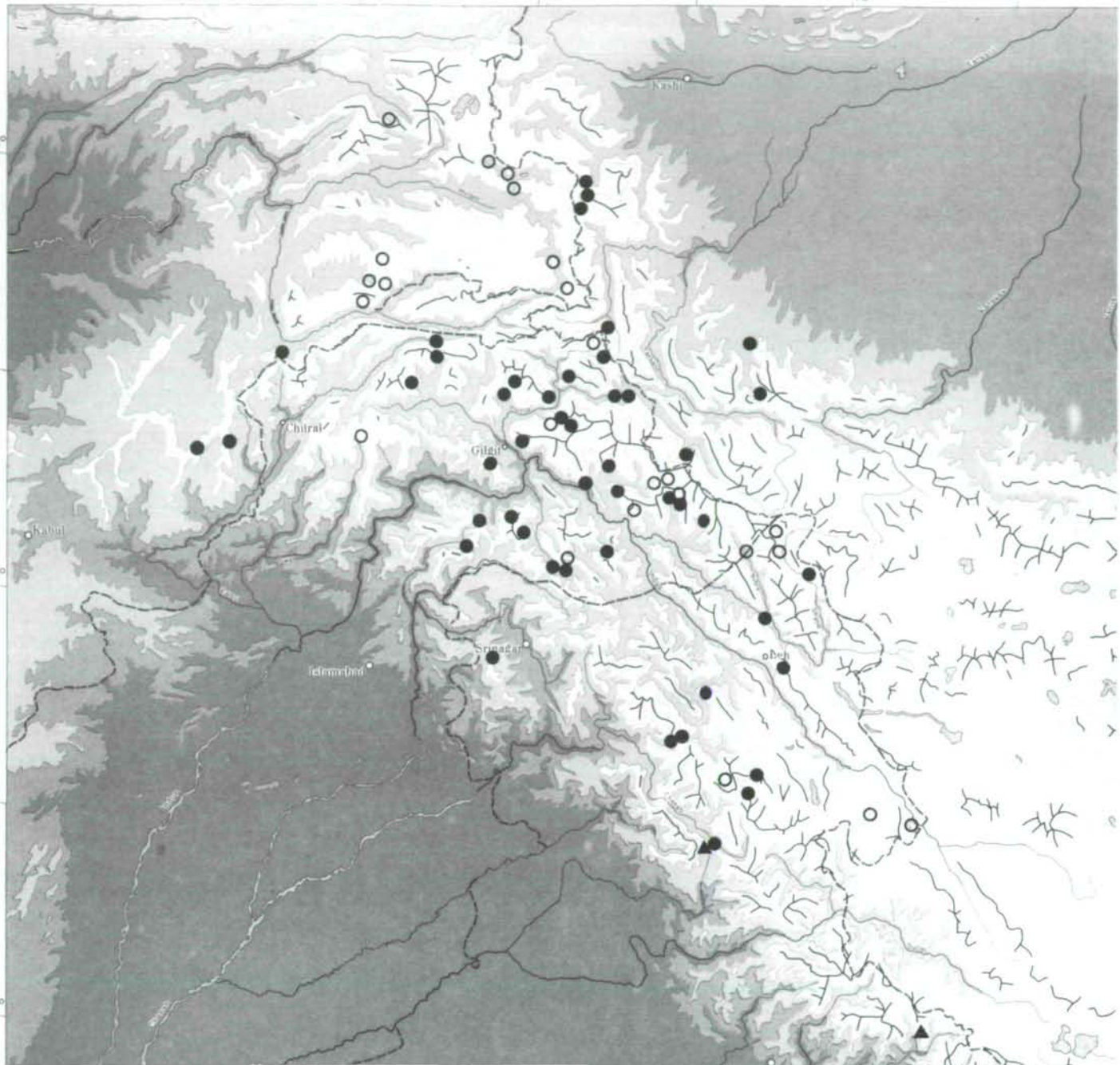
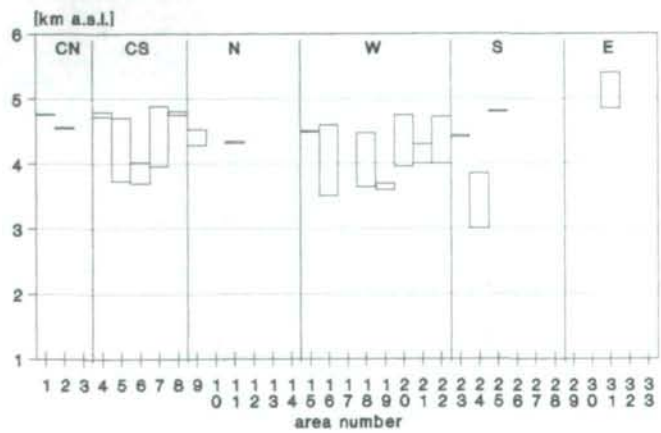


● 256. Lloydia serotina



▲ Lloydia longiscapa

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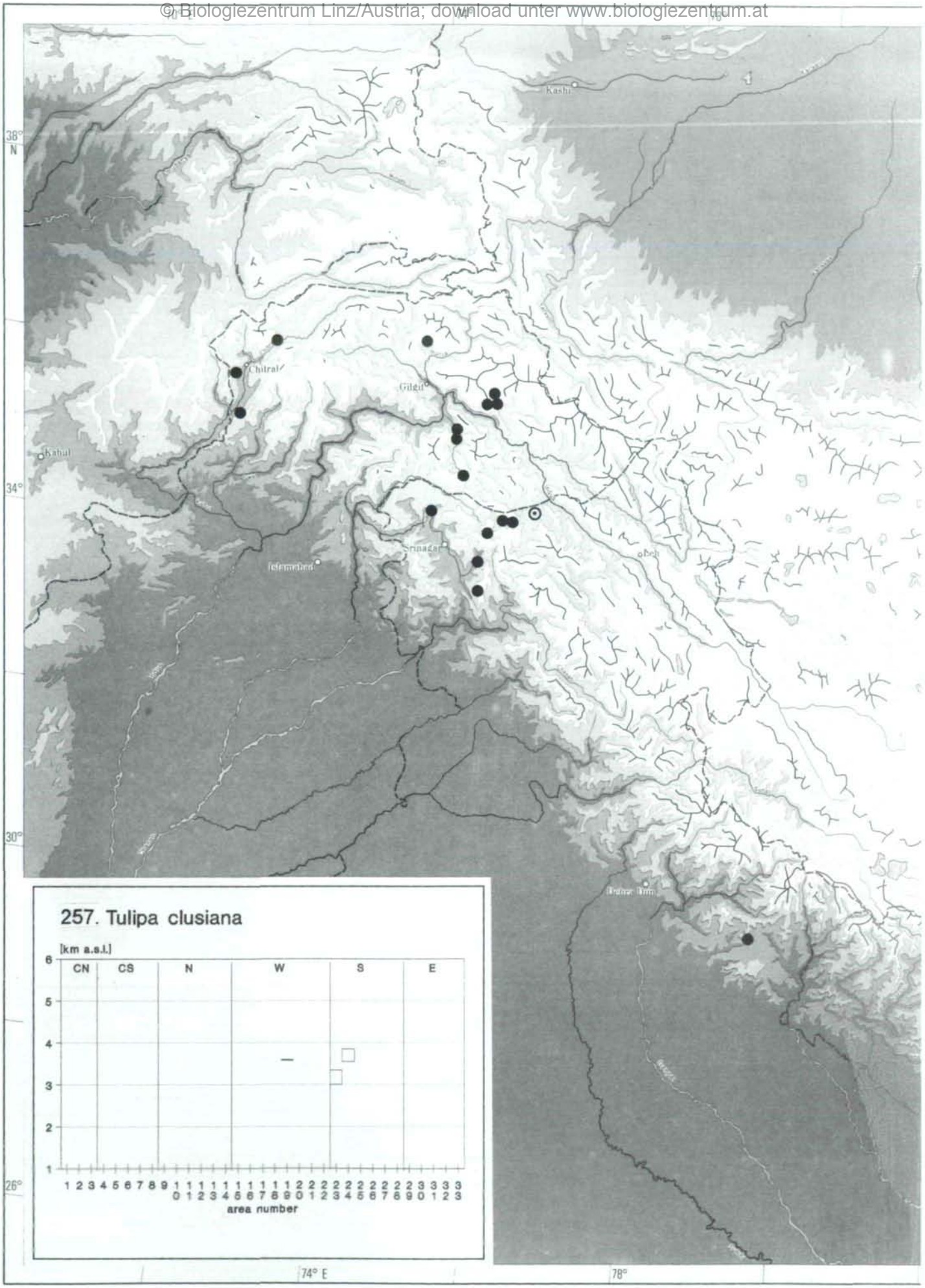

257. Tulipa clusiana

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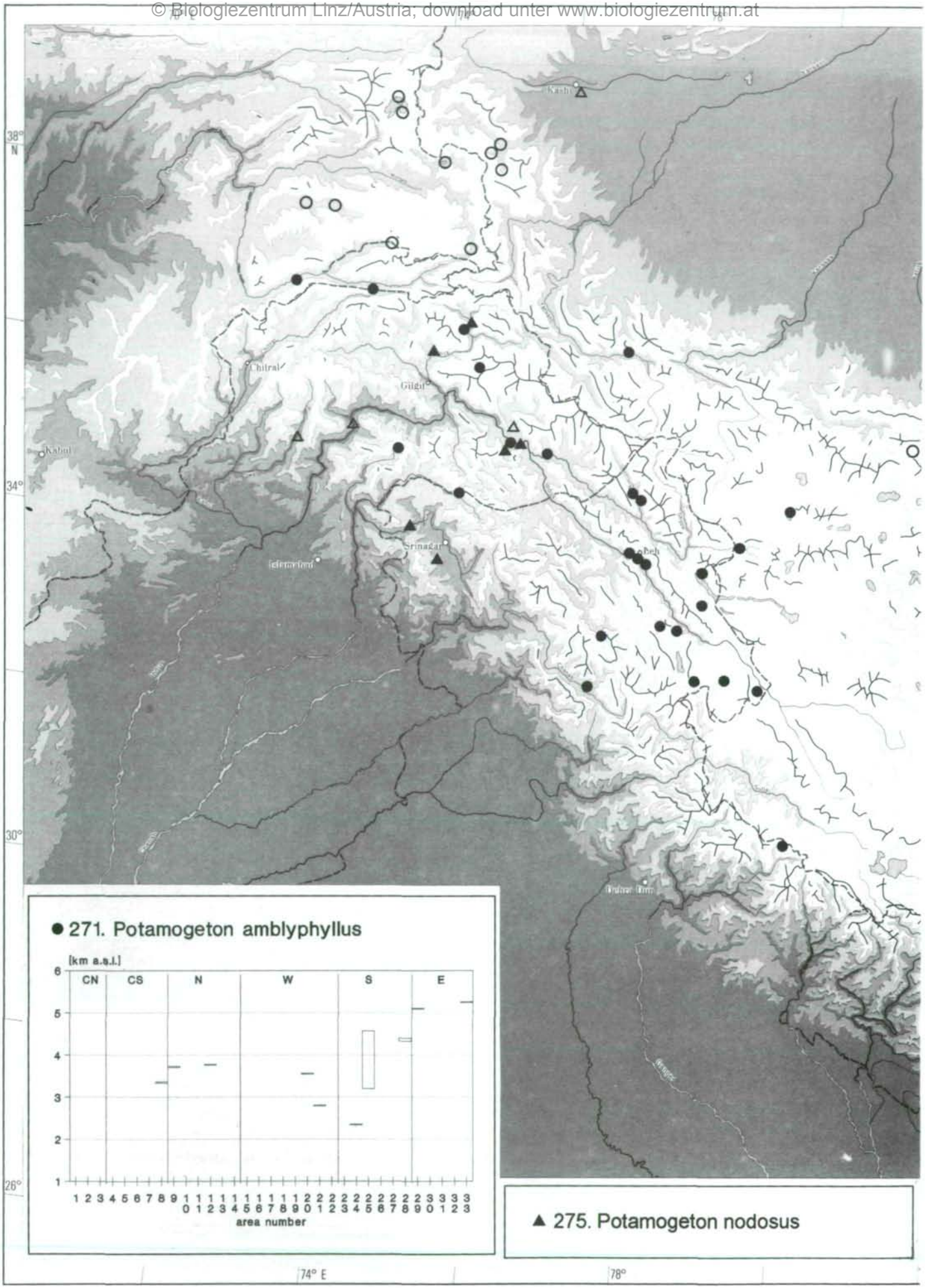

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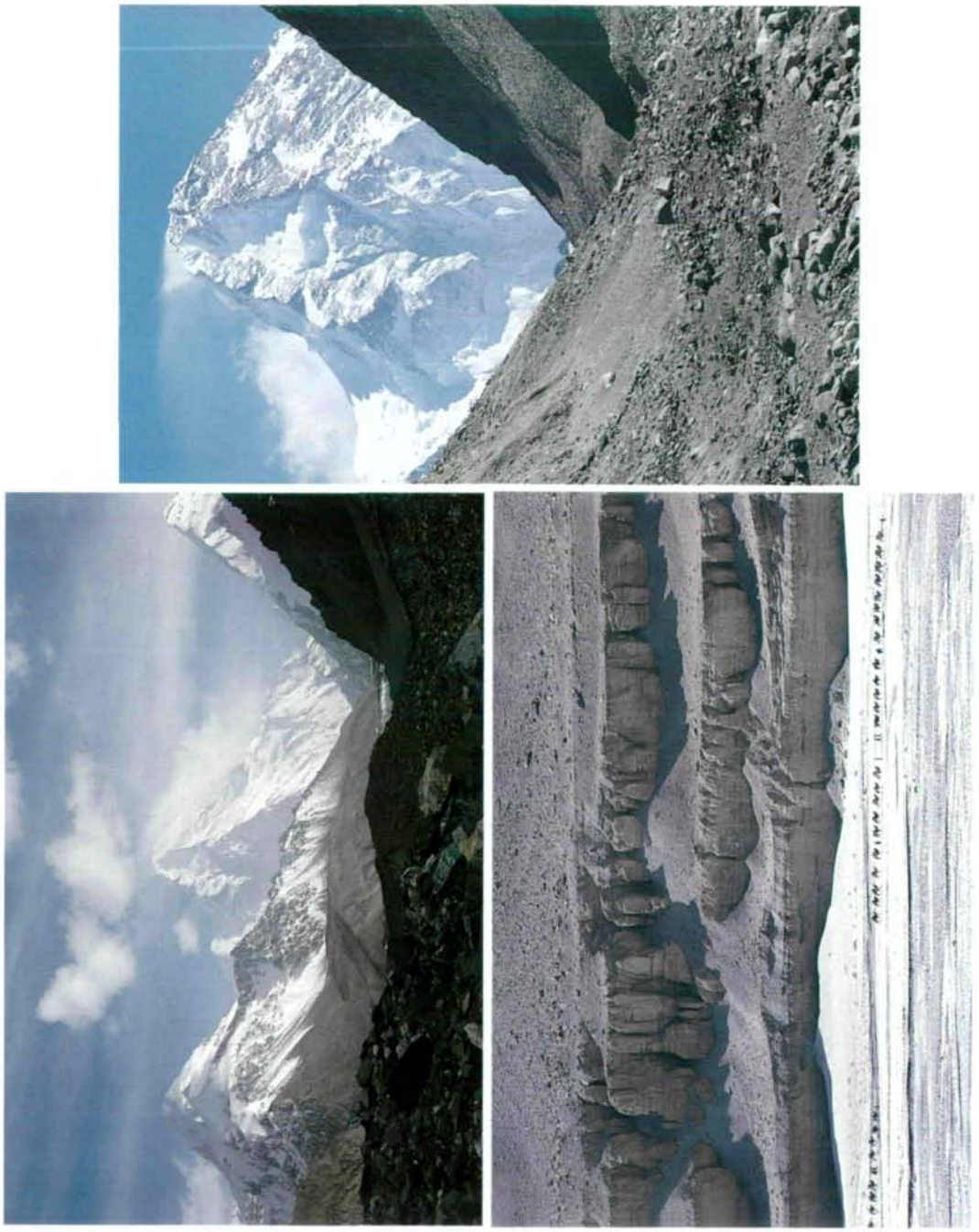

Tafel 1 - Pl. 1: **Landschaften der Karakorum-Nordabdachung** - Landscapes of the Karakorum N declivity.
1. K2-Nordseite, Gipfel (8611 m) 15 km entfernt, Ansicht von 4580 m über den K2-N Gl. Obergrenze alpin-subnivaler Vegetationsflecken (*Carex borii*, *Thylacospermum caespitosum*, *Sibbaldia tetrandra*) im Mittelgrund unterhalb der aktuellen Schneegrenze bei 5000-5200 m (Foto: 1986-09-08, *B.Dickoré*). 2. K2, Ansicht vom unteren K2-N Vy. (4000 m). Subalpine Wüste (*Krascheninnikovia ceratoides*, *Stipa caucasica* subsp. *glareosa*) im Vordergrund (Foto: 1986-09-02, *B.Dickoré*). 3. Lower Surukwat Vy. (Yarkand, 3550 m). Montan-subalpine Wüste (*Krascheninnikovia ceratoides*, *Ephedra intermedia*) auf glaziofluvialen Schotterterrassen, Talboden nahezu vegetationslos (Foto: 1986-10-23, *B.Dickoré*).

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Tafel 2 - Pl. 2: **Cyperaceae**.
1. Carex borii, Aghil P. N 4520 m (Yarkand). Charakteristische endemische Art hochalpiner Rasen. (Foto: 1986-08-30, *B.Dickoré*). **2. Carex nivalis**, K2-N Gl. 4480 m (K2-North). Gesellschaftsbildend auf Granit-Blockschutt der alpinen Stufe (Foto: 1986-09-09, *B.Dickoré*). **3. Kobresia schoenoides** und **Carex orbicularis**, W Mazar 3870 m (Yarkand). Subalpine Quellsumpf-Gesellschaft (Foto: 1986-08-25, *B.Dickoré*).

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Tafel 3 - Pl. 3: **Gramineae.**
1. **Elymus nutans**, N Mazar 4000 m (Yarkand). Häufige Art auf Flußschotter (*Myricaria bracteata*) der subalpinen Stufe (Foto: 1986-08-20, *B.Dickoré*). 2. **Stipa orientalis**, Aghil Gorge 3920 m (Yarkand). Subalpine Art, häufig im W und S Karakorum, selten im NE (Foto: 1986-08-29, *B.Dickoré*). 3. **Stipa caucasica** subsp. **glareosa**, K2-N Vy. 4100 m (K2-North). Häufige und charakteristische Art subalpiner (Halb-) Wüsten im NE Karakorum und Ladakh (Foto: 1986-09-04, *B.Dickoré*).