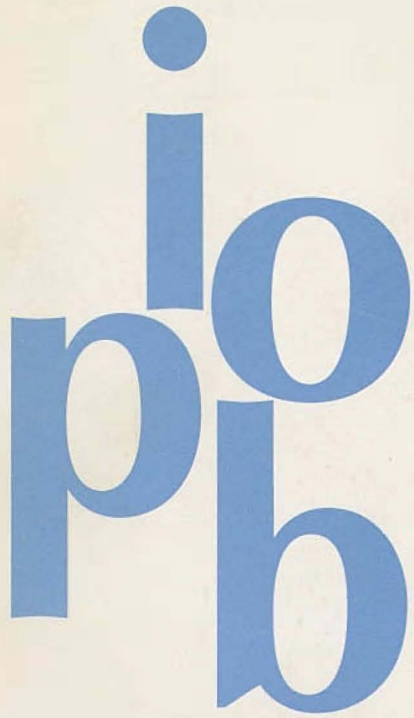


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INTERNATIONAL ORGANIZATION OF PLANT BIOSYSTEMATISTS



NEWSLETTER NO. 26/27

EDITED BY
L. Borgen & B. Jonsell – D.J. Crawford & C.A. Stace

Oslo 1997



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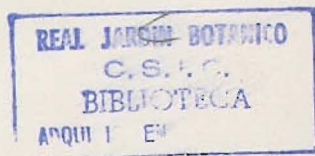
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Editorial comments

1

Dear IOPB Members,
At last again an IOPB Newsletter, now from Scandinavia, a joint effort from Oslo and Stockholm. Your editors are

now Liv Borgen and Bengt Jonsell and we regret a delay in the production and compensate by making this one quite thick as a double issue. A bit of an excuse may be that we temporarily have been editing the proceedings from the IOPB Symposium in Tromsø in the summer of 1995. In fact, both issues were handed off in October, but it will of course take some months more before you will see the proceedings out.

You will here recognize much of the contents you are used to from Krystyna's many newsletters. We are particularly glad for the contributions from our co-editors Clive and Dan, who are supplying the most valuable chromosomal and molecular news. An up-to-date directory has been supplied by our treasurer, Peter Hoch, and we hope that many new names will be added during the years to come.

Impressions from the Tromsø meeting are presented as well as once more the executives and council members elected. This issue will be sent, on the costs of the Bergius Foundation, Stockholm, to potential members particularly in the Nordic countries as a means of marketing the IOPB and should therefore contain full information about the organization.

We have accepted the task of editing the Newsletter until 1998, the year for our next meeting, in Amsterdam. There is a discussion about the future status of IOPB including the forms for a newsletter and a committee within the council was in Tromsø appointed to report on this issue during 1996. Your editors refer the discussion under a new headline "points of view", which we hope to be able to fill with ample contributions. Do give *your* point of view to the next newsletter – it is important that we hear from many members. A decision has to be taken in Amsterdam.

The theme of the Amsterdam meeting is suggested to be "Plant evolution in man made habitats" as recently told by Konrad Bachmann and Hans den Nijs, the organizers. This is most appropriate considering the situation in much of densely populated Europe including the Netherlands and we are much looking forward to August 1998, the time proposed. You find details in a special note in this Newsletter.

We start at home – present biosystematics in our close surroundings and hope to give more glimpses from Scandinavia in coming newsletters. But we should avoid to be too much Nordic-biased, so please send us news from other places. They may be short or longer and need not follow a standard pattern, rather the contrary to stimulate the readers.

Material may be sent to Bengt Jonsell, Bergius Foundation, Box 50017, S-104 05 Stockholm, Sweden – we two editors are longing to hear from you.

The editors

News & Notes

2 Recently published

Grant, W. F. 1995. A chromosome atlas and interspecific – inter-generic index for *Lotus* and *Tetragonolobus* (Fabaceae). – *Can. J. Bot.* 73: 1787–1809.

Hultgård, U.-M., Martinsson, K. & Moberg, R. (ed.) 1996. The Nordic Flora – towards the twenty-first century. Studies in honour of Bengt Jonsell on the occasion of his 60th birthday 11 June 1996. – *Acta Univ. Ups. Symb. Bot. Ups.* 31 (3), 363 pp. Contains with its 28 papers by Nordic and some extra-Nordic authors a wealth of biosystematics and a few other topics related to the Nordic flora.

Nwosu, M. O. Dr.

Botany Department, University of Nigeria, Nsukka, P.M.B. 006, Nigeria

RECENT PUBLICATIONS

Nwosu, M. o. & Okafor, Josephine, I. 1995. Preliminary studies of the antifungal activities of some medicinal plants against *Basidiobolus* and some other pathogenic fungi – *Mycoses* 38 (5–6): 191–195. Blackwell Science Publ. Berlin.

Nwosu, M. O. 1996

Germination, Seedling Morphology and Anatomy of *Plukenetia conophora* Müll. Arg. (syn. *Tetracarpidium conophorum* (Müll. Arg.) Hutch. & Dalz. (Euphorbiaceae). – *Vikram Journ. India* (in press).

Nwosu, M. O. 1996

Ethnobotany and anatomy of two Nigerian vegetable plants *Talinum triangulare* (Por-

tulacaceae) and *Vernonia amygdalina* Del. (Asteraceae). – *Ethnobotany Journ. New Delhi Deep Publ.* (in press).

CURRENT PROJECT

A re-examination of *Piper guineense* Schum. & Thonn. (Piperaceae). Morphology, distribution and phytochemistry.

PROJECT COMPLETED

Ichthyotoxic plants of Nigeria, their use as anaesthetic in aquaculture by rural fish farmers in the humid forest belt of Nigeria and their medicinal properties. (African Development Foundation, Washington DC., USA).

PROJECT STARTED

An anatomic-systematic study of medicinal and aromatic plants of Nigeria (II) – *Mitracarpus villosus* (Sw.) DC. (Rubiaceae).

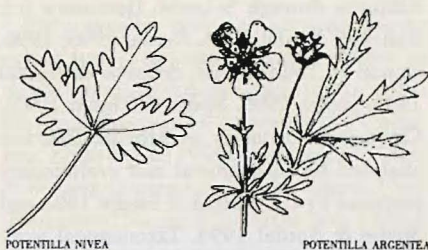
Requests

3 ... from Dr. Elzbieta Kuta

Department of Plant Cytology & Embryology, Institute of Botany of the Jagiellonian University, Grodzka 52, PL-31-044 Kraków, Poland, would appreciate papers concerning karyology and chromosome structure of the genus *Luzula* and seeds of *Luzula purpurea*, *L. alpino-pilosa*, *L. nivea*, *L. sylvatica* subsp. *sieberi*, *L. multiflora* ($2n = 24$).

... from Dr. M. O. Nwosu

Botany Dept, Univ. of Nigeria, Nsukka, P.M.B. 006, Nigeria: Herbarium specimens of *Piper* spp. and articles related to *Piper guineense* would be highly appreciated.



POTENTILLA NIVEA

POTENTILLA ARGENTEA

Call for scientists with interest in *Potentilla*

At a workshop held at the Biological Institute, Blindern, University of Oslo, 28th–30th October 1996, a group of Nordic researchers working on various aspects relating to the taxonomy of the genus *Potentilla* discussed the possibility of founding a "Potentilla Society". The main task of the Society would be to construct a widely applicable and useful species concept within the genus *Potentilla*, based on results from previous, ongoing and future cooperative research efforts. Moreover, the Society could act as a forum for exchange of plant material, ideas and experiences by organizing mailing lists, workshops and symposia. By this call we hope to reach many scientists from all over the world who are actively working with descriptive and experimental problems concerning *Potentilla*.

Anyone interested in joining a Potentilla Society should contact:

Dr Bente Eriksen

Department of Systematic Botany

University of Göteborg

Carl Skottsbergs Gata 22 B

S-413 19 Göteborg, Sweden

Tel. +46 31 773 2666, Fax +46 31 773 2677

e-mail bente.eriksen@systbot.gu.se

and write a few lines about their projects.

Remember to state a full postal address and e-mail address, if any, for the mailing list.

The Profile: Biosystematics in Oslo - Stockholm/Uppsala today

4

Biosystematics in Scandinavia goes back to the classical works of Turesson, Clausen, Müntzing and others during the 1920's and

1930's. Thus, experimentally based cytological and genecological studies of plant populations have one of their main centres of origin in Scandinavia. Due to a certain "adaptive radiation" several institutions in Scandinavia today include biosystematic aspects in their work. We will present these activities in the home areas of your present Newsletter editors.

Oslo, Norway

In Oslo studies related to traditional biosystematics started with Kristian Horn (1903–1981) and took off with the monumental work of Gunvor Snekvik Knaben (1911–1993) on the *Papaver radicum* complex and other arctic-alpine plants. In recent years two groups at the University of Oslo, one at the Botanical Garden and Museum and the other at the Botanical Department, Institute of Biology, have renewed and developed biosystematics, using a wide array of old as well as new experimental approaches, including population genetics (DNA sequencing, RAPDs, SCARs). Cooperation between the groups is extensive to the benefit of staff members and students. The work has been concentrated on three main areas: Macaronesia, Tropical Africa and the Nordic-Arctic area.

Much work has centred in the Macaronesian phytogeographical area with a tradition back to 1814 and Christen Smith, the

first director of the Botanical Garden in Oslo. Extensive cytological work has been done by Liv Borgen as partly summarized in Ardévol et al. 1993. Selected Brassicaceae and Asteraceae genera (e.g. *Lobularia*, *Sinapidendron*, *Diplotaxis*, *Argyranthemum*, *Nauplius*) have been subject to biosystematic and taxonomic work, recently including population genetics (Borgen 1995a, 1996) and cladistic biogeography (Borgen 1995b) as well as more traditional biosystematics and taxonomy (Rustan 1996). The flora of the Cape Verde Islands has been studied intensely during the past years, including clinal patterns of variation and taxonomy of the genus *Frankenia*, Frankeniaceae (Brochmann 1993a, Brochmann et al. 1995). Ongoing cooperation between Norwegian and German botanists will result in a flora of the Cape Verde endemics (Brochmann et al., in prep.)

Taxonomic and biosystematic work has been undertaken on several groups of Tropical African 'lilies', particularly Amaryllidaceae, Anthericaceae, Asphodelaceae, Hyacinthaceae and Hypoxidaceae by Inger Nordal and Brita Stedje, the latter presently in a position at the Agricultural University at Ås, 40 km S of Oslo. The aims have been twofold: 1) taxonomic revisions for the ongoing flora projects of Ethiopia, Cameroun, Gabon, Tropical East Africa and Flora Zambesiaca, and 2) elucidation of the evolutionary pathways and phylogenies using modern methods. The interest in tropical African lilies started in Uppsala during Nordal's stay there 1969–1970. Close connections and joint work Oslo - Uppsala are still upheld through Mats Thulin in Uppsala.

A new branch on this cooperative network is developed in Zimbabwe through Shakkie Kativu and Clemence Zimudzi, and in

Ethiopia through Sebsebe Demissew (cf. Kativu & Nordal 1993, Nordal 1995, 1996, Nordal & Thulin 1993, Sebsebe & Nordal 1996, Stedje 1996, Stedje & Thulin 1995). Chromosome cytology on African lilies was analysed for taxonomical and evolutionary purposes by e.g. Nordal & Stedje 1993 and Stedje & Nordal 1994. Taxonomical work involving DNA analyses started in Oslo with the use of RFLP-analyses of cp-DNA in *Crinum*, Amaryllidaceae (Fangan & Nordal 1993, Nordal & Fangan 1994). Scope and methods were expanded and sophisticated by including sequencing of PCR products from the trnL intron and the intergeneric spacer between trnL and trnF genes (Fangan et al. 1994, Stedje & Nordal, in prep.).

In the Nordic area the genus *Cochlearia* (Brassicaceae) has been studied by Nordal and co-workers (for references, see Nordal & Laane 1996). Chromosomes and glucosinolate contents, as well as crossing experiments and morphometry, were included in the analyses to settle the taxonomy and distribution pattern of a notoriously difficult group.

A project to test former Nordic plant geographical hypotheses, i.e. the 'nunatak' and 'tabula rasa' theories by means of isoenzyme analyses was initiated by Inger Nordal on *Vahlodea atropurea*, Poaceae and *Lychnis alpina*, Caryophyllaceae (cf. Haraldsen & Wessenberg 1993), and further developed in cooperation with Bengt Jonsell in Stockholm to include *Arabis petraea*, Brassicaceae (Jonsell et al. 1995, see also under Stockholm/Uppsala). Former hypotheses on plant migrations have also been tested in Norwegian populations of *Gentiana pneumonanthe*, a joint project between Hans den Nijs, Amsterdam and Liv Borgen, Oslo (e.g. Oostermeijer et al. 1996).

On a smaller geographical scale isoenzymes have been analysed and related to reproduction and putative origin of taxa within the genus *Poa* (Nordal & Iversen 1993, Brysting, Elven Nordal 1996), *Vincetoxicum* (Gram & Borgen, in prep.) and *Viola* subgen. *Viola* (Marcussen, Borgen & Nordal, in prep.). Other studies related to reticulations within the violets include the *V. palustris* group and recently *V. canina* – *V. persicifolia* (Røren et al. 1994).

One major project in Oslo during the past years includes evolution within arctic-alpine *Draba*, resulting in several papers (the most recent ones being Brochmann 1993 b, Brochmann et al. 1993) based on several approaches, including chromosome studies, crossing experiments, isoenzymes, and reproductive studies. More projects on Arctic and Nordic *Draba* are planned, partly in cooperation between Christan Brochmann and Reidar Elven, Oslo, and David Murray, Fairbanks, Alaska.

More recently a project on the *Cerastium alpinum* – *C. arcticum* complex, Caryophyllaceae, has been initiated by Borgen, Elven and Nordal. The ongoing studies include analyses of genetic variation by means of isoenzymes, RAPDs and SCARs, the latter in cooperation with Brochmann and Henriette Giese, Risø. In addition studies related to cytology, morphometry and reproduction are going on in this complex. Future plans include the use of genomic in situ hybridization. The main aims are to elucidate pathways and geographic patterns and to reach a reasonable taxonomy in this intriguing group (several papers in prep. by Brysting, Hagen et. al.).

Brochmann and his students have, in cooperation with Konrad Bachmann, Amsterdam, now Gatersleben, and Thomas Nilsson,

Stockholm (see also Stockholm/Uppsala) studied polyploid evolution, speciation and phylogeography within Nordic and Arctic *Saxifraga* using RAPDs and other techniques (Brochmann et al. 1996, Brysting, Gabrielsen et al. 1996).

New studies related to microendemism within the Arctic flora (Svalbard) started during the summer of 1996, so far based on student projects supervised by Brochmann, Elven and Nordal. The first phase is concentrated on the genera *Potentilla* and *Papaver*, using morphometrics, isoenzymes and RAPDs. Biosystematics started more or less with the genus *Papaver* in Oslo and recently the circle has been closed by applying new molecular and demographic analyses (Nordal et al. in press, Elven, Nordal & Solstad, in prep.).

SCIENTIFIC PUBLICATIONS 1993-96

Ardévol González, J.F., Borgen, L. & Pérez de Paz, P. L. 1993. Checklist of chromosome numbers counted in Canarian vascular plants. - *Sommerfeltia* 18: 1-59.

Borgen, L. 1995a. Biosystematics of *Lobularia*, Cruciferae, revisited: evidence from isoenzyme data. - *Giorn. Bot. Ital.* 129: 105-114.

Borgen, L. 1995b. Cladistic biogeography in the Atlantic Islands: a case study based on two plant genera, *Lobularia* and *Nauplius*. - *Bot. Mus. Mun. Funchal, Sup. no. 4*, 123-137.

Borgen, L. 1996. Genetic differentiation in endemic *Lobularia* (Brassicaceae) in the Canary Islands. - *Nord. J. Bot.* 16, in press.

Brochmann, C. 1993 a. Clinal and parallel evolution in the vascular flora of the Cape Verde Islands, W. Africa. - *Courier Forschungs-Institut Senckenberg* 159: 67-85.

- Brochmann, C. 1993 b. Reproductive strategies of diploid and polyploid populations of arctic *Draba* (Brassicaceae). - *Plant Systematics and Evolution* 185: 55–83.
- Brochmann, C., Borgen, L. & Stedje, B. 1993. Crossing relationships and chromosome numbers of Nordic populations of *Draba* (Brassicaceae), with emphasis on the *D. alpina* complex. - *Nord. J. Bot.* 121: 1–147.
- Brochmann, C., Gabrielsen, T. M., Hagen, A. & Tollefsrud, M. M. 1996. Seed dispersal and molecular phylogeography; glacial survival, *Tabula rasa*, or does it really matter? - *Skr. Norske Vidensk.-Akad. Oslo. I. Matem.-naturv. Kl. n. s.*, in press.
- Brochmann, C., Lobin, W., Sunding, P. & Stabbetorp, O. 1995. Parallel ecocline evolution and taxonomy of *Frankenia* (Frankeniaceae) in the Cape Verde Islands, W. Africa. - *Nord. J. Bot.* 15: 603–623.
- Brochmann, C., Nilsson, T. & Gabrielsen, T. M. 1996. A classical example of postglacial allopolyploid speciation re-examined using nucleotide sequences and RAPD markers: *Saxifraga osloënsis*. - *Acta Univ. Ups. Symb. Bot. Ups.* 31 (3): 75–89.
- Brysting, A. K., Elven, R. & Nordal, I. 1996. The hypothesis of hybrid origin of *Poa jemtlandica* (Almq.) Richter elucidated by morphometry and isozyme studies. - *Nord. J. Bot.* 16, in press.
- Brysting, A. K., Gabrielsen, T. M., Sørlibråten, O., Ytrehorn, O. & Brochmann, C. 1996. The Purple Saxifrage (*Saxifraga oppositifolia*) in Svalbard: two taxa or only one? - *Polar Research* 15 (2), in press.
- Fangan, B. M. & Nordal, I. 1993. A comparative analysis of morphology, chloroplast-DNA and distribution within the genus *Crinum* (Amaryllidaceae). - *J. Biogeogr.* 20: 55–61.
- Fangan, B. M., Stedje, B., Stabbetorp, O. E., Jensen, E. S. & Jakobsen, K. S. 1994. A general approach for PCR-amplification and sequencing of chloroplast DNA from crude vascular plant and algal tissues. - *BioTechnol.* 16 (3): 484–494.
- Haraldsen, K. B. & Wesenberg, J. 1993. Population genetic analyses of an Amphioceanic species: *Lychnis alpina* (Caryophyllaceae). - *Nord. J. Bot.* 13: 377–387.
- Jonsell, B., Kustås, K. & Nordal, I. 1995. Genetic variation in *Arabis petraea*, a disjunct species in Northern Europe. - *Ecography* 18: 321–332.
- Kativu, S. & Nordal, I. 1993. New combinations in the African species of *Chlorophytum* (Anthericaceae). - *Nord. J. Bot.* 13: 59–65.
- Nordal, I. 1995. Amaryllidaceae. - In Thulin, M. (ed.). *Flora of Somalia*, Vol. 4: 56–62. Royal Bot. Gard. Kew, London.
- Nordal, I. 1996. Amaryllidaceae, Anthericaceae, Hypoxidaceae, Asphodelaceae. - *Flora of Ethiopia*, Vol. 6, in press.
- Nordal, I. & Fangan, B. M. 1994. Taxonomical inferences of a molecular study in the genus *Crinum* (Amaryllidaceae). - XIIIth A.E.T.F.A.T. Proceedings, Vol. 1: 545–555. Zomba, Malawi.
- Nordal, I., Hestmark, G. & Solstad, H. 1996. Reproductive biology and demography of *Papaver radicum* – a key species in Nordic plant geography. - *Opera Botanica*, in press.
- Nordal, I. & Iversen, A. P. 1993. Mictic and monomorphic versus partenogenetic and polymorphic – a comparison of two mountain grasses. - *Opera Botanica* 121: 19–27.
- Nordal, I. & Laane, M. M. 1996. Taxonomic delimitation within *Cochlearia officinalis* s. lat. with particular discussion on the rank of *C. anglica*. - *Acta Univ. Ups. Symb. Bot.*

- Ups. 31 (3): 47-57.
- Nordal, I. & Stedje, B. 1993. The genus *Ornithogalum* in Zimbabwe. - *Kirkia* 24: 60-65.
- Nordal, I. & Thulin, M. 1993. Synopsis of *Anthericum* and *Chlorophytum* in the Horn of Africa including the description of nine new species. - *Nord. J. Bot.* 13: 257-280.
- Oostermeijer, G., Hvatum, H., den Nijs, H. & Borgen, L. 1996. Genetic variation, plant growth strategy and population structure of the rare, disjunctly distributed *Gentiana pneumonanthe* in Norway. - *Acta Univ. Ups. Symb. Bot. Ups.* 31 (3): 185-203.
- Rustan, Ø. H. 1996. Revision of the genus *Diplotaxis* (Brassicaceae) in the Cape Verde Islands, W. Africa. - *Nord. J. Bot.* 16: 19-50.
- Rustan, Ø. H. & Brochmann, C. 1993. Additions to the vascular flora of Cabo Verde. III. - *Garcia de Orta, Sér. Bot.* 11: 31-62.
- Røren, V., Stabbetorp, O. & Borgen, L. 1994. Hybridization between *Viola canina* L. and *V. persicifolia* Schreb. in Norway. - *Nord. J. Bot.* 14: 165-172.
- Sebsebe Demissew & Nordal, I. 1996. Asphodelaceae. - *Flora of Ethiopia Vol 6*, in press.
- Stedje, B. 1996. Hyacinthaceae. - *Flora of Tropical East Africa*. Rotterdam. 32 pp.
- Stedje, B. & Nordal, I. 1994. Anthericaceae versus Asphodelaceae, a pilot study based on Ethiopian material. - XIIIth A.E.T.F.A.T. Proceedings, Vol. 1: 513-524. Zomba, Malawi.
- Stedje, B. & Thulin, M. 1995. Synopsis of Hyacinthaceae in tropical East and North-East Africa. - *Nord. J. Bot.* 15: 591-601.

Stockholm/Uppsala, Sweden

Your other editor is at home in both those cities, less than an hour's journey from each other, and is more or less involved in the biosystematics going on in both places.

Bengt's base is a research institute at the Royal Swedish Academy of Sciences named the Bergius Foundation (Swedish "Bergianska Stiftelsen") according to a testimonium from 1791. It was stated that this institute had to "give a yearly increase" to natural history, particularly botany, and to promote horticulture in the country. Accordingly the Bergius Botanic Garden is connected to the Foundation. The testimonium also stipulates that the Foundation has to be directed by a person "in quality of professor" titled "Professor Bergianus", the eighth of whom in succession is now your editor.

The primary scientific achievement of the Bergius Foundation today is the *Flora Nordica*, a scientific flora of the vascular plants of the five Nordic countries (Denmark, Finland, Iceland, Norway and Sweden), which is to appear in four volumes. Botanists all over Norden contribute, but the secretariate is situated and much of the writing is made in Stockholm. It will synthesize in condensed form the immense knowledge of the Nordic vascular plants, including biosystematics, and point to problems for future research. Particularly the comments or discussions very often following the formal treatment of a species will provide a wealth of biosystematic information with references to literature and point to problems worthy of further research. Also the information about chromosome numbers, which for Norden are given with information of the province in the area from which it emanates, would be of particular biosystematic interest. The manuscript for Vol-

ume 1 is now complete and in its final phase of editing and material for Volume 2 is on its way.

All biosystematic work in Norden is of course of high interest for Flora Nordica, but time and the number of available botanists permit only a small fraction to be attacked in direct connection to the flora. An example are studies of a species as *Viola rupestris* in which differentiation related to presumed early postglacial immigration routes are investigated in a joint Stockholm/Oslo project (Nordal & Jonsell, in prep.). In a similar cooperation *Arabis petraea*, another species which posed intriguing immigration questions was studied (Jonsell, Kustås & Nordal 1995). In this species an extraordinarily high intrapopulation enzymatic variation was revealed. Also the differentiation in *Parnassia palustris* is now taken up by isozymic analyses by Ulla-Maj Hultgård in a joint project with Liv Borgen, Oslo, as an extension of the previous studies by Hultgård (1987).

Natural conditions of special interest in our area are the land lift shores of the Baltic, supplying a permanent pioneer situation for species able to make use of it, and the Baltic limestone islands Öland and Gotland. In these areas in particular endemism in Nordic taxa on species level or below has developed postglacially, i.e. during at most 10.000 years, or seems to be under way. Some biosystematic studies are focusing these problems. The degree of variation from intrapopulation to interregional level in the orchid *Dactylorhiza traunsteineri*, bound to calcareous fens in both the areas mentioned, was studied by Eva Andersson by means of biometric and ecological analyses, hybridization and pollination experiments in the field, to give some examples (Andersson 1994, 1995, 1996). A few years

ago studies focusing the land lift shores including biometry and transplantation experiments were performed in taxa of *Galium* and *Myosotis* (Apelgren 1990, 1991 a, b, Apelgren & Lernstål 1991) and in the semi-aquatic *Callitriche* (Martinsson 1991 a, b, c, 1996), for which also reproductive biology and the situation of decline in many types of waters were paid attention to. All these studies were performed at the Department of Systematic Botany of Uppsala University in close cooperation with the Bergius Foundation in Stockholm. Research activities relating to these evolutionary interesting areas are in progress in other Swedish centres as well (e.g. Lund, Umeå) and will hopefully be presented in a coming newsletter.

There are more orchid projects in Uppsala. An orchid exclusive to Gotland in our Nordic flora, *Orchis spitzelii*, has been devoted a study mainly treating its pollination biology and floral evolution but also the problem about the age of its highly disjunct population on the island in the Baltic (Fritz 1990, 1995, Fritz & Nilsson 1994). A large scale isozyme study is giving important insights into the evolution of the *Dactylorhiza incarnata-maculata* (Hedréen 1996 a) and *Pseudorchis*, which has apparently immigrated to Norden from two directions, is compared by its isozymes (Reinhammar 1995, Reinhammar & Hedréen, in press). Also the genus *Carex* is being studied: problems relating to the differentiation between pairs of mountain and lowland taxa (Reinhammar in prep.) and the intricate *Carex flava* group with a poorly understood display of endemism in Norden (Hedréen 1996 b, and in prep.).

There is a great tradition of biosystematic research also in Uppsala departments of the Agricultural University of Sweden (SLU),

where Göte Turesson was a professor and Hedda Nordenskiöld produced her classical *Luzula* studies. Today studies are related to problems of species conservation and flora protection as the investigations on the highly diminishing *Gentianella* species, which include many long term field experiments in the traditional agricultural landscape (Lennartsson & Svensson 1996, Lennartsson in prep.).

Returning to Stockholm, now to the Institute of Botany at the University, a classical Scandinavian endemic, *Saxifraga osloënsis*, is being restudied by means of isozymic, RAPD and other molecular methods (Brochmann, Nilsson & Gabrielsen 1996, Nilsson 1995 a, b, and in press), which seem to confirm its allopolyploidy and point to a possible multiple origin. As proper for this Norwegian-Swedish endemic this is again a Stockholm/Oslo cooperation. In Stockholm we hope to go on with molecular studies of further endemics, as those on the Baltic islands in the *Senecio jacobaea* group – this time with the Bergius Foundation and the Department of Phanerogamic Botany in the Natural History involved.

As you see much biosystematics is going on in Stockholm/Uppsala, but under various roofs and in various constellations of cooperation and the projects cited are only parts of the research activities in the institutes mentioned which mainly focus other branches of systematic, evolutionary or ecological botany. Except for the Flora Nordica project and what is directly connected there, the view for the future is a bit uncertain, depending much upon where now most active scientists will finally obtain their positions.

SCIENTIFIC PUBLICATIONS MAINLY FROM THE 1990's

- Andersson, E. 1994. On the identity of orchid populations: a morphometric study of the *Dactylorhiza traunsteineri* complex in eastern Sweden. - Nord. J. Bot. 14: 269–275.
- Andersson, E. 1995. Age-related morphological differentiation among populations of *Dactylorhiza traunsteineri* (Orchidaceae). - Nord. J. Bot. 15: 127–137.
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GENTIANELLA CAMPESTRIS



IOPB Chromosome Data 11

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edited by Clive A. Stace
Department of Botany
University of Leicester
Leicester LE1 7RH
England.

E-mail: cas7@le.ac.uk. Please send contributions to Professor Stace at the above address (preferably by e-mail, but failing that on a 3.5 inch microdisc with text in ASCII-file and a printed copy) using the *exact layout* of the present list and stating whether or not you are a member of IOPB. Neither proofs nor reprints will be made available, but the editor will acknowledge receipt of contributions and raise queries with authors if necessary.

Reports by:

- **I. Daniela**, Department of Plant Systematics and Geography, Institute of Botany, Georgian Academy of Sciences, Kojori Road 1, 380007 Tbilisi, Georgia. Vouchers in TBI. Author's name abbreviated to ID.

ALISMATACEAE

Sagittaria trifolia L. 2n=22. Georgia: Ozurgeti area, Ureki, 15.08.1993, ID.

ASTERACEAE

Achillea bisserata Bieb. 2n=18. Georgia: Mtskheta, Armazi Gorge, 25.05.1995, ID.

A. millefolium L. 2n=18. Georgia: Tbilisi, Legvtakhevi Gorge, 10.05.1993, ID.

Bidens tripartita L. 2n=48. Georgia: Environs of Tbilisi, Saburtalo, 30.09.1994, R. Gagnidze.

Erigeron alpinus L. 2n=18. Georgia: Kazbegi area, vicinity of Sameba Church, 2150m, 09.07.1995, ID.

Hieracium pilosella L. 2n=18. Georgia: Kazbegi area, Elia, 2000m, 08.07.1995, ID.

Scariola viminea (L.) F.W. Schmidt. 2n=18. Georgia: Tbilisi, environs of Central Botanical Garden, 05.09.1994, R. Gagnidze.

Tragopon graminifolius DC. 2n=12. Georgia: Tbilisi, Legvtakhevi Gorge, 20.05.1995, ID.

DIPSACACEAE

Scabiosa caucasica Bieb. 2n=36. Georgia: district Javakheti, environs of Lake Paravani, 12.07.1994, P. Chkheidze.

FABACEAE

Trifolium ambiguum Bieb. 2n=16,32. Georgia: Kazbegi area, near the Ecological Station, 1900m, 08.07.1995, ID.

T. ambiguum Bieb. 2n=24. Georgia: Kazbegi area, Gergeti, Mt. Kvena, 2450m, 12.07.1995, ID.

Trifolium repens L. 2n=16. Georgia: Kazbegi area, Pansheti, on pebbles, 11.07.1995, ID.

GENTIANACEAE

Centaurium pulchellum (Sw.) Druce. 2n=36. Georgia: Ozurgeti area, Ureki, coastal area, 12.08.1993, ID.

Gentiana septemfida Pall. 2n=26. Georgia: Bakuriani, Tskhratskharo, 2200m, 17.08.1995, ID.

LILIACEAE

Polygonatum polyanthemum (Bieb.) A. Dietr. 2n=18. Georgia: Mtskheta, Armazi Gorge, 25.05.1995, ID.

Tulipa lipskyi Grossh. 2n=24. Russian Federation: Krasnodar district, Caucasian State Biosphere Reserve, Mt. Iatirgvarta, 2700m, 06.06.1988, ID.

POACEAE

Cynosurus echinatus L. 2n=14,14+2B.
Georgia: Tbilisi, Legvtakhevi Gorge,
19.07.1993, R. Gagnidze.

Melica transsilvanica Schur. 2n=18. Georgia:
Tbilisi, Legvtakhevi Gorge, 11.06.1994, T.
Kurdadze.

Polypogon monspeliensis (L.) Desf. 2n=28.
Georgia: Poti area, Maltakva, swampy sub-
stratum, 16.08.1993, ID.

Festuca valesiaca Gaudin. 2n=14. Georgia:
Tbilisi, Nutsudidze plateau, 02.05.1993, ID.

Koeleria caucasica (Domin) B. Fedtsch.
2n=14. Georgia: Tbilisi, Legvtakhevi Gorge,
10.05.1993, ID.

SCROPHULARIACEAE

Scrophularia scopolii Hoppe ex Pers. 2n=26.
Georgia: Ozurgeti area, Ureki, 14.08.1993,
ID.

URTICACEAE

Parietaria judaica L. 2n=26. Georgia: Shiraki,
Vashlovani Reserve, 15.05.1995, T.
Kurdadze.

ZYGOPHYLLACEAE

Zygophyllum fabago L. 2n=22. Georgia:
Tbilisi, Legvtakhevi Gorge, 10.05.1993, ID.

• **I. Daniela**, Department of Plant System-
atics and Geography, Institute of Botany,
Georgian Academy of Sciences, Kojori Road
1, 380007 Tbilisi, Georgia. Vouchers in TBI.
Author's name abbreviated to ID.

ASTERACEAE

Anthemis candidissima Willd. ex Spreng.
2n=18. Georgia: environs of Tbilisi, Nut-
subidze plateau, 02.05.1993, ID.

Carthamnus glaucus Bieb. 2n=20. Georgia:
environs of Tbilisi, Saburtalo, 01.10.1994,
R. Gagnidze.

Crassocephalum crepidioides (Benth.) Moore.
2n=40. Georgia: Ozurgeti area, Ureki,
14.08.1993, ID.

Grossheimia macrocephala (Muss.-Puschk. ex
Willd.) Sosn. et Takht. 2n=18. Georgia:
Bakuriani, Tskhratskharo, 2200m, 17.08.
1995, ID.

Inula orientalis Lam. 2n=16. Georgia:
Kazbegi area, Mt. Kuro, 2000m, 08.07.
1995, ID.

Taraxacum stevenii DC. 2n=16. Georgia:
Bakuriani, Tskhratskharo, 2400m, 17.08.
1995, ID.

BRASSICACEAE

Coluteocarpus vesicaria (L.) Holmboe. 2n=14.
Georgia: Mtskheta, Armazi Gorge, 25.05.
1995, ID.

CAMPANULACEAE

Campanula trautvetteri Grossh. ex Fed.
2n=90. Georgia: Javakheti district, Para-
vani, vicinity of field station, 25.07.1994,
P. Chkheidze.

CARYOPHYLLACEAE

Cerastium argenteum Bieb. 2n=36. Georgia:
Tbilisi, Legvtakhevi Gorge, 05.05.1993, ID.

Dianthus orientalis Adam. 2n=30. Georgia:
Tbilisi, Legvtakhevi Gorge, 10.06.1994, T.
Kurdadze.

LAMIACEAE

Betonica macrantha C. Koch 2n=16. Georgia:
Kazbegi, Elia, 1900m, 08.07.1995, ID.

LIMONIACEAE

Acantholimon lepturoides (Jaub. et Spach)
Boiss. 2n=30. Georgia: Tbilisi, Legvtakhevi
Gorge, 20.07.1994, T. Kurdadze.

VALERIANACEAE

Centranthus longiflorus Stev. 2n=16, 16+2.
Georgia: Tbilisi, Legvtakhevi Gorge, 14.07.
1994, T. Kurdadze.

• **C. Dobes & B. Hahn**, Institute of Botany and Botanical Garden, University of Vienna, Rennweg 14, 1030 Vienna, Austria. Vouchers are deposited in WU unless otherwise stated: BW (private collection of B. Wallnöfer), EH (private collection of E. Hörandl) or LI. The collectors are B. Hahn (BH), B. Wallnöfer (BW), C. Dobes (D), E. Hörandl (EH), E. & G. Gülles (G), G. Morawetz (GM), J. Walter (JW), M. Kosch (K), G.H. Leute (L), F. Reiner (R), W. Till (T) and W. Morawetz (WM). The number preceding the date of collection denotes the square of the distribution grid map (see Niklfeld H., 1971. Bericht über die Kartierung der Flora Mitteleuropas. *Taxon* 20: 545-571) from which the material originates (e.g. 7864/1). The work has been supported by the University of Vienna and the Austrian Academy of Sciences.

AMARANTHACEAE

Amaranthus deflexus L. 2n=34. Austria: Vienna: 18th district: Währinger Park, 186m a.s.l., 7864/1, 02. 09. 1991, JW s.n.

APIACEAE

Conium maculatum L. 2n=22. Austria: Vienna, 11th district, along tracks of the railway Vienna - Wolfsthal, between St. Marxer Friedhof cemetery and Geystrasse, 180m a.s.l., 7864/1, 28. 09. 1989, BW 1431, voucher BW.

Eryngium planum L. 2n=16. Austria: Lower Austria, valley of River March, on embankment c. 3.5km S. of Dürnkrot, c. 150m a.s.l., 7567/1, 13. 09. 1991, G s.n.

Hacquetia epipactis (Scop.) DC. 2n=16. Austria: Carinthia, Karawanken: Loiblpass, along the old road 100m from the old custom house, 1350m a.s.l., 9551/4, 25. 05. 1989, G s.n.

Heracleum austriacum L. subsp. *austriacum*. 2n=22. Austria: Upper Austria. Haller Mauern, west-facing slopes of the mountain Bosruck, 200m below the cave Wildfrauenhöhle, 1500m a.s.l., 8352/3, 14. 08. 1989, G s.n.

ASPARAGACEAE

Convallaria majalis L. 2n=38. Austria: Carinthia, Klagenfurter Becken, mountain Ulrichsberg (southern part), c. 920m a.s.l., 9351/2, 1991, L s.n.

Polygonatum odoratum (Mill.) Druce. 2n=20. Austria: Styria, Zeller Staritzen, mountain Kastenriegel, 1094m a.s.l., 8357/2, 07. 06. 1990, G s.n.

ASTERACEAE

Centaurea nigrescens Willd. subsp. *vochinensis* (Bernh. ex Rchb.) Nyman. 2n=22. Austria: Carinthia, Karawanken, Pluschgrabben, 9453/4, L, K s.n.

Crepis froelichiana DC. subsp. *dinarica* (Beck) Guterm. 2n=8. Austria: Carinthia, Dobratsch, 24. 03. 1994.

BORAGINACEAE

Omphalodes scorpioides (Haenke) Schrank. 2n=36. Austria: Vienna, 2nd district, Prater, c. 0.4km N.W. of the historic pavilion "Lusthaus", c. 158m a.s.l., 7864/2, 01. 05. 1988, EH 1139, voucher EH.

BRASSICACEAE

Cardaminopsis halleri (L.) Hay. subsp. *ovirensis* (Wulf.) Hegi & E. Schm. 2n=16. Austria: Styria, Eisenerz, along the trail to summit of mountain Pfaffenstein, c. 850m a.s.l., 8455/3, 14. 04. 1991, G s.n.

Cochlearia pyrenaica DC. 2n=12. Austria: Lower Austria, Innerhalbach, 7km S. of Kleinzell, 550m a.s.l., 8060/1, 31. 05. 1988, G s.n.

Dentaria enneaphyllos L. 2n=80. Austria: Lower Austria, N. of Pernitz, S.W. of

- Schaerfthal, c. 500m a.s.l., 8061/4, 25. 04. 1993, T s.n.
- D. glandulosa* W. & K. 2n=48. Austria: Styria, valley of River Mur, W. of Ehrenhausen, near Spielfeld-Strass, c. 260m a.s.l., 9259/3, 01. 05. 1993, D s.n.
- D. pentaphyllos* L. 2n=48. Austria: Carinthia, Karawanken, Eisenkappel, along rivulet Lipnikbach, 3km S.E. of Sittersdorf and 0.5km N.E. of Homelitschach, c. 700m a.s.l., 9453/4, 02. 05. 1993, D s.n.; Carinthia, Karawanken, in gorge Tscheppaschlucht, near Ferlach, 700m a.s.l., 9551/2, 25. 05. 1989, G s.n.
- Descurainia sophia* (L.) Webb ex Prantl. 2n=28. Austria: Lower Austria, Steinfeld, 1km N.N.W. of Breitenau, 340m a.s.l., 8262/4, 21. 06. 1991, JW s.n.
- Draba aizoides* L. subsp. *beckeri* (Kern.) Hoerandl & Guterm. 2n=16. Austria: Lower Austria, Northern Alps, mountain Reisalpe, S.W. of Kleinzell, c. 0.4–0.7km S.W. of the hut, 1340m a.s.l., 8059/2, 08. 08. 1993, EH 5454.
- Petrocallis pyrenaica* (L.) R.Br. 2n=14. Austria: Carinthia, Karawanken, along trail to summit of mountain Hochobir, southern part, 2000m a.s.l., 9452/4, 29. 06. 1989, G s.n.
- Thlaspi caerulescens* J. & K. Presl. 2n=14. Austria: Carinthia, Nockberge, 1km S.S.E. of Ebene Reichenau, at the farm "Sepp im Schuss", c. 1200m a.s.l., 9149/1, 26.03. 1991, G s.n.
- BUTOMACEAE**
- Butomus umbellatus* L. 2n=39. Austria: Lower Austria, Tullnerfeld, Altenwörth, pastures of River Danube, 185m a.s.l., 7661/1, 20. 08. 1988, G s.n.
- CAMPANULACEAE**
- Campanula pulla* L. 2n=34. Austria: Upper

- Austria, Warscheneck, between huts Dürmler Hütte and Linzer Haus at "Hals", 1570m a.s.l., 8351/2, 12. 08. 1989, G s.n.
- CARYOPHYLLACEAE**
- Cerastium arvense* L. subsp. *arvense*. 2n=64±2. Austria: Carinthia, Karawanken, along trail between Schaidasattel and mountain Hochobir, Kreuzwiese, 1680m a.s.l., 9552/2, 29. 06. 1989, G s.n.
- Dianthus superbus* L. 2n=30. Austria: Carinthia, Nockberge, mountain Falkert, 9148/2, 08. 08. 1990, L s.n.
- Lychnis viscaria* L. 2n=24. Austria: Lower Austria, Waldviertel, 5km N.W. of Dürnstein, Sandlstrasse, 600m a.s.l., 7558/4, 30. 05. 1990, G s.n.
- Petrorhagia prolifera* (L.) Ball & Heyw. 2n=30. Austria: Vienna, 2nd district, Praterstern, railway station "Wien Nord", 160m a.s.l., 7764/3, 25. 08. 1991, JW s.n.
- Saponaria officinalis* L. 2n=28. Austria: Lower Austria, banks of River Danube, Altenwörth, 4km W. of the hydroelectric power plant "Altenwörth", 180m a.s.l., 7660/2, 22. 08. 1987, G s.n.
- Stellaria nemorum* L. s.str. 2n=26. Austria: Styria, Aflenzer Staritzen, Seebergsattel, 1270m a.s.l., 8357/4, 08. 06. 1990, G s.n.
- CHENOPODIACEAE**
- Atriplex sagittata* Borkh. 2n=18. Austria: Lower Austria, Weinviertel, 11.5km N.W. of Hollabrunn, Goggendorf, 245m a.s.l., 7361/4, 15. 10. 1991, JW s.n.
- Bassia prostrata* (L.) A.J. Scott. 2n=18. Austria: Lower Austria, Weinviertel, 2km N. of Jetzelsdorf, near Zellerndorf, 275m a.s.l., 7263/3, 17. 10. 1993, D s.n.
- Chenopodium opulifolium* Schrad. ex Koch & Ziz. 2n=54. Austria: Vienna, 23rd district, Lainzer Tiergarten, at the entry Güten-

bachtor, 290m a.s.l., 7863/1.03. 10. 1991, JW s.n.

Chenopodium polyspermum L. 2n=18. Austria: Vienna, 23rd district: Lainzer Tiergarten, at the entry Gütenbachtor, 290m a.s.l., 7863/1, 03. 10. 1991, JW s.n.

Chenopodium urticum L. 2n=18. Austria: Vienna, 23rd district, Lainzer Tiergarten, E. of the entry Gütenbachtor, 290m a.s.l., 7863/1, 03. 10. 1991, JW s.n.

COLCHICACEAE

Colchicum autumnale L. 2n=c.36. Austria: Lower Austria, Wienerwald, Gruberau, 0.5km W. of Schusternazl, 390m a.s.l., 7862/4, 22. 03. 1990, G s.n.

FABACEAE

Anthyllis vulneraria L. subsp. *alpestris* (Kit. ex Schult.) Asch. & Gr. 2n=12. Austria: Carinthia, Nockberge, Saureggen, 4km N. of Ebene Reichenau, 1700m a.s.l., 9149/1, 17. 10. 1988, G s.n.

Astragalus glycyphyllos L. 2n=16. Austria: Lower Austria, Wienerwald, Exelbergstrasse, Rotes Kreuz, 497m a.s.l., 7763/1, 24. 08. 1988, G s.n.

Lathyrus linifolius (Reichard) Baessl. 2n=14. Austria: Carinthia, Klagenfurter Becken, Maria Saal, Stutterner Moos, 475m a.s.l., 9352/1, 04. 08. 1991, L s.n.

Lathyrus sylvestris L. 2n=14. Austria: Lower Austria, Weinviertel, Ladenbrunner Wald, c. 5km N. of Asparn/Zaya, 350m a.s.l., 7364/4, 13. 09. 1988, G s.n.

Lathyrus vernus (L.) Bernh. 2n=14. Austria: Lower Austria, Weinviertel, Kreuttal, Unteralberndorf, along rivulet Russbach, 200m a.s.l., 7564/4, 05. 04. 1990, G s.n.

Medicago minima (L.) Bartal. 2n=16. Austria: Vienna, 2nd district, Prater: banks of River Donaukanal between Freudenau and Praterspitz, c. 160m a.s.l., 7864/2, 30.

07. 1989, EH 910.

Vicia sativa L. 2n=12. Austria: Lower Austria, Weinviertel, Blumenthal, near Zistersdorf, c. 200m a.s.l., 7466/3, 22. 07. 1985, GM s.n.

GLOBULARIACEAE

Globularia nudicaulis L. 2n=16. Austria: Carinthia, Karawanken, Vellacher Kotschna, along trail to Sanntaler Scharte, 1250m a.s.l., 9653/1, 24. 05. 1989, G s.n.

JUNCACEAE

Luzula alpinopilosa (Chaix) Breistr. 2n=12. Austria: Vorarlberg, Silvretta, Obervermunt, along trail to Hochmaderjoch, 2100m a.s.l., 9026/3, 28. 07. 1988, G s.n.

Luzula sudetica (Willd.) Schult. 2n=48. Austria: Styria, Totes Gebirge, Salzofen-Elm area, c. 200m E.N.E. of the hut Pühlingerhütte, 1660m a.s.l., 8349/2, 26. 09. 1989, EH 1546, voucher EH.

LAMIACEAE

Leonurus marrubiastrum L. 2n=26. Austria: Lower Austria, Weinviertel, embankment of River Zaya, 3.7km N.N.E. of Drösing, c.148m a.s.l., 7467/2, 10. 10. 1992, JW s.n.

Lycopus europaeus L. 2n=22. Austria: Lower Austria, Weinviertel, Fürstenwald, S.E. of Hohenau, Lake Pommersee, 150m a.s.l., 7467/2, 20. 05. 1990, BW 9347, vouchers in BW, LI, WU.

Prunella grandiflora (L.) Scholler. 2n=28. Austria: Lower Austria, Wienerwald, Kaltenleutgeben, Saugraben, 350m a.s.l., 7863/3, 11. 09. 1987, G s.n.

LINACEAE

Linum alpinum Jacq. 2n=18. Austria: Lower Austria, Rax, valley Schwarzatal, along the trail "Rudolfssteig", 700m a.s.l., 8260/4, 18. 05. 1989, G s.n.

MALVACEAE

Alcea biennis Winterl. 2n=42. Austria: Lower

Austria, Weinviertel: 2km W.N.W. of Zellerndorf and 0.4km W.N.W. of summit of mountain Altenberg, 260m a.s.l., 7261/4, 17. 10. 1993, D s.n.

MENYANTHACEAE

Menyanthes trifoliata L. 2n=54. Austria: Lower Austria, Waldviertel, north-western part, 1990, WM s.n.

PAPAVERACEAE

Papaver dubium L. subsp. *austromoravicum* (Kubat) Hoerandl. 2n=28. Austria: Lower Austria, valley of River March, c. 1.5km E. of Sierndorf/March, c. 150m a.s.l., 7467/3, 19. 06. 1993, EH 5221.

PARNASSIACEAE

Parnassia palustris L. 2n=18. Austria: Vorarlberg, Montafon, Rätikon, along trail to summit of mountain Tschagunser Mittagsspitze, 1940m a.s.l., 8925/1, 27. 09. 1988, G s.n.

POLYGONACEAE

Persicaria bistorta (L.) Samp. 2n=48. Austria: Lower Austria, Waldviertel, near Weitra, Heinrichs, near the cemetery, 580m a.s.l., 7255/1, 31. 05. 1990, G s.n.

Rumex acetosa L. 2n=14. Austria: Lower Austria, Northern Alps, mountain Gippel, valley Weissenbachtal, 650m a.s.l., 8159/4, 23. 05. 1990, G s.n.

RANUNCULACEAE

Thalictrum aquilegifolium L. 2n=14. Austria: Carinthia, Karawanken, Vellacher Kotschna, at the hut Offner Hütte, 1469m a.s.l., 9653/1, 01. 07. 1989, G s.n.

ROSACEAE

Sanguisorba minor Scop. subsp. *minor* 2n=28. Austria: Lower Austria, Northern Alps, mountain Schneeberg, valley Hengsttal, S.S.W. of Puchberg am Schneeberg, c. 860m a.s.l., 8261/1, 25. 07. 1993, EH 5429.

Sanguisorba minor Scop. subsp. *polygama* (W.

& K.) Cout. 2n=28. Austria: Lower Austria, Thermenlinie, Perchtoldsdorfer Heide, c. 1.5km N.W. Perchtoldsdorf, c. 300m a.s.l., 7863/3, 16. 06. 1993, EH 5220; Vienna, 21st district, Strebersdorf, banks of canal Marchfeldkanal, c. 0.6km E.N.E. of railway station, c. 160m a.s.l., 7764/1, 15. 06. 1993, EH 5215.

SCROPHULARIACEAE

Digitalis grandiflora Mill. 2n=56. Austria: Carinthia, Karawanken, Ebriach, at beginning of road to mountain Obir, 600m a.s.l., 9553/1, 02. 07. 1989, G s.n.

Melampyrum subalpinum (Juratzka) Kern. subsp. *subalpinum* var. *angustissimum*. 2n=18. Austria: Lower Austria, Thermenlinie, Gainfarn, inside castle Merkenstein, 450m a.s.l., 8062/2, R s.n.

URTICACEAE

Urtica dioica L. 2n=52. Austria: Burgenland, Mattersburg, Rohrbach, "Teichwiesen", 2.5km E. of railway station "Rohrbach-Marz", 300m a.s.l., 8264/4, 01. 04. 1991, G s.n. 2n=36. Austria: Lower Austria, valley of River March, near "Hufeisen", 1.5km E. to 2km E.N.E. of Sierndorf/March, c. 150m a.s.l., 7467/3, 16. 05. 1993, EH 5116.

Urtica kiroviensis Rogow. 2n=26. Austria: Lower Austria, Weinviertel, "Fürstenwald" S.E. of Hohenau, 150m a.s.l., 7467/2, 20. 05. 1990, BW 2008, voucher BW.

• **R. Gagnidze, D. Mtskhvetadze, Ts. Gviniashvili & Ts. Avazneli**, Department of Plant Systematics and Geography, Institute of Botany, Georgian Academy of Sciences, Kojori schosse 1, 380007, Tbilisi, Georgia. Vouchers in TBI. Authors' names abbreviated to RG, DM, TG and TA.

ASTERACEAE

Cicerbita racemosa (Willd.) Beav. 2n=16.

Georgia: Tusheti, basin of River Chanchakhovani, gorge of River Khiso, 1800m, 01.07.1988, RG.

Erigeron uniflorus L. 2n=18. Georgia: Tusheti, gorge of River Gometsris Alazani, Etelta, 3000m, 07.08.1986, D. Chelidze.

BRASSICACEAE

Arabis brachycarpa Rupr. 2n=16. Georgia: Kartli, Tskhra-Tskharo pass, 08.08.1971, DM.

A. nordmanniana Rupr. 2n=16. Georgia: Abkhazeti, Gagra mountain range, Kudaishara (Ashkhabashkha), 26.08.1967, Z. Gvinianidze & DM.

A. sachokiana (N. Busch) N. Busch. 2n=16. Georgia: Abkhazeti, Gagra mountain range, Arabika mountain mass, 26.08.1967, Z. Gvinianidze & DM.

FABACEAE

Lathyrus annuus L. 2n=14. Georgia: Shiraki, gorge of River Kasris-tskhali, 200m, 09.07.1979, M. Sokhadze.

L. aphaca L. 2n=14. Georgia: Shiraki, gorge of River Kasris-tskhali, 200m, 09.07.1979, TA.

L. cicera L. 2n=14. Georgia: Shiraki, gorge of River Kasris-tskhali, 200m, 07.07.1979, TA.

L. hirsutus L. 2n=14. Georgia: Mtiuleti, Dusheti, lakeside Bazaleti, 900m, 16.07.1988, TA.

L. ketzkhovelii Avazneli. 2n=14. Georgia: Lechkhumi, Khvamli, 2000m, 23.07.1980, TA.

L. palustris L. 2n=14. Georgia: Abkhazeti, basin of River Bzybi, gorge of River Anishkhtsara, 11.07.1979, V. Jabrova-Kolakovskaja.

L. pratensis L. 2n=14. Georgia: Kartli,

Bakuriani, 1750m, 15.07.1981, TA & M. Khutsishvili.

L. roseus Stev. 2n=14. Georgia: Kartli, Bakuriani, 1750m, 14.07.1981, Z. Gvinianidze & TA.

L. rotundifolius Willd. 2n=14. Georgia: Kartli, Borjomi, gorge of River Chobis-khevi, 1000m, 11.07.1982, Z. Gvinianidze, L. Khintibidze & TA.

L. sativus L. 2n=14. Georgia: Racha, Ambrolauri, Khidikari, 450m, 29.07.1982, TA.

L. setifolius L. 2n=14. Georgia: Kakheti, Eniseli, 300m, 19.07.1982, I. Lachashvili.

L. silvestris L. 2n=14. Georgia: Racha, Ambrolauri, Itsa, 450m, 25.07.1982, TA & N. Narikashvili.

L. tuberosus L. 2n=14. Georgia: Kartli, Tsodreti, 800m, 08.07.1980, TA.

Orobis cyaneus Stev. 2n=14. Georgia: Shiga-Kartli, Ermani mountain mass, 2350m, 06.07.1979, Z. Gvinianidze & TA.

O. nissolia (L.) Avazneli. 2n=14. Georgia: Kartli, Tskhneti, 800m, 19.07.1982, TA.

O. sphaericus (Retz) Avazneli. 2n=14. Georgia: Kartli, Tbilisi, gorge of River Legvtakhevi, 550m, 02.06.1981, TA & M. Khutsishvili.

O. vernus L. 2n=14. Georgia: Kartli, Bakuriani, 1750m, 15.07.1981, TA.

OPHIOGLOSSACEAE

Botrychium lunaria (L.) Swartz. 2n=c.60. Georgia: Tusheti, gorge of River Kvavlo, 2550m, 31.07.1987, RG, D. Chelidze & Sh. Shetekauri.

PLANTAGINACEAE

Plantago saxatilis Bieb. 2n=24. Georgia: Tusheti, Kavkasioni, Abano pass, 2800m, 16.07.1986, RG & M. Pataraja.

POACEAE

Alopecurus armenus (C. Koch) Grossh. 2n=14. Georgia: Djavakheti, Lakeside Paravani,

2100m, 21.08.1992, RG, DM, Sh. Shetekauri & G. Kuchukhidze.

SAXIFRAGACEAE

Saxifraga sibirica L. $2n=20$. Georgia: Kakheti, gorge of River Batsara, Sakisto mountain mass, 2500m, 10.08.1990, RG & TG.

- **R. Gagnidze & M. Churadze**, Department of Plant Systematics and Geography, Institute of Botany, Georgian Academy of Sciences, and Department of Botany, University of Tbilisi, Kojori schosse 1, 380007, Tbilisi, Georgia. Vouchers in TB. Authors abbreviated to RG and MC.

RANUNCULACEAE

Ranunculus baidarae Rupr. $2n=32$. Georgia: Shiga-Kartli, Kavkasioni, Ermani mountain mass, 2350, 2450 & 2700m, 12.08.1984, RG & MC.

R. brutius Ten. $2n=16$. Georgia: Abkhazeti, Mamzishkha mountain range, Shkha-Bashkha, 1850m, 18.06.1980, RG & MC.

R. caucasicus Bieb. $2n=16$. Georgia: Shiga-Kartli, Kavkasioni, Fidar mountain mass, 2600m, 5.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, gorge of River Britat, 2600m, 8.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, Ermani mountain mass, 2450m, 12.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, gorge of river Khodzis-tskhali, 2600m, 10.08.1984, RG & MC.

R. cappadocicus Willd. (*R. ampelophyllus* Somm. et Levier). $2n=16$. Georgia: Abkhazeti, Mamzishkha mountain range, Shkha-Bashkha, 1850m, 20.06.1980, RG & MC.

R. grandiflorus L. (*R. anemonefolius* DC., *R. elegans* C.Koch). $2n=24$. Georgia: Shiga-Kartli, Kavkasioni, Ermani mountain mass, 2400m, 14.08.1984, RG & MC.

R. lojkae Somm. et Levier. $2n=16$. Georgia: Shiga-Kartli, Kavkasioni, Ermani mountain mass, 2700m, 12.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, Kelistba pass, 3100m, 22.08.1984, RG & MC.

R. obesus Trautv. $2n=28$. Georgia: Guria, Ajara-Imereti mountain range, Chinchao, between Bakhmaro and Gomismta, 2300-2400m, 27.07.1985, MC.

R. oreophilus Bieb. $2n=16, 32$. Georgia: Shiga-Kartli, Kavkasioni, gorge of Britat, 2800m, 8.08.1984, RG & MC. $2n=24$. Georgia: Shiga-Kartli, Kavkasioni, gorge of River Khodzis-tskhali, 2800m, 10.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, Fidar mountain mass, 2600m, 5.08.1984, RG & MC; Shiga-Kartli, Kavkasioni, Ermani mountain mass, 2350m, 12.08.1984, RG & MC. $2n=32$. Georgia: Shiga-Kartli, Kavkasioni, Kelis-tba pass, 3100m, 22.08.1984, RG & MC.

R. raddeanus Regel. $2n=16$. Georgia: Abkhazeti, Mamzishkha mountain range, Shkha-bashkha, 1850m, 18.06.1980, RG & MC.

R. repens L. $2n=32$. Georgia: Shiga-Kartli, Kavkasioni, gorge of River Britat, 2000m, 8.08.1984, RG & MC.

- **R. Gagnidze & Ts. Gviniashvili**, Department of Plant Systematics and Geography, Institute of Botany, Georgian Academy of Sciences, Kojori schosse 1, 380007, Tbilisi, Georgia. Vouchers in TBI. Authors abbreviated to RG and TG.

ALLIACEAE

Allium kunthianum Vved. $2n=16$. Georgia: Khevsureti, gorge of River Arguni, environs of village Shatili, 1600m, 09.07.1990, RG & L. Khutsishvili.

ASTERACEAE

Jurinea filicifolia Boiss. 2n=36. Georgia: Tusheti, upper reaches of River Pirikiti-Alazani, Atsunta mountain mass, 3100m, 18.08.1989, Sh. Shetekauri.

Kemulariella rosea (Stev. ex Bieb.) Tamamsch. 2n=18. Georgia: Tusheti, gorge of river Diklos-tskhali, Chesho mountain mass, 1800m, 13.07.1986, RG, D. Chelidze & Sh. Shetekauri.

Pyrethrum balsamita (L.) Willd. 2n=18. Georgia: Javakheti, S.E coast of Lake Paravani, near village Paravani, 2100m, 21.08.1992, RG, D. Mtskhvetadze, Sh. Shetekauri & G. Kuchukhidze.

P. leptophyllum Stev. 2n=18. Georgia: Tusheti, basin of River Chanchakhovani, gorge of River Khiso, 1800m, 10.07.1988, RG.

Scorzonera dzhavakhetica Sosn. ex Grossh. 2n=14. Georgia: Javakheti, limestone mountain mass of Tetrobi, 2100m, 10.09.1984, TG & M. Pataraiia.

BRASSICACEAE

Pseudovesicaria digitata (C.A.Mey.) Rupr. 2n=10. Georgia: Tusheti, Kavkasioni, Shaviklde mountain mass, 3200m, 22.08.1986, RG & D. Chelidze.

CARYOPHYLLACEAE

Arenaria steveniana Boiss. 2n=26. Georgia: Javakheti, limestone mountain mass of Tetrobi, 2100m, 10.09.1984, TG & M. Pataraiia.

Silene lacera (Stev.) Sims. 2n=18. Georgia: Tusheti, Plateau of Shenako, pine woods, 1800m, 07.08.1986, TG.

IRIDACEAE

Crocus scharojani Rupr. 2n=8. Georgia: Svaneti, Ugvir mountain range, 1900m, 17.08.1991. RG, TG & L. Khutsishvili.

LAMIACEAE

Betonica nivea Stev. 2n=16. Georgia: Khev-

sureti, Mutso mountain mass, 1750m, 11.08.1990, D. Chelidze & Sh. Shetekauri.

PAPAVERACEAE

Corydalis conorhisa Ledeb. 2n=16. Georgia: Tusheti, Kavkasioni, Abano pass, 2600m, 16.07.1986, RG & M. Pataraiia.

POACEAE

Alopecurus tuscheticus Trautv. 2n=28. Georgia: Tusheti, gorge of River Kvavlo, 2650m, 31.07.1987. RG, D. Chelidze & Sh. Shetekauri.

PRIMULACEAE

Primula luteola Rupr. 2n=22. Georgia: Tu-sheti, basin of River Pirikiti-Alazani, between the mountain masses of Dartlo and Chesho, 1750m, 21.08.1987, RG & D. Chelidze.

RANUNCULACEAE

Ficaria fascicularis C.Koch. 2n=16. Georgia: Javakheti, limestone mountain mass of Tetrobi, 2200m, 31.05.1985, D.Chelidze & L.Zautashvili.

ROSACEAE

Alchemilla caucasica Bieb. 2n=64. Georgia: Kakheti, gorge of River Batsara, Mt. Sakisto, 2500m, 10.08.1990, RG & TG.

• **W.F. Grant**, Department of Plant Science, P.O. Box 4000, Macdonald Campus of McGill University, Ste. Anne de Bellevue, Quebec H9X 3V9, Canada. Vouchers in MTMG.

FABACEAE

Lotus japonicus (Regel) Larsen. 2n=12. Japan: around Nagaike pond, Kande-Cho, Nishi-ku, Kobe City, 01.07 1995, H. Takano & K. Watanabe.

Lotus japonicus (Regel) Larsen. 2n=12. Japan: slope of baseball field, Kobe University Campus, July 1995, K. Watanabe.

- **S. Y. Kamble**, Department of Botany, University of Poona, Pune 411 007, Maharashtra, India. Vouchers in Herbarium of Botanical Survey of India (BSI), Pune 411 001.

ASPARAGACEAE

- Asparagus racemosus* Willd. n=10. India: Patur, Akola district, Maharashtra, Kamble 152656.
- A. laevisimus* Steud. n=10. India: Medshi, Akola district, Maharashtra, Kamble 152507.
- A. gonocladus* Bak. n=10. India; Experimental Garden of Botanical Survey of India, Pune, Maharashtra, Kamble 161044.
- A. adscendens* Roxb. n=10. India: Garden of Jawaharlal Nehru Ayurvedic Medicinal Plants Garden and Herbarium, Kothrud, Pune, Maharashtra, Kamble 161057.

BIGNONIACEAE

- Crescentia cujete* L. n=12. India: Experimental Garden of Botanical Survey of India, Pune, Kamble 161015.

CACTACEAE

- Epiphyllum macropterum* Britton & Rose. n=11. India; Experimental Garden of Botanical Survey of India, Western Circle, Pune, Maharashtra, Kamble 161021.

CONVOLVULACEAE

- Ipomoea petaloidea* Choisy. n=15. India: Morna, Akola district, Maharashtra, Kamble 152761.

OROBANCHACEAE

- Aeginetia indica* L. n=15. India; Raipur and Tarobanda, Amravati district, Maharashtra, Ansari 144004.

ZINGIBERACEAE

- Costus speciosus* Smith. n=9. India: Tarobanda, Amravati district, Maharashtra, Kamble 144025.

- **Elzbieta Kuta & Leslaw Przywara**, Department of Plant Cytology and Embryology, Institute of Botany, Jagiellonian University, Grodzka 52, 31-044 Kraków, Poland, & **Ryszard Ochyra**, Laboratory of Bryology, W. Szafer Institute of Botany, Polish Academy of Sciences, Lubicz 46, 31-512, Kraków, Poland. The work concerning Polish material was supported by the Committee for Scientific Research. Vouchers in Kram.

BRYACEAE

- Leptobryum pyriforme* (Hedw.) Wils. n=20. Poland: Western Carpathians, Pogórze Lessowe, Rozbórz near Przeworsk, Ochyra 91/95.
- Rhodobryum roseum* (Hedw.) Limpr. n=10. Poland: Western Carpathians, Dolina Strazyska in the Tatra Mts, Ochyra 100/95.

DICRANCEAE

- Holomitrium perichaetiale* (Hook.) Brid. n=10. New Zealand: North Island, Tongariro National Park, Taranaki Falls, Przywara TNP-36.
- Dicranoloma menziesii* (Hook.f & Wils.) Par. n=8. New Zealand: North Island, Mt. Egmont, Stratfort Mountain Hut, Przywara ME-97.

JUNGERMANNIACEAE

- Chandonanthus squarrosus* (Hook.) Mitt. n=9. New Zealand: North Island, Tongariro National Park, Taranaki Falls, Przywara TNP-32, TNP-34 & TNP-44. n=18. New Zealand: North Island, Tongariro National Park, Taranaki Falls, Przywara TNP-26.

LEPTOSTOMACEAE

- Leptostomum inclinans* R. Br. n=12. New Zealand: North Island, Tongariro National Park, Taranaki Falls, Przywara TNP-12.

MNIACEAE

- Mnium ambiguum* H. Müll. n=6. Poland:

Western Carpathians, Pogórze Lessowe, Rozbórz, near Przeworsk, Ochyra 89/95.

Mnium spinosum (Voit) Schwaegr. n=6. Poland: Western Carpathians, Dolina Strazyska in the Tatra Mts, Ochyra 99/95.

Plagiomnium rostratum (Schrad.) T. Kop. n=6. Poland: Western Carpathians, Rozbórz, near Przeworsk, Ochyra 90/95; Western Carpathians, Dolina Strazyska in the Tatra Mts, Ochyra 98/95.

POLYTRICHACEAE

Dendrologotrichum dendroides (Hedw) Broth. n=7. New Zealand: North Island, Tongariro National Park, Mangatepopo Valley, Przywara TNP-66.

• **C.A.F. Pinto-Magiao, N.L. Pierozzi, S.C.P. Castro & M.D. Soares-Scott**, Seção de Citologia, and S.L. Jungmendaçolli, R.B. Torres & L.C. Bernacci, Seção de Botânica, Instituto Agrônômico, Caixa Postal 28, 13020-902, Campinas, SP, Brazil. Localities in Brazil. Vouchers in IAC.

APOCYNACEAE

Forsteronia pubescens A. DC. 2n=18. Tietê - SP, Estação Experimental de Tietê, IAC 29197.

Peschiera australis (Muell. Arg.) Miers. 2n=22. Jundiá, IAC 28773.

ASTERACEAE

Elephantopus mollis H.B.K. 2n=22. Jundiá - SP, Estação Experimental de Jundiá, IAC 28676.

BEGONIACEAE

Begonia cucullata Willd. 2n=±30. Jundiá, IAC 28670.

CAESALPINIACEAE

Cassia hirsuta L. 2n=28. São Roque - SP, Estação Experimental de São Roque, IAC 28821.

C. flexuosa L. 2n=16. Monte Alegre do Sul - SP, Estação Experimental de Monte Alegre do Sul, IAC 28934.

Senna splendida (Vogel) Irwin & Barneby var. *splendida*. 2n=26. Jundiá - SP, Estação Experimental de Jundiá, IAC 28688.

FABACEAE

Indigofera hirsuta L. 2n=16. São Roque - SP, Estação Experimental de São Roque, IAC 28822.

I. suffruticosa Mill. 2n=16. Monte Alegre do Sul - SP, Estação Experimental de Monte Alegre do Sul, IAC 28953.

HYPOXIDACEAE

Hypoxis decumbens L. 2n=±58. Jundiá - SP, Estação Experimental de Jundiá, IAC 28664.

LAMIACEAE

Hyptis umbrosa Salzm. 2n=16. Jundiá - SP, Estação Experimental de Jundiá, IAC 28697.

MIMOSACEAE

Mimosa inovisa Mart. 2n=52. São Roque - SP, Estação Experimental de São Roque, IAC 28836.

POACEAE

Panicum maximilianii Schrad. ex Schult. 2n=34/36. Jundiá - SP, Estação Experimental de Jundiá, IAC 28677.

PORTULACACEAE

Talinum patens (Jacq.) Willd. 2n=24. Jundiá - SP, Estação Experimental de Jundiá, IAC 28705.

RUBIACEAE

Ixora cf. gardneriana Benth. 2n=22. Jundiá - SP, Estação Experimental de Jundiá, IAC 28701.

I. renulosa Benth. 2n=22. IAC 29311.

Palicourea macgravii St. Hil. 2n=22+3B. Jundiá - SP, Estação Experimental de Jundiá, IAC 28698.

Psychotria hoffmannseggiana (Willd. ex Roem. & Schult.) Muell. Arg. 2n=22. Jundiá - SP, Estação Experimental de Jundiá, IAC 28700.

SOLANACEAE

Solanum americanum Mill. 2n=24. Jundiá - SP, Estação Experimental de Jundiá, IAC 28709.

S. bullatum Vell. n=15. Jundiá - SP, Estação Experimental de Jundiá, IAC 28674.

ULMACEAE

Trema micranta (L.) Blume. 2n=20. São Roque - SP, Estação Experimental de São Roque, IAC 28797.

VIOLACEAE

Hybanthus atropurpureus (St. Hil.) Taub. 2n=16. Jundiá - SP, Estação Experimental de Jundiá, IAC 28657.

• **J.R. Stehmann, J.A.H. Dutilh, J. Semir & E.R. Forni-Martins**, Departamento de Botânica, Instituto de Biologia, Unicamp, Caixa Postal 6109, 13081-970 Campinas, SP, Brazil. Localities in Brazil. Vouchers in UEC. First author abbreviated to JRS.

SOLANACEAE

Petunia axillaris (Lam.) B.S.P. n=7. RS: Cacapava do Sul, JRS et al. 1320; Cacapava do Sul, JRS et al. 1223.

P. elegans J. Miers. n=9. MG: Brumadinho, JRS 1160.

P. heterophylla Sendtner. n=9. RS: Torres, JRS et al. 1247.

P. humilis R.E.Fries. n=9. RS: Uruguaiana, JRS et al. 1584.

P. integrifolia (Hook.) Schinz & Thell. n=7. RS: Santa Maria, JRS et al. 1208; Encruzilhada do Sul, JRS et al. 1363 et al.

P. kleinii L.B. Sm. & Downs. n=9. SC: Mafra, JRS et al. 1948 et al.

P. linoides Sendtner. n=9. PR: Matos Costa, JRS & A. Ippolito 1670.

P. micrantha R.E.Fries. n=9. SP: Itarare, JRS & J.A.H. Dutilh 1164.

P. ovalifolia J. Miers. n=9. RS: Julio de Castilho, JRS et al. 1182a.

P. paranensis Dusen. n=9. PR: São Luis do Puruna, JRS & J. Semir 1594.

P. regnellii R.E.Fries. n=9. SC: São Bento do Sul, JRS et al. 1705.

P. sellowiana Sendtner. n=9. RS: Cambara do Sul, JRS 1250. n=9. SC: Bom Jardim da Serra, JRS et al. 1532.

P. sendtneriana R.E.Fries. n=9. SC: Bom Jardim da Serra, JRS & J.A.H. Dutilh 1558.

P. spathulata L.B. Sm. & Downs. n=18. PR: Bituruna, JRS et al. 1174; Bituruna, JRS & A. Ippolito 1678. n=9. SC: Matos Costa, JRS & A. Ippolito 1674; Matos Costa, JRS & A. Ippolito 1674.

P. variabilis R.E.Fries. n=9. RS: Vacaria, JRS 1155.

• **A.O.S. Vieira**, Departamento de Biologia Animal e Vegetal - CCB - Universidade Estadual de Londrina, CxP 6001, 86051-970 Londrina, Paraná, Brazil, & **G.J. Shepherd**, Departamento de Botânica - IB - Universidade Estadual de Campinas, CxP 6109, 13081-970 Campinas, São Paulo, Brazil. Localities in Brazil. Vouchers in UEC.

CAMPANULACEAE

Lobelia camporum Pohl. n=7. Minas Gerais: Andradas, G.J. Shepherd & A.O.S. Vieira 12256. n=7. São Paulo: Serra da Bocaina, G.J. Shepherd & S.L.K. Shepherd 12897. n=21. Minas Gerais: Poços de Caldas, Gouvêia et al. FPC-763; Lavras, H.F. Leitão Filho et al. 11655.

L. exaltata Pohl. n=14. São Paulo: Mogi-Guaçu, A.O.S. Vieira 12267. n= 14. Minas Gerais: Poços de Caldas. A.O.S. Vieira 12249.

L. fistulosa Vell. n=14. São Paulo: São José do Barreiro, A.O.S. Vieira 13327.

L. hassleri Zahlb. n=14. Paraná: Campina Grande do Sul, A.O.S. Vieira 12228; Araucária-Lapa road, km 35, A.O.S. Vieira 12230.

L. langeana Dusen. n=14. Paraná: Serra do Mar, BR277 road, km 54. A.O.S. Vieira 12230.

L. thapsoidea Schott. n=14. Espírito Santo: Vitória-Belo Horizonte road, km 89, G.J. Shepherd 36556.

- **S.I. Warwick & L.D. Black**, Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, K.W. Neatby Bldg., C.E.F., Ottawa, Ont., Canada K1A 0C6. Material grown from seed received from the crucifer germplasm collection of Dr C. Gómez-Campo, Instituto Nacional de Investigaciones Agrarias, 28003-Madrid, Spain (GCC number). Vouchers in DAO (BCN number).

BRASSICACEAE

Crambe laevigata DC. ex Christ. n=15. Spain: Canary Islands, Tenerife (28°N 16°W), valley of Masca, GCC 3150-74, BCN 8217.

Erucastrum littoreum subsp. *brachycarpum* (Maire & Weiller) Gómez-Campo. n=24. Morocco: near Fäs (34°N 5°W), rocks in Jbel Zalagh, GCC 3018-74, BCN 8025.

- **S.I. Warwick, C. Crompton, L.D. Black & W. Wotjas**, Eastern Cereal and Oilseed Research Centre, Agriculture and Agri-Food Canada, K.W. Neatby Bldg.,

C.E.F., Ottawa, Ont., Canada K1A 0C6. All seeds collected by S.I. Warwick and L.D. Black. Co.=County, Twp.=Township, Conc.=Concession. Voucher numbers for DAO herbarium specimens are listed in brackets.

POACEAE

Apera spica-venti (L.) Beauv. 2n=14. Canada: Ontario, Haldimand-Norfolk Co., Middleton Twp., Conc. 1, Lot 12S (42°48'N 80°39.5'W), winter rye field (82-AS-2; DAO 328559); Ontario, Haldimand-Norfolk Co., North Walsingham Twp., Conc. 8, Lot 19N (42°44.5'N 80°30.5'W), winter wheat field (82-AS-12; DAO 328562); Ontario, Haldimand-Norfolk Co., North Walsingham Twp., Conc. 11, Lot 18S (42°45'N 80°32'W), winter wheat field (82-AS-13; DAO 293968); Ontario, Haldimand-Norfolk Co., North Walsingham Twp., Conc. 12, Lot 10N (42°45'N 80°36'W), winter rye field (82-AS-17; DAO 328552).

Panicum miliaceum L. 2n=36. Canada: Ontario, Carleton Co., Osgoode Twp., Conc. 10, Lot 36 (45°12'N 75°24.5'W), maize field, olive seed/crown type (PM-81-2; DAO 310591); Ontario, Russell Co., Cambridge Twp., Conc. 9, Lot 11 (45°16'N 75°05'W), maize field, white seed (PM-81-6; DAO 310579); Ontario, York Co., Town of Markham Twp., Conc. 7, Lot 27 (43°55'N 79°18'W), maize field, tan seed (PM-81-14; DAO 310624); Ontario, Wellington Co., West Garafraxa Twp., Conc. 5, Lot 28 (43°50'N 80°27'W), maize field, orange seed (PM-81-15; DAO 310623); Ontario, Elgin Co., Malahide Twp., Conc. 6, Lot 16 (42°45.5'N 80°58'W), maize field, white seed (PM-81-24; DAO 310589); Ontario, Northumberland Co., Hamilton Twp., Ha-

milton Twp., Conc. 8, Lot 14 (44°06'N 78°14'W), maize field, tan seed (PM-81-11; DAO 342840).

Setaria faberi Herrm. 2n=36. Canada: Ontario, Carleton Co., Osgoode Twp., Conc. 2, Lot 35 & 36 (45°09'N 75°32'W), maize field (GF-81-1; DAO 310588); Ontario, Grenville Co., Oxford on Rideau Twp., Conc. 1, Lot 18 (45°00'N 76°44'W), maize field (GF-81-2; DAO 310587); Ontario, Brant Co., Brantford Twp., Conc. 2, Lot 7 (43°08'N 80°23'W), maize field (GF-81-3; DAO 310586); Ontario, Essex Co., Malden Twp., Conc. 3, Lot 30W (43°04'N 83°05'W), soybean field (GF-81-4; DAO 310701); Ontario, Kent Co., Gore of Camden Twp., Conc. 4, Lot 4 (42°55'N 82°11'W), maize field (GF-81-8; DAO 310688).

S. faberi Herrm. 2n=36. United States: Ohio, Huron Co., between Norwalk & Olena, highway 250S (41°10'N 82°25'W), soybean field (GF-81-5; DAO 310700); Ohio, Franklin Co., 2 km N. of Shadesville, highway 23 (39°48'N 83°00'W), maize field (GF-81-6; DAO 310699); Michigan, Ingham Co., 2 km W. of Williamston, highway 43E (42°40'N 84°07'W), maize field (GF-81-7; DAO 310687); New York, Cortland Co., Cortland (42°36'N 76°10'W), wasteground/old maize field (GF-81-9; DAO 386737).

Sorghum halepense (L.) Pers. 2n=40. Canada: Ontario, Peel Co., City of Brampton Twp., Conc. 6, Lot 11 (43°46'N 79°44'W), maize field (N-1; JG-81-1; DAO 342843); Ontario, Waterloo Co., Woolwich Twp., Conc. 1, Lot 19 (43°31'N 80°33'W), maize field (N-2; JG-81-2; DAO 342826); Ontario, Huron Co., Ashfield Twp., Conc. 10, Lot 5 (43°56'N 81°37'W), maize field (N-4; JG-81-5; DAO 342812); Ontario, Huron, Hullett Twp., Conc. 8, Lot 8 (43°40'N 81°24'W), bean

field (N-5; JG-81-6; DAO 342814); Ontario, Elgin Co., Yarmouth Twp., Conc. 5, Lot 18 (42°43'N 81°07'W), maize field (N-6; JG-81-7; DAO 342836); Ontario, Middlesex Co., Exfrid Twp., Range 6, Lot 2 (42°46'N 81°29.5'W), bean field (N-7; JG-81-8; DAO 342834); Ontario, Kent Co., Howard Twp., Conc. 10, Lot 16 (42°26'N 81°50'W), maize field (N-8; JG-81-9; DAO 342832); Ontario, Essex Co., Colchester South Twp., Conc. Front, Lot 40 (42°1.5'N 82°50.5'W), soybean field (N-9; JG-81-10; DAO 342828); Ontario, Brant Co., Brantford Twp., Conc. 2, Lot 7 (43°08'N 80°23'W), maize field, overwintering biotype (O-1; JG-81-3; DAO 342844).

S. halepense (L.) Pers. 2n=40. United States: Ohio, Franklin Co., S. of Columbus (39°48'N 83°00'W), maize field, overwintering biotype (O-2; JG-81-12; DAO 342827); New York, Cortland Co., S of Cortland (42°36'N 76°10'W), waste ground/old maize field, overwintering biotype (O-3; JG-81-13; DAO 386713).



APERA SPICA-VENTI



News from Molecular Biosystematists 7

6

edited by Dan J. Crawford
Department of Plant Biology
The Ohio State University
Columbus, Ohio 43210-
1293, USA

E-mail: dcrawford@magnus.acs.ohio-state.edu. Please send your contributions to Professor Crawford at the above address stating whether or not you are IOPB Member. Thank you.

• **Andrea D. Wolfe**, Department of Plant Biology, Ohio State University:

I have two main areas of research in the lab including the biosystematics of *Penstemon* and related genera of tribe Cheloneae (Scrophulariaceae) and the molecular evolution of nuclear and plastid genes in plant lineages containing nonphotosynthetic members.

PENSTEMON

Currently there are two projects focusing on *Penstemon*, which revolve around a phylogenetic reconstruction of the genus. The first project involves a collaboration with several colleagues (Dr James Thomson, SUNY at Stonybrook; Dr Paul Wilson, California State University at Northridge; and Dr Scott Armbruster, University of Alaska at Fairbanks, now University of Trondheim, Norway) to examine the evolution of pollen presenta-

tion strategies in a genus having great variation in anther morphology (four of the six subgenera are defined by differences in anther morphologies) and pollination mechanisms, as well as numerous apparent shifts in pollination modes such as from bee to bird. A phylogenetic reconstruction (with Dr Qiyun Xiang) of as many of the 250+ species of *Penstemon* as possible is underway using chloroplast restriction sequence data and unclear ITS sequence data.

The second project (with Shannon Datwyler) focuses on the biosystematics of the subgenus *Dasanthera*. The sixteen taxa in subg. *Dasanthera* represent the woody species of *Penstemon*, and this subgenus is sister to all other subgenera of *Penstemon*. There are purportedly two examples of diploid hybrid speciation in subg. *Dasanthera* and we will be using chloroplast and nuclear markers to test these hypotheses and to examine patterns of hybridization in this group. We are also in the process of developing microsatellite markers to assist in the evaluation of potential hybrid speciation and hybridization in *Penstemon*.

CHELONEAE

The Cheloneae, as originally circumscribed by Wettstein, included the holarctic genus *Scrophularia*, several genera from South Africa and Asia as well as several North America genera. Results from chloroplast DNA (PCR-amplified) restriction-site data (Wolfe et al. in press) recently revealed that the Cheloneae may be restricted to the North American taxa. As a continuation of that study, *rbcl* sequencing and a whole genome cpDNA restriction-site survey is currently underway in the lab.

MOLECULAR EVOLUTION OF NUCLEAR AND PLASTID GENES IN PARASITE PLANTS

Plants that lack chlorophyll do not have a functional photosynthetic apparatus. The lack of chlorophyll is a lethal mutation unless the plant has access to a source of reduced carbon. Parasitic plants have adapted to a heterotrophic lifestyle in that they are attached to a host plant, and the host plant provides the parasite with the products of photosynthesis (reduced carbon). Because parasitic plants have circumvented the need to make their own food, the photosynthetic apparatus is under relaxed functional constraint (i.e. the selective pressures to maintain photosynthetic function are eased). Parasitic plants that have adapted to complete heterotrophy (holoparasites) have dramatic changes in the plastid genome for genes encoding proteins involved in photosynthesis.

One project in the lab (with Dr Claude dePamphilis, Vanderbilt University) is a continuation of an investigation of the molecular evolution of plastid photosynthetic genes in parasitic plants of the Scrophulariales. In our investigation of the molecular evolution of *rbcL* we confirmed the multiple loss of photosynthesis in the monophyletic lineage including the parasitic plants of Scrophulariaceae and Orobanchaceae (dePamphilis, Young & Wolfe, in press; Wolfe & dePamphilis, in prep.). At least two species of the holoparasitic genus *Orobanche* have an intact reading frame for the *rbcL* compared to pseudogene formation or deletion of the locus in all of the other taxa of Orobanchaceae examined to date (Wolfe & dePamphilis, in review). The next phase of the project is to continue the survey of other photosynthetic genes in all of the taxa examined thus far and to move into the nuclear genome.

The other major project just beginning in the lab is a parallel study of parasitic plants in an independent plant lineage. For the next several years we will be exploring the molecular evolution of photosynthetic and chlorophyll biosynthesis genes in the mycoheterotrophic plants of the Ericales (including *Pyrola*, *Monotropa*, *Allotropia*, *Pterospora*, *Sarcodes*, *Hypopitys*, *Hemitomes*, *Pityopus* and *Pleuriscospora*). *Pyrola* includes some non-photosynthetic members, whereas all of the other genera traditionally circumscribed by the Monotropaceae are non-photosynthetic. Included in this investigation is a phylogenetic reconstruction of the species of *Pyrola* and a survey of the plastid photosynthetic genes present or absent in each genus. Our study will also include a survey of some of the nuclear-enclosed photosynthetic genes with a sequencing focus on single-copy genes of the plastid ATPase complex.

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Meetings – Past & Future

7 Tromsø, Norway

VARIATION AND EVOLUTION IN ARCTIC AND ALPINE PLANTS. Report from VI International IOPB Symposium, Tromsø, Norway, July 29 – August 2, 1995.

Despite the location well north of the Arctic Circle at 69°40' N, and a rather narrow theme in line with the geographical position, the Symposium had a good response, with 150 participants from 20 countries. Seemingly, all enjoyed the harsh but amiable settings.

Thanks to the hospitality of the University of Tromsø, logistics were optimal and the programme proceeded smoothly according to schedule. Students from the local Institute of Biology and Geology were good helpers throughout the arrangements.

Papers and posters were grouped under four main headings: (1) Diversity, (2) Reproductive strategies, (3) Molecular approaches, and (4) Global change. A total of 25 invited and 11 contributed papers were presented, plus 65 posters.

It was amply demonstrated that floristic diversity is substantial at high latitudes (session 1) but that such floras are susceptible to the effects of human impact, for instance global warming (session 4). Measures are taken to follow future potential changes; in this respect, intensions and progress of the worldwide ITEX (International Tundra Experiment) programme were presented.

As always in an IOPB Symposium evolutionary aspects were in focus. The many interesting presentations concerning reproduction, demography and seed biology (session

2) drew attention to recruitment and survivorship among arctic-alpine plant species and the challenge to do more long-term observations of these aspects in arctic and alpine environments.

Molecular approaches may provide the ultimate key to a more profound understanding of biogeographic and phylogenetic patterns and the processes resulting therein. Current methods and methodological constraints were presented (session 3). Options are numerous and methods develop rapidly, making regular up-dating imperative.

The Organizers had managed to sponsor a group of 21 participants from Russia and other parts of the previous USSR. Arve Elvebakk, University of Tromsø, was the local organizer of their logistics and transport. The Symposium thus offered a unique opportunity to exchange information concerning the flora of the whole Arctic region and the future organization, and progress of a Panarctic flora project were discussed among some of the participants. In addition aspects from the Alps and Pyrenees, the Rockies, mainlands of Japan and Australia and even a subantarctic island were represented in papers and posters.

Participants enjoyed the one day excursion in the middle of the programme to the Fløya Mountain just outside Tromsø, with a lush alpine vegetation under the skilled guidance of Ola Skifte and Torstein Engelskjøn, Tromsø Museum. The excursion finished with a dinner at the mountain restaurant. Staff members of Tromsø Museum and Institute of Biology and Geology also made a guided tour through the "Arctic – Alpine Garden", the northernmost botanic garden in the world, founded in 1994.

Among organized social events the reception at Tromsø Museum was, thanks to the

organizer, Brynhild Mørkved, a very pleasant event. The so-called "Symposium Dinner", which took place on board an old fishing vessel moving along the coast will certainly be remembered, hopefully with pleasure, by those who took part. The somewhat rude facilities on board may have been a surprise to some. Most participants seemed to enjoy the sea view of Tromsø and the opportunity to catch cod and other fish, afterwards served fresh on board.

Pre- and Post-Symposium excursions went to Spitsbergen, Svalbard and to Abisko in northernmost Swedish Lapland with 20 participants in each, partly the same people in both. Rumours go that despite nasty weather both were successful. The Spitsbergen group was guided by Reidar Elven and Torstein Engelskjøn, the one to Abisko by Bengt Jonsell, Ulf Molau and Mats Sonesson.

The head organizers of the Symposium, who happen to be your new Newsletter Editors have now finished the editing of the Symposium Proceedings, which will include 20 main papers to be published in the Nordic series "Opera Botanica", hopefully early in 1997.



PAPAVER LESTADIANUM

Qingdao, China

Workshop on higher plant mutagen bioassays. Report by William F. Grant, Department of Plant Science, P. O. Box 4000, McGill University, Macdonald Campus, Ste Anne de Bellevue, Quebec H9X 3V9, Canada.

INSTRUCTION OF THE PLANT BIOASSAYS FROM PREPARED MATERIAL. - *Tradescantia* clone 4430, highly sensitive to chemical mutagens, and heterozygous for flower colour (blue dominant, pink recessive) was used to practice the *Tradescantia* stamen hair assay (mutagen assay) and the *Tradescantia* micronucleus assay (chromosome aberration assay). *Allium cepa* or *Vicia faba* root tips were used to determine anaphase chromosome aberrations. Slide preparations, scoring of mutations and chromosome aberrations, and factors such as solvent controls, toxicity effects and data analyses were discussed. The participants were to return to their respective laboratories and carry out a monitoring (water or air pollution from a nearby potentially contaminated water or air source) or a laboratory experiment (using water or soil from a potentially contaminated source) using two of the bioassays. The results are to be reported to the organizers within six months as a final report to the UN Environment Program and for publication. Following the Workshop, the Chinese hosts arranged for the International participants to visit The Great Wall and the Summer Palace and the Palace Museum in Beijing. (A publication on "Environmental Monitoring for Genotoxicity with Plant Systems" was recently published in *Mutation Research* 310: 167-266, 1994.) Anyone wishing to participate in future Workshops should contact Prof. Ma.

Barcelona, Spain

IV CONFERENCE ON PLANT TAXONOMY,
BARCELONA, SPAIN, SEPTEMBER 19-22 1996.

The conference took place at the magnificent Aula Magna, University of Barcelona, with 190 participants from 20 countries, in memory of the Catalan botanists Josep Cuatrecasas (1903-96) and Maria Àngels Cardona (1940-91). The latter many will know as a dedicated biosystematist.

The sessions included studies on (1) the Catalan flora, (2) cytogenetics, (3) the Mediterranean flora, (4) flora of North Africa, (5) current molecular methods, (6) flora of the Iberian Peninsula and South America, (7) Cryptogams and (8) flora of the Iberian Peninsula and Macaronesia, with fourteen invited papers and approximately 100 posters in five additional, non-concurrent poster sessions. The scope was wide and progress in many fields was reported. The results of numerous techniques were presented, including new and promising molecular ones. Ongoing Mediterranean - North African flora projects received much attention. Presentations were in Catalan, Spanish, French and English with simultaneous translations.

Three concurrent one-day excursions were optional; (1) The Eastern Pyrenees, (2) Serra-lada Transversal Catalana and (3) the Ebro Delta, with many participants in each. A reception took place in the old Gothic City Hall and the conference dinner was held in the modern Maremagnum area in the harbour.

During the closing session the following declaration was accorded by the Conference participants:

1. To claim from the authorities the recognition of the scientific task of taxonomists and the necessary financial support in this field. This research is mandatory for get-

ting the appropriate level of knowledge of biodiversity, increasingly threatened by the impact of human activities. Only on the basis of this knowledge shall we be able to preserve our natural resources and to ensure their sustainable use.

2. To manifest publicly the interest of continuing taxonomic studies on the Western Mediterranean flora without regard to any kind of frontier, especially to those that separate the North and the South of the Mediterranean.
3. To declare that Herbaria are a basic reference for all works on biodiversity, systematics and evolution of plants. Thus, it is an exigency of the scientific community to support the institutions that maintain them, to ensure their conservation, accessibility and the dissemination of the information they convey.
4. To call the attention of the competent authorities in scientific research to the need for accepting the challenge of providing suitable housing for the scientific collections in Catalonia, with particular emphasis on the Botanic Institute of Barcelona, and for making them available to the international scientific community.

The next Conference on Plant Taxonomy was announced to take place in Lisbon, Portugal, in 1999.

Liv Borgen

Umeå, Sweden

SCAPE MEETING 1996. SCAPE, that is the Scandinavian association for pollination ecology, is an informal group arranging annual meetings in a highly professional way. It was started ten years ago by a few Swedish pollination ecologists, among whom Ola Jennersten and L. Anders Nilsson. Very soon was Denmark included by particularly Marianne Philipp and Jens Mogens Olesen and their students. The group has grown by successively adding those interested in the field in the other Nordic countries and the meetings now circulate among those and are usually arranged in some field station under quite informal but scientifically very rewarding conditions. As a rule Nordic scientists predominate but celebration years the meetings are made more international.

This year's meeting a decade after the first one was excellently arranged by Jon Ågren and his group at the Institute of Plant Ecology at Umeå University in Northern Sweden. It was held between the 25th and 29th of September, the first days at the university campus; then it moved according to the good field traditions of SCAPE to a place at the fascinating coast of the Bothnian Gulf, Norrfällsviken, 150 km to the south of Umeå.

To this symposium a number of leading specialists had been invited to give lectures and all of very high quality and interest. The nestor of pollination ecology, professor Knut Faegri from Bergen, gave generously from his unique perspective in lecture and discussions and with those caveats which long experience rightly should express. Among invited speakers were also Scott Armbruster, now of Trondheim, Norway, formerly Anchorage, and Spencer Barrett of Toronto who both talked in general terms about evolution and ecology of

pollination. Paul Cox, Provo in Utah, gave fascinating views on both wind and water pollination and Douglas Schemske, Seattle, draw great perspectives from two case-studies. Johanna Schmitt, Providence, USA, combined about evolution, ecology and flowering time, while James Thomson, Stony Brook, went deeply into pollinator traffic problems.

In addition to the Nordic countries and those already mentioned the Netherlands, Great Britain, France, Spain and Japan were represented; in all there were about 130 participants.

A strong feature of the SCAPE meetings is to give room for presentations by young people of their results, albeit sometimes preliminary, not only in posters but also in papers, somewhat of a training ground where you meet your colleagues from other institutes in a friendly atmosphere. This important purpose was amply manifested also this time and demonstrated the strength of this field of research in Scandinavia.

Although pollination ecology is in the centre of SCAPE there are of course innumerable openings and bridges towards population biology and biosystematics. In later years the borderlines are not so distinct and quite a few papers fall as well in the latter groupings – if groupings on the whole should be mentioned here. The next SCAPE meeting will again be more internally Nordic but those interested from outside are of course welcome. It will take place on the Swedish West Coast in September 1997 and be organized by Ulf Molau, Gothenburg. You will find details in the next issue of the IOPB Newsletter.

Bengt Jonsell

Amsterdam, Netherlands

VII INTERNATIONAL IOPB SYMPOSIUM 1998.

According to the decision of the general assembly in Tromsø in July 1995 our next international symposium will be hosted by the Evolutionary Botany group of the University of Amsterdam. There has been formed a local organizing committee consisting of Prof. Konrad Bachmann (Chairman, University of Amsterdam/ IPK Gatersleben, Germany); Hans C. M. den Nijs (Secretary, University of Amsterdam), Leo W. D. van Raamsdonk (Agricultural University, Wageningen) and R. van der Meijden (University of Leiden). As it stands now the symposium is scheduled for the period of Monday August 10 (arrivals and registration) through Saturday August 15 (closing ceremony). Departures are foreseen on Sunday August 16. The general title of the symposium will be:

PLANT EVOLUTION IN MAN-MADE HABITATS

Under this heading we foresee the following symposia to be organized, each of which will take approximately half a day.

1. Evolution in disturbed habitats
2. Evolution in crop-weed complexes
3. Evolution of man-made plants
 - a. Mapping of traits
 - b. Domestication: simulating evolution
4. Biodiversity and Stability
5. Evolution of invasive plant species
 - a. Apomixis: clonal vs sexual speciation
 - b. Adaptation: genetics vs plasticity

There will be two well elaborated poster sessions, and all-day excursion to several typical and attractive habitats in the surroundings of Amsterdam on Thursday.

We plan to send the first circular by January 1997 to all members. If you like to sug-

gest other colleagues who may be interested to receive this circular, please contact me:

Hans C. M. den Nijs
Secretary, Organizing Committee
VII International IOPB Symposium
Institute for Systematics & Population Biology
Hugo de Vries Laboratory
University of Amsterdam
Kruislaan 318,NL-1098 SM Amsterdam,
The Netherlands
Tel.: +31 20 525 7680, Fax: +31 20 525 7662
e-mail: nijs@bio.uva.nl



GENTIANA PNEUMONANTHE

Points of view

8 Future perspectives for IOPB – independence or merger?

The strength of IOPB is a strong international profile, regular publication of an informative Newsletter, and regular arrangement of successful international meetings at three years intervals. However, despite any efforts to promote IOPB, our organization stays rather small (cf. IOPB Directory). A discussion of future organization and of a possible affiliation with other organizatory bodies has therefore started among Executive and Council members.

The term "biosystematy" was initially coined by Camp and Gilly back in 1943, to cover new approaches to "delimit natural biotic units" as they put it at that time. Gradually, usage has established a slightly different term, "biosystematics", not only for chromosome data and experimental taxonomy, the new fields in the 1940's and 1950's, but now for covering all kinds of new fields in the biologically based systematics, including, amongst others, plant breeding systems, plant demography, population genetics, and molecular systematics.

Historically, IOPB was affiliated with IAPT, International Association for Plant Taxonomy, using Taxon as a promotor of its interests, amongst others the publication of "IOPB Chromosome Number Reports" under the auspices of Åskell Löve. When Bill Grant took over as the President of IOPB in 1981, he felt that time was ripe for establishing IOPB as an independent organization. He arranged an international meeting in 1983, where the

decision was made. During Bill Grant's presidency the organization was fully established and the Newsletter started.

Thanks to the meticulous work of Krystyna Urbanska the IOPB Newsletter has appeared regularly from No 1, 1983, to No 25, 1995. Under her editorship the Newsletter has steadily improved. The column "Profile of a lab" started in No. 1 and her initial wish that "information exchange be effective" has really come true. Chromosome number reports started in No. 9, 1987, and from No. 13, 1989, Clive Stace took over as a column editor for the recurrent column "IOPB Chromosome Data", the Newsletter thus replacing Taxon's role in that respect. To keep space with new approaches the column "News from Molecular Biosystematics" was started in No. 20, 1993, with Dan J. Crawford as the editor. With the announcement of Krystyna's withdrawal as the Newsletter editor during the Tromsø-meeting in 1995 Executives and Council were faced with the questions: shall the Newsletter continue and who will take over the editorial responsibilities? With joint efforts we hope to be able to continue at least as long as Bengt's presidency lasts.

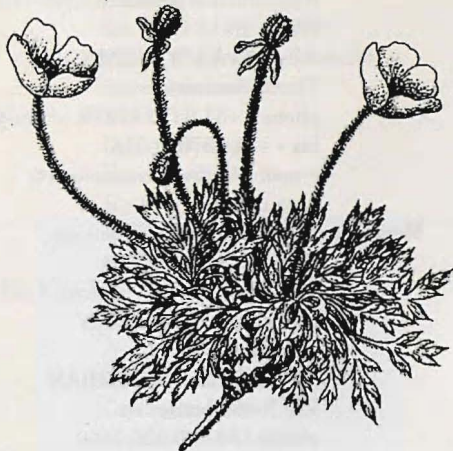
During the Tromsø meeting other options were discussed. It was suggested that IOPB should join efforts with the predominantly Japanese organization "Society for the Study of Species Biology" (SSSB) and co-edit their journal "Plant Species Biology" (PSB), in which an IOPB Editorial Board already has been established. IOPB got a nice offer from its managing editor and IOPB Executive member, Shoichi Kawano, to obtain a reduced subscription price and free pages for IOPB subjects.

Many of the "old-timers", like the present Newsletter editors, feel quite comfortable

under the "biosystematics" umbrella. Some other people, as Olov Hedberg, have recently argued strongly in favour of keeping this somewhat old-fashioned term for the application to all kinds of methods on living plants and plant populations. Others may feel that time has run out for this particular term and would perhaps prefer that we rename ourselves as "plant species biologists". In our opinion, this term is no more, no less, informative than the classic "biosystematists".

We urge all ordinary IOPB members to take this subject seriously and give their views as a contribution to this new column, "Points of view". Of course IOPB is free to discuss other options than SSSB/PSB as well. We know for sure that we are welcome to return to the fold of IAPT/Taxon. WHAT IS YOUR OPINION? Continue as now or merge?

Liv Borgen & Bengt Jonsell



PAPAVER LESTADIANUM

IOPB
Executive and Council 1995-98

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EXECUTIVE

President, **Bengt E. Jonsell**

Bergius Bot. Garden
P.O.B. 50017
S-10405 STOCKHOLM, Sweden
phone • +46 8 156 896
fax • +46 8 612 9005
e-mail • bengtj@internet.kva.se

Vice-President - President Elect,

Konrad Bachmann

Hugo de Vries Lab.
Univ. of Amsterdam
Kruislaan 318
NL-1098 SM AMSTERDAM
The Netherlands
phone • +31 20 525 7817
fax • +31 20 525 7662
e-mail • bachmann@bio.uva.nl

Past President, **Peter H. Raven**

Missouri Bot. Garden
P.O.B. 229
ST. LOUIS, MO 63166-0299
USA
phone • +1 314 577 5110
fax • +1 314 577 9595
e-mail • raven@mobot.org

Editor Newsletter, **Liv Borgen**

Bot. Garden & Museum
University of Oslo
Trondheimsveien 23 B
N-0562 OSLO 5, Norway
phone • +47 22 85 17 78
fax • +47 22 85 18 35
e-mail • liv.borgen@toyen.uio.no

Co-Editor Newsletter "Molecular News"

Daniel J. Crawford

Dept. of Botany
Ohio State University
1735 Neil Ave

COLUMBUS, OH 43210-1293
USA

phone • +1 614 292 8952
fax • +1 614 292 6345
e-mail • dcrawford@magnus.
acs.ohio-state.edu

Co-Editor Newsletter "Chromosome Data",

Clive A. Stace

Dept. of Botany
University of Leicester
LEICESTER LE1 7RH, U.K.
phone • +44 116 252 3381
fax • +44 116 252 2791
e-mail • (secre.) jmdcw1@
leicester.ac.uk/e-mail • (prof.
Stace) cas7@leicester.ac.uk

Secretary/Treasurer, **Peter C. Hoch**

Missouri Bot. Garden
P. O. B. 299
ST. LOUIS, MO 63166-0299
USA
phone • +1 314 577 5175
fax • +1 314 577 9596
e-mail • hoch@mobot.mobot.org

Regional Treasurer (European currency),

Leo W.D. van Raamsdonk

Centre for Plant Breeding &
Reproduction Research, CPRO-DLO
P.O.B. 16
NL-6700 AA WAGENINGEN
The Netherlands
phone • +31 8370 77279
fax • +31 8370 16513
e-mail • l.wd.van.raamsdonk@
cpro.agro.nl

Member ex officio for 1998 Symposium,

Hans C. M. den Nijs

Hugo de Vries Lab.
University of Amsterdam
Kruislaan 318
NL-1098 SM AMSTERDAM
The Netherlands
phone • +31 20 525 7660
fax • +31 20 525 7662
e-mail • njis@popmail.bio.uva.nl

COUNCIL

Randall J. Bayer

Dept. of Botany
University of Alberta Edmonton,
ALTA T6G 2E9, Canada
fax • +1 403 492 9457
e-mail • randallbayer@mts.uacs.
alberta.ca

Jorge V. Crisci

Museo de la Plata
1900 La Plata
BUENOS AIRES, Argentina
email • crisci@lasbe.org.ar

Philip Garnock-Jones

School of Biological Sciences
Victoria Univ. of Wellington
P.O. Box 600
WELLINGTON, New Zealand
fax • +64 4 4715331
e-mail • phil.garnock-jones@
vuw.ac.nz

Herbert Hurka

Institut für Biologie
Univ. Osnabrück
Barbarastr. 11
D-49076 OSNABRÜCK
Germany
fax • +49 541 969 2870
e-mail • hurka@cipfb5.biologie.
uni-osnabrueck.de

Shoichi Kawano

Dept of Biology
Faculty of Science
Kyoto University
KYOTO 606, Japan
fax • +81 75 753 4122

Jan Kirschner

Institute of Botany
Academy of Sciences
CZ-25243 PRUHONICE 1
Czech Republic
fax • +42 1 643 6529
e-mail • kirschn@csearn.bitnet

Tatsuyoshi Morita

Biological Lab.

Faculty of Education
University of Niigata
8050 Ikarashi-ninocho
NIIGATA-SHI 950-21, Japan
fax • +81 25 263 1277
e-mail • morita@ed.niigata-u.
ac.jp

David F. Murray

Museum
Univ. of Alaska
907 Yukon Drive
FAIRBANKS, AK 99775-1200
USA
fax • +1 907 474 5469
e-mail • fdfm@aurora.alaska.
edu

Jürg Stöcklin

Botanical Institute
University of Basel
Schönbeinstrasse 6
CH4056 BASEL, Switzerland
Fax • +41 61 267 3504

Suzanne I. Warwick

Centre for Land & Biological
Resources Research Agriculture
and Agri-food
Canada, K. W. Neatby Bldg
C.E.F., OTTAWA, Ontario
Canada K1A 0C6
fax • +1 613 995 1823
e-mail • warwick@ncccot2.agr.ca

IOPB Directory

10

Klaus Adolphi
Kolpingstr. 36
D-53547 ROSSBACH, Germany

Focke Albers
Botanisches Inst.
& Bot. Garten der Univ.
Schlossgarten 3
D-4400 MÜNSTER, Germany

S. I. Ali
Department of Botany
University of Karachi
KARACHI 75 270, Pakistan

William S. Alverson
Botany Department
University of Wisconsin
MADISON, WI 53706, USA

R. & N. Amirouche
Lab. Génétique Ecologique
Institut des Sciences de la Nature
USTHB
BP 39 El Alia, Bab-Ezzouar
AIGIERS 16111, Algeria

Gregory J. Anderson
Biological Sciences Group U-43
University of Connecticut
STORRS, CT 06268, USA

Joe M. Anderson
408 Anderson
TAHLEQUAH, OK 74464, USA

Bruno Anzalone
Dipartimento di Biologia Vegetale
Universita di Roma "La Sapienza"
Citta Universitaria
I-00185 ROMA, Italy

Karin Apelgren
Inst. för Grundutbildning
BMC, Box 592
S-751 24 UPPSALA, Sweden

J.E. Armstrong
Department of Biological Sciences

Illinois State University
NORMAL, IL 61761-6901, USA

Sven E. Asker
Inst. of Genetics
University of Lund
Sölvegatan 29
S-22362 LUND, Sweden

K. Bachmann
Hugo de Vries Laboratory
University of Amsterdam
Kruislaan 318
NL-1098 SM AMSTERDAM
The Netherlands

A. Badr
Botany Department
Faculty of Science
Tanta University
TANTA A.R., Egypt

John F. Bain
Biological Sciences Department
4401 University Drive
University of Lethbridge
LETHBRIDGE, Alberta
Canada T1K 3M4

M. Baltisberger
Geobotanisches Institut ETH
Zollikerstrasse 107
CH-8008 ZÜRICH, Switzerland

Theodore M. Barkley
Herbarium - Division of Biology
Kansas State University
Ackert Hall
MANHATTAN, KS 66506, USA
herbksc@matt.ksu.edu

Randall Bayer
University of Alberta
Department of Botany
EDMONTON, Alberta
Canada T6G 2E9

Michael D. Bennett
Jodrell Laboratory, Royal Botanic
Gardens
KEW, Richmond
Surrey TW9 3DS, Great Britain

Cornelis Berg
The Norwegian Arboretum
Milde
N-5067 STORE MILDE, Norway

Dr. Aleksandra Berkutenko
Institute of Biological Problems of
the North
24, Karl Marxstreet
MAGADAN, Russia

Luis Bernardello
Museo Botanico
Universidad Nacional de Cordoba
Casilla de Correo 495
5000 CORDOBA, Argentina

Astrid Blab
Ericogasse 26
A-1190 WIEN, Austria

Solange Blaise
Universite de Paris, Fac. des Sci.
D'Orsay
Lab. de Biol. Vegetale C.
Batiment 362
F-91405 ORSAY, Essonne, France

C. Ann Blakey
Department of Biology
Ball State University
MUNCIE, IN 47306, USA
blakey@teosinte.agron.missouri.edu

C. Blanche
Dept de Botanica, Fac. de Farmacia
Univ. de Barcelona
Av. Joan XXIII, s/n
E-08028 BARCELONA, Spain

Bruce A. Bohm
Department of Botany
#3529-6270 University Building
University of British Columbia
VANCOUVER, B.C. V6T 2B1
Canada

Lynn Bohs
Department of Biology
University of Utah
SALT LAKE CITY, UT 84112
USA

Sung Min Boo
Department of Biology
College of Natural Sciences
Chungnam National University
DAEJEON 305-764, Korea

Brian M. Boom
The New York Botanical Garden
BRONX, NY 10458, USA

- Liv Borgen
Botanical Garden & Museum
University of Oslo
Trondheimsvn. 23B
N-0562 OSLO 5, Norway
- Joyce Bork
American University in Cairo
113, Sharia Kasr El Aini
CAIRO, Egypt
- Bot. Garden & Museum, Biblioteket
University of Oslo
Trondheimsvn. 23B
N-0562 OSLO 5, Norway
- Botan. Garten & Museum
Bibliothek
Berlin-Dahlem
Koenigin-Luise-Strasse 6-8
D-14191 BERLIN, Germany
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Bibliothek
Menzingerstrasse 67
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Library
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SOUTH YARRA, Vic. 3141
Australia
- Botanic Institute
University of Aarhus
Nordlandsvej 68
DK-8240 RISSKOV, Denmark
- Botanical Library
P.O. Box 7
FI-00014 Helsinki University
Finland
- Texas Botanical Research Institute
509 Pecan street
FORT WORTH, TX 76102-4060
USA
- J. M. G. Bouharmont
Laboratoire de Cytogénétique
Univ. Catholique de Louvain
Place de la Croix-du-Sud 4
B-1348 LOUVAIN-LA-NEUVE
Belgium
- W. A. Brandenburg
CPRO
- Nwe Wageningseweg 1
NL-6721 ND BENNEKOM
The Netherlands
- Barbara Briggs
Royal Botanic Gardens
Mrs. Macquarie's road
SYDNEY, N. S. W. 2000, Australia
- Brit. Mus. Nat. History
General Library
Cromwell Road
LONDON SW7 5BD, England
- Christian Brochmann
Division of Botany
University of Oslo
PO BOX 1045 Blindern
N-0316 OSLO, Norway
- Luc Brouillet
Herbier Marie-Victorin
Institut Botanique
Université de Montreal
4101, Rue Sherbrook Est
MONTREAL, QC H1X 2B2
Canada
- Leo P. Bruederle
Department of Biology
University of Michigan
FLINT, MI 48532, USA
- Karl Peter Butler
Institut für Botanik &
Landschaftskunde
Frankfurterstrasse 119b
D-63067 OFFENBACH AM MAIN
Germany
- Sara Lucia Camargo-Ricalde
Universidad Autonoma
Metrop.-Iztapalapa
Av Michoacan y Calzada
de la Purisima
Iztapalapa
Apdo. Postal 55-532
MECIXO D.F.C. P 09340, Mexico
- Christopher S. Campbell
Department of Plant Biology and
Pathology
5722 Deering Hall
University of Maine
ORONO, ME 04469-5722, USA
207/581-2969
campbell@maine.maine.edu
- D. Cartier
Université de Paris
Fac. des Sciences d'Orsay
Lab. de Biologie Vegetale C.
Bâtiment 362
F-91405 ORSAY, Essonne, France
- Dr Jacques Cayouette
Centre Land & Biological
Resources Research
Central Experimental Building
Wm Saunders building
OTTAWA K1A 0C6, Canada
- Carlo A. Cenci
06070 Badiola
PERUGIA, Italy
- Kenton L. Chambers
Herbarium
Botany Department
Oregon State University
CORVALLIS, OR 97331, USA
- Hazel M. Chapman
Ag Research, Canterbury
Agriculture & Science Centre
P.O. Box 60
LINCOLN, New Zealand
- Fu Cheng-xin
Botany Division
Zhejiang Agricultural University
HANGZHOU 310029, PR China
- C. C. Chinnappa
Department of Biology
University of Calgary
CALGARY, Alberta
Canada T2N 1N4
- Jerry G. Chmielewski
Department of Biology
Vincent Science hall
Slippery Rock University
SLIPPERY ROCK, PA 16057-1326
USA
- James A. Christian
Box 3179
Tech Station
RUSTON, LA 71272, USA
- Joseph C. Colosi
Biology Department
Allentown College
CENTER VALLEY, PA 18034
USA

Conservatoire & Jardin Botanique
Library
Case Postale 60
CH-1292 Chambesyl/Geneve
Switzerland

Daniel Crawford
Department of Plant Biology
Ohio State University
1735 Neil Avenue
COLUMBUS, OH 43210-1293, USA

Jorge V. Crisci
Museo de la Plata
1900 LA PLATA, Argentina
+54 21 259909

Clifford Crompton
Agriculture Canada
Centre Land & Biological
Resources
Saunders Building CEF
OTTAWA, ON K1A 0C6, Canada

Romana Czapik
Department of Plant Cytology &
Embryology
Jagellonian University
Grodzka 52
31-044 KRAKOW, Poland

Janina Dabrowska
Institute of Botany
Wroclaw University
Kanonka street 6/8
PL-50 328 WROCLAW, Poland

Ivan N. Danylyk
Institute of Ecology of the
Carpathians
Chaikovsky Str. 17
LVIV, 290000, Ukraine
eco@sigma.icmp.lviv.ua

William S. Davis
Department of Biology
University of Louisville
LOUISVILLE, KY 40292, USA

Charles F. Delwiche
Indiana University
Department of Biology
Jordan Hall Rm 142
BLOOMINGTON, IN 47405, USA

Claude W. dePamphilis
Vanderbilt University
Department of Biology

Box 1821-B
NASHVILLE, TN 37235, USA

Melanie L. Devore
Department of Plant Biology
1735 Neil Avenue
COLUMBUS, OH 43210-1293
USA

David L. Dilcher
Florida Museum of Natural History
University of Florida
GAINESVILLE, FL 32611, USA

J. F. Doebley
Plant Biology Department
University of Minnesota
ST. PAUL, MN 55108, USA

Stephen R. Downie
Department of Plant Biology
University of Illinois
URBANA, IL 61801, USA

Rivka Dulberger
Tel-Aviv University
Department of Botany
TEL-AVIV 69978, Israel

Elin H. Dyrli
Biological Institute
University of Oslo
PO Box 1066, Blindern
OSLO, Norway

Chester Dziekanowski
Biology Department-Gardner Hall
1 University Plaza
University of Wisconsin
PLATTEVILLE, WI 53818, USA

James E. Eckenwalder
Department of Botany
University of Toronto
25 Willcockstreet
TORONTO, Ontario M5S 3B2
Canada

Jacqueline Egli
Milchbuckstrasse 14
CH-8057 ZÜRICH, Switzerland

J.W. Elisens
Department of Botany &
Microbiology
University of Oklahoma
NORMAN, OK 73019, USA

Barbara Erter
University Herbarium Jepson
1001 Valley Life Sciences,
Bldg #2465
BERKLEY, CA 94720-2465, USA
erter@ucjeps.berkeley.edu

W. Hardly Eshbaugh
Department of Botany
Miami University
175 Upham Hall
OXFORD, OH 45056, USA
phone: +513-529-4212
fax: 513-529-4243

Dianne Fahselt
Department of Plant Sciences
University of Western Ontario
LONDON, Ontario
Canada N6A 5B7

Claude Farron
Botanisches Institut der Universität
Basel
Postfach 246
CH-4009 BASEL, Switzerland

C. Favarger
Institut de Botanique
Univ. de Neuchatel
Ch. de Chantemerle 9
CH-2000 NEUCHATEL
Switzerland

Francois Felber
Institut de Botanique
Univ. de Neuchatel
Chemin de Chantemerle 22
CH-2000 NEUCHATEL 7
Switzerland

Carlos Fernandez Lopez
Colegio Universitario "Santo Reino"
E-23071 JAEN, Spain

Silvia Fineschi
Istituto per l'Agroselvicoltura
CNR Viale Marconi 2
I-05010 PORANO - TR, Italy

Manfred Fischer
Institute of Botany, Universität Wien
Rennweg 14
A-1030 WIEN, Austria

Maria Flores-Cruz
Universidad Autonoma
Metrop.-Iztapalapa

Av Michoacan y Calzada
de la Purisima
Iztapalapa, Apdo. Postal 55-532
MEXICO D.F.C. P 09340, Mexico

Donna I. Ford
Northeast Missouri State University
Division of Science
KIRKSVILLE, MO 63501, USA

Ludwik Frey
W. Szafer Institute of Botany
Lubicz 46
PL-31-512 KRAKOW, Poland
+48 12 215144 +48 12 219790

I. Fukuda
Div. of Biology
Tokyo Woman's Christian University
Zempukuji, Suginami
TOKYO 167, Japan

Paul Gadek
School of Biological Science
P.O. Box 1
KENSINGTON, N.S.W., Australia

Nicole Galland
Inst. Bot. Syst. & Geobot
Université de Lausanne
CH-1015 LAUSANNE, Switzerland

F. Garbari
Dip. Scienze Botaniche
Università di Pisa
Via Luca-Ghini 5
I-56100 PISA, Italy

P.J. Garnock-Jones
School of Biological Sciences
Victoria University of Wellington
PO BOX 600
WELLINGTON, New Zealand
+64 4 4721000 +64 4 4715331
phil.garnock-jones@vuw.ac.nz

Camille Gervais
Pavillon Charles-Eugene Gervais
Université Laval
QUEBEC QUE G1K 7P4, Canada

Bill Later Department
PO Box 1943
BIRMINGHAM, AL 35201-1943
USA

Dr Paul Goetghebeur
Laboratorium voor Morfologie

Systematiek en Ecologie van
Planten
Ledeganckstraat 356
9000 GENT, Belgium
fax: +32 91 645342

Guenther Gottschlich
Hermann-Kurz-strasse 35
D-72074 TUBINGEN, Germany

Verne Grant
Department of Botany
University of Texas
AUSTIN, TX 78713-7640, USA

William F. Grant
Department of Plant Science
Macdonald, College of McGill
University
Box 4000
STE. ANNE DE BELLEVUE, QC
Canada H9X 3V9
fax: +514 398 7897

Rosaura Grether-Gonzales
Universidad Autonoma Metrop.-
Iztapalapa
Av Michoacan y Calzada de la
Purisima
Iztapalapa, Apdo. Postal 55-532
MEXICO D.F.C. P 09340, Mexico

Werner Greuter
Bot. Garten & Museum, Berlin-
Dahlem Königin-Luisenstr. 6-8
D-1000 BERLIN, Germany

Wang Guang-Xi
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Pushpendra K. Gupta
Dept. of Agricultural Botany
Meerut University
MEERUT 250005, India

Perry Gustafson
USDA
206 Curtis Hall
University of Missouri
COLUMBIA, MO 65211, USA

James Hamrick
Department of Botany
University of Georgia
ATHENS, GA 30602, USA

Ronald L. Hartman
Department of Botany
The University of Wyoming
3165 University Station
LARAMIE, WY 82071, USA

Kiyoshi Hashimoto
c/o The Hiroshima Bot. Garden
Kurashige, Itsukaichi-cho
HIROSHIMA, 731-51, Japan

Christ. H. Haufler
Department of Botany
University of Kansas
LAWRENCE, KS 66045-2106, USA

Jingbiao He
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

P. V. Heath
9 Hazeldene Meads
BRIGHTON, BNI SLR, England

C.C. Heyn
Department of Botany
The Hebrew University
JERUSALEM 91904, Israel

L. Michael Hill
Biology Department
Bridgewater College
BRIDGEWATER, VA 22812, USA

Jerry L. Hill
N-111 Turner Hall
University of Illinois
1102 S. Goodwin Avenue
URBANA, IL 61801, USA

Peter C. Hoch
Missouri Botanical Garden
P.O. Box 299
ST. LOUIS, MO 63166-0299, USA

Annelies Hofman
Eldersloo 11
9453 VD ELDERSLOO
The Netherlands

Kent E. Holsinger
Dept. of Ecology & Evol. Biology
University of Connecticut, U-43
75, North Eagleville Road
STORRS, CT 06269, USA
holsinge@uconnvm.uconn.edu

De-yuan Hong
Laboratory Systematic &
Evolutionary Botany
Academica Sinica
20 Nanxicum, Xiangshan
BEIJING 100093, PR China

Sara B. Hoot
Field Museum of Natural History
Roosevelt Road at Lakeshore Drive
CHICAGO, IL 60605, USA

Marina Horjales
Depto. Biología Vegetal
Colegio Universitario de Vigo
Apto. 874
E-36200 VIGO (Pontevedra), Spain

Ping-sheng Hsu
Department of Biology
Fudan University
SHANGAI 200433, PR China

Wang Hui-qin
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Ulla-Maj Hultgård
Department of Syst. Botany
Uppsala University
Villavägen 6
S-752 36 UPPSALA, Sweden

H. Hurka
Institut für Biologie
Spezielle Botanik
Barbarastrasse 11
D-4500 OSNABRÜCK, Germany
fax +49 541 9692870

Hugh Iltis
Department of Botany
University of Wisconsin
132 Birge Hall
430 Lincoln Drive
MADISON, WI 53106, USA

Institut de Botanique
Bibliothèque
22, Chemin de Chantemerle
CH-2007 NEUCHÂTEL
Switzerland

Kunio Iwatsuki
Botanical Garden
Tokyo University

3-7-1 Hakusan, Bunkyo
TOKYO 112, Japan

Romana Izmailow
Jagellonian University
Institute of Botany
Dept. Plant Cytology & Embryology
Grodzka str. 52
31-044 KRAKOW, Poland

R. C. Jackson
Department of Biological Sciences
Texas Techn. University
LUBBOCK, TX 79409, USA

Andrzej Jankun
Jagellonian University
Institute of Botany
Dept. Plant Cytology & Emhryology
Grodzka str. 52
31-044 KRAKOW, Poland

Chen Jia-kuan
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Almut G. Jones
Herbarium, Dept. of Plant Biology
University of Illinois
505 South Goodwin Avenue
URBANA, IL 61801, USA

David T. Jones
2262 S E 27th Drive
HOMESTEAD, FL 33035, USA

Bengt E. Jonsell
Bergius Botanical Garden
Box 50017
S-104 05 STOCKHOLM, Sweden

Stephen L. Jury
Plant Science Laboratories
University of Reading
Whiteknights, READING RG6 2AS
England

Mary T.K. Kalin de Arroyo
Laboratorio de Sistemática y
Ecología Vegetal, Depto. Biología,
Univ. de Chile, Casilla 653
SANTIAGO, Chile
phone +56-271-2983 /92

Georgia Kamari
Botanical Institute

Department Biology
University of Patras
26500 PATRAS, Greece

S. Kawano
Department of Botany
Faculty of Science
Kyoto University
KYOTO 606, Japan
phone: +075-753-4131
fax: +075-753-4122

Sterling C. Keeley
Department of Botany
University of Hawaii
3190 Maile Way
HONOLULU, HI 96822-2279
USA

David J. Keil
Department of Biological Sciences
California Polytechnic State
University
SAN LUIS OBISPO, CA 93407
USA

Sylvia Kelso
Department of Biology
Colorado College
COLORADO SPRINGS, CO 80903
USA

Nazik S. Khandjian
Ministry of Nature & Environment
Protection
35 Moskovian Street
YEREVAN, 375002, Armenia

Andrej Khokhrajakov
Leningradsky prospekt 62
Flat 9
MOSCOW 125167, Russia

Jan Kirschner
Botanical Institute
Academy Science Czech Republic
252 43 PRUHONICE 1
Czech Republic
phone/fax: +42-2-6436529 /95

Mikio Kobayashi
Utsunomiya University
Faculty of General Education
Mine-machi 350
UTSUNOMIYA 321, Japan

M. Kovanda
Czech Academy of Science

- Botanical Institute
252 43 PRUHONICE 1
Czech Republic
- Martin Krähenbühl
Institut Botanique Université
Chemin de Chantemerle 22
CH-2000 NEUCHÂTEL 7
Switzerland
- Joseph L. Krahulik
National Tropical Botanical Garden
Post Office Box 340
Lawai, KAUAI, HI 96765, USA
- Dr Ivan M. Krasnoborov
Central Siberian Botanical Garden
Zolotodolinskaya 101
NOVOSIBIRSK 630090, Russia
- M. Kroenlein
Jardin Exotique de Monaco
B. P. 105
MONTE CARLO MC 98002
Monaco CEDEX
- Philippe Küpfer
Institut de Botanique
Chemin de Chantemerle 22
CH-2007 NEUCHÂTEL
Switzerland
- Elzbieta Kuta
Jagellonian University
Institute of Botany
Dept. Plant Cytology & Embryology
Grodzka str. 52
31-044 KRAKOW, Poland
- L.H. Bailey Hortorium
467 Mann Library Bldg.
Cornell University
ITHACA, NY 14853-4301, USA
- W.F. Lamboy
Plant Genetic Resources Unit
New York State Agric. Exper.
Station, Cornell University
GENEVA, NY 14456-0462, USA
- Landbou Universiteit Wageningen
Bibliotheek
Postbus 9100
NL-6700 HA WAGENINGEN
The Netherlands
- Elias Landolt
Geobotanisches Institut ETH
- Zuerichbergstrasse 38
CH-8044 ZÜRICH, Switzerland
- Meredith A. Lane
R.L. McGregor Herbarium
University of Kansas
2045 Constant Ave, Campus West
LAWRENCE, KS 66047, USA
phone: +913-864-4493
fax: +913-864-5298
- Jean-Jacques Lazare
Centre d'Ecologie Montagnarde de
Gabas
Université Bordeaux I
F-64440 LARUNS, France
- C. Lefebvre
Lab. d'Ecologie Vegetale et de
Génétique
Chaussee de Wavre 1850
B-1160 BRUXELLES, Belgium
- Ben A. LePage
Department of Botany
University of Alberta
EDMONTON, Alberta T6G 2E9
Canada
- F. Harlan Lewis
14280 Sunset Blvd.
PACIFIC PALISADES, CA 90272
USA
- Walter H. Lewis
Department of Biology
Washington University
Box 1137
ST. LOUIS, MO 63130, USA
- Felix Llamas-Garcia
Dpto. of Plant Biology
University of Leon
E-24071 LEON, Spain
- Hann-Chung Lo
Department of Forestry
National Taiwan University
P.O.Box 13-387
TAIPEI, Taiwan 107, PR China
- Francisco C. Lorea
Missouri Botanical Garden
P.O. Box 299
ST. LOUIS, MO 63166, USA
- T.K. Lowrey
Department of Biology
- University of New Mexico
ALBUQUERQUE, NM, USA
- Lazarus Walter Macior
Department of Biology
University of Akron
AKRON, OH 44325-3908, USA
- Paul C. Macmillan
Department of Biology
Hanover College
HANOVER, IN 47243, USA
- Jean-Francois Manen
1, ch. de l'Impératrice
CH-1292 Chambésy/GENÈVE
Switzerland
- V. S. Manickam
St. Xavier's College
Palayamkottai - 627 002
TAMIL NADU, India
+91-462-72283, +91-462-72845
- Karol Marhold
Institute of Botany
Slovak Academy of Sciences
Dubravska cesta 14
842 23 BRATISLAVA, Slovakia
- Daniel L. Marsh
P.O. Box 7570
Henderson State University
ARKADELPHIA, AR 71999-0001
USA
- Arturo M. Martinez
Serrano 665
1414 BUENOS AIRES, Argentina
- Angelica Martinez-Bernal
Universidad Autonoma Metrop.-
Iztapalapa
Av Michoacan y Calzada de la
Purissima
Iztapalapa
Apdo. Postal 55-532
MEXICO D.F.C. P 09340, Mexico
- Pavol Mártonfi
Dept. Exper. Botany & Genetics
Faculty of Science
P.J. Safarik University
Manesova 23
SK-04154 KOSICE, Slovakia
- Richard M. McCourt
Department of Biological Sciences

DePaul University
1036 W. Belden
CHICAGO, IL 60614, USA

J. McNeill
Royal Ontario Museum
100 Queen's Park
TORONTO, Ontario M5S 2C6
Canada
phone+1-416-5865515
fax: +1-416-5868044

Dr Vlastimil Mikolas
Botanical Garden and Herbarium
23, Manes street
SK 043 52 KOSICE, Slovakia

Ministere Environnement Faune
a/s Dir. Conservation & Patrimoine
Ecologique
2360, Chemin Ste-Foy
STE FOY, QC G1V 4H2, Canada

J. Paul Minkin
961 West Goodview Drive
VIRGINIA BEACH, VA 23464
USA

Missouri Botanical Garden
Library
P.O. Box 299
ST. LOUIS, MO 63166, USA

Marta Mizianty
W. Szafer Institute of Botany
Polish Academy of Sciences
Lubicz Str. 46
31-512 KRAKOW, Poland
+48 12 21-51-44/249
+48 12 21-97-90

Julian Molero
Department of Botany
Faculty of Pharmacy
Univ. of Barcelona
Zona Univ. de Pedralbes
E-08028 BARCELONA, Spain

J.M. Montserrat-Marti
Institut Botanic
Av. Muntanyans s/n, Parc de Montuic
E-08004 BARCELONA, Spain

A. Gerry Moore
Vanderbilt University
Department of Biology
Box 1812-B
NASHVILLE, TN 37235, USA

Tatsuyoshi Morita
Niigata University
8050 Ikarashi-ni-no-cho
NIIGATA, Japan

J. K. Morton
Department of Biology
University of Waterloo
WATERLOO, Ontario
Canada N2L 3G1

Sergei L. Mosyakin
Vascular Plants Department
N.G. Kholodny Institute of Botany
Ukraine Academy of Sciences
2 Tereshchenkivska Str.
KIEV, GSP-1, 252601, Ukraine
+744-225-2038
smos@botan.kiev.ua

Larisa G. Mouradian
Abovian street 26a-57
375001 YEREVAN-1, Armenia

Jeanette Mullins
P.O. Box 576
CALIFORNIA, PA 15419, USA

David F. Murray
University of Alaska Museum
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Kruislaan 318
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The Netherlands
phone: +31-20-5257660
fax: +31-20-5257715

Inger Nordal
Biology Department
University of Oslo
P.O. Box 1045, Blindern
N-0316 OSLO, Norway

Øystein Normann
Trondarnes Distriktsmuseum
Box 721
N-9401 HARSTAD, Norway

Fiona M. Norris
Department of Botany
State Museum Natural and Cultural
History
1525 Bernice street
PO Box 19000A
HONOLULU, HI 96817-09816
USA
+808-847-3511

Maria O. Nwosu
c/o Prof dr M. Popp
Inst. Angewandte Botanik
Westfälische-Wilhelms Universität
Hindenburgweg 55
MÜNSTER, Germany

Department of Botany
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NSUKKA
Anambra State, Nigeria

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Department of Biology
College General Education
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OSAKA 560, Japan

Ching-I Peng
Inst. of Botany, Academia Sinica
Nankang
TAIPEI, Taiwan, 11529, PR China

Pedro Luis Perez de Paz
Dep. de Biología Vegetal (Bot.)
Facultad de Farmacia
Universidad de La Laguna
TENERIFE, Islas Canarias, Spain

James B. Phipps
Department of Plant Sciences
The University of Western Ontario
LONDON, Ontario
Canada NOM 1A0

D. Phitos
Botanical Institute
Department Biology
University of Patras
GR 265 00 PATRAS, Greece

R. E. G. Pichi Sermolli
Via Cantagrilli 1
I-50020 Montagnana val di Pesa
FIRENZE, Italy

Prof. Michael C. Pimenov
Botanical garden
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Dept. of Plant Cytology and
Embryology, Inst. of Botany
Jagellonian University
Grodzka St. 52
31-044 KRAKOW, Poland

A. M. Powell
Department of Biology
Sul Ross State University
Box 6064
ALPINE, Texas 79832, USA

James S. Pringle
Royal Botanical Gardens
P.O. Box 399
HAMILTON, Ontario L8N 3H8
Canada

Jean Prudhomme
38 bis avenue Gambetta
F-69250 NEUVILLE-SUR-SAONE
France

S. Puech
Lab. de Syst. et d'Ecologie
Mediterraneennes
Institut de Botanique
Rue Auguste-Broussonet
F-3400 MONTPELLIER, France

M. Qaiser
Department of Botany
University of Karachi
KARACHI-32, Pakistan

James A. Quinn
Department of Biological Sciences
Rutgers University
PISCATAWAY, NJ 08855-1059
USA

L.W.D. van Raamsdonk
Centrum Plantenveredelings &
Reproductie Onderzoek
Postbus 16
NL-6700 AA WAGENINGEN
The Netherlands

S.N. Raina
Cytogenetic Laboratory
Department of Botany
University of Dehli
DEHLI 110007, India

Peter H. Raven
Missouri Botanical Garden
P. O. Box 299
ST. LOUIS, MO 63166, USA
phone: +314-577-5110
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Tadeus Reichstein
Inst. of Organic Chemistry
University of Basel
1, St. Johannis-Ring
CH-4056 BASEL, Switzerland

Lars-Gunnar Reinhammer
Department of Systematic Botany
University of Uppsala
Villavägen 6
S-752 36 UPPSALA, Sweden
phone: +46 18 18 2782
fax: +46 18 5087 02
lars-gunnar.reinhammer@systbot.
uu.se

Howard C. Reynolds
Division of Biological Sciences
Fort Hays State University
HAYS, KS 67601-4099, USA

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Ana T. Romero
Facultad de Ciencias
Dep de Biología Vegetal
Universidad de Granada
E-18071 GRANADA, Spain

Josep A Rossello
Botànica-Dpto Biología vegetal
Facultad de Ciencias, Universidad
VALENCIA
E-46071 Burjassot-Valencia, Spain

Arne Rousi
Department of Botany
University of Turku
SF-20500 TURKU 50, Finland
phone: +358-21-6336101
fax: +358-21-331167

Royal Botanic Gardens, Kew
RICHMOND, Surrey TW9 3AE
England

George Russell
Department of Botany
The University
LIVERPOOL L69 3BX, England

Elvira Sahuquillo Balbuena
Depto Biología Animal y Vegetal
Facultad de Ciencias, Campus A
Zapateira
Universidad de La Coruña
15071 LA CORUÑA, Spain

Per H. Salvesen
Botanical Institute

University of Bergen
Allegatan 14
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D-7400 TÜBINGEN, Germany

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CHICAGO, IL 60657-1418, USA

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Département des Sciences
Forestières
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Canada

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Germany

Alexander Shirokov
Nizhny Novgorod Stadt University
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NIZHNYI NOVGOROD 603106
Russia
dront@glas.apc.org

Anatoly V. Shurkhal
Vavilov Inst. of General Genetics
Gubkin street 3
MOSCOW B-333, Russia 1178809

Sun Siang-chung
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Ram J. Singh
University of Illinois
Department of Agronomy
W-203 Turner Hall
1102 South Goodwin Avenue
URBANA, IL 61801-4798, USA

Sigmund Sivertsen
UNF
Vitenskapsmuseet
N-7004 TRONDHEIM, Norway

Gideon Smith
Deputy Director Research
National Botanical Institute
Private Bag X101
0001 PRETORIA, R S A

A.J.E. Smith
School of Biological Sciences
University of Wales
BANGOR, Gwynedd LL57 2UW
Great Britain

Pam & Douglas Soltis
Department of Botany
Washington State University
PULLMAN, WA 99164, USA

Franz Speta
Oberösterr. Landesmuseum
Museumstr. 14
A-4010 LINZ, Austria

C. A. Stace
Department of Botany

University of Leicester
LEICESTER LE1 7RH, England
phone: +533-523381
fax: +533-522791

Brita Stedje
Biol. Inst., Department of Botany
University of Oslo
P.O. Box 1045
Blindern
N-0316 OSLO 3, Norway

Jürg Stöcklin
Botanisches Institut der Universität
Basel
Schönbeinstrasse 6
CH-4056 BASEL, Switzerland

Arne Strid
Botanical Laboratory
University of Copenhagen
140 Gothersgade
DK-1123 COPENHAGEN
Denmark

Tod F. Stuessy
Department of Botany
The Ohio State University
1735 Neil Avenue
COLUMBUS, OH 43210, USA

Carol R. Sweeney
Department of Biology
Niagra University
Niagra University, NY 14109, USA

Krystyna Szybowska
Jagellonian University
Institute of Botany
Dept. Plant Cytology & Embryology
Grodzka str. 52
PL 31-044 KRAKOW, Poland

Fernando Tammaro
Dipartimento di Scienze Ambientali
Università di LAquila
Italy

Noriyuki Tanaka
Biological Laboratory
Tokyo University
359 Otsuka, Hachioji-shi
TOKYO 192-03, Japan

Charlotte Taylor
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P.O. Box 299
ST. LOUIS, MO 63166, USA

Herwig Teppner
Karl-Franzens-Universität Graz
Institut für Botanik
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Sue A. Thompson
Section of Botany
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Shirley C. Tucker
Department of Botany
Louisiana State University
BATON ROUGE, LA 70803, USA

Perti J. Uotila
Botanical Museum
P.O. Box 7
FI-00014 Helsinki University
Finland

Krystyna M. Urbanska
Geobotanisches Institut ETH
Zuerichbergstrasse 38
CH-8044 ZÜRICH, Switzerland
phone: +41-1-2563877
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F.H. Utech
Carnegie Museum of Natural
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4400 Forbes Avenue
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Joan Valles Xirau
Catedra de Botanica
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Sake van der Kloet
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Peter van Dijk
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NL-6871 CP RENKUM
The Netherlands

P. van der Veken
Lab. Morphologie
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Planten
Universiteit van Gent
Ledeganckstraat 35
9000 GENT, Belgium

Regine Verlaque
Univ. de Provence
Cytotaxinomie Vegetale
Centre de St.-Charles
F-13331 MARSEILLE Cedex 3
France

Philippe P.E. Vernet
Lab. Génétique Evolution
Populations Végétale URA CN
1185
Université de Lille
Bat. SN 2, 2nde étage
F-59655 VILLENEUVE D'ASQ
France

Robert K. Vickery Jr
Biology Department
University of Utah
SALT LAKE CITY, UT 84112
USA

Florence S. Wagner
Department of Botany
The University of Michigan
ANN ARBOR, MI 48109-1048
USA

Warren H. Wagner
Department of Botany
The University of Michigan
ANN ARBOR, MI 48109-1048
USA

Robert S. Wallace
Department of Botany - Bessey Hall
Iowa State University
AMES, IA 50011, USA

Michael Warnock
Sam Houston State University

Department of Biological Sciences
HUNTSVILLE, TX 77341, USA

Suzanne I. Warwick
Biosystematics Research Centre
W. Saund. Bldg.
Central Experimental Farm
OTTAWA, Ontario K1A 0G6
Canada
phone: +1 613 996 1665
fax: +1 613 995 1823

K. Watanabe
Biological Institute
Faculty of General Education
Kobe University
KOBE, 657, Japan

Marcia J. Waterway
Plant Science Department,
Macdonald Campus
McGill University
2111 Lakeshore Road
STE. ANNE DE BELLEVUE
H9X 1C0, QC, Canada

Frank D. Watson
Department of Biology
St Andrews College
LAURINBURG, NC 28352, USA

C. J. Webb
Botany Division, D.S.I.R.
Private Bag
CHRISTCHURCH, New Zealand

H. E. Weber
Am Buehner Bach 12
D-49565 BRAMSCHE 3
Germany

Dona Weifenbach
Department of Biology
University of Southwestern
Louisiana
LAFAYETTE, LA 70504, USA

Gunnar Weimarck
Botanic Garden
S-413 19 COTHENBURG, Sweden

Judith G. West
Herbarium Australiense
CSIRO
P. O. Box 1600
CANBERRA CITY, ACT 2601
Australia

G. Wiegleb
Fachbereich 7 Biologie
Universitaet Oldenburg
Postfach 2503
D-2900 OLDENBURG, Germany

Dieter Wilken
Santa Barbara Botanic Garden
1212 Mission Canyon Road
SANTA BARBARA, CA 93105
USA

Kenneth C. Wilson
Department of Botany
Miami University
OXFORD, OH 45056, USA

Helga Winge
Dep Genetica - IB - UFRGS
C P 15053 - Campus do Vale
91501 - PORTO ALLEGRE, Brazil

Robert Wingfield
Apdo 7357
Coro
FALCON, Venezuela

Paul G. Wolf
Department of Biology
Utah State University
LOGAN, UT 84322, USA

Dennis W. Woodland
Biology Department
Andrews University
BERRIEN SPRINGS, MI 49104
USA

Chunsheng Xiang
Department of Biology
University of Waterloo
WATERLOO, Ontario N2L 3G1
Canada

Tetsukazu Yahara
Department of Biology
University of Tokyo
Komaba 3-8-1, Meguro-Ku
TOKYO 153, Japan
phone: +81-3-3465-6043
fax: +81-3-3485-2904

Jun You
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Guo Youhao
Department of Biology
Wuhan University
Wuchang 430072
HUBEI, PR China

Dr Boris A. Yurtsev
Far North Vegetation Department
Komarov Botanical Institute
ul. Prof. Popov 2
ST. PETERSBURG 197376, Russia

Ren Zhuge
Southwest Forestry College
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William J. Zimmerman
Department of Natural Sciences
University of Michigan
4901 Evergreen Road
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