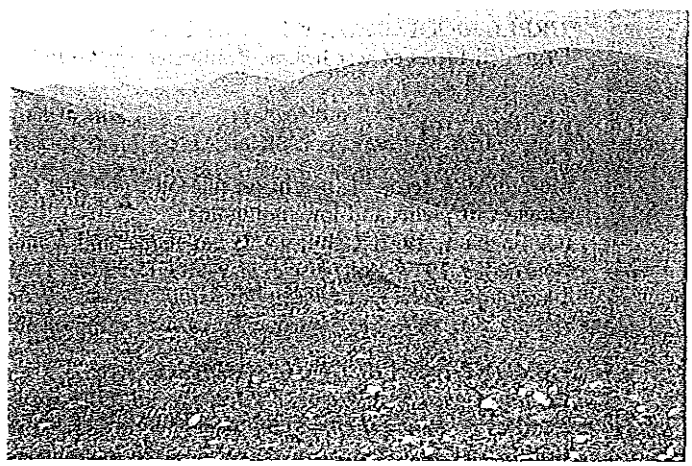
3 Scrub and grassland



31

31 Heath and scrub

Temperate shrubby areas: Atlantic and alpine heaths, subalpine bush and tall herb communities, deciduous forest recolonization, hedgerows, dwarf conifers.

31.1 **WET HEATHS**
Ericion tetralicis; Ulicion minoris p.; Genistion micrantho-anglicae p.
Humid, peaty or semi-peaty heaths (other than blanket bogs).
(Lebrun *et al.*, 1949; Ellenberg, 1963; Depasse *et al.*, 1970; Géhu, 1973; Westhoff and den Held, 1975; Noirfalise and Vanesse, 1976; De Sloover *et al.*, 1978; Rivas-Martinez, 1979; Gimingham *et al.*, 1979; Bournérias, 1979; Noirfalise *et al.*, 1980; de Smidt, 1981; Polunin and Walters, 1985)

31.11 NORTHERN WET HEATHS
Wet heaths with *Erica tetralix* and sphagnums.

31.12 SOUTHERN WET HEATHS
Wet heaths with *Erica tetralix* and *E. ciliaris* and sphagnums.

31.13 PURPLE MOORGRASS WET HEATHS
Degraded facies of wet heaths, dominated by *Molinia caerulea.*

31.2 **DRY HEATHS**
Calluno-Ulicetea
Mesophile or xerophile heaths on siliceous, podsolic soils in moist Atlantic and sub-Atlantic climates of plains and low mountains.
(Gimingham, 1972; Géhu, 1973; Noirfalise and Vanesse, 1976; Gimingham *et al.*, 1979; Bournérias, 1979; Noirfalise *et al.*, 1980; Ratcliffe, 1980; Polunin and Walters, 1985; Webb, 1986)

31.21 SUBMONTANE *VACCINIUM* HEATHS
Calluno-Genistion pilosae p.; Vaccinion vitis-idaeae p.
Heaths rich in *Vaccinium spp.*, usually with *Calluna vulgaris,* of the northern and western British Isles, the Hercynian ranges and the lower levels of the Alps, the Pyrenees and the Cordillera Cantabrica.
(Lebrun *et al.*, 1949; Ellenberg, 1963; Schumacker, 1973; Noirfalise and Vanesse, 1976; De Sloover *et al.*, 1978; Rivas-Martinez, 1979; Gimingham *et al.*, 1979; Noirfalise *et al.*, 1980; Ratcliffe, 1980; Webb, 1986; Noirfalise, 1987; Salomez, *in litt.* 1990)

31.211 **Northern isles *Vaccinium* heaths**
Calluna-Empetrum hermaphroditum-Vaccinium vitis-idaea heaths of the Orkneys and Shetlands.

31.212 **Upland British *Vaccinium* heaths**
Upland *Vaccinium-Empetrum* heaths of northern and western Britain, with *Vaccinium myrtillus* or *V. vitis-idaea* and *Empetrum nigrum* or *E. hermaphroditum.* They can be further subdivided according to the Ratcliffe (1980) classification, as follows:

31.2121 **British southern bilberry heaths**
Southern *Vaccinium myrtillus* dominated heaths characteristic of well-drained sub-montane sites south of the Highlands.

31.2122 **British chionophilous bilberry heaths**
Vaccinium myrtillus dominated heaths of areas with prolonged snow cover in the eastern and central Highlands, Cheviots and Moffat-Tweedsmuir hills with *Empetrum hermaphroditum* and *Vaccinium uliginosum.*

31.2123 **British species-rich bilberry heaths**
Species-rich *Vaccinium myrtillus* heaths with *Alchemilla alpina* and abundant grasses, mainly of the central and south-western Highlands, with outliers in northern English and Welsh uplands.

31.2124 **British mat-grass-bilberry heaths**
Vaccinium myrtillus-Nardus stricta heaths of northern England and Wales.

31.2125 **British mountain crowberry-bilberry heaths**
Vaccinium myrtillus heaths with abundant *Empetrum hermaphroditum, Carex bigelowii,* bryophytes and lichens mostly associated with large shallow snow beds in the central and western Highlands, with related outliers in England and Wales.

31.2126 **British lichen-bilberry heaths**
Vaccinium myrtillus-Empetrum heaths rich in *Cetraria* and *Cladonia* lichens, but poor in bryophytes, mostly of the eastern and central Highlands.

31.2127 **British cowberry heaths**
Vaccinium vitis-idaea heaths, generally species-poor, mainly of the Peak District and eastern Wales.

31.2128 **British ling-liverwort heaths**
Tall *Calluna vulgaris-Vaccinium* heaths with a ground layer dominated by leafy liverworts, characteristic of the north-west Highlands, with fragmentary stands in more southerly western uplands.

31.213 **Hercynian *Vaccinium* heaths**
Submontane heaths of the Vosges, the Black Forest, the Ardennes, the Eifel and other Hercynian ranges of Germany, with *Calluna vulgaris, Vaccinium myrtillus, V. vitis-idaea, V. uliginosum* and montane lycopodes.

31.214 **Sub-montane Alpine *Vaccinium* heaths**
Vaccinium spp. heaths of the collinar and montane levels of the Alps with *Calluna vulgaris, Artemisia alba, Silene otites, Campanula spicata* and other thermophile species.

31.215 **Submontane Pyreneo-Cantabrian *Vaccinium* heaths**
Vaccinium-rich heaths of the collinar and montane levels of the Pyrenees and the Cordillera Cantabrica.

31.22 SUB-ATLANTIC *CALLUNA-GENISTA* HEATHS
Calluno-Geniston pilosae p.
Low *Calluna* heaths often rich in *Genista,* mostly of the North Sea lowlands. Similar formations occurring in British upland areas, montane zones of high mountains of the western Mediterranean basin and high rainfall influenced Adriatic areas are most conveniently listed here.
(Lebrun *et al.,* 1949; Ellenberg, 1963; Depasse *et al.,* 1970; Géhu, 1973; Westhoff and den Held, 1975; Noirfalise and Vanesse, 1976; Gruber, 1978; Gimingham *et al.,* 1979; Bournérias, 1979; Rivas-Martinez, 1979; Noirfalise *et al.,* 1980; Ratcliffe, 1980; Groppali *et al.,* 1980; De Smidt, 1981; Feoli *et al.,* 1981; Bassilana, 1984; Webb, 1986; Ardito, 1989; Salomez, *in litt.* 1990)

31.221 **Northern *Calluna-Genista* heaths**
Danish, German and northern Dutch (north of the Rhine) heaths with *Calluna vulgaris, Genista anglica, G. pilosa* and with *Vaccinium* and *Empetrum* present.

31.222 **Elbe *Calluna-Genista* heaths**
Elbe basin formations with *Genista germanica.*

31.223 **Campino-Flandrian *Calluna-Genista* heaths**
Southern Dutch, Belgian and north-western French heaths with *Calluna vulgaris, Genista anglica* and *G. pilosa.*

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31.224 **Campino-Flandrian *Erica cinerea* heaths**
Erica cinerea-dominated formations of the Southern Dutch, Belgian and north-western French range of the *Calluna-Genista* heaths.

31.225 **British *Calluna-Genista* heaths**
British heaths with *Calluna vulgaris* or *Erica cinerea* and often *Genista anglica*. They include in particular:

31.2251 **East Anglian *Calluna-Festuca* heaths**
Lowland, species-poor *Calluna vulgaris-Festuca ovina* heaths of East Anglia and adjacent areas.

31.2252 **Spring squill heath**
Maritime *Calluna vulgaris-Erica cinerea* heaths with *Scilla verna,* of the coasts of south-western England, western Wales, Cumbria, Scotland and the isles.

31.2253 **British *Calluna-Sieglingia* heaths**
Species-rich *Calluna vulgaris-Danthonia (Sieglingia) decumbens* heaths.

31.2254 **English *Calluna*-Deschampsia heaths**
Species-poor *Calluna vulgaris-Deschampsia flexuosa* heaths of northern Pennine foothills, North Yorkshire moors and west Midlands.

31.2255 **British *Calluna*-bearberry heaths**
Arctostaphylos uva-ursi-Calluna vulgaris heaths with *Genista anglica* and often *Erica cinerea* and *Vaccinium vitis-idaea* of eastern Highlands, Teesdale, Lake District and Orkney.

31.2256 **Upland *Calluna*-bell heather heath**
Submontane heather-moors dominated by *Calluna vulgaris,* with varying amounts of *Erica cinerea* and *Vaccinium vitis-idaea,* related to 31.212.

31.2257 **Highland prostrate *Calluna* heath**
Wind-clipped, prostrate *Calluna vulgaris* or *Calluna* and lichen mats, of montane passes and lower summits of the Highlands and other isolated upland areas.

31.2258 **Southern English *Calluna*-bristle bent heath**
Calluna vulgaris-Agrostis curtisii heaths of Dorset and Hampshire.

31.226 **Montane *Calluna-Genista* heaths**
Heaths of the montane zone (beech forest level) of the Central Massif, Pyrenees and south-western Alps with *Genista anglica, G. pilosa, Vaccinium myrtillus.*

31.227 ***Empetrum nigrum* heaths**
Coastal non-dunal *Calluna* and *Empetrum nigrum* heaths of the Baltic, the North Sea and Scotland.

31.228 **Illyrian heaths**
Illyrian heaths with *Calluna vulgaris* and *Genista germanica.*

31.229 **Po basin heaths**
Calluna vulgaris heaths of the fluvio-glacial terraces that constitute the high plains of the Po river system.

31.22A ***Genista sagittalis* heaths**
Calluna vulgaris-Genista sagittalis heaths of the south-western Alps.

31.23 ATLANTIC *ERICA-ULEX* HEATHS
Ulicenion minoris; Daboecenion cantabricae p.; Ulicion maritimae p.
Heaths rich in gorse (*Ulex*) of the Atlantic margins.
(Tüxen and Oberdorfer, 1958; Dendaletche, 1973; Géhu, 1973, 1975, 1984; Noirfalise and Vanesse, 1976; Gimingham *et al.*, 1979; Rivas-Martinez, 1979; Polunin and Walters, 1985; Webb, 1986; Izco, 1987)

31.231 **Maritime gorse heaths**
Wind-swept heaths with prostrate, cushiony *Ulex maritimus* and numerous other maritime ecotypes (*Cytisus scoparius* subsp. *maritimus, Ulex gallii* f. *humilis, Erica vagans*) of the immediate proximity of the ocean: Brittany, Cornwall, Cotentin, southern Ireland, Cantabrian coast.

31.232 **Gallo-Irish *Ulex gallii*-Erica cinerea heaths**
Widespread Irish and Welsh Atlantic heaths, with *Ulex gallii* and *Erica cinerea.*

31.233 **Irish Erica *mackaiana* heaths**
Western Irish heaths comprising the northern, isolated populations of *Erica mackaiana.*

31.234 **Northern *Erica vagans* heaths**
Irish, Cornish and Armorican heaths, other than cushiony maritime formations, containing *Erica vagans,* northern irradiation of 31.241.

31.2341 **Armorican *Erica vagans* heaths**
Heaths of Brittany, other than prostrate coastal ones, containing the uncommon and local *Erica vagans.*

31.2342 **Lizard *Erica vagans* heaths**
Extensive *Erica vagans*-dominated communities of the Lizard peninsula of Cornwall.

31.23421 **Lizard tall heath**
Erica vagans-Schoenus nigricans heath of moist, shallow depressions of the Lizard plateau, dominated by Cornish heath.

31.23422 **Lizard mixed heath**
Erica vagans-Ulex europaeus heath of well-drained areas of the Lizard plateau, dominated by Cornish heath and common gorse.

31.235 **Anglo-Armorican western gorse heaths**
Armorican, Cotentin and western English heaths with *Ulex gallii* and *Erica cinerea* or *Erica ciliaris.*

31.2351 **Anglo-Armorican *Ulex gallii-Erica cinerea* heaths**
Driest variants of the Atlantic western gorse Anglo-Armorican heaths.

31.2352 **Anglo-Armorican *Ulex gallii-Erica ciliaris* heaths**
More mesophile western gorse heaths, marked by the replacement of *Erica cinerea* by *E. ciliaris.*

31.2353 **Anglo-Armorican *Ulex gallii-Calluna* heaths**
Calluna vulgaris facies of the Anglo-Armorican western gorse heaths.

31.2354 ***Ulex gallii*-bristle bent heaths**
Southern English, short, often grassy heaths in which *Ulex gallii* is accompanied by *Erica spp.* and various grasses, in particular *Agrostis curtisii.*

31.236 **Cantabro-Pyrenean *Erica mackaiana-E. ciliaris* heaths**
Heaths with *Ulex gallii, Erica mackaiana, E. ciliaris, Daboecia cantabrica* of the beech level of the Pyrenees and the Cantabrian chain and, very locally, of Galicia; *Ulex europaeus* and *Erica mackaiana* heaths of the calcareous Picos de Europa.

31.237 **Cantabro-Pyrenean *Erica vagans-E. cinerea* heaths**
Heaths with *Ulex gallii, Erica vagans, E. cinerea* and *Pseudarrhenatherum longifolium* of the French and Spanish Basque coast and of the beech level of the Atlantic Pyrenees and of the Cantabrian chain, mostly on mildly acid or slightly calcareous soils.

31.238 **Anglo-Norman dwarf gorse heaths**
Heaths with *Ulex minor* and *Erica cinerea* or *E. ciliaris* of interior and oriental Brittany, the Perche, Normandy, the Paris Basin, southern and south-eastern England.

31

31.2381 **Anglo-Norman *Ulex minor-Erica cinerea* heaths**
Driest variants of the dwarf gorse Anglo-Norman heaths.

31.2382 **Anglo-Norman *Ulex minor-Erica ciliaris* heaths**
More mesophile dwarf gorse heaths, marked by the replacement of *Erica cinerea* by *E. ciliaris.*

31.2383 **Anglo-Norman *Ulex minor-Calluna vulgaris* heaths**
Calluna vulgaris facies of the Anglo-Norman dwarf gorse heaths.

31.239 **Aquitano-Ligerian dwarf gorse heaths**
Heaths with *Ulex minor* and *Erica cinerea, E. ciliaris* or *E. scoparia* of Aquitaine, Saintonge, Poitou, Sologne and the Loire region.

31.2391 **Aquitano-Ligerian *Ulex minor-Erica cinerea* heaths**
Driest variants of the dwarf gorse Aquitano-Ligerian heaths.

31.2392 **Aquitano-Ligerian *Ulex minor-Erica ciliaris* heaths**
More mesophile dwarf gorse heaths, marked by the replacement of *Erica cinerea* by *E. ciliaris,* accompanied or not by *E. scoparia.*

31.2393 **Aquitano-Ligerian *Ulex minor-Erica scoparia* heaths**
Mesophile dwarf gorse heaths with *Erica scoparia* and no *E. ciliaris.*

31.24 IBERO-ATLANTIC *ERICA-ULEX-CISTUS* HEATHS
Daboecenion cantabricae p.; Ericenion umbellatae p., Ericenion aragonensis; Ulicion maritimae p.; Genistion micrantho-anglicae p.
Aquitanian heaths with rock-roses. Iberian heaths with numerous species of heathers (notably *Erica umbellata, E. aragonensis)* and brooms, rock-roses and often *Daboecia.* When the rock-roses and other Mediterranean shrubs become dominant they should be classified under sclerophyllous scrubs (32).
(Tüxen and Oberdorfer, 1958; Géhu, 1973; Polunin and Smythies, 1973; Noirfalise and Vanesse, 1976; Gimingham *et al.,* 1979; Rivas-Martinez, 1979; Penas and Diaz Gonzalez, 1985; Izco, 1987; Bayer and Lopez Gonzalez, 1989)

31.241 **Biscay heaths**
Coastal and collinar *Erica-Ulex-Cistus* heaths of the periphery of the Bay of Biscay.

31.2411 **Aquitanian *Erica-Cistus* heaths**
Erica cinerea and *Cistus salvifolius* heaths of the Aquitanian coast, with irradiations in the Landes and to the Montagne noire and Minervois.

31.2412 **Gascony-Sologne arid heaths**
Arid *Erica cinerea* heaths of interior sandy hills and dunes of the Landes of Gascony and of Sologne gravels, with *Halimium alyssoides.*

31.2413 **Northern Iberian heaths**
Erica vagans, E. cinerea and sometimes *E. ciliaris* heaths, with *Calluna vulgaris* and *Ulex europaeus,* of the coasts, hills and lower montane areas of the Atlantic slope of Cantabria, the Asturias and Galicia.

31.242 **Luso-Galician heaths**
Atlantic Galician and Portuguese *Erica cinerea, E. umbellata* and *Ulex europaeus* heaths.

31.2421 **Luso-Galician collinar heaths**
Coastal and collinar, thermo-Atlantic Galician and northern Portuguese heaths with *Erica cinerea, E. umbellata, Ulex minor, Ulex europaeus, U. micranthus, Cistus salvifolius* and *Halimium alyssoides.*

31.2422 **Luso-Galician maritime heaths**
Cushiony heaths with *Ulex europaeus* ssp. *latebracteatus* f. *humilis* and *Erica cinerea* of cliff-tops of Galicia, north and central Portugal (southern vicariant of 31.231).

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31.243 **Cabreran heaths**
Low *Calluna vulgaris*-rich heaths of interior north-western mountains, limited to the Sierra de la Cabrera and the neighbouring Sierra Segundera, Pena Trevinca and Sierra del Teleno.

31.2431 **Cabreran dry whin heaths**
Open, cushiony formations of *Calluna vulgaris, Erica umbellata, Genista sanabrensis, Halimium umbellatum, H. alyssoides* occupying dry, superficial soils.

31.2432 **Cabreran mesophile whin heaths**
Formations of *Calluna vulgaris, Genista carpetana, G. anglica, G. micrantha* and *Thymelaea coridifolia* (*T. dendryobryum*) of wetter stations.

31.244 **Galicio-Leonese heaths**
Erica aragonensis or *E. umbellata* heaths of the interior slopes of the Cordillera Cantabrica, of interior Galicia and of the Leonese mountains.

31.2441 **Galicio-Leonese *Erica aragonensis* heaths**
Supra-Mediterranean *Erica aragonensis* heaths with *Chamaespartium tridentatum, Calluna vulgaris, Halimium alyssoides* of the interior slopes of the Cantabrian Cordillera, eastern Galician ranges, Leon mountains and the Sierra de Cabrera.

31.2442 **Galicio-Leonese *Erica umbellata* heaths**
Lower altitude heaths on the confines of Galicia and Leon dominated by *Erica umbellata* accompanied by *Erica cinerea, Calluna vulgaris, Chamaespartium tridentatum, Halimium alyssoides, H. umbellatum* and Mediterranean elements such as *Lavendula stoechas* ssp. *pedunculata.*

31.2443 **Galicio-Leonese *Erica cinerea* heaths**
Erica cinerea-dominated variants of the Galician and Leonese heaths of 31.2442.

31.245 **Oro-Castillan heaths**
Erica aragonensis heaths of the Cordillera Central and the summits of the Montes de Toledo.

31.2451 **Western Cordilleran *Erica aragonensis* heaths**
E. aragonensis formations of the western Cordillera Central (Serra da Estrela, Sierra de Gata, Sierra de Pena de Francia) with *E. umbellata, Halimium alyssoides* and sometimes *Juniperus nana.*

31.2452 **Ayllon *Erica aragonensis* heaths**
E. aragonensis formations of the Sierra de Ayllon with *H. viscosum, H. ocymoides, Genista pilosa* and, sometimes, *Arctostaphylos uva-ursi.*

31.2453 **Villuercan *Erica aragonensis* heaths**
Isolated summital *Erica aragonensis* heaths of the Montes de Toledo (Villuercas).

31.246 **Sorian heaths**
Erica aragonensis and *Calluna vulgaris* heath communities of the northern Iberian Range, often with *Genista pilosa* or, on wetter soils, *G. anglica* and *G. micrantha.*

31.2461 **Sorian summital heaths**
Calluna heaths of high peaks, with *Viola montcaunica.*

31.2462 **Sorian *Erica aragonensis* heaths**
Beech-zone *E. aragonensis* heaths with *Arctostaphylos uva-ursi.*

31.2463 **Sorian *Erica vagans* heaths**
Formations of lower beech zone, with *Erica vagans.*

31.2464 **Sorian collinar heaths**
Erica arborea, E. cinerea, Calluna vulgaris formations of acidophilous oak zone.

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31.247 **Cuencan heaths**
Erica aragonensis heaths of the southern Iberian Range (Valdemeca, Serrania de Cuenca) with *Thymelaea subrepens.*

31.248 **Luso-Extremaduran heaths**
Formations rich in *Erica umbellata* of the meso-Mediterranean and occasionally thermo-Mediterranean zones of the western parts of the Iberian peninsula, intermediate between heath and maquis.

31.249 ***Erica andevalensis* heaths**
Formations constituted by the local endemic *Erica andevalensis* on soils rich in heavy metals of the Rio Odiel basin in western Andalusia.

31.3 **MACARONESIAN HEATHS**
Heaths of the Canary Islands, Azores and Madeira.
(Delvosalle, 1964; Duvigneaud, 1977; Page, 1979; White, 1983; Bramwell and Bramwell, 1983; Wildpret de la Torre and del Arco Aguilar, 1987; Machado, *in litt.)*

31.31 CANARIAN HEATHS
Andryalo-Ericetalia p.
Low and medium-tall ericaceous formations of the cloud belt of the Canary Islands.

31.311 **Canarian *Erica scoparia* heaths**
Humid low heaths of high elevations of Tenerife (Anaga) and La Gomera (Incherada), with *E. scoparia* ssp. *platycodon.*

31.312 **Canarian *Erica arborea* heaths**
Low and medium-tall stages of the *Erica arborea, Myrica faya* and *Ilex canariensis* formations (tall forest-like formations are listed as 45.9).

31.32 MADEIRAN CLOUD HEATHS
Sometimes fairly tall, 2-3 metres high, *Erica arborea, Myrica faya, Erica scoparia, Laurus azorica, Cletura arborea* and *Pteridium aquilinum* heaths of the cloud zone of Madeira.

31.33 MADEIRAN SUMMITAL HEATHS
Erica cinerea var. *maderensis*-dominated heaths of the highest peaks of Madeira.

31.34 AZOREAN LOWLAND HEATHS
Erica azorica, Myrica faya and *Laurus azorica* heaths of the lower altitudes of the Azores.

31.35 AZOREAN 'UPPER WOODS' HEATHS
Heath facies of the *Erica azorica* and *Juniperus brevifolia* 'upper woods' of the Azores.

31.36 AZOREAN SUMMITAL HEATHS
Calluna vulgaris, Daboecia azorica and *Thymus caespititius* communities of the highest altitudes of the Azores (1 200-1 500 m).

31.4 **ALPINE AND BOREAL HEATHS**
Small, dwarf or prostrate shrub formations of the alpine and subalpine zones dominated by ericaceous species, *Dryas octopetala* or dwarf junipers; *Dryas* heaths of the British Isles.

31.41 DWARF AZALEA AND *VACCINIUM* HEATHS
Loiseleurio-Vaccinion
Trailing azalea, *Loiseleuria procumbens,* and lichen mats of high windswept localities in the Alps and Pyrenees, often with *Vaccinium.*
(Ellenberg, 1963; Gruber, 1978; Gimingham *et al.,* 1979; Polunin and Walters, 1985; Salomez, *in litt.* 1990)

31.411 ***Loiseleuria* heaths**

31.412 **Alpine *Vaccinium* heaths**

31.42 ALPENROSE HEATHS

Rhododendro-Vaccinion

Rhododendron ferrugineum-dominated heaths of acid podzols in the Alps and Pyrenees, often with *Vaccinium,* sometimes with *Pinus mugo.* They often alternate in mosaic with 31.431 and 31.44.

(Ellenberg, 1963; Gruber, 1978; Gimingham *et al.,* 1979; Polunin and Walters, 1985)

31.43 DWARF JUNIPER SCRUB

Juniperion nanae, Pino-Juniperion sabinae p., Pino-Cytision purgantis p.

Usually dense formations of prostrate junipers.

(Ellenberg, 1963; Horvat *et al.,* 1974; Gruber, 1978; Guinochet and Vilmorin, 1978; Sfikas, 1978; Gimingham *et al.,* 1979; Strid, 1980; Pignatti, 1982; Polunin and Walters, 1985; Chiappini, 1985a; Noirfalise, 1987; Peinado Lorca and Rivas-Martinez, 1987)

31.431 ***Juniperus nana* scrub**

Thermophile *Juniperus nana*-dominated heaths of the subalpine zone of the central and southern Alps, northern and central Apennines, Corsica, Sardinia, Forez, Pyrenees and of the upper levels of high Greek and Iberian mountains.

31.432 ***Juniperus sabina* scrub**

Oro-Mediterranean *J. sabina* heaths of Iberia, inner Alpine valleys and rare Apennine stations.

31.433 ***Juniperus hemisphaerica* scrub**

J. hemisphaerica heaths of Iberia, the southern Apennines, Sicily (Madonie, Etna) and Greece.

31.43 ***Juniperus oxycedrus* scrub**

J. oxycedrus heaths of high Greek mountain slopes.

31.44 *EMPETRUM-VACCINIUM* HEATHS

Empetro-Vaccinietum

Dwarf heaths dominated by *Empetrum hermaphroditum, Vaccinium uliginosum, Arctostaphylos alpina* and lycopodes (*Huperzia selago, Diphasiastrum alpinum*) of the Alps, Pyrenees, Central Massif, Jura, Northern Apennines.

(Ellenberg, 1963; Gruber, 1978; Gimingham *et al.,* 1979; Polunin and Walters, 1985)

31.45 BOREO-ALPINE SCOTTISH HEATHS

Alpine heaths of the highlands and islands of Scotland, with *Juniperus nana, Loiseleuria procumbens, Empetrum hermaphroditum, Arctostaphylos uva-ursi, A. alpina* and elements of Alpine flora.

(Ratcliffe, 1977, 1980; Gillingham *et al.,* 1979; Noirfalise, 1987)

31.451 **Scottish bearberry-azalea heaths**

Arctostaphylos alpina-Loiseleuria procumbens facies of the boreo-alpine Scottish heaths characteristic of the northern Highlands.

31.452 **Scottish crowberry-azalea heaths**

Empetrum hermaphroditum-Loiseleuria procumbens facies of the boreo-alpine Scottish heaths characteristic of the Cairngorms.

31.453 **Scottish dwarf juniper heaths**

Juniperus nana facies of the boreo-alpine Scottish heaths.

31.46 *BRUCKENTHALIA* HEATHS

Balkanic heaths with *Bruckenthalia spiculifolia, Vaccinium myrtillus.*

(Horvat *et al.,* 1974; Polunin and Walters, 1985)

31.47 BEARBERRY HEATHS

Mugo-Rhodoretum hirsuti p., Juniperion nanae p., i.a.

Alpine and subalpine mats of *Arctostaphylos uva-ursi* or *A. alpina.*

(Ellenberg, 1963, 1988)

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31.48 HAIRY ALPENROSE HEATHS
Mugo-Rhodoretum hirsuti p.
Forest substitution heaths, treeline fringe formations and alpine heaths or mats dominated by *Rhododendron hirsutum* of calcareous soils in the Alps. *Erica herbacea* and *Rhodothamnus chamaecistus* may be constituents of the heaths.
(Ellenberg, 1963, 1988)

31.49 MOUNTAIN AVENS MATS
Dryas octopetala may form woody mats in various calcicolous alpine grasslands (36) or rock vegetations (62). If sufficiently extensive they can be listed as heaths under this heading, together with the distinctive British and Irish formations.
(Ellenberg, 1963, 1988; Ratcliffe, 1980; Noirfalise, 1987)

31.491 **High montane *Dryas* mats**
Mats of *Dryas octopetala* of continental mountains, in calcicolous alpine grasslands and on high mountain rocks.

31.492 **Durness *Dryas* mats**
Northern Scottish low altitude *Dryas* heaths associated with Durness limestone and shell sand.

31.493 **Hebridean *Dryas* mats**
Hebridean mixed *Dryas-Arctostaphylos* heaths of Durness limestones.

31.494 **Burren *Dryas* mats**
Dryas-Arctostaphylos heaths of the Burren in western Ireland.

31.495 **Highland *Dryas* mats**
High-altitude species-rich *Dryas* cliff-ledge communities of the mica-schist hills of the central Highlands of Scotland, with fragmentary outposts in Lakeland and Snowdonia.

31.4A APENNINE *VACCINIUM* HEATHS
Dwarf mats of *Vaccinium myrtillus, V. uliginosum s.l.* and, locally, *Empetrum nigrum* of the northern and central Apennines.
(Pignatti, 1982; Noirfalise, 1987)

31.5 **DWARF MOUNTAIN PINE SCRUB**
Mugo-Rhodoretum hirsuti
Pinus mugo brushes of well-drained, often calcareous, soils in the Alps and Appenines, frequently accompanied by *Rhododendron hirsutum, Erica herbacea, Arctostaphylos uva-ursi, A. alpina, Rhodothamnus chamaecistus.*
(Ellenberg, 1963, 1988; Pignatti, 1982; Richard and Pautou, 1983; Noirfalise, 1987; Maurin *in litt.*, 1989)

31.51 INNER ALPINE DWARF MOUNTAIN PINE SCRUB
Formations of the dry inner Alps.

31.52 OUTER ALPINE DWARF MOUNTAIN PINE SCRUB
Formations of the northern and south-eastern outer Alps.

31.53 SOUTH-WESTERN ALPINE DWARF MOUNTAIN PINE SCRUB
Local formations of the south-western Alps (Haute Roya, Ligurian Alps).

31.54 APENNINE DWARF MOUNTAIN PINE SCRUB
Rare and local Apennine formations of the Parmian Apennines, the Abruzzi and the Campanian Apennines.

31.6 **SUBALPINE BUSH AND TALL HERB COMMUNITIES**
Betulo-Adenostyletea p.
Bushy facies of the tall herb communities (*Betulo-Adenostyletea*) of moist, rich soils mostly of the subalpine zone of higher mountain ranges (see 37.8).
(Vanden Berghen, 1982)

31.61 GREEN ALDER BRUSH

Alnetum viridis, Cymbalerion hepaticifoliae p.

Dense thickets of green alders characteristic of the Alps and Corsica.

(Ellenberg, 1963, 1988; Gamisans, 1976, 1985; Gruber, 1978; Lambinon *et al.*, 1978; Guittonneau and Huon, 1983; Ozenda, 1985; Polunin and Walters, 1985)

31.611 **Alpine green alder scrub**

Alnetum viridis

Green alder (*Alnus viridis* ssp. *viridis*)-dominated formations, rich in tall herbs, of slopes with a good water-holding capacity, mostly on siliceous soils, in the subalpine and lower alpine belts of the Alps.

31.612 **Corsican sweet alder brush**

Cymbalarion hepaticifoliae, p.

One to three metre-tall brush of the Corsican endemic *A. viridis* ssp. *suaveolens,* sometimes accompanied by a few *Sorbus aucuparia, Acer pseudoplatanus* or *Rhamnus alpina,* limited to the moist, cool, north-facing slopes (ubacs) and, locally, to humid torrent galleries on the south-facing slopes (adrets) of the subalpine (1 600-2 100 m) belt of Corsica.

31.62 WILLOW BRUSH

Salicion arbusculae (Salicion waldsteinianae) i.a.

Willow-dominated facies of the subalpine tall herb communities of higher medio-European mountains and of the northern British Isles.

(Guinochet and Vilmorin, 1973; Ratcliffe, 1980; Polunin and Walters, 1985; Noirfalise, 1987; Vigo and Ninot, 1987; Ellenberg, 1988; Oberdorfer, 1990; Rodwell, 1991)

31.621 **Pyreneo-Alpine willow brush**

Continental mountain tall herb communities dominated by willow bushes.

31.6211 **Alpine small willow brush**

Brushes of *Salix hastata, S. glaucocinerea, S. helvetica* or other small willows, similar in appearance to, and often interspersed with, green alder brush.

31.6212 **Alpine prostrate willow brush**

Lower formations of prostrate or near-prostrate *Salix alpina, S. breviserrata, S. waldsteiniana, S. caesia, S. foetida, S. glabra;* formations of very small prostrate willows characteristic of snow patches (36.1) are excluded.

31.6213 **Alpine tall willow brush**

Taller *Salix pentandra, S. appendiculata* thickets.

31.6214 **Pyrenean willow brush**

Salix pyrenaica formations of the Pyrenees, often with *Dryas octopetala.*

31.622 **Subarctic willow brush**

Subarctic *Salix lapponum, S. lanata, S. arbuscula* or *S. myrsinites* formations of ungrazed cliff ledges in the central and northern Highlands of Scotland.

31.623 **Northern willow brush**

Mixed *S. aurita, S. atrocinerea, S. repens* and *S. caprea* scrub on ungrazed ledges, islands and gullies of the northern British Isles.

31.63 SUBALPINE TALL HERBS WITH BUSHES

Other bushy facies (*Vaccinium, Rubus, Sorbus*) of the subalpine tall herb communities (see 37.8). Tall bushy facies of other subalpine associations, such as *Amelanchier, Rhamnus, Sorbus* thickets associated with *Juniperus nana-Arctostaphylos uva-ursi* heaths can be included.

(Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Dupias, 1985)

31

31.64 BRITISH ROSEROOT COMMUNITY

Tall-herb dominated community with *Rhodiola rosea, Alchemilla glabra, Rubus saxatilis, Geum rivale, Geranium sylvaticum, Angelica sylvestris, Vaccinium myrtillus, Heracleum sphondylium, Saussurea alpina,* colonizing steep crags out of range of grazing, mostly characteristic of the Scottish Highlands with outposts in the Moffat Hills, Lakeland and North Wales.

(Ratcliffe, 1977, 1980; Polunin and Walters, 1985)

31.7 **HEDGEHOG-HEATHS**

Primary cushion heaths of the high, dry mountains of the Mediterranean region, with low, cushion-forming, often spiny shrubs, such as *Acantholimon, Astragalus, Erinacea, Vella, Bupleurum, Ptilotrichum, Genista, Echinospartum, Anthyllis* and various composites and labiates; secondary, zoogenic cushion heaths of the same regions, either downslope extensions of the oro-Mediterranean formations, and dominated by the same species, or specifically montane, often *Genista*-dominated.

(Rechinger, 1943, 1951; Tüxen and Oberdorfer, 1958; Rivas Goday and Rivas-Martinez, 1958; Delvosalle and Duvigneaud, 1962; Archiloque *et al.,* 1969; Polunin and Smythies, 1973; Horvat *et al.,* 1974; Ozenda, 1975, 1985; Girerd, 1978; Ozenda *et al.,* 1979; Izco, 1979; Molinier and Martin, 1980; Polunin, 1980; Reisigl and Danesch, 1980; Strid, 1980, 1989; Quézel, 1981; Nimis, 1981; Zaffran, 1982; Pignatti, 1982; White, 1983; Bramwell and Bramwell, 1983; Géhu, 1984; Rivas-Martinez, Diaz *et al.,* 1984; Polunin and Walters, 1985; Dupias, 1985; Chiappini, 1985a; Noirfalise, 1986; Peinado Lorca and Rivas-Martinez, 1987; Wildpret de la Torre and del Arco Aguilar, 1987; Camarda and Valsecchi, 1990; Gamisans, 1991)

31.71 PYRENEAN HEDGEHOG-HEATHS

Junipero-Genistetum horridae

Echinospartum horridum formations of dry slopes of the supra-Mediterranean zone of the southern Pyrenees; accompanying the dense, spiny cushions are *Juniperus hemisphaerica, Buxus sempervirens, Ononis fruticosa, Arctostaphylos uva-ursi* ssp. *crassifolia* and *Pinus sylvestris.*

31.72 CORDILLERAN HEDGEHOG-HEATHS

Cytiso oromediterranei-Echinospartetum barnadesii, Echinosparto pulviniformis-Cytisetum oromediterranei, Teucrii salviastri-Echinospartetum pulviniformis, Genisto hystricis-Echinospartetum lusitanici

Formations of the Cordillera Central and adjacent areas dominated by diverse forms of *Echinospartum.*

31.721 **Gredos hedgehog-heaths**

Oro-Mediterranean heaths of the Sierra de Gredos dominated by the endemic *Echinospartum lusitanicum* ssp. *barnadesii.*

31.722 **Bejar-Pena de Francia hedgehog-heaths**

Oro-Mediterranean heaths of the Sierra de Bejar and Pena de Francia dominated by *Echinospartum ibericum* ssp. *pulviniformis.*

31.723 **Estrela hedgehog-heaths**

Relict heaths of highly xeric upper supra-Mediterranean and oro-Mediterranean stations of the Serra da Estrela dominated by *Echinospartum ibericum* ssp. *pulviniformis.*

31.724 **Western Cordilleran secundary hedgehog-heaths**

Secundary *Echinospartum lusitanicum-Genista hystrix* hedgehog-heaths developed on skeletal soils of the supra-Mediterranean zone of the western Cordillera Central and surrounding areas.

31.73 NEVADAN HEDGEHOG-HEATHS

Erinacetalia p., Lavandulo-Genistion boissieri p.

Highly developed hedgehog formations of the Sierra Nevada with *Erinacea anthyllis, Vella spinosa, Astragalus sempervirens* ssp. *nevadensis, A. granatensis* ssp. *granatensis (A. boissieri), Ptilotrichum spinosum, Bupleurum spinosum, Genista baetica.* Associated dwarf suffrutescent formations of high slopes and crests.

31

31.731 Lower Nevadan hedgehog-heaths
Salvio-Lavanduletum lanatae p., Astragalo-Velletum spinosae p., Santolino-Salvietum oxyodonti p., Thymo-Cistetum laurifolii p.
Supra-Mediterranean (lower xeroacanthic) hedgehog-heaths occupying mainly the 1 700-2 000 m altitudinal range, often rich in *Bupleurum spinosum,* with *Vella spinosa, Erinacea anthyllis* or *Echinospartum boissieri.*

31.732 Middle Nevadan hedgehog-heaths
Astragalo-Velletum spinosae p.
Oro-Mediterranean (higher xeroacanthic) hedgehog-heaths occupying mainly the 2 000-2 300 m altitudinal range, with *Vella spinosa, Erinacea anthyllis, Ptilotrichum spinosum, Astragalus sempervirens* ssp. *nevadensis, A. granatensis* ssp. *granatensis.*

31.733 Upper Nevadan hedgehog-heaths
Upper oro-Mediterranean hedgehog-heaths occupying mainly the 2 300-2 600 m altitudinal range, with *Erinacea anthyllis, Astragalus sempervirens* ssp. *nevadensis, A. granatensis* ssp. *granatensis, Juniperus nana* and *J. sabina* ssp. *humilis.*

31.734 Nevadan dwarf cushion-heaths
Dwarf suffrutescent formations of windswept crests and slopes on very superficial soils.

31.7341 Siliceous Nevadan dwarf cushion-heaths
Arenario-Sideritetum glacialis
Formations of base-rich siliceous soils at 2 600-2 900 m with *Sideritis glacialis, Arenaria pungens, Astragalus sempervirens* ssp. *nevadensis.*

31.7342 Calcareous Nevadan dwarf cushion-heaths
Andryalion agardhii: Convolvulo-Andryaletum agardhii = Andryalo-Convolvuletum p.
Formations of white-tomentose dwarf cushions developed on calcareous soils (Trevenque, Dornajo, Dilar) with *Andryala agardhii, Erodium boissieri, Scabiosa pulsatilloides, Santolina elegans, Globularia spinosa, Pterocephalus spathulatus, Helianthemum pannosum.*

31.735 Nevadan *Genista* hedgehog-heaths
Genisto-Juniperetum nanae
Genista baetica-dominated hedgehog-heaths, often with *Juniperus nana* and *G. purgans,* of siliceous soils.

31.74 FRANCO-IBERIAN HEDGEHOG-HEATHS
Oro-Mediterranean and montane hedgehog-heaths of other Iberian ranges and of southern France.

31.741 *Erinacea* hedgehog-heaths
Erinacetalia: Xeroacantho-Erinaceion p.
Oro-Mediterranean *Erinacea*-dominated and related hedgehog-heaths.

31.7411 Baetic *Erinacea-Vella* hedgehog-heaths
Astragalo-Velletum spinosae p.
Hedgehog-heaths of the Baetic and sub-Baetic ranges and of the southern Iberian Range, dominated by *Erinacea anthyllis* and/or by *Vella spinosa, Astragalus granatensis* ssp. *granatensis, A. sempervirens* ssp. *nevadensis, Bupleurum spinosum, Ptilotrichum spinosum,* developed in particular in the Sierras de Segura, de Cazorla, de Alcaraz, Tejeda, Harana, Magina, de Baza, La Sagra, de Gador, Maria and on a few summits of the Sierra de Ronda.

31.7412 Iberian Range *Erinacea* hedgehog-heaths
Saturejo-Erinaceetum
Erinacea anthyllis-dominated hedgehog-heaths of the Iberian Range (Teruel, Cuenca, Guadalajara, Soria), often in altitudinal contact with *Genista pumila* formations.

31

31.7413 **Maestrazgo *Erinacea-Genista* hedgehog-heaths**
Genisto hispanicae-Erinaceetum, Erodio-Erinaceetum
Hedgehog-heaths with *Genista hispanica* ssp. *hispanica* and/or *Erinacea anthyllis* of the Maestrazgo, eastern spur of the Iberian Range under maritime influence.

31.7414 **South-eastern *Erinacea* hedgehog-heath**
Hedgehog-heaths with *Genista lobelii* ssp. *longipes, Erinacea anthyllis, Vella spinosa* of the sub-Baetic Aitana and Mariola ranges in the arid south-east.

31.7415 **South-eastern *Daphne* hedgehog-heaths**
Formations with *Daphne oleoides* ssp. *hispanica* of the mountains of the arid south-east.

31.742 **Peri-Nevadan dwarf cushion-heaths**
Andryalion agardhii p.
Oro-Mediterranean, and sometimes supra-Mediterranean, formations of dwarf white-tomentose, cushion-forming suffrutescents of the high sub-Baetic and Baetic ranges; characteristic are *Andryala agardhii, Convolvulus boissieri, Hippocrepis squamata* ssp. *eriocarpa, Pterocephalus spathulatus* and *Thymus granatensis.*

31.7421 **Cazorla dwarf cushion-heaths**
Formations of the Sierras de Cazorla, Segura, Alcaraz, Taibilla of the high Guadalquivir basin, with *Erodium cazorlanum, Scorzonera albicans.*

31.7422 **Baza-Tejeda-Ronda dwarf cushion-heaths**
Hippocrepidi-Pterocephalum spathulatae p. = *Andryalo-Convolvuletum p.*
Formations of the Sierras Tejeda, Almijara, la Torrecilla, Harana, Baza, la Sagra, Cazulas, Lapeza and of the Serrania de Ronda with *Anthyllis vulneraria* ssp. *argyrophylla, A. tejedensis, Helianthemum viscidulum.*

31.7423 **Magina dwarf cushion-heaths**
Helianthemo-Pterocephaletum
Formations of the Sierra de Magina with *Helianthemum pannosum* ssp. *frigidulum, Lithodora nitida* and *Viola cazorlensis.*

31.7424 **Maria-Maimon dwarf cushion-heaths**
Centaureo-Sideritetum stachydioidis
Formations of the Sierras Maria and Maimon with *Centaurea baetica, Sideritis stachydioides, Alyssum cadevallianum.*

31.743 ***Echinospartum boissieri* hedgehog-heaths**
Lavandulo-Genistion boissieri
Mostly supra-Mediterranean hedgehog-heaths colonizing superficial, eroded soils and wind-swept stations of calcareous Baetic and sub-Baetic ranges, comprising many cushion plants and generally physiognomically dominated by the large hemispherical shrubs of *Echinospartum boissieri.*

31.7431 **Alcaraz *Echinospartum* hedgehog-heaths**
Saturejo-Genistetum boissieri
Formations of the Sierra de Alcaraz, sometimes including *Erinacea anthyllis.*

31.7432 **Gador *Echinospartum* hedgehog-heaths**
Convolvulo-Lavanduletum lanatae
Formations of the 1 300-1 900 m altitudinal range in the Sierra de Gador, often with *Erinacea anthyllis* or *Ulex parviflorus.*

31.7433 **Baetic *Echinospartum* hedgehog-heaths**
Santolino-Salvietum oxyodonti
Formations developed in the 800-1 400 m altitudinal range of other Baetic and sub-Baetic ranges, often, in the higher mountains, immediately below *Erinacetalia* communities.

31

31.744 **Catalano-Valencian *Erinacea* hedgehog-heaths**
Genistion lobelii p.: Erinaceo-Anthyllidetum montanae i.a.
Uncommon hedgehog-heaths with *Erinacea anthyllis* and *Anthyllis montana,* and related cushion plant formations, colonizing windswept stations with skeletal soil of the Mediterranean mountains of north-eastern Spain (Montsant, Llaveria, Cardo, Maestrazgo septentrional, Beceite; Montserrat; Bergueda, and Solsones).

31.745 ***Genista* cushion-heaths**
Genistion lobelii p., Genistion occidentalis
Mostly supra-Mediterranean hedgehog garrigues and heaths physiognomically dominated by small, hemispherical *Genista.*

31.7451 **Pyreneo-Cantabrian cushion-heaths**
Genistion occidentalis: Lithodoro diffusae-Genistetum legionensis, Lithodoro diffusae-Genistetum occidentalis, Arctostaphylo crassifoliae-Genistetum occidentalis, Teucrio pyrenaici-Genistetum occidentalis
Cushion-heaths dominated by *Genista hispanica* ssp. *occidentalis* or *Genista hystrix* ssp. *legionensis,* often with *Erica vagans, Arctostaphylos uva-ursi* ssp. *crassifolia* or *Lithodora diffusa,* characteristic of the Pyrenean-Cantabrian system, where they may occur from the collinar to the subalpine level.

31.7452 ***Genista sanabrensis* cushion-heaths**
Heaths dominated by the cushions of *Genista sanabrensis,* with *Erica umbellata* and *Calluna vulgaris,* occupying crests of southern Galicio-Leonese mountains at about 1 800 m (see 31.2431).

31.7453 ***Genista pumila* cushion-heaths**
Aphyllantion: Lino-Genistetum pumilae
Cushion heaths dominated by *Genista pumila* ssp. *pumila* of windswept plateaux and crests of the Meseta and of the northern and southern Iberian range.

31.7454 ***Genista scorpius* cushion-heaths**
Aphyllantion: Armerio-Salvietum phlomoidis p. i.a.
Meseta hedgehog-heaths with *Genista scorpius,* rich in cushion-forming small shrubs.

31.7455 ***Genista pseudopilosa* cushion-heaths**
Aphyllantion: Helianthemo-Genistetum pseudopilosae
Unarmed *Genista pseudopilosa*-dominated hedgehog-heaths with *Erinacea anthyllis* and other cushion plants of the Sierras de Alcaraz and Segura.

31.7456 ***Genista lobelii* and *G. pulchella* cushion-heaths**
Genistion lobelii p.
Genista lobelii and *G. pulchella* hedgehog-heaths of windswept hilltops of south-eastern France.

31.746 **Collinar *Astragalus* hedgehog-heaths**
Aphyllantion p.
Local meso- and supra-Mediterranean *Astragalus* formations of the Spanish Meseta.

31.7461 **Dueran *Astragalus* hedgehog-heaths**
Santolino-Astragaletum boissieri
Supra-Mediterranean *Astragalus granatensis* ssp. *granatensis* (*A. boissieri*) formations of pastoral runs of the left bank of the middle Duero (Soria, Segovia) and of the highlands of Atienza (Guadalajara).

31.7462 **Southern Mesetan *Astragalus* hedgehog-heaths**
Paronychio-Astragaletum tumidi
Meso- and supra-Mediterranean hedgehog-heaths with *Astragalus clusii (A. tumidus)* of the southern Meseta, from La Mancha to the Baetic hills of eastern Andalusia (Orce, Sagra, Baza, Maria), with *Paronychia aretioides, Genista pumila* ssp. *mugronensis, G. scorpius.*

31

31.747 **Summital Balearic labiate hedgehog-heaths**
Hypericion balearici: Teucrietum subspinosae, Pastinacetum lucidae p.
Cushion-forming communities with *Teucrium subspinosum, T. asiaticum, Pastinaca lucida, Thymelaea velutina* and *Paeonia cambessedesii.*

31.7471 **Mallorcan hedgehog-heaths**
Formations of high elevations of Mallorca, dominated by *Teucrium subspinosum.*

31.7472 **Menorcan hedgehog-heaths**
Formations of Menorca with *Cistus creticus* and *Teucrium subspinosum* var. *spinescens.*

31.75 CYRNO-SARDIAN HEDGEHOG-HEATHS
Carici-Genistetalia (Carlinetalia macrocephalae)
Expanses of small, compact bushes with *Astragalus sirinicus* ssp. *genargenteus, Rosa seraphini, Anthyllis hermanniae, Thymus herba-barona, Cerastium boissieri, Genista salzmannii, G. corsica, Berberis aetnensis, Prunus prostrata* and *Daphne oleoides,* of Sardinian and Corsican mountains.

31.751 ***Astragalus genargenteus*** **hedgehog-heaths**
Astragaletum genargentei
Oro-Mediterranean *Astragalus sirinicus* ssp. *genargenteus* hedgehog-heaths of the Gennargentu and Monte Albo in Sardinia and of the high mountains of Corsica.

31.752 **Cyrno-Sardian *Euphorbia* hedgehog-heaths**
Formations of wind-swept crests of Corsica and Sardinia dominated by the low spiny cushions of *Euphorbia spinosa.*

31.753 **Cyrno-Sardian *Thymus* cushion-heaths**
Formations of the mountains of Corsica and Sardinia dominated by the hemispherical cushions of the endemic *Thymus herba-barona.*

31.754 **Cyrno-Sardian *Genista* hedgehog-heaths**
Hedgehog-heaths of high mountains of Corsica and Sardinia and secondary heaths of the montane level dominated by *Genista salzmanii* (including var. *lobelioides*) or *G. corsica.*

31.755 **Cyrno-Sardian *Berberis* hedgehog-heaths**
Formations of the mountains of Corsica and Sardinia dominated by *Berberis aetnensis.*

31.756 **Cyrno-Sardian *Anthyllis* hedgehog-heaths**
Formations of the mountains of Corsica and Sardinia dominated by *Anthyllis hermanniae.*

31.76 MOUNT ETNA HEDGEHOG-HEATHS
Astragaletum siculi
Lava-colonizing formations with cushions of *Astragalus granatensis* ssp. *siculus, Berberis aetnensis, Juniperus hemisphaerica, Genista aetnensis, Adenocarpus bivonae, Viola aethnensis.*

31.77 MADONIE AND APENNINE HEDGEHOG-HEATHS
Hedgehog-heaths formed by *Astragalus spp.* or *Genista spp.,* of the mountains of the southern Italian peninsula and Sicily, except Etna.

31.771 **Madonie *Astragalus* hedgehog-heaths**
Astragaletum nebrodensis
Oro-Mediterranean hedgehog-heaths of the Madonie with *Astragalus granatensis* ssp. *nebrodensis.*

31.772 **Sila-Aspromonte *Astragalus* hedgehog-heaths**
Astragaletum calabri
Oro-Mediterranean hedgehog-heaths of the Sila and Aspromonte with *Astragalus parnassi* ssp. *calabrus.*

31.773 **Apennine *Astragalus sirinicus* hedgehog-heaths**
Hedgehog-heaths with *Astragalus sirinicus* ssp. *sirinicus* of the central and southern Apennines, south to northern Calabria.

31.774 **Madonie *Genista cupanii* hedgehog-heaths**
Genistetum cupanii
Montane *Genista cupanii*-dominated hedgehog-heaths of the Madonie.

31.775 **Gargano *Genista* hedgehog-heaths**
Chamaecytiso-Genistetum michelii
Montane hedgehog-heaths of Monte Gargano with *Genista sylvestris* ssp. *dalmatica.*

31.78 SUBALPINE PELOPONNESE HEDGEHOG-HEATHS
Daphno-Festucetea: Stipo-Morinion p.
Hedgehog-dominated facies of mostly secondary grassland-scrubland communities replacing *Abies cephalonica* forests in the 1 500-1 800 m altitudinal range of Peloponnese mountains, in particular, Taygetos, Parnon and Kyllini, composed of *Stipa pulcherrima* and *Morina persica,* with bushes and cushion-shaped perennials including *Astragalus angustifolius, Daphne oleoides, Juniperus haemispherica, Berberis cretica, Anthemis montana, Ribes uva-crispa, Prunus cocomilia.*

31.79 LOWER ALPINE GREEK HEDGEHOG-HEATHS
Daphno-Festucetea: Eryngio-Bromion p.
Hedgehog-heaths developed on relatively humus-rich soils above treeline, in the 1 700-2 200 m altitudinal range of high Greek mountains; hedgehog facies of associated grasslands; similar, impoverished formations descending into the forest belts of the same mountains, with the exception of those of the Peloponnese, where they are replaced by distinctive formations, listed under 31.78.

31.791 **Greek tragacanth hedgehog-heaths**
Hedgehog-heaths of the Taygetos, Kyllini, Chelmos, Parnassus, Vardousia, Giona and calcareous central and northern Pindus, dominated by the large hemispherical tussocks of the tragacanths *Astragalus creticus* ssp. *rumelicus,* and/or *A. parnassi,* and with *Marrubium velutinum, M. cyllenaeum, Juniperus hemisphaerica, Daphne oleoides, Eryngium amethystinum, Sideritis clandestina, Cirsium cylleneum.*

31.7911 **Southern Peloponnese tragacanth hedgehog-heaths**
Astragalus creticus ssp. *rumelicus* heaths of the southern Peloponnese.

31.7912 **Kyllini-Chelmos tragacanth hedgehog-heaths**
Astragalus parnassi ssp. *cylleneus* and *A. creticus* ssp. *rumelicus* heaths of Kyllini and Chelmos.

31.7913 **Greek mainland tragacanth hedgehog-heaths**
Astragalus creticus ssp. *rumelicus* and/or *A. parnassi* ssp. *parnassi* heaths of the mainland.

31.792 **Greek *Astragalus angustifolius* hedgehog-heaths**
Astragalus angustifolius heaths, with *Marrubium thessalum* or *M. velutinum* ssp. *haussknechtii.*

31.7921 **Olympus *Astragalus angustifolius* hedgehog-heaths**
Formations of the Olympus system dominated by *A. angustifolius.*

31.7922 **Pindus *Astragalus angustifolius* hedgehog-heaths**
Formations of the Pindus dominated by *A. angustifolius* (or *A. sirinicus*).

31.793 **Greek cushion-heaths**
Cushion formations not dominated by thorny, tussock-forming species of *Astragalus.*

31.7931 ***Daphne oleoides* cushion-heaths**
Formations dominated by small bushes of *Daphne oleoides,* usually accompanied by stripped grassland components (36.437).

31

31.7932 *Buxus sempervirens* **cushion-heaths**
Formations dominated by low mats of *Buxus sempervirens,* characteristic of middle slopes of Greek mountains, in particular Olympus.

31.7A UPPER ALPINE GREEK HEDGEHOG-HEATHS
Daphno-Festucetea: Astragalo-Seslerion
Shrubby formations colonizing the altitudinal range immediately above that occupied by the communities of 31.79, as well as stony slopes with shallow soil, loose screes and humus-deficient soils within the main 1 700-2 200 m range of these communities. Included are true spiny hedgehog-heaths, cushiony formations of dwarf suffrutescents and bush-dominated facies of stripped grasslands. *Astragalus angustifolius, Acantholimon androsaceum, Astragalus lacteus, Convolvulus cochlearis, Rindera graeca, Aster alpinus, Globularia stygia, Minuartia stellata, Erysimum pusillum, Thymus teucrioides, Alyssum kionae, Paronychia kapela, Thymus hirsutus, Anthyllis aurea, Achillea ageratifolia, Sideritis scardica, Linum flavum, Thymus boissieri, Sesleria caerulans* are characteristic.

31.7A1 **Upper alpine *Astragalus* hedgehog-heaths**
Formations dominated by the dense tussocks of *Astragalus angustifolius.*

31.7A2 ***Minuartia* cushion-heaths**
Communities dominated by the large, domed mats of *Minuartia stellata.*

31.7A3 **Greek dwarf cushion-heaths**
Formations of the high reaches of Greek mountains, rich in dwarf suffrutescents.

31.7A4 **Upper alpine bushy grasslands**
Bushy facies of the high altitude stripped grasslands (36.437).

31.7B CRETAN HEDGEHOG-HEATHS
Saturejetea spinosae
Hedgehog-heaths of high mountains of Crete, in the 1 500-2 500 m altitudinal range, with *Astragalus creticus* ssp. *creticus, A. angustifolius, Acantholimon androsaceum, Atraphaxis billardieri, Berberis cretica, Chamaecytisus creticus, Daphne oleoides, Prunus prostrata, Euphorbia acanthothamnos, Verbascum spinosum, Sideritis syriaca, Satureja spinosa, Asperula idaea, Rhamnus prunifolius, Pimpinella tragium, Acinos alpinus.*

31.7B1 **Cretan tragacanth hedgehog-heaths**
Astragalion cretici p.
Astragalus creticus ssp. *creticus*-dominated hedgehog-heaths of the Psiloriti and Dikti mountains of central and eastern Crete.

31.7B2 **Cretan *Astragalus angustifolius* hedgehog-heaths**
Verbascion spinosae p.; Astragalion cretici p.
Astragalus angustifolius-dominated hedgehog-heaths of the Lefka Ori, Psiloriti and Dikti mountains of Crete.

31.7B3 **Cretan *Chamaecytisus* hedgehog-heaths**
Chamaecytisus creticus-dominated hedgehog-heaths of Crete.

31.7B4 **Other Cretan hedgehog-heaths**

31.7C AEGEAN SUMMITAL HEDGEHOG-HEATHS
Isolated, endemic-rich, mostly summital hedgehog-heaths of calcareous mountains of Aegean islands and Mount Athos.

31.7C1 **Aegean tragacanth hedgehog-heaths**
Hedgehog-heaths of mountain summits of Aegean islands, characterized by large tragacanths.

31.7C11 **Kerki tragacanth hedgehog-heath**
Mount Kerki summit community of Samos with *Astragalus creticus* var. *samius, A. angustifolius, Acantholimon androsaceum, Atraphaxis billardieri, Centaurea spinosa* var. *tragacanthoides, C. xylobasis, Genista fasselata* var. *subsericans, Prunus prostrata, Silene urvillei, Lithospermum hispidulum, Thymus squarrosus.*

31.7C12 **Ambelos tragacanth hedgehog-heath**
Mount Ambelos summit community of Samos with *Astragalus ptilodes, Acantholimon androsaceum, Prunus prostrata, Silene urvillei.*

31.7C13 **Chios tragacanth hedgehog-heath**
Formations with *Astragalus trojanus* var. *chius* of the highlands of Chios.

31.7C14 **Lesbos tragacanth hedgehog-heath**
Mount Petrovuni summit community of Lesbos with *Astragalus parnassi (A. lesbiacus).*

31.7C15 **Samothrace tragacanth hedgehog-heath**
Mount Phanga summit community of Samothrace with *Astragalus parnassi* var. *samothracius* and *Genista fasselata* var. *subsericans.*

31.7C16 **Athos tragacanth hedgehog-heath**
Mount Athos communities with *Astragalus monachorum* and *A. angustifolius* ssp. *pungens.*

31.7C17 **Euboa tragacanth hedgehog-heath**
Mount Delphi community of Euboa with *Astragalus creticus* var. *euboicus, Daphne oleoides, Prunus prostrata.*

31.7C2 **Aegean *Astragalus angustifolius* hedgehog-heaths**
Communities characterized by the dense tussocks of *Astragalus angustifolius.*

31.7C21 **Lesbos Olympus hedgehog-heath**
Mount Olympus summit community of Lesbos with *Astragalus angustifolius* and *Silene urvillei.*

31.7C22 **Thasos hedgehog-heath**
Mount Agia Illias summit community of Thasos.

31.7D MONTANE *GENISTA ACANTHOCLADA* HEDGEHOG-HEATHS
Formations dominated by hemispherical shrubs of *Genista acanthoclada* of the middle levels (about 800-1 200 m) of mountains and plateaux of the Peloponnese.

31.7E *ASTRAGALUS SEMPERVIRENS* HEDGEHOG-HEATHS
Astragalus sempervirens ssp. *sempervirens,* ssp. *muticus,* ssp. *cephalonicus* formations of the southern Alps, the eastern Pyrenees, Iberia, the Apennines and Greece, transitional between the alpine and subalpine heaths of 31.4 and the true Mediterranean hedgehog-heaths of 31.7.

31.7F CANARIAN CUSHION-HEATHS
Spartocytision nubigeni
Open formations dominated by broom-like plants of the montane zone (above 1 900 m) of the Canary Islands, with many endemic species.

31.7F1 **Tenerife cushion-heaths**
Spartocytisetum nubigeni
Formations of Tenerife with *Spartocytisus supranubius, Adenocarpus viscosus* var. *viscosus, Descurainia bourgaena, Pterocephalus lasiospermus, Erysimum scoparium, Scrophularia glabrata, Nepeta teydea, Echium wildpretii, E. auberianum, Cheirolophus teydis, Plantago webbii, Sideritis cretica, Argyranthemum teneriffae, Pimpinella cumbrae, Arrhenatherum calderae.*

31.7F2 **La Palma cushion-heaths**
Telino benehoavensi-Adenocarpetum spartioidis
Formations of La Palma with *Adenocarpus viscosus* var. *spartioides,* the very rare *Genista benehoavensis* and *Descurainia gilba, Pterocephalus porphyranthus, Viola palmensis, Echium wildpretii, E. gentianoides, Micromeria lasiophylla* ssp. *palmensis.*

31

31.8 THICKETS

Prunetalia, Cytisetalia scopario-striati, Epilobietea angustifolii

Pre- and post-forest formations, mostly deciduous, of Atlantic or medio-European affinities, characteristic of the deciduous forest zone, but also colonizing cool, moist or disturbed stations of the Mediterranean evergreen forest zone.

31.81 MEDIO-EUROPEAN RICH-SOIL THICKETS

Prunetalia: Pruno-Rubion fruticosi p., Berberidion

Thickets of *Prunus spinosa, P. mahaleb, Rosa spp., Cornus mas, C. sanguinea, Sorbus aria, Crataegus spp., Lonicera xylosteum, Rhamnus catharticus, R. alpinus, Clematis vitalba, Ligustrum vulgare, Viburnum lantana, V. opulus, Rubus spp., Amelanchier ovalis, Cotoneaster integerrimus, C. nebrodensis, Pyrus pyraster, Malus sylvestris, Euonymus europaeus, Corylus avellana, Ulmus minor, Acer campestre, A. monspessulanum, Carpinus betulus* characteristic of forest edges, hedges and (mostly *Carpinion* or *Quercion pubescenti-petraeae)* woodland recolonization, developed on soils relatively rich in nutrients, neutral or calcareous.

(Lebrun *et al.*, 1949; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Westhoff and den Held, 1975; Bournérias, 1979; Noirfalise *et al.*, 1980; Vanden Berghen, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Diaz Gonzalez and Fernando Prieto, 1987; Navarro Andrés and Valle Gutiérrez, 1987; Peinado Lorca and Martinez Parras, 1987; Rameau *et al.*, 1989; Oberdorfer, 1990; Jonglet *in litt.*, 1990; Salomez *in litt.*, 1990; Rodwell, 1991)

31.811 Blackthorn-bramble scrub

Pruno-Rubion fruticosi p.: Pruno-Rubenion fruticosi ('*Prunion spinosae*')

Mesophile, often luxuriant, communities characteristic of *Carpinion* forest edges and substitution formations with, among others, *Prunus spinosa, Carpinus betulus, Crataegus spp., Sambucus nigra, Rosa spp., Viburnum opulus, Rubus spp.* Included are species-poor *Prunus spinosa* thickets, such as British *Prunus spinosa-Rubus fruticosus* scrub and corresponding mainland formations with *Rubus fruticosus, R. elegantispinosus, R. bifrons, R. armenicus.*

31.8111 Sub-Atlantic blackthorn-bramble scrub

Prunus spinosa, Carpinus betulus, Crataegus spp., Rosa spp., Rubus spp. communities of the European mainland, under sub-Atlantic or subcontinental climates.

31.8112 Atlantic blackthorn-bramble scrub

Prunus spinosa, Rubus spp. communities of the British Isles and other areas of strongly Atlantic climate. *Ulex europaeus, Hedera helix, Lonicera periclymenum, Pteridium aquilinum* are often present.

31.812 Blackthorn-privet scrub

Berberidion

Communities of more calcareous, drier soils and warmer exposure characteristic of the *Quercion pubescenti-petraeae* and of xeric, calciphilous forms of the *Carpinion,* with, among others, *Prunus spinosa, Ligustrum vulgare, Viburnum lantana, Cornus mas, Rhamnus catharticus.*

31.8121 Atlantic and medio-European blackthorn-privet scrub

Communities occupying the domaine of the *Carpinion* and northern irradiations of *Quercion pubescenti-petraeae* communities.

31.81211 Medio-European blackthorn-privet scrubs

Prunus spinosa, Ligustrum vulgare, Viburnum lantana, Cornus mas, Rhamnus catharticus, Crataegus spp., Carpinus betulus communities of the European mainland, under sub-Atlantic or subcontinental climates.

31.81212 Atlantic hawthorn-ivy scrubs

Communities of the British Isles and areas of strongly Atlantic climates differing from 31.81211 in particular in the scarcity of *Carpinus betulus.*

31.812121 Atlantic calcicline scrub
Widespread neutrophilous to calcareous species-rich thorny scrub and semi-natural hedge communities of the British Isles, with *Crataegus monogyna, Hedera helix, Rubus spp., Prunus spinosa, Fraxinus excelsior.* Included are the *Hedera helix-Urtica dioica, Mercurialis perennis* and *Brachypodium sylvaticum* subcommunities of the *Crataegus monogyna-Hedera helix* scrub.

31.812122 Wayfaring tree chalk scrub
Species-rich communities, mostly of southeastern England, characterized by the abundance of *Viburnum lantana, Ligustrum vulgare, Cornus sanguinea, Tamus communis* and *Clematis vitalba,* and the frequency of *Taxus baccata* saplings and *Juniperus communis.*

31.8122 **Sub-Mediterranean blackthorn-privet scrub**
Prunetum mahaleb, i.a.
Communities with *Prunus mahaleb, Acer monspessulanum* and other xero-thermophile species, occupying the southern part of the west European range of the unit as well as a few highly xero-thermic central European sites.

31.8123 **Rock pear scrub**
Berberidion: Cotoneastro-Amelanchieretum
Possibly primary scrub formations with *Cotoneaster integerrimus, C. nebrodensis* and *Amelanchier ovalis* developed on very shallow soils between *Xerobromion* grasslands and open xerothermic oak woods.

31.8124 **Sea buckthorn scrub**
Berberidion: Salici-Hippophaetum rhamnoidis
Formations characterized by the physiognomically distinctive presence of *Hippophae rhamnoides,* ssp. *fluviatilis* or ssp. *carpatica.*

31.8125 **Inner Alpine barberry scrub**
Thorny heaths of inner Alpine valleys with *Berberis vulgaris.*

31.81251 **Marmot plum scrub**
Berberido-Prunetum brigantiacae
Inner Alpine formations with *Prunus brigantina.*

31.81252 **Other inner Alpine barberry scrubs**

31.8126 **Iberian barberry scrub**
Berberidion: Pruno spinosae – Berberidetum cantabricae
North-western Iberian montane communities with *Berberis vulgaris* ssp. *cantabrica, Prunus spinosa, Corylus avellana, Sorbus aria, Taxus baccata, Crataegus monogyna, Ribes alpinum, R. petraeum, Rhamnus alpinus.*

31.82 BOX THICKETS
Berberidion p.
Box-dominated formations of 31.81, 31.89, 31.8A or 31.8B.
(Tüxen and Oberdorfer, 1958; Lopez, 1976; Noirfalise *et al.,* 1980; Vigo and Ninot, 1987)

31.83 ATLANTIC POOR SOIL THICKETS
Prunetalia p.: Pruno-Rubion fruticosi p.: Frangulo-Rubenion (Rubion subatlanticum; Franguletalia)
Thickets of *Rubus spp., Frangula alnus, Sorbus aucuparia, Corylus avellana, Lonicera periclymenum, Cytisus scoparius,* characteristic of forest edges, hedges and (mostly *Quercion)* woodland recolonization developed on soils relatively poor in nutrients, usually acid, mostly under climates with strong Atlantic influence.
(Vanden Berghen, 1982; Ellenberg, 1988; Rameau *et al.,* 1989; Oberdorfer, 1990; Rodwell, 1991)

31.831 **Bramble thickets**
Formations dominated by *Rubus spp.,* including British *Rubus fruticosus-Holcus lanatus* underscrub.

31

31.832 **Alder buckthorn, rowan, honeysuckle thickets**
Other formations (except broom fields, gorse thickets, hazel thickets and bracken fields, separately coded below).

31.84 BROOM FIELDS
Cytisetalia scopario-striati
Formations with an upper stratum dominated by tall brooms.
(Tüxen and Oberdorfer, 1958; Lopez, 1976; Gruber, 1978; Noirfalise *et al.*, 1980; Lopez Gonzalez, 1982; Pignatti, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Dupias, 1985; Chiappini, 1985b; Peinado Lorca and Rivas-Martinez, 1987; Wildpret de la Torre and del Arco Aguilar, 1987; Vigo and Ninot, 1987; Machado, *in litt.* 1989)

31.841 **Medio-European *Cytisus scoparius* fields**
Sarothamnion scoparii (*Pruno-Rubion fruticosi: Sarothamnenion*)
Expanses of broom (*Cytisus scoparius*), a common recolonization stage of the *Quercion* in the plains and hills of northern and middle Europe, reaching the montane zone in the higher mountains.

31.8411 **Lowland and hill broom fields**
Cytisus scoparius fields of the lowlands, hills and low mountains of northern, western and central Europe.

31.8412 **Alpine broom fields**
Montane *Cytisus scoparius* fields of the Alpine system.

31.8413 **Central Massif *Cytisus scoparius* fields**
Montane beech-level formations of *Cytisus scoparius* of the Central Massif.

31.8414 **Pyrenean *Cytisus scoparius* fields**
Prunello pyrenaicae-Sarothamnetum scoparii
Montane formations of *Cytisus scoparius* of the Pyrenees.

31.842 ***Cytisus purgans* fields**
Pino-Cytision purgantis p., Genistion polygaliphyllae p.
Cytisus purgans-dominated formations of higher levels (upper montane, subalpine, oro-Mediterranean) of south-western European mountains, often associated with dwarf juniper scrubs (31.43) or hedgehog-heaths (31.7), and physiognomically reminiscent of the latter.

31.8421 **Cévennes *Cytisus purgans* fields**
Localized formations of the upper levels of the Cévennes.

31.8422 **Pyrenean *Cytisus purgans* fields**
Pino-Cytision purgantis: Senecio-Genistetum purgantis i.a.
Upper montane Pyrenean formations appearing on the edge of, or as substitution of, acidophilous pine woods.

31.8423 **Galicio-Cantabrian *Cytisus purgans* fields**
Genistion polygaliphyllae: Cytisetum scopario-purgantis p., Cytiso cantabrici-Genistetum obtusirameae p.
Galician and oro-Cantabrian upper montane formations.

31.8424 **Upper Cordilleran *Cytisus purgans* fields**
Pino-Juniperetea: Pino-Cytision purgantis: Junipero nanae-Cytisetum oromediterranei p., Cytiso oromediterranei-Echinospartetum barnadesii p., Cytiso oromediterranei-Echinospartetum pulviniformis p.
Alti-Mediterranean and oro-Mediterranean formations of the Cordillera Central.

31.8425 **Lower Cordilleran *Cytisus purgans* fields**
Cytiso oromediterranei-Genistetum cinerascentis p.
Upper supra-Mediterrranean formations of the Cordillera Central.

31.8426 **Galicio-Leonese *Cytisus purgans* fields**
Genisto sanabrensis-Juniperetum nanae
Oro-Mediterranean formations of the high southern Galicio-Leonese sierras.

31.8427 **Nevadan *Cytisus purgans* fields**
Genisto-Juniperetum nanae cytisetosum
Oro-Mediterranean formations of the Sierra Nevada.

31.843 **Piornales**
Genistion floridae, Genistion polygaliphyllae
Cytisus multiflorus, C. striatus, C. scoparius, C. grandiflorus, C. cantabricus, Genista florida and other tall broom fields of the Iberian peninsula, mostly characteristic of the transition between the Atlantic and Mediterranean domains.

31.8431 **White-flowered broom fields**
Genistion polygaliphyllae: Cytisenion multiflorae, Genistenion polygaliphyllae p.; Genistion floridae p.
Formations rich in white-flowered *Cytisus multiflorus* of the western Meseta, the (mostly western) Cordillera Central, the sierras of southern Galicia and Leon and the western Cantabrian mountains, in which *C. multiflorus* is either the only tall broom or is an important component of broom fields also containing yellow-flowered *Genista florida* ssp. *polygaliphylla, G. florida* ssp. *florida, G. cinerea* ssp. *cinerascens, Cytisus scoparius* and others.

31.8432 **North-western Iberian *Genista florida* fields**
Genistion polygaliphyllae: Genistenion polygaliphyllae, Cytisenion striati p.
Formations rich in *Genista florida* ssp. *polygaliphylla* of the oro-Cantabrian region, the sierras of southern Galicia and Leon, the Serra da Estrela, the northern Iberian range, with *Cytisus cantabricus, C. scoparius, C. striatus, Genista obtusiramea, Adenocarpus complicatus.*

31.8433 **North-western Iberian *Cytisus* fields**
Genistion polygaliphyllae: Cytisenion striati
Formations rich in *Cytisus striatus* or *C. ingramii* of the western Cordillera Central and of Galician hills and plateaux, with *Genista florida* ssp. *polygaliphylla, Cytisus scoparius, C. multiflorus* or *Ulex europaeus.*

31.8434 **Central Iberian *Genista florida* fields**
Genistion floridae: Genistenion floridae
Formations rich in *Genista florida* ssp. *florida* of the Cordillera Central and the southern Iberian range, with *Cytisus scoparius, C. multiflorus, C. striatus, Genista cinerea* ssp. *cinerascens, Adenocarpus hispanicus.*

31.8435 **Upper Cordilleran *Genista cinerea* fields**
Formations dominated by *Genista cinerea* ssp. *cinerascens* of higher elevations of the Cordillera Central.

31.8436 **Central Iberian *Cytisus* fields**
Genistion floridae p.
Formations rich in *Cytisus striatus* or *C. scoparius* of the Cordillera Central and the Montes de Toledo with *Genista florida* ssp. *florida* or *Chamaespartium tridentatum.*

31.8437 **Andalusian broom fields**
Genistion floridae: Adenocarpenion decorticantis
Formations of *Cytisus reverchonii, C. grandiflorus, Adenocarpus decorticans* of the supra-Mediterranean zone of Andalusian mountains.

31.844 **Tyrrhenian broom fields**
Broom fields of peninsular Italy and of the large Tyrrhenian islands.

31.8441 **Peninsular Italian broom fields**
Supra-Mediterranean and montane peninsular formations with *Cytisus scoparius, C. sessilifolius* or *Adenocarpus complicatus.*

31.8442 **Insular Tyrrhenian broom fields**
Supra-Mediterranean and montane formations of Corsica, Sardinia and Sicily with *Cytisus scoparius.*

31

31.845 ***Genista aetnensis* stands**
Formations of the very large *Genista aetnensis*, endemic to the western Mediterranean and of considerable biogeographical interest, with a distribution limited to Sicily and Sardinia.

31.8451 **Etna *Genista aetnensis* stands**
Formations of *Genista aetnensis* colonizing the lava fields of the eastern flank of Mount Etna.

31.8452 **Sardinian *Genista aetnensis* stands**
Very rare and localized *Genista aetnensis* formations of Sardinia (east and Iglesiente).

31.846 **Canary Island broom fields**
Micromerio-Telinion teneriffae
Canary Island formations with *Teline spp., Micromeria spp., Adenocarpus foliolosus* developed in particular in the humid montane zone where they replace heaths on sunnier exposures.

31.85 GORSE THICKETS
Ulex europaeus thickets of the Atlantic domain (including British *Ulex europaeus-Rubus fruticosus* scrub *p.*)
(Bournérias, 1984; Ellenberg, 1988; Rodwell, 1991)

31.86 BRACKEN FIELDS
Extensive, often closed communities of the large fern *Pteridium aquilinum*.

31.861 **Sub-Atlantic bracken fields**
Pteridium aquilinum fields appearing as a recolonization stage of the *Quercion* of the Atlantic and sub-Atlantic areas of continental Europe, including the British Isles and the Iberian peninsula.

31.862 **Macaronesian bracken fields**
Pteridium facies of the heaths of the Atlantic Islands.

31.863 **Supra-Mediterranean bracken fields**
Pteridium aquilinum fields of the *Quercetalia pubescenti-petraeae* zone.

31.87 WOODLAND CLEARINGS
Epilobietea angustifolii
Communities colonizing medio-European and sub-Mediterranean deciduous or coniferous woodland clearings, clear-felled or burnt areas.
(Lebrun *et al.*, 1949; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Noirfalise *et al.*, 1980; Vanden Berghen, 1982; Oberdorfer, 1990)

31.871 **Herbaceous clearings**
Epilobion angustifolii, Atropion
Short-lived herbaceous communities colonizing recent clearings.

31.8711 **Willowherb and foxglove clearings**
Epilobion angustifolii
Communities of acid soils with raw humus, composed of *Epilobium angustifolium, Digitalis purpurea, D. grandiflora, Senecio sylvaticus, Calamagrostis epigeios, Carex pilulifera.*

31.8712 **Burdock and deadly nightshade clearings**
Atropion
Formations of mull soils, with *Arctium nemorosum, Atropa bella-donna, Bromus ramosus, Hypericum hirsutum, Fragaria vesca, Stachys alpina, D. lutea.*

31.872 **Shrubby clearings**
Sambuco-Salicion capreae
Formations of *Salix caprea, Sambucus nigra, S. racemosa, Sorbus aucuparia, Rubus spp.* succeeding the herbaceous formations in the regrowth of clearings.

31

31.88 COMMON JUNIPER SCRUB
Middle European lowland and montane communities dominated by *Juniperus communis*.
(Bournérias, 1984; Ellenberg, 1988; Oberdorfer, 1990; Rodwell, 1991)

31.881 **Juniper downs**
Juniperus communis colonization of medio-European calcareous grasslands.

31.882 **Juniper heaths**
J. communis colonization of heaths and related communities.

31.883 **Juniper-wood sorrel woodland**
Upland formation of the central highlands of Scotland and of northern England, in which *Juniperus communis* is the most abundant small tree or large shrub, accompanied by ericoids, ferns, grasses, briophytes and a fairly rich flora of herbaceous dicots.

31.89 SOUTH-WESTERN SUB-MEDITERRANEAN DECIDUOUS THICKETS
Pruno-Rubion ulmifolii, Lonicero-Berberidion hispanicae
Mostly deciduous shrubs and hedges, usually tall and luxuriant, often very rich in lianas, of Mediterranean France, of sub-Mediterranean areas of the Iberian peninsula and of moist stations in the Mediterranean zone of the Iberian peninsula.
(Tüxen and Oberdorfer, 1958; de Bolos *et al.*, 1970; Guinochet and Vilmorin, 1973; Westhoff and den Held, 1975; Rivas-Martinez, 1975c, 1980; Lopez, 1976; Rivas-Martinez, Diaz *et al.*, 1984; Peinado Lorca *et al.*, 1984; Peinado Lorca and Rivas-Martinez, 1987)

31.891 **Franco-Iberian sub-Mediterranean deciduous thickets**
Rubo-Coriaretum i.a.
Formations mostly of moist stations within the Mediterranean zone of France, Catalonia, the Balearics and Valencia, with *Rosa sempervirens, Rubus ulmifolius, Tamus communis, Prunus spinosa, Cornus sanguinea, Crataegus monogyna* and, locally, *Coriaria myrtifolia*.

31.892 **Western Iberian sub-Mediterranean deciduous thickets**
Rubo ulmifolii-Tametum communis, Lonicero hispanicae-Rubetum ulmifolii, Rhamno catharticae-Crataegetum laevigatae, Lonicero etruscae-Rosetum agrestis i.a.
Formations of the western, particularly north-western, part of the Iberian peninsula, with *Crataegus monogyna, Prunus spinosa, Cornus sanguinea, Ligustrum vulgare, Sambucus nigra, Euonymus europaeus*, brambles, particularly the Mediterranean *Rubus ulmifolius*, various roses, notably *Rosa sempervirens* and *Rosa canina* agg., and particularly rich in lianas, *Tamus communis, Smilax aspera, Clematis vitalba, Lonicera periclymenum, L. etrusca, Rubia peregrina, Bryonia cretica, Vitis vinifera, Humulus lupulus*.

31.893 **Central Iberian sub-Mediterranean deciduous thickets**
Sabino-Berberitum hispanicae, Pruno malahebo-Berberitum hispanicae, Rosetum micrantho-agrestis i.a.
More continental formations of central Iberia, developed mostly on deep, moist soils in the supra-Mediterranean zone of the Meseta, the Ebro basin, the Cordillera Central, the southern Iberian range, the Montes de Toledo, the Sierra Morena and the western Baetic or sub-Baetic mountains, with *Berberis hispanica, Prunus spinosa, P. mahaleb, Crataegus monogyna, Ribes uva-crispa, Rubus ulmifolius, Lonicera xylosteum, L. etrusca, Amelanchier ovalis, Rhamnus saxatilis*, numerous roses of the *Rosa agrestis* and *R. canina* aggregates (e.g. *Rosa micrantha, R. pouzinii, R. corymbifera, R. sicula*) and, locally, *Hippophae rhamnoides*.

31.894 **Oro-Baetic sub-Mediterranean deciduous thickets**
Lonicero-Berberidion hispanicae: Crataego-Loniceretum arboreae
Supra- and oro-Mediterranean formations of eastern sub-Baetic and Baetic mountains (Sierras de Cazorla, Segura, Baza, Magina, Alcaraz and the Sierra Nevada), with *Lonicera arborea, L. splendida, Prunus ramburii, Cotoneaster granatensis, Berberis hispanica, Crataegus monogyna, Rosa spp.*

31.8A TYRRHENIAN SUB-MEDITERRANEAN DECIDUOUS THICKETS
Formations of peninsular Italy, Sicily, Sardinia and Corsica.
(Pignatti, 1982; Chiappini, 1985a, b; Gamisans, 1985, 1991)

31

31.8A1 **Cyrno-Sardian sub-Mediterranean deciduous thickets**
Formations of Corsica and Sardinia with *Rubus ulmifolius, Rosa agrestis, R. canina, R. serafini, Prunus spinosa, Crataegus monogyna, Clematis vitalba, Pyrus amygdaliformis, Rhamnus persicifolius*.

31.8A2 **Italo-Sicilian sub-Mediterranean deciduous thickets**
Formations of the Italian peninsula and Sicily with *Rubus ulmifolius, Rosa sempervirens, R. arvensis, Pyrus amygdaliformis, P. communis, Malus sylvestris, Amelanchier ovalis, Cotoneaster integerrimus, C. nebrodensis, Pyracantha coccinea, Crataegus monogyna, C. laciniata, Prunus spinosa, P. cocomilia, P. mahaleb, Coriaria myrtifolia, Cotinus coggygria, Pistacia terebinthus, Euonymus europaeus, Paliurus spina-christi, Rhamnus catharticus, Lonicera xylosteum, L. etrusca*.

31.8B SOUTH-EASTERN SUB-MEDITERRANEAN DECIDUOUS THICKETS (SCHIBLJAK)
Prunion fruticosae
Deciduous pre- and post-forest formations, forest edges, hedges and woodland recolonization of the *Quercion frainetto* and *Ostryo-Carpinion* zones of the Balkan peninsula, with very local irradiations in central Europe, extreme north-eastern Italy and the Aegean.
(Rechinger, 1951; Ellenberg, 1988; Horvat *et al.*, 1974; Polunin and Walters, 1985; Oberdorfer, 1990)

31.8B1 **Central European sub-Mediterranean deciduous thickets**
Prunetum fruticosae
Prunus fruticosa formations of dry, continental Central European areas, notably east of the Harz mountains.

31.8B2 **Illyrian sub-Mediterranean deciduous thickets**
Prunus fruticosa formations of north-eastern Italy.

31.8B3 **Greek sub-Mediterranean deciduous thickets**
Varied, often species-rich formations of temperate and sub-Mediterranean areas of continental Greece and the northern Aegean with *Prunus spinosa, P. fruticosa, P. mahaleb, P. cerasifera, P. cocomilia, Pyrus amygdaliformis, Pyracantha coccinea, Crataegus monogyna, C. laciniata, Sorbus domestica, Rosa sempervirens , R. canina* agg., *R. rubiginosa* agg., *Rubus ulmifolius, Euonymus spp., Cornus mas, Cornus sanguinea, Ligustrum vulgare, Rhamnus saxatilis, Berberis vulgaris, Clematis vitalba, Paliurus spina-christi, Cotinus coggygria, Rhus coriaria, Coriaria myrtifolia, Syringa vulgaris, Cercis siliquastrum, Coronilla emerus, Colutea arborescens, Juniperus oxycedrus, J. communis, Buxus sempervirens, Corylus spp., Acer spp., Fraxinus ornus, Ulmus minor, Carpinus spp., Ostrya carpinifolia, Quercus spp.*.

31.8B4 **Aegean sub-Mediterranean deciduous thickets**
Southern and eastern Aegean formations with *Crataegus monogyna, C. azarolus, Prunus cocomilia, P. webbii, P. prostrata, P. discolor, Pyrus amygdaliformis, Rubus ulmifolius, Rosa sempervirens, Berberis cretica, Rhododendron flavum, Acer sempervirens, Quercus brachyphylla, Q. infectoria*.

31.8C HAZEL THICKETS
Thickets or brush, often very extensive, composed exclusively or predominantly of *Corylus spp.*, a frequent facies of 31.81, 31.83, 31.89, 31.8A, and 31.8B.
(Dupias, 1985; Ellenberg, 1988)

31.8D DECIDUOUS SCRUB WOODLAND
Early stages of deciduous tall forest regrowth or colonization composed predominantly of young individuals of tall forest species. The type of scrub woodland can be specified by placing at the third, fourth and fifth decimal places of 31.8D the first three digits after the decimal point of 41 that characterize the corresponding tall forest type.

31.8E COPPICE
Regrowth stages of woodland treated in coppice without standards. The type of coppice can be specified by placing at the third, fourth and fifth decimal places of 31.8E the first three digits after the decimal point of 41 that characterize the corresponding tall forest type.

31.8F MIXED SCRUB WOODLAND

Early stages of mixed tall forest regrowth or colonization composed predominantly of young individuals of tall forest species. The type of scrub woodland can be specified by placing at the third, fourth and fifth decimal places of 31.8F the first three digits after the decimal point of 41 that characterize the corresponding tall forest type.

31.8G CONIFEROUS SCRUB WOODLAND

Early stages of conifer forest regrowth or colonization composed predominantly of young individuals of tall forest species. The type of scrub woodland can be specified by placing at the third, fourth and fifth decimal places of 31.8G the first three digits after the decimal point of 42 that characterize the corresponding tall forest type.

32

32 Sclerophyllous scrub

Mediterranean and sub-Mediterranean evergreen sclerophyllous bush and scrub (maquis, garrigue, matorral, phrygana *sensu lato*), recolonization and degradation stages of broad-leaved evergreen forests, supra-Mediterranean garrigues, pseudo-maquis, Macaronesian xerophytic communities.

32.1 ARBORESCENT MATORRAL

Quercetalia ilicis, Pistacio-Rhamnetalia alaterni i.a.
Pre- or post-forest formations with a more or less dense arborescent cover and with a usually thick, high evergreen shrub stratum. They are mostly degradation or reconstitution stages of the broad-leaved evergreen forests (45) or their substitution, intermediate between them and maquis (32.2 to 32.5); some are substitution stages of thermophilous deciduous (41) or conifer (42) forests.
(Rivas-Martinez, 1974; Quézel, 1981; Tomaselli, 1981a)

32.11 EVERGREEN OAK MATORRAL
Meso-Mediterranean arborescent matorral organized around evergreen oaks. Dense, low, coppice-like woods of evergreen oaks.
(Horvat *et al.*, 1974; Rivas-Martinez, 1974; Quézel, 1981; Tomaselli, 1981a; Chiappini, 1985a)

32.111 *Quercus suber* matorral
Arborescent matorral mostly of *Quercus suber*. Detailed habitats can be coded by placing at the fourth and fifth decimal places of 32.111 the second and third digits after the decimal point of 45.2 that characterize the corresponding cork oak forest.

32.112 Acidiphile *Quercus ilex* and *Q. rotundifolia* matorral
Arborescent matorral mostly of *Q. ilex* or *Q. rotundifolia*, usually with *Erica arborea* and *Arbutus unedo*, on siliceous substrates of the western Mediterranean. Detailed habitats can be coded by placing at the fourth, fifth and sixth decimal places of 32.112 the second, third and fourth digits after the decimal point of 45.3 that characterize the corresponding evergreen oak forest.

32.113 Calciphile *Quercus ilex, Q. rotundifolia, Q. coccifera* matorral
Arborescent matorral mostly of *Q. ilex, Q. rotundifolia* or *Q. coccifera* on calcareous substrates of the western Mediterranean. For *Q. ilex* or *Q. rotundifolia* matorrals, detailed habitats can be coded by placing at the fourth, fifth and sixth decimal places of 32.113 the second, third and fourth digits after the decimal point of 45.3 that characterize the corresponding evergreen oak forest. For Italian *Q. coccifera* formations, use 32.1135.

32.114 Eastern Mediterranean *Quercus ilex, Q. coccifera* matorral
Arborescent matorral mostly of *Q. ilex* or *Q. coccifera (Q. calliprinos)* on both siliceous and calcareous substrates of the eastern Mediterranean.

32.1141 Greek *Q. ilex* arborescent matorral
Formations derived from 45.31C.

32.1142 Cretan *Q. ilex* arborescent matorral
Formations derived from 45.31D.

32.1143 Greek *Q. coccifera* arborescent matorral
Formations derived from 45.41.

32.115 Mixed oak arborescent matorral
Arborescent matorral organized around mixed evergreen (*Q. suber, Q. ilex, Q. rotundifolia*) and deciduous (*Q. pyrenaica, Q. faginea*) oaks of Iberia.

32

32.116 **Evergreen oak low woods**
Dense, low, coppice-like formations of evergreen oaks.

32.1161 ***Q. ilex, Q. rotundifolia* low woods**
Q. ilex, Q. rotundifolia formations. Detailed habitats can be coded by placing at the fifth, sixth and seventh decimal places of 32.1161 the second, third and fourth digits after the decimal point of 45.3 that characterize the corresponding evergreen oak forest.

32.1162 ***Q. coccifera* low woods**
Q. coccifera (Q. calliprinos) formations. Detailed habitats can be coded by placing at the fifth decimal place of 32.1162 the second digit after the decimal point of 45.4 that characterizes the corresponding kermes oak forest.

32.12 OLIVE AND LENTISC MATORRAL
Thermo-Mediterranean or thermo-Canarian arborescent matorral with *Olea europaea* ssp. *sylvestris, O. europaea* ssp. *cerasiformis, Ceratonia siliqua, Pistacia lentiscus, P. atlantica* or *Myrtus communis* (see 45.1).
(Bolos *et al.*, 1970; Horvat *et al.*, 1974; Rivas-Martinez, 1974; Quézel, 1981; Tomaselli, 1981a; Chiappini, 1985a, b; Veri and Pacioni, 1985; Gamisans, 1985; Rivas-Martinez and Costa, 1987; Serrada *et al.*, 1988)

32.121 **Olive arborescent matorral**
Olea europaea ssp. *sylvestris*-dominated formations (see 45.11).

32.122 **Carob arborescent matorral**
Ceratonia siliqua-dominated formations (see 45.12).

32.123 **Lentisc arborescent matorral**
Tall *Pistacia lentiscus*-dominated formations.

32.124 **Myrtle arborescent matorral**
Tall *Myrtus communis*-dominated formations (e.g. Balearic *murtedas, Clematidi-Myrtetum*).

32.125 **Canarian olive-lentisc arborescent matorral**
Canary Island *Olea europaea* ssp. *cerasiformis* or *Pistacia atlantica*-dominated formations (see 45.13).

32.13 JUNIPER MATORRAL
Mediterranean and sub-Mediterranean evergreen sclerophyllous bush and scrub organized around arborescent junipers. Mixed dominance can be indicated by combination of codes.
(Rechinger, 1951; Bolos and Molinier, 1960; Bolos *et al.*, 1970; Horvat *et al.*, 1974; Rivas-Martinez, 1974; Quézel, 1981; Ozenda, 1981, 1985; Tomaselli, 1981b; Chiappini, 1985a, b; Gamisans, 1985; Peinado Lorca and Rivas-Martinez, 1987)

32.131 ***Juniperus oxycedrus* arborescent matorral**
Arborescent matorral dominated by *Juniperus oxycedrus s.l.*

32.1311 **Inland *Juniperus oxycedrus* arborescent matorral**
Juniperus oxycedrus ssp. *oxycedrus*-dominated formations of dry, rocky slopes and deforested areas.

32.1312 ***Juniperus macrocarpa* arborescent matorral**
Juniperus oxycedrus ssp. *macrocarpa* formations of coastal sands and abrupt shores; many are dunal and can be coded under 16.27.

32.1313 ***Juniperus transtagana* arborescent matorral**
Juniperus oxycedrus ssp. *transtagana* formations of maritime sands of south-western Portugal; they should usually be listed under 16.27.

32.132 ***Juniperus phoenicea* arborescent matorral**
Arborescent matorral dominated by *Juniperus phoenicea s.l.*

32

32.1321 **Inland *Juniperus phoenicea* arborescent matorral**
Juniperus phoenicea ssp. *phoenicea*-dominated formations occupying steep rocky slopes of the meso-Mediterranean and, locally, thermo-Mediterranean or lower supra-Mediterranean zones, particularly developed on crests and spurs of the mountains bordering the Ebro depression, in calcareous mountains of Valencia, in the south-western Alps and Provence, in Sardinia, in Sicily, in Puglia and in southern Greece. Remarkable, generally uncommon, stands of old, tall trees may take on an almost woodland appearance.

32.1322 ***Juniperus lycia* arborescent matorral**
Juniperus phoenicea ssp. *lycia*-dominated formations of coastal sands, alluvions and abrupt shores. Many are dunal and can be coded under 16.27.

32.133 ***Juniperus excelsa* and *J. foetidissima* arborescent matorrals**
Arborescent matorrals of Greece dominated by *Juniperus excelsa* or *J. foetidissima*.

32.1331 ***Juniperus excelsa* arborescent matorral**
Formations derived from 42.A3.

32.1332 ***Juniperus foetidissima* arborescent matorral**
Formations derived from 42.A4.

32.134 ***Juniperus communis* arborescent matorral**
Mediterranean formations dominated by *Juniperus communis*.

32.135 ***Juniperus drupacea* arborescent matorral**
Formations derived from 42.A5, limited to the Peloponnese.

32.136 ***Juniperus thurifera* arborescent matorral**
Formations derived from 42.A2.

32.14 PINE MATORRAL
Mediterranean and sub-Mediterranean sclerophyllous brush and scrub dotted by pines. Mixed dominance can be indicated by combination of codes.
(Horvat *et al.*, 1974; Rivas-Martinez, 1974; Quézel, 1981; Tomaselli, 1981a; Polunin and Walters, 1985)

32.141 **Mesogean pine arborescent matorral**
Formations dominated by *Pinus pinaster* ssp. *pinaster*.

32.142 **Stone pine arborescent matorral**
Formations dominated by *Pinus pinea*.

32.143 **Aleppo pine arborescent matorral**
Formations dominated by *Pinus halepensis*.

32.144 **Aegean pine arborescent matorral**
Formations dominated by *Pinus brutia*.

32.145 **Black pine and scots pine arborescent matorral**
Formations dominated by black pines (*Pinus pallasiana, P. salzmannii*) or occasionally by scots pines (*P. sylvestris*).

32.15 ARBOR-VITAE MATORRAL
Arisaro vulgare-Tetraclinidetum articulatae
Relict *Tetraclinis articulata* forest remnants of the Sierras de Cartagena in the arid Iberian South-east, with a low, open vegetation of *Arisarum vulgare, Periploca laevigata, Chamaerops humilis, Rhamnus lycioides, Asparagus stipularis, A. albus, Lithodora fruticosa, Brachypodium retusum, Lavandula dentata, Thymus glandulosus, Teucrium carthaginense* and an admixture of *Tetraclinis* of varied age, from seedlings to old trees; *Pinus halepensis* (a man-encouraged competitor), *Olea europaea* ssp. *sylvestris* and *Quercus ilex* may be part of the arborescent layer. This formation is of exceptional bio-geographical and historical importance.

(Rivas-Martinez, 1974; Templado, 1974; Quézel, 1981; Tomaselli, 1981b; Alcaraz Ariza and Peinado Lorca, 1987)

32.16 DECIDUOUS OAK MATORRAL
Formations dominated by semi-deciduous or deciduous oaks.

32.161 **Eastern deciduous oak matorral**
Mediterranean or sub-Mediterranean evergreen sclerophyllous bush and scrub organized around eastern Mediterranean deciduous or semi-evergreen oaks (*Quercus macrolepis, Q. trojana, Q. anatolica, i.a.).*
(Quézel, 1981)

32.162 **Western deciduous oak matorral**
Mediterranean or sub-Mediterranean evergreen sclerophyllous bush and scrub organized around western thermo-Mediterranean, meso-Mediterranean and sometimes supra-Mediterranean deciduous or semi-evergreen oaks (*Q. canariensis, Q. faginea, Q. pyrenaica, Q. pubescens, i.a.*).
(Rivas-Martinez, 1974)

32.17 ARID ZONE MATORRAL
Ziziphetum loti p.
Pre-desert brush of *Periploca laevigata, Lycium intricatum, Asparagus stipularis, A. albus, Withania frutescens* (32.25) with tall *Ziziphus lotus*, confined to the arid Iberian South-east.
(Freitag, 1971; Rivas-Martinez, 1974; Quézel, 1981; Alcaraz Ariza and Peinado Lorca, 1987)

32.18 LAUREL MATORRAL
Humid arborescent matorral with tall laurel (*Laurus nobilis*) developed locally in Sardinia, Sicily and Campania, in particular.
(Fenaroli, 1970; Chiappini, 1985a, b; Veri and Pacioni, 1985)

32.19 CYPRESS MATORRAL
Maquis dominated by native (in the Aegean; see 42.A1) or planted cypress (*Cupressus*).
(Quézel, 1981)

32.1A *ZELKOVA* MATORRAL
Zelkovo-Aceretum sempervirentis, Vincetoxico-Zelkovetum abeliceae
Formations of the mountains of Crete, for the most part hedgehog-heaths, dominated by sparse to moderately closed stands of *Zelkova abelicea*, a rare, declining Tertiary relict of Pontic affinities, often associated with *Acer sempervirens*.
(Zaffron, 1982)

32.2 **THERMO-MEDITERRANEAN SHRUB FORMATIONS**
Pistacio-Rhamnetalia alaterni: Oleo-Ceratonion, Asparago-Rhamnion oleoidis, Periplocion angustifoliae, Rhamno-Quercion cocciferae p., Juniperion lyciae p., Ceratonio-Rhamnion; Phlomidetalia purpureae; Anthyllidetalia terniflorae; Calluno-Ulicetalia: Stauracanthenion boivinii, Ericenion umbellatae p.; Lavanduletalia stoechidis: Stauracantho genistoidis-Halimion halimifolii, Ulici argentei-Cistion ladaniferi p.
Shrub formations characteristic of the thermo-Mediterranean zone. Included here are those formations, for the most part indifferent to the siliceous or calcareous nature of the substrate, that reach their greatest extension or optimal development in the thermo-Mediterranean zone. Also included are the numerous, strongly characterized, thermophile formations endemic to the south of the Iberian peninsula, mostly thermo-Mediterranean but sometimes meso-Mediterranean; in their great local diversity they are a western counterpart of, and sometimes approach in appearance, the mostly eastern Mediterranean phryganas, which, however, on account of their strong structural singularity, are listed separately under 33.
(Rechinger, 1951; Rivas-Goday and Rivas-Martinez, 1968; Fenaroli, 1970; Lapraz, 1970, 1973a, 1974, 1977; Freitag, 1971; Horvat *et al.*, 1974; Rivas-Martinez, 1974, 1979; Ozenda *et al.*, 1979; Tomaselli, 1981 a, b; Quézel, 1981; Chiappini 1985 a, b; Veri and Pacioni, 1985; Bueno *et al.*, 1985; Noirfalise, 1986; Camarda and Valsecchi, 1990)

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32.21 THERMO-MEDITERRANEAN BRUSHES, THICKETS AND HEATH-GARRIGUES

Oleo-Ceratonion, Asparago-Rhamnion, Ceratonio-Rhamnion, Juniperion lyciae p., Rhamno-Quercion cocciferae p.

Lentisc-dominated or lentisc-rich brushes and related formations with *Olea europaea* ssp. *sylvestris, Pistacia lentiscus, Rhamnus alaternus, R. lycioides* ssp. *lycioides, oleoides, velutinus, graecus, Myrtus communis, Rubia peregrina, R. tenuifolia, Thymus capitatus, Prasium majus, Asparagus stipularis, A. acutifolius, A. albus, A. aphyllus, Cneorum tricoccon, Daphne gnidium, Phillyrea angustifolia, P. latifolia, Osyris quadripartita, O. alba, Bupleurum fruticosum, B. gibraltaricum, Ephedra fragilis, Chamaerops humilis,* various oaks (*Quercus ilex, Q. rotundifolia, Q. suber, Q. coccifera; Q. fruticosa), Sarcopoterium spinosum, Calicotome villosa, C. spinosa*, widespread in the thermo-Mediterranean zone of the Iberian peninsula (except the arid Iberian South-east: 32.25), of the Balearics, Corsica, Sardinia and Sicily, of continental France and Italy, of peninsular and archipelagic Greece. A few extremely distinctive habitats formed by facies of these formations, distributed throughout large portions of their range, are separated under 32.22, 32.23 and 32.24. Other characteristic habitats are listed below as subdivisions of 32.21.

(Rechinger, 1951; Rivas Goday and Rivas-Martinez, 1968; Bolos *et al.*, 1970; Freitag, 1971; Horvat *et al.*, 1974; Rivas-Martinez, 1974, 1979; Brullo *et al.*, 1977; Rivas-Martinez *et al.*, 1980; Pignatti, 1982; Gamisans, 1985; Chiappini, 1985b; Peinado Lorca and Rivas-Martinez, 1987; Rivas-Martinez and Costa, 1987)

32.211 **Oleo-lentisc brush**

Usually pluri-specific brushes in which *Olea europea* ssp. *sylvestris* accompanied by *Pistacia lentiscus* plays a determinant physiognomic role. Almost entirely restricted to the thermo-Mediterranean zone, they are represented by particularly well-developed, extensive stands in southern Iberia, the Balearics, Sardinia, Sicily, southern Greece and the Aegean. When the characteristic species increase in height they grade into arborescent matorral (32.12).

32.212 **Thermo-Mediterranean heath-garrigues**

Formations dominated by the thermophile, often calciphile, heathers *Erica multiflora* and *E. manipuliflora*, best developed in the thermo-Mediterranean zones of southern and eastern Spain, the Balearics, Sardinia, Sicily, Pantelleria, southern Italy, southern Greece and the Aegean. Western meso-Mediterranean formations are listed under 32.4B.

32.2121 **Western *Erica multiflora* heath-garrigues**

Usually calciphile *Erica multiflora* formations of the Iberian and Italian peninsulas and the large western Mediterranean islands.

32.2122 **Western *Erica manipuliflora* heath-garrigues**

Rare, calciphile *Erica manipuliflora* formations of Puglia and Sicily.

32.2123 **Eastern *Erica manipuliflora* heath-garrigues**

Erica manipuliflora formations of Greece and its archipelagoes.

32.213 **Thorny burnet brush**

Non-cushion formations dominated by *Sarcopoterium spinosum* of the eastern Mediterranean.

32.214 **Lentisc brush**

Pistacia lentiscus-dominated or -rich formations, widespread and abundant in thermo-Mediterranean and coastal meso-Mediterranean zones of the entire Mediterranean basin; locally, similar formations may appear in warm inland meso-Mediterranean areas. Often low and sometimes very open, the lentisc brush can, in favourable situations, reach a height of several metres, grading into arborescent matorral (32.123).

32.215 ***Calicotome* brush**

Thermo-Mediterranean formations physiognomically dominated by the brilliantly flowering *Calicotome villosa* or *C. spinosa*.

32.216 **Laurel thickets**

Laurus nobilis thickets of humid or fresh stations, lower facies of 32.18.

32.217 **Coastal *Helichrysum* garrigues**
Low formations of *Helichrysum* (*H. italicum* ssp. *microphyllum, H. italicum* ssp. *italicum*) with spurges (*Euphorbia pithyusa, i.a.*), *Pistacia lentiscus, Camphorosma monspeliaca, Artemisia densiflora, Thymelaea passerina, T. hirsuta, T. tartonraira* of the immediate vicinity of sea cliffs, forming the transition between cliff vegetations or clifftop phryganas and thermo-Mediterranean brushes; they are particularly characteristic of the large Mediterranean islands.

32.218 **Myrtle thickets**
Myrtus communis-dominated brush. Particularly noteworthy formations occur in the Balearics (*Clematidi-Myrtetum*), in southern Iberia, in Sardinia, in the Aegean. Myrtle thickets can in favourable situations reach a height of a few metres, grading into arborescent matorral (32.124).

32.219 **Thermo-Mediterranean kermes oak brushes**
Quercus coccifera thickets rich in thermo-Mediterranean elements, in particular, *Pistacia lentiscus, Chamaerops humilis, Rhamnus lycioides, Asparagus albus, A. acutifolius, Bupleurum gibraltariensis.*

32.2191 **Iberian thermo-Mediterranean kermes oak brush**
Melico-Cocciferetum, Rhamno lycioidis-Quercetum cocciferae, Bupleuro gibraltarii-Pistacietum lentisci, Querco cocciferae-Pistacietum lentisci, Asparago albi-Rhamnetum oleoides, Chamaeropo-Rhamnetum lycioides, Rhamno lycioidis-Quercetum cocciferae
Formations of *Quercus coccifera* of southern Portugal, southern and eastern Spain and the Ebro basin.

32.2192 **Tyrrhenian thermo-Mediterranean kermes oak brush**
Rare *Quercus coccifera* formations of Liguria, Corsica, Sardinia and Sicily.

32.2193 **Greek thermo-Mediterranean kermes oak brush**
Formations of *Quercus coccifera* of the thermo-Mediterranean zone of Greece and its archipelagoes.

32.21A ***Phillyrea* thickets**
Phillyrea angustifolia or *P. media*-dominated formations; they constitute facies, in particular of the southern Iberian *Asparago-Rhamnion* and of the Aegean *Ceratonio-Rhamnion*, notably on Samothrace and Rhodes; they constitute also remarkable coastal formations on Minorca, based on the endemic *P. media* var. *rodriguezii*, and in Valencia.

32.21A1 **Minorcan *lentiscares***
Aro picti-Phillyreetum rodriguezii
Thickets of *Phillyrea media* var. *rodriguezii* restricted to Minorca.

32.21A2 **Valencian *mata***
Phillyreo-Rhamnetum angustifoliae
Thickets of *Phillyrea angustifolia, Pistacia lentiscus, Quercus coccifera, Rhamnus lycioides* ssp. *angustifolia, R. alaternus* of fixed dunes of Valencia. They are almost extinct, surviving only in the Dehesa de la Albufera. The code should be used in conjunction with 16.28.

32.21A3 **Western *Phillyrea*** thickets
Phillyrea angustifolia or *P. media*-dominated formations of the western Mediterranean.

32.21A4 **Eastern *Phillyrea* thickets**
Phillyrea angustifolia or *P. media*-dominated formations of the eastern Mediterranean.

32.21B **Buckthorn-asparagus brushes**
Thermo-Mediterranean formations in which *Asparagus spp.* and/or *Rhamnus lycioides* predominate.

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32.21C ***Osyris* brushes**
Formations dominated by *Osyris alba* or *O. tripartita*.

32.21D **Storax thickets**
Styrax officinalis-dominated formations of thermo- and meso-Mediterranean areas of the eastern Mediterranean.

32.21E ***Buxus balearica* box thickets**
Cneoro-Buxetum balearicae; Aceri-Buxetum
Buxus balearica formations of coastal regions of Andalusia, bordering the Sea of Alboran, and of the Balearics.

32.21F **Dwarf oak scrub**
Formations of the semi-evergreen shrub *Quercus fruticosa* of southern Portugal and western Andalusia.

32.21G **Tall spiny broom brush**
Brushes dominated by tall, spiny species of *Genista*.

32.21G1 **Karpathos and Kasos tall spiny broom brush**
Genista fasselata formations of Karpathos and Kasos.

32.21G2 **Pantelleria tall spiny broom brush**
Genista aspalathoides formations of Pantelleria.

32.21H **Corema brush**
Corema album-dominated formations of the south-western coasts of the Iberian peninsula. Most of them are dunal and can be listed under 16.28, completed by this code.

32.21I **Thermo-Mediterranean juniper brushes**
Formations rich in thermo-Mediterranean elements dominated by prostrate or low shrubby *Juniperus oxycedrus* or *J. phoenicea*. Many of them are dunal and can be listed under 16.28, completed by this code. See also 32.2B2.

32.22 TREE-SPURGE FORMATIONS
Stands of *Euphorbia dendroides*, remarkable tertiary relict of Macaronesian origin; they occur as a facies of the thermo-Mediterranean brushes of the Balearics, Corsica, Sardinia, Sicily, Islas Eolie, Egadi, Pelagi, Pantelleria, Crete, and, very locally, of those of the coasts of northern Catalonia, south-eastern France, peninsular Italy and its islands, central Greece, notably on slopes facing the gulf of Corinth, the Peloponnese and the Aegean archipelagoes. Particularly extensive and robust stands occur in Sicily, Sardinia and Crete where they may extend to relatively high altitudes.
(Rechinger, 1951; Bolos *et al.*, 1970; Pignatti, 1972; Horvat *et al.*, 1974; Brullo *et al.*, 1977; Rivas-Martinez *et al.*, 1980; Ozenda, 1981; Becker *et al.*, 1982; Lopez Gonzalez, 1982; Gamisans, 1985; Chiappini, 1985b; Peinado Lorca and Rivas-Martinez, 1987)

32.23 DISS-DOMINATED GARRIGUES
Garrigues invaded and dominated by the high tussocks of *Ampelodesmos mauritanica*; typically thermo-Mediterranean, they also occur extensively in the meso-Mediterranean zone. They are most prevalent on the Tyrrhenian coast of central and southern Italy and in Sicily.
(Pignatti *et al.*, 1962; Reisigl and Danesch, 1980; Pignatti, 1982)

32.24 PALMETTO BRUSH
Chamaerops humilis-dominated formations; other thermo-Mediterranean brushes or garrigues rich in the physiognomically important palmetto can be identified by a combination of this code and that of the other appropriate subdivision of 32.2. Palmetto brushes are best represented in the coastal areas of south-western, southern and eastern Iberia, the Balearics, Sicily and its satellite islands, with more sporadic occurrences in the Guadalquivir basin, Sardinia, and the Tyrrhenian coasts and islands of peninsular Italy.
(Fenaroli, 1970; Ozenda *et al.*, 1979; Reisigl and Danesch, 1980; Tomaselli 1981a, b; Chiappini, 1985b; Noirfalise, 1986)

32.25 PRE-DESERT SCRUB

Periplocion angustifoliae, Anthyllidetalia terniflorae

Shrub formations constituting, with the halo-nitrophilous scrubs (15.724) and the localized gypsum scrubs (15.93), much of the natural and semi-natural vegetation of the arid zone of south-eastern Spain (Almeria, Murcia, Alicante), a highly distinctive region of unique climatological, biological and landscape character within Europe, extremely rich in African and endemic species. Several of the most remarkable formations remain in only a few undisturbed localities and are gravely at risk. Outposts of these communities exist in Sicily, the Egadi islands and Pantelleria.

(Delvosalle and Duvigneaud, 1962; Rivas Goday and Rivas-Martinez, 1968; Brullo *et al.*, 1970; Freitag, 1971; Rivas-Martinez, 1974; Ozenda *et al.*, 1979; Pignatti, 1982; Ferre Bueno *et al.*, 1985; Noirfalise, 1986; Alcaraz Ariza and Peinado Lorca, 1987)

32.251 Iberian jujube brush

Ziziphetum loti

Communities dominated by hummocks of the lotus tree *Ziziphus lotus*, usually with *Lycium intricatum, Withania frutescens, Asparagus albus, A. stipularis, Rhamnus lycioides*, of the arid Iberian South-east. Very tall stands can be coded as 32.17.

32.252 Sicilian jujube brush

Ziziphus lotus formations of western Sicily.

32.253 *Maytenus* brushes

Rhamno angustifoliae-Maytenetum europaei

More or less dense, spiny brushes limited to very restricted areas of the Almerian and Carthagenian coasts of the arid Iberian South-east, dominated by the shrub of African affinities *Maytenus senegalensis* var. *europaeus* with *Rhamnus lycioides* ssp. *angustifolia* and ssp. *velutinus, Asparagus albus, A. stipularis, A. horridus, Chamaerops humilis* and occasionally *Buxus balearica*.

32.254 Iberian *Periploca* scrubs

Gymnosporio europaeae-Periplocetum angustifoliae

Open, sometimes sparse brush dominated by *Periploca laevigata* ssp. *angustifolia* with *Osyris quadripartita, Chamaerops humilis, Pistacia lentiscus, Rhamnus lycioides* and locally *Calicotome infesta* ssp. *intermedia, Tetraclinis articulata, Maytenus senegalensis* or *Lycium intricatum*, limited to very arid coastal areas of Murcia and Almeria.

32.255 Pantellerian *Periploca* scrubs

Periploco-Euphorbietum dendroidis

Summer deciduous shrub formations of *Periploca laevigata* ssp. *angustifolia, Lycium intricatum, Euphorbia dendroides* with *Prasium majus, Pistacia lentiscus, Asparagus acutifolius, Phillyrea angustifolia, Calicotome villosa* of the south-western coast of Pantelleria and of the Egadi islands.

32.256 Tall arid brushes

Anthyllidetalia terniflorae: Genisto-Phlomidion almeriensis

Communities essentially endemic to the province of Almeria, constituted by *Phlomis purpurea* ssp. *almeriensis, P. caballeroi, Genista spartioides* ssp. *retamoides, G. umbellata, G. ramosissima, G. cinerea* ssp. *valentina, Launaea arborescens, L. lanifera, Lavatera oblongifolia, Linum suffruticosum, Salsola webbii, Salvia candelabrum, Sideritis foetens, Thymelaea tartonraira, Ulex parviflorus* ssp. *canescens, Frankenia webbii, Anthyllis terniflora*. Formations belonging to this alliance dominated by large, non-spiny brooms are listed separately under 32.26.

32.2561 *Salsola webbii* brush

Frankenio-Salsoletum webbii

Tall brush communities of arid slopes at the base of coastal mountains with *Salsola webbii, Launaea arborescens, Anthyllis terniflora, Frankenia webbii, Echium pycnanthum*.

32

32.2562 **Sideritis brush**
Salvio-Sideritetum foetens
Montane brush of sunny calcareous slopes of the Sierra de Gador and the Sierra de Alhamilla, rich in endemics among which the shrubs *Sideritis foetens* and *Lavandula lanata* and the woody perennials *Salvia candelabrum, Lavatera oblongifolia* and *Ptilostemon hispanicus*.

32.2563 **Gorse-phlomis scrub**
Phlomidi-Ulicetum canescentis
Formation endemic to the base-rich volcanic rocks of the mountains of Cabo de Gata, dominated by the gorse *Ulex argenteus* ssp. *erinaceus*, of extraordinarily limited range, accompanied by *Phlomis purpurea* ssp. *almeriensis, P. caballeroi* and numerous elements of thermo-Mediterranean brushes, *Asparagus spp., Pistacia lentiscus, Quercus coccifera, Chamaerops humilis*.

32.2564 ***Genista umbellata* garrigues**
Corydothymo-Phlomidetum almeriensis
Open scrub rich in dwarf shrubs and dominated by the large cushions of ssp. *umbellata* of the remarkable, taxonomically widely isolated, southern and south-eastern Spanish endemic *Genista umbellata*, in association with the also cushion-forming *Thymus capitatus, Genista spartioides* ssp. *retamoides*, another southern Spanish endemic, and *Phlomis purpurea* ssp. *almeriensis*. This formation, which presents physiognomic similarities with phryganas (33), constitutes a transition between the arid brushes and the thermo-Mediterranean garrigues of section 32.27, in particular those formed by the only other population of *G. umbellata* (ssp. *equisetiformis*). Many of the accompanying dwarf shrubs, such as *Thymus glandulosus, Satureja obovata, Teucrium eriocephalum*, however, are Iberian South-east endemics or preferentials.

32.257 **Arid garrigues**
Anthyllidetalia terniflorae: Thymo-Siderition leucanthae, Anthyllido-Salsolion papillosae.
Low, open garrigues, often of steppic character, occupying mostly skeletic soils of the arid Iberian South-east.

32.2571 **Murcio-Alicantian arid garrigues**
Thymeo-Siderition leucanthae
Diverse formations of the northern part of the arid Iberian South-east characterized by various combinations of the dwarf shrubs *Helianthemum caput-felis, H. cinereum* ssp. *cinereum, H. pilosum* ssp. *violaceum, Hypericum ericoides, Launaea pumila* and the endemic *Astragalus hispanicus, Sideritis leucantha* ssp. *tragoriganum, Teucrium pumilum* ssp. *carolipaui, Thymus longiflorus* ssp. *moroderi*.

32.2572 **Almerian arid garrigues**
Anthyllido-Salsolion papillosae
Very open formations limited to the areas of the Iberian South-east with the most extreme arid conditions, characterized by *Anabasis articulata, Frankenia webbii, Haloxylon articulatum, Launaea lanata, Limonium album, Teucrium gnaphalodes, Sideritis pusilla* ssp. *flavovirens*, and an exceptional number of endemics, including *Coris hispanica, Euzomodendron bourgaeanum, Herniaria fontanesii* ssp. *almeriana, Limonium insignis, Salsola papillosa, Santolina viscosa, Sideritis pusilla* ssp. *pusilla, S. pusilla* ssp. *osteoxyla, Teucrium eriocephalum, T. almeriense*.

32.25721 ***Limonium-Anabasis* arid garrigues**
Limonio-Anabasetum articulatae p.
Formations rich in succulent plants of argillous and stony soils of Murcia and Almeria, with *Anabasis articulata* and *Limonium insignis*.

32.25722 **Cabo de Gata arid garrigue**
Limonio-Anabasetum articulatae charidemetosum
Formations of Cabo de Gata (*Charidemum Promontorium*) with *Teucrium charidemi, Caralluma europaea* var. *confusa, Lapiedra martinezii, Anthirrhinum charidemi, Dianthus charidemii, Sideritis pusilla* ssp. *osteoxyla*, taxa for the most part endemic to the promontory.

32

32.25723 **Tabernas arid garrigues**
Anabaso-Euzomodendretum
Species-rich formations of the arid depression between the Sierras de Gador, Filabres and Alhamilla, with *Euzomodendron bourgaeanum, Coris hispanica, Koelpinia linearis.*

32.25724 **Coastal Almerian arid garrigues**
Teucrio-Sideritetum pusillae
Coastal Murcio-Almerian formations with *Teucrium gnaphalodes, T. baltasari, Sideritis pusilla* ssp. *pusilla* and ssp. *flavovirens, Launaea nudicaulis.*

32.26 THERMO-MEDITERRANEAN BROOM FIELDS (*RETAMARES*)
Formations dominated by retamas (*Lygos spp.)* or by large, non-spiny thermo-Mediterranean brooms of genera *Cytisus* and *Genista.*
(Delvosalle and Duvigneaud, 1962; Brullo *et al.*, 1977; Lopez Gonzalez, 1982; Pignatti, 1982; Peinado Lorca and Rivas-Martinez, 1987; Rivas-Martinez and Costa, 1987)

32.261 **Iberian retama brush**
Genisto scorpii-Retametum, Cytiso multiflorae-Retametum, Cytiso scoparii-Retametum, Retamo-Adenocarpetum decorticantis
Thermo-, meso- and, locally, lower supra-Mediterranean *Lygos sphaerocarpa* formations of the Ebro basin, the Meseta, the Iberian Range, the Central Cordillera, Extremadura and eastern Portugal, the Baetic and sub-Baetic mountains, in which the retama either forms pure, often very open, stands or associates with various brooms such as *Cytisus multiflorus, C. scoparius* or *Adenocarpus decorticans.*

32.262 **Lusitanian retama brush**
Lygos monosperma formations of coastal south-western Andalusia and southern Portugal.

32.263 ***Genista speciosa* broom fields**
Phlomidetalia purpureae: Ulici-Genistetum speciosae
Tall, open formations dominated by, or rich in, the endemic *Genista cinerea* spp. *speciosa,* with *Phlomis purpurea* ssp. *purpurea, Ulex parviflorus* ssp. *willkommii, Cronanthus biflorus, Ptilostemon hispanicus,* and, sometimes, *Lavandula lanata, Catananche coerulea, Teucrium polium, Salvia candelabrum* or *Satureja graeca,* of the lower meso-Mediterranean slopes of hills facing the Guadalquivir depression of eastern Andalusia.

32.264 ***Genista valentina* broom fields**
Genisto-Phlomidion almeriensis: Genisto valentinae-Calicotometum intermediae, Retamo sphaerocarpae-Genistetum valentinae
Formations of the arid Iberian South-east dominated by the endemic *Genista valentina,* accompanied by *Lygos sphaerocarpa* or, in the Sierra de Cartagena area, *Calicotome infesta spp. intermedia.*

32.265 ***Genista retamoides* broom fields**
Genisto-Phlomidion almeriensis p.; Phlomidetalia purpureae: Lavandulo dentatae-Genistetum retamoidis
Formations of the coast of the Sea of Alboran and of the arid Iberian South-east dominated by the endemic *Genista spartioides* ssp. *retamoides.*

32.266 ***Genista haenseleri* broom fields**
Phlomidetalia purpureae: Corodothymo capitati-Genistetum haenseleri
Open formations of abrupt, hot, sunny slopes of the Sierras de Ojen, Mijas (Unidad Blanca), southern Andalusia characterized by the presence of the striking, tall endemic broom *Genista haenseleri,* associated with *Phlomis purpurea* ssp. *purpurea, Ulex parviflorus* ssp. *willkommii, Genista umbellata* ssp. *equisetiformis, Thymus capitatus, Teucrium fruticans.*

32

32.267 ***Genista ramosissima* broom fields**
Genisto-Phlomidion almeriensis: Thymelaeo-Genistetum ramosissimae
Formations characterized by the presence of the usually dominant, non-spiny broom *Genista ramosissima* of south-eastern Spain and North Africa, limited to the hills of the Rio Aguas basin and the Macizo de Bedar; *Thymelaea tartonraira, Phlomis purpurea* ssp. *almeriensis* may be very abundant.

32.268 **Sicilian retama brush**
Retama fields formed on maritime sands of southern Sicily by *Lygos raetam* ssp. *gussonei*, European and Sicilian endemic related to *Lygos raetam* of the southern Palaearctic sub-desert belt.

32.269 **Eolian broom fields**
Thermo-Mediterranean formations of volcanic rocks and sands of Stromboli and Vulcano dominated by the very tall Eolian endemic broom *Cytisus aeolicus,* with the Tyrrhenian insular endemic *Centaurea aeolica.*

32.26A ***Genista ephedroides* broom fields**
Formations dominated by the Tyrrhenian endemic *Genista ephedroidres*, restricted to a few localities on western and northern Sardinian headlands, the north coast of Sicily, the Eolian and Ponsian islands and the Cilento coast (Campania).

32.26B **Ibiza broom fields**
Cytiso fontanesii-Genistetum dorycnifoliae
Formations characterized by the remarkable, tall Ibiza endemic *Genista dorycnifolia*, accompanied by the eastern Iberian *Chronanthus biflorus* (*Cytisus fontanesii*).

32.27 MEDITERRANEAN GORSE-HEATHS
Ulici argentei-Cistion ladaniferi p. i.a.
Western Mediterranean formations, for the most part limited to the lower meso-Mediterranean and thermo-Mediterranean zones of the western Iberian peninsula, dominated by gorse (*Ulex spp., Stauracanthus spp.*) of thermo-Mediterranean affinities, or by the spiny, globular broom *Genista hirsuta*, accompanied by a cortège of plants characteristic of the meso- and thermo-Mediterranean cistus maquis (32.331), thermo-Mediterranean brushes (32.21) or, occasionally, meso-Mediterranean garrigues (32.4). Other thermo-Mediterranean gorse formations will be found among the more specialized extreme southern Iberian endemic communities listed under 32.25, 32.28, 32.29, 32.2A, 32.2B and 32.2C
(Braun-Blanquet, Pinto da Silva and Rozeira, 1956, 1964; Rivas Goday and Rivas-Martinez, 1968; Rivas-Martinez, 1979)

32.271 **Monchique *Ulex argenteus* gorse-heaths**
Cisto ladaniferae-Ulicetum argentei
Ulex argenteus ssp. *argenteus*-dominated or -rich formations of low slopes of the Sierra da Monchique and neighbouring areas of Algarve and south-west Alentejo, usually with *Cistus ladanifer*. The gorse is endemic to the area; the communities inhabited by its two equally restricted relatives, *U. argenteus* ssp. *subsericeus* and *U. argenteus* ssp. *erinaceus* are listed under 32.2A3, 32.2B4 and 32.2563.

32.272 **Lusitanian *Ulex densus* gorse-heaths**
Cushion-heaths of *Ulex densus* formed in substitution stages of the *Melico-Cocciferetum* on dry, calcareous coastal hills of the Tejo and Estremadura regions of central-western Portugal; the gorse is endemic to the area.

32.273 **Morena *Ulex eriocladus* gorse heaths**
Ulici eriocladi-Cistetum ladaniferae p., Ulici eriocladi-Ericetum umbellatae p., Helianthemo-Saturejetum micranthae p.
Formations of the western Sierra Morena (Sierra de Aracena, Badajos region, south-eastern Portugal) dominated by *Ulex eriocladus*, developed mostly in the meso-Mediterranean zone and locally in contact with *Erica umbellata* heaths; the gorse is endemic to the area.

32.274 **Franco-Iberian *Ulex parviflorus* gorse-heaths**
Ulex parviflorus ssp. *parviflorus*-dominated formations of central-western Portugal, southern and eastern Spain and southern France, locally distributed on calcareous or siliceous substrates of the thermo-Mediterranean and lower meso-Mediterranean zones, occasionally ascending to higher elevations. Communities including the related *Ulex parviflorus* ssp. *willkommii, U. baeticus* and *U. australis* are listed under 32.28, 32.2A and 32.2C, clearly meso-Mediterranean formations under 32.4H.

32.275 **Alentejo *Stauracanthus* gorse-heaths**
Stauracanthus genistoides ssp. *spectabilis*-dominated formations of the coast of Alentejo; the gorse has a very restricted distribution: outside of its Alentejo stations it occurs only in Morocco.

32.276 **Luso-Extremaduran *Genista hirsuta* gorse-heaths**
Genisto hirsuti-Cistetum ladaniferae
Genista hirsuta-dominated formations of thermo- and meso-Mediterranean Luso-Extremaduran regions, widespread and physiognomically striking by the hemispherical port of the shrub, similar to that of many gorses and of phrygana species.

32.28 IBERIAN THERMO-MEDITERRANEAN GARRIGUES
Phlomidetalia purpureae
Mostly calcicolous, open garrigues of the extreme south of the Iberian peninsula characterized by the abundance of *Phlomis purpurea* ssp. *purpurea, Ulex parviflorus* ssp. *willkommii, Genista umbellata* ssp. *equisetiformis, Thymus eryanthus, Thymus capitatus, Micromeria graeca, Teucrium polium, Calicotome villosa, Asperula hirsuta.*

32.281 **Baetic garrigues**
Saturejo-Coridothymion p.
Varied calcicolous formations of Baetic hills; they may be dominated by any of a number of characteristic species of the class, and in particular by *Thymus capitatus, Teucrium polium, Helianthemum hirtum, Phlomis purpurea* ssp. *purpurea* or *Ulex parviflorus* ssp. *willkommii*; they occur locally throughout the entire Baetic area. A few communities, remarkable for the dominance of less widespread, often endemic, usually striking species, and, in many cases, for their adaptation to non-calcareous soils or to outlying areas, have been listed separately.

32.282 **Ronda *Ononis speciosa* garrigues**
Saturejo-Coridothymion p.: Bupleuro-Ononidetum speciosae
Spectacular formations dominated by the endemic shrub *Ononis speciosa* with *Bupleurum gibraltaricum, Thymus capitatus, Micromeria graeca, Phlomis purpurea* ssp. *purpurea, Ulex parviflorus* ssp. *willkommii, Genista umbellata* ssp. *equisetiformis, Calicotome villosa, Satureja obovata, Ptilostemon hispanicus,* locally distributed in calcareous areas of the Serrania de Ronda and satellite ranges.

32.283 **Guadalquivir *Genista equisetiformis* garrigues**
Saturejo-Coridothymion p.: Genisto-Cytisetum fontanesii
Sub-Baetic formations of calcareous hills lining the Guadalquivir depression of Andalusia with the large cushion-forming *Genista umbellata* ssp. *equisetiformis* and *Chronanthus biflorus* accompanied by *Thymus capitatus, T. eryanthus* and *Ulex parviflorus spp. willkommii.*

32.284 **Alboran *Genista equisetiformis* garrigues**
Saturejo-Coridothymion p.: Lavandulo stoechidi-Genistetum equisetiformis
Acidophilous formations limited to rare enclaves of the slopes above the Sea of Alboran, with *Genista umbellata* ssp. *equisetiformis, Ulex parviflorus* ssp. *willkommii, Calicotome villosa, Lavandula stoechas* ssp. *stoechas, Adenocarpus grandiflorus.*

32.285 **Andalusian magnesium garrigues**
Staehelino-Ulicion baetici
Ulex baeticus-dominated or -rich formations of ultrabasic dolomites, serpentines and peridotites of the Serrania de Ronda and its peripheral ranges.

32

32.2851 **Ronda dolomite garrigues**
Ulici-Halimietum viscosi = Cisto clusii-Ulicetum baetici
Dolomitic formations with *Ulex baeticus, Phlomis purpurea* ssp. *purpurea, Cistus clusii, Halimium viscosum, Euphorbia baetica, Linaria clementei* and, sometimes, *Genista haenseleri* of the Serrania de Ronda, Sierra Blanquilla, de Ojen and surrounding areas.

32.2852 **Ronda serpentine and peridotite garrigues**
Asperulo-Staehelinetum baeticae
Formations of serpentines and peridotites of the Sierra de Carratraca and a few nearby stations of the Serrania de Ronda with *Ulex baeticus* (or sometimes *Genista umbellata* ssp. *equisetiformis*), *Galium boissieranum, Staehelina baetica, Centaurea carratracensis*.

32.2853 **Bermeja *Ulex* garrigues**
Halimio atriplicifolii-Digitaletum laciniatae p.
Formations of the Sierra Bermeja dominated by *Ulex baeticus*.

32.286 **Bermeja *Halimium* garrigues**
Halimio atriplicifolii-Digitaletum laciniatae p.
Tall *Halimium atriplicifolium* formations of the peridotites of the Sierra Bermeja with *Phlomis purpurea* ssp. *purpurea, Genista lanuginosa, G. hirsuta, Lavandula stoechas.*

32.29 GIBRALTAR *STAURACANTHUS* GORSE-HEATHS
Stauracanthion boivinii
Highly distinctive formations, dominated by the endemic gorse *Stauracanthus boivinii*, limited to a few locations with siliceous, oligotrophic soils and high precipitation of the thermo- and lower meso-Mediterranean zone of the vicinity of the Straits of Gibraltar.
(Braun-Blanquet, Pinto da Silva and Rozeira, 1964; Rivas-Martinez, 1979; Asensi Marfil and Diez Garretas, 1987)

32.291 **Aljibe *Stauracanthus* gorse-heaths**
Formations of the Sierras del Aljibe, Blanquilla, del Niño and de Ojen with the Gibraltar endemics *Genista tridens* and *Bupleurum foliosum*.

32.292 **Algarve *Stauracanthus* gorse-heaths**
Very local formation of the coast of the Algarve, with *Genista triacanthos, Erica umbellata, Calluna vulgaris* and *Tuberaria major*.

32.2A SOUTH-WESTERN IBERIAN XERO-PSAMMITIC BRUSHES
Stauracantho genistoidis-Halimion halimifolii
Open brushes formed by *Stauracanthus genistoides* ssp. *genistoides, Halimium halimifolium, H. commutatum* and *Cistus bourgaeanus*, highly adapted to the extreme aridity and oligotrophy of fossil dunes and other deep, fixed sands with very low water table of the coastal areas of the south-western Iberian peninsula.
(Braun-Blanquet, Pinto da Silva and Rozeira, 1964; Rivas-Martinez, 1979; Rivas-Martinez *et al.*, 1980; Asensi Marfil and Diez Garretas, 1987)

32.2A1 **Southern Andalusian *monte blanco***
Halimio halimifolii-Stauracanthetum genistoidis
Formations of the coasts of the Gulf of Cadiz, between the estuaries of the Rios Guadalete, Guadalquivir and Tinto, particularly characteristic of the Coto Doñana (*monte blanco*), in which the characteristic shrubs listed above are accompanied by, in particular, *Lavandula stoechas* ssp. *lusitanica, Armeria velutina* and *Thymus tomentosus* and, in the wide transition zone with the *monte negro*, by *Ulex australis* and *Erica scoparia*.

32.2A2 **Guadalquivir xero-psammitic brushes**
Halimio commutati-Cistetum bourgaeani
Somewhat transitional formations of inland sands of the Guadalquivir valley with *Halimium viscosum, Genista hirsuta, Cistus crispus* and elements of thermo-Mediterranean brushes.

32.2A3 **Algarve xero-psammitic brushes**
Ulici subsericei-Cistetum bourgaeani
Very local formation of the Algarve coast with *Lavandula stoechas* ssp. *lusitanica, Armeria macrophyla* and the extremely narrow endemic *Ulex argenteus* ssp. *subsericeus*.

32.2A4 **Lusitanian xero-psammitic brushes**
Helichryso angustifolii-Stauracanthetum genistoides
Formations of sands of the Atlantic coast of Portugal with *Helichrysum italicum* and *Corema album*.

32.2B CABO DE SÃO VICENTE BRUSHES
Junipero-Cistetum palhinhae, Asparago-Rhamnetum oleoidis juniperetosum lyciae i.a.
Low brush and garrigue formations of the dolomitic tableland, karsts, sands and terra-rosas of the vicinity of Cabo de São Vicente, with dwarf *Juniperus phoenicea* ssp. *lycia, Cistus palhinhae, Ulex argenteus* ssp. *erinaceus*, rich in endemics.
(Braun-Blanquet, Pinto da Silva and Rozeira, 1964; Polunin and Smythies, 1973; Rivas-Martinez, 1974)

32.2B1 **Cabo de São Vicente *Teucrium-Armeria* garrigue**
Very low, open garrigue of *Teucrium polium* ssp. *vincentinum, Armeria pungens, Helichrysum italicum, Asteriscus maritimus* of the windswept, karstic tableland of Cabo de São Vicente.

32.2B2 **Cabo de São Vicente juniper brush**
Dwarf, prostrate *Juniperus phoenicea* ssp. *lycia* brush with *Cistus palhinhae, Biscutella vincentina, Teucrium polium* ssp. *vincentinum, Antirrhinum majus* ssp. *cirrhigerum, Armeria pungens, Iberis procumbens, Cerinthe major* ssp. *gymnandra*.

32.2B3 **Cabo de São Vicente *Cistus palhinhae* fields**
Cistus fields formed by the spectacular, large-flowered, lustrous-leaved, low *Cistus palhinhae*, endemic to these communities.

32.2B4 **Cabo de São Vicente *Ulex* garrigue**
Formations of *Ulex argenteus* ssp. *erinaceus*, restricted endemic found only in this community and that of Cabo de Gata (32.2563), with *Cistus crispus, C. palhinhae, C. salvifolius, Armeria pungens, Teucrium polium* ssp. *vincentinum, Thymus camphoratus*.

32.2B5 **Cabo de São Vicente *Genista-Thymus* garrigue**
Phrygana-like formations of *Genista hirsuta* and *Thymus*, with *Cistus salvifolia, Phlomis purpurea, Ophrys ciliata, Serapias strictiflora*.

32.2C THERMO-MEDITERRANEAN HEATHS
Ericion umbellatae: Erico scopariae-Ulicetum australis; Genistion micrantho-anglicae: Erico ciliaris-Ulicetum lusitanici
Closed formations of heather, gorse and halimium constituting the extensive *monte negro* of the Coto Doñana; alternating with the xerophile *monte blanco* (32.2A1), they occupy deep, sandy, oligotrophic soils with a water table close to the surface; their composition includes an admixture of thermo-Mediterranean and Atlantic heath species together with local endemics. Particularly characteristic in the Guadalquivir area, they are locally represented north to the Sado-Tago river area of coastal Portugal.
(Rivas-Martinez, 1979; Rivas-Martinez *et al.*, 1980; Asensi Marfil and Diez Garretas, 1987)

32.2C1 **Dry Andalusian *monte negro***
Erico scopariae-Ulicetum australis
Formations of higher ground with the endemic gorse *Ulex australis, Erica scoparia, Calluna vulgaris, Genista triacanthos, Erica umbellata, Halimium halimifolium, Cistus salvifolius*.

32.2C2 **Humid Andalusian *monte negro***
Erico ciliaris-Ulicetum lusitanici
Formations of semi-peaty edges of fresh-water lagoons and depressions where the winter and spring water table reaches the surface, with *Ulex minor* var. *lusitanicus, Erica ciliaris, E. scoparia, Calluna vulgaris, Genista anglica, Molinia caerulea, Pteridium aquilinum, Cistus salvifolius*.

32

32.3 MESO-MEDITERRANEAN SILICICOLOUS MAQUIS

Cisto-Lavanduletea, Pistacio-Rhamnetalia alaterni: Ericenion arboreae

Shrubby formations, often tall, on mostly siliceous soils of the meso-Mediterranean zone of the Iberian peninsula, France, Italy and the large western Mediterranean islands, degradation stages of evergreen oak forests. Very similar formations of the thermo-Mediterranean zone and of the eastern Mediterranean are included.

(Duvigneaud, 1953; Rivas-Martinez, 1974, 1979; Quézel, 1981)

32.31 HIGH MAQUIS

Highest formations, with a tall stratum of *Erica arborea, Arbutus unedo* and *Quercus spp.* but few or no emergent oaks, in contrast to 32.1.

(Rechinger, 1951; Braun-Blanquet, Pinto da Silva and Rozeira, 1964; Fenaroli, 1970; Horvat *et al.*, 1974; Quézel, 1981; Gamisans, 1985; Polunin and Walters, 1985; Chiappini, 1985a, b; Veri and Pacioni, 1985; Peinado Lorca and Rivas-Martinez, 1987; Rivas-Martinez and Costa, 1987)

32.311 Western Mediterranean high maquis

Ericenion arboreae: Phillyreo angustifoliae-Arbutetum unedi, Phillyreo rodriguezi-Arbutetum unedi, Erico arboreae-Arbutetum unedi i.a.

Formations with *Erica arborea, Arbutus unedo, Quercus ilex, Phillyrea angustifolia, P. media, Viburnum tinus, Rhamnus alaternus, Juniperus oxycedrus, Fraxinus ornus.*

32.312 Luso-Extremaduran high maquis

Ericenion umbellatae: Cisto psilosepali-Ericetum lusitanicae i.a.

Formations with *Erica lusitanica, E. arborea, E. scoparia, Cistus psilosepalus, C. populifolius* developed in particular in the vicinity of lauriphyllus formations of ravines and water-course edges of the Montes de Toledo.

32.313 Eastern Mediterranean high maquis

Orno-Quercetum ilicis p.; Andrachno-Quercetum ilicis p.

Formations of Greece and the Balkan peninsula, with *Erica arborea, Arbutus unedo, A. andrachne, Pistacia terebinthus, Phillyrea latifolia, Juniperus oxycedrus, Quercus coccifera, Q. ilex.*

32.32 LOW ERICACEOUS MAQUIS

Erico scopariae-Lavandulo stoechidis, Ampelodesmo-Ericetum scopariae, Erico scopariae-Cistetum populifolii i.a.

Lower (usually less than one metre) maquis rich in *Calluna vulgaris, Erica scoparia, E. cinerea* or sometimes low *E. arborea*, often accompanied by *Cistus spp., Lavandula stoechas* and various brooms.

(Braun-Blanquet, Pinto da Silva and Rozeira, 1964; Braun-Blanquet, 1974; Lavagne and Moutte, 1977; Rivas-Martinez, 1979; Quézel, 1981; Gamisans, 1985; Polunin and Walters, 1985; Peinado Lorca and Rivas-Martinez, 1987)

32.33 TALL CISTUS MAQUIS

Meso-, thermo- and occasionally supra-Mediterranean formations of Iberia and southern France, in which the tall, large-flowered *Cistus ladanifer* is prominent. Included are more or less dense, homogeneous fields of *C. ladanifer*, which can be identified by addition of digit 1 in the fourth decimal place of any of the subdivisions below, and more varied formations dominated by tall clumps of *C. ladanifer*, which can be identified by addition of digit 2 in the fourth decimal place of these subdivisions.

(Loisel, 1971; Rivas-Martinez, 1979; Quézel, 1981; Peinado Lorca and Rivas-Martinez, 1987)

32.331 South-western Iberian tall cistus maquis

Ulici argentei-Cistion ladaniferi p.

Abundant formations rich in gorses, spiny brooms or, occasionally, heathers, developed on usually shallow soils in the thermo- and meso-Mediterranean zones of the south-west of the Iberian peninsula.

32.332 Central Iberian tall cistus maquis
Cistion laurifolii p.
Formations with brooms, heathers and lavenders of siliceous soils, generally rather eroded and oligotrophic of the meso- and, locally, supra-Mediterranean zones of the Meseta, the Iberian Range and its satellites, the eastern Cordillera Central and southern Galicia and Leon.

32.333 Baetic tall cistus maquis
Phlomidetalia purpureae p. i.a.
Formations of southern Andalusia, developed in siliceous or peridotite ranges in association with local Baetic floras.

32.334 Tyrrhenian tall cistus maquis
Calicotomo-Cistion ladaniferi p.
Localized meso- and thermo-Mediterranean formations of siliceous or decalcified soils and subhumid climates of the Tyrrhenian hinterland (crystalline Provence, Valencia), often with heath elements.

32.34 LOW CISTUS MAQUIS

Western Mediterranean formations of small or medium *Cistus spp.*, most characteristic of the siliceous soils of the meso-Mediterranean zone, but also widely occurring in the thermo-Mediterranean zone and in the siliceous supra-Mediterranean zone. Formations of mostly calciphile *Cistus* species (e.g. *C. albidus, C. clusii*) and of indifferent species accompanied by strongly calciphile floras are listed under 32.4; formations of entirely thermo-Mediterranean species (e.g. *Cistus bourgaeanus, C. palhinhae, C. heterophyllus*) and of widespread species associated with co-dominant thermo-Mediterranean species have been listed under 32.2. Included here are all other formations; homogeneous, more or less dense cistus fields can be identified by addition of digit 1 in the fourth decimal place of the subdivisions below, more varied maquis of which the relevant cistus species is an essential element, by addition of digit 2 in the fourth decimal place of these subdivisions.
(Loisel, 1971; Braun-Blanquet, 1974; Girerd, 1978; Rivas-Martinez, 1979; Quézel, 1981; Lopez Gonzalez, 1982; Gamisans, 1985; Polunin and Walters, 1985; Chiappini, 1985b; Peinado Lorca and Rivas-Martinez, 1987)

32.341 *Cistus monspeliensis* maquis
Formations dominated by *Cistus monspeliensis*, widespread in the Mediterranean region; homogeneous fields form in particular after fires.

32.342 *Cistus salvifolius* maquis
Formations dominated by *Cistus salvifolius*, equally widespread, though less often dominant, in the entire Mediterranean region.

32.343 *Cistus populifolius* maquis
Formations dominated by *Cistus populifolius*, often taller, mainly of cooler, moister, shadier, siliceous or serpentine stations of the meso-Mediterranean zone of the southern half of the Iberian peninsula, in particular of Portugal, Extremadura, the Sierra Morena, the Montes de Toledo, the Iberian Range system, the mountains of Andalusia Occidental, entering in several areas into the supra- or thermo-Mediterranean zones and extending north locally to northern Iberia and Languedoc.

32.344 *Cistus laurifolius* maquis
Cistion laurifolii p. i.a.
Formations dominated by *Cistus laurifolius*, often also of medium height, widespread on siliceous or decalcified soils in meso- and supra-Mediterranean Iberia, particularly in the *Quercus pyrenaica* realm, extending to the montane zone of the Pyrenees, and locally to sub-Mediterranean areas of the southern Central Massif and the south-western Alps.

32.345 *Cistus psilosepalus* maquis
Ericenion umbellatae: Halimio ocymoidis-Cistetum psilosepali p.
Formations dominated by *Cistus psilosepalus* of moist, lime-free soils of the western half of the Iberian peninsula, usually associated with southern heath elements, within the Atlantic influence, frequently located in depressions and gullies.

32.346 ***Cistus crispus* maquis**
Formations of southern and eastern Iberia, southern France and western Sicily dominated by *Cistus crispus*.

32.347 ***Cistus incanus* maquis**
Cistus incanus (including ssp. *corsicus* and ssp. *creticus*) formations of the Balearics, Corsica, Sardinia, Sicily and peninsular Italy.

32.348 ***Cistus albidus* maquis**
Silicicolous formations with *Cistus albidus*. Most *C. albidus* formations have a pronounced garrigue character and should be listed under 32.4; however, some may be accompanied by a cortège so typical of silicolous maquis that they are better retained here.

32.35 LOW *CISTUS-LAVANDULA STOECHAS* MAQUIS
Usually varied west-Mediterranean maquis rich in *Lavandula stoechas*, accompanied by *Cistus spp.*, *Erica spp.*, brooms (*Genista spp.*, *Cytisus spp. i.a.*). The subspecies of *L. stoechas* can be used to characterize regional groups of communities otherwise differing by the assembly of accompanying species. In all cases, pure or almost pure *Lavandula* formations can be identified by addition of digit 1 in the fourth decimal place, digit 2 denoting the varied formations.
(Loisel, 1971; Rivas-Martinez, 1979; Gamisans, 1985; Chiappini, 1985a, b)

32.351 **Central Mediterranean lavender maquis**
Calicotomo-Cistion ladaniferi p.
Formations with *Lavandula stoechas* ssp. *stoechas* of north-eastern Iberia, France, Italy and the western Mediterranean islands.

32.352 **Central Iberian lavender maquis**
Cistion laurifolii p.
Formations of central Iberia with *Lavandula stoechas* ssp. *pedemontana*.

32.353 **Western Iberian lavender maquis**
Ulici argentei-Cistion ladaniferi p.
Formations of western Iberia with *Lavandula stoechas* ssp. *luisieri* or *L. stoechas* ssp. *sampaiana*.

32.36 LOW SPARSE MAQUIS
Sparse, low silicicolous formations of *Helichrysum spp.*, *Cistus spp.*, *Erica spp.* physiognomically similar to calcicolous garrigues.

32.37 BROOM-DOMINATED MAQUIS
Low, west-Mediterranean maquis dominated by leguminous shrubs (*Cytisus, Teline, Genista, Adenocarpus, Calicotome spinosa*).
(Lavagne and Moutte, 1977; Rivas-Martinez, 1979; Lopez Gonzalez, 1982)

32.371 ***Genista hystrix* maquis**
Formations, widespread in north-western areas of the Iberian peninsula, with *Genista hystrix*.

32.372 **Mixed brooms maquis**
Leguminous formations, other than those dominated by *Genista hystrix*, with numerous local variants.

32.4 **WESTERN MESO-MEDITERRANEAN CALCICOLOUS GARRIGUES**
Rosmarinetalia: Rosmarino-Ericion, Aphyllanthion p.
Shrubby formations, often low, on mostly calcareous soils of the meso- Mediterranean zone of the Iberian peninsula, France, Italy and the large western Mediterranean islands. Included here are those formations that reach their optimal development within the meso-Mediterranean zone although they often enter the thermo- or supra-Mediterranean levels. The subdivisions proposed are based on the physiognomically most significant dominants; co-dominance can be indicated by use of multiple codes.

(Hübl *et al.*, 1958; Barkman, 1958; Lausi and Poldini, 1962; Rivas Goday and Rivas-Martinez, 1968; Archiloque *et al.*, 1969, 1970; Fenaroli, 1970; Lapraz, 1970, 1973a, b, 1976, 1984; Costa, 1974; Lavagne and Moutte, 1977; Ozenda *et al.*, 1979; Izco, 1979; Reisigl *et al.*, 1980; Quézel, 1981; Ozenda, 1981; Pignatti, 1982; Devaux *et al.*, 1983; Ozenda, 1985; Polunin and Walters, 1985; Dominicis *et al.*, 1985; Chiappini, 1985 a, b; Veri and Pacioni, 1985; Gamisans, 1985; Fenaroli, 1985; Fernandez Gonzalez *et al.*, 1986; Peinado Lorca and Rivas-Martinez, 1987; Camarda and Valsecchi, 1990)

32.41 KERMES OAK GARRIGUES
Formations, usually relatively closed and tall, dominated by *Quercus coccifera* with little or no *Pistacia lentiscus* or other thermo-Mediterranean shrubs, very widespread in the meso-Mediterranean zone of the Iberian peninsula and southern France.

32.42 ROSEMARY GARRIGUES
Formations, usually relatively tall, dominated by *Rosmarinus officinalis*.

32.43 CISTUS GARRIGUES
Formations, mostly meso-Mediterranean, but often also thermo- or supra-Mediterranean, dominated by the low, calciphilous *Cistus albidus* or *C. clusii*, or occasionally by indifferent species, usually accompanied by a more varied flora than that of the silicicolous cistus maquis, though sometimes capable of forming dense cistus fields. These can be identified by use of digit 1 in the fourth decimal place, digit 2 being reserved for more varied formations.

32.431 ***Cistus albidus* garrigues**
Formations dominated by *Cistus albidus*, widespread in Iberia, France, the Balearics and Liguria, with local stations in other parts of northern Italy, and in Corsica and Sardinia.

32.432 ***Cistus clusii* garrigues**
Formations of *Cistus clusii*, mostly widespread in rather warm, dry areas of the southern and eastern parts of the Iberian peninsula and in the Balearics, with a very limited representation on Monte Gargano, in Calabria, and in Sicily.

32.433 ***C. monspeliensis, C. salvifolius, C. incanus* garrigues**
Garrigues with *Cistus monspeliensis, C. salvifolius* or *C. incanus*. Many formations of these species are maquis or maquis-like communities, best listed under 32.3. Some, however, with a pronounced calciphile character and a garrigue structure, can be listed here.

32.44 SPURGE GARRIGUES
Formations dominated by bushy or robust perennial *Euphorbia* species.

32.441 **Spiny spurge garrigues**
Euphorbia spinosa cushion garrigues of very dry soils of the meso- or thermo-Mediterranean zones of southern France, Corsica, Sardinia, Sicily and peninsular Italy.

32.442 **Unarmed spurge garrigues**
Formations with other, often woody-stocked, clump-forming *Euphorbia* species (e.g. *E. fragifera, E. characias*).

32.45 PROSTRATE JUNIPER GARRIGUES
Meso-Mediterranean garrigues dominated by *Juniperus oxycedrus* or other low, shrubby junipers.

32.46 LAVENDER GARRIGUES
Meso-, or sometimes thermo-, Mediterranean garrigues rich in calciphile *Lavandula latifolia* or, occasionally, *L. angustifolia*; almost pure fields of *L. latifolia* may form, in particular, as a facies of calcareous grasslands.

32.461 **Lavender stands**
Homogeneous, or almost homogeneous, *L. latifolia* stands invading grasslands.

32.462 **Lavender mixed garrigues**
Other, more varied, lavender formations.

32

32.47 THYME, SAGE, GERMANDER AND OTHER LABIATE GARRIGUES
Characteristically very low, open garrigues of which the main components are labiate shrubs of *Thymus* (e.g. *T. piperella, T. funkii, T. zygis, T. vulgaris, T. capitatus, T. mastigophorus), Salvia* (e.g. *S. lavandulifolia, S. officinalis), Teucrium* (e.g. *T. polium, T. marum, T. subspinosum, T. aragonense, T. gnaphalodes, T. chamaedrys, T. montanum), Sideritis* (e.g. *S. scordioides, S. incana), Micromeria* (e.g. *M. fruticosa, M. graeca, M. juliana), Satureja* (e.g. *S. montana), Stachys* (e.g. *S. glutinosa), Nepeta* (e.g. *N. foliosa)* or other genera (except *Lavandula* and *Rosmarinus*).

32.48 *GENISTA* GARRIGUES
Formations characterized by the abundance of small, spiny brooms such as *Genista scorpius, G. hispanica, G. corsica, G. lucida.*

32.481 ***Genista scorpius, G. hispanica* garrigues**
Formations of southern France and Spain; some Meseta formations are listed under 31.7 (hedgehog-heaths) or 32.6.

32.482 ***Genista corsica* garrigues**
Formations of Corsica and Sardinia; many formations are hedgehog-heaths (32.7).

32.483 ***Genista lucida* garrigues**
Formations of Mallorca.

32.49 *CALICOTOME* GARRIGUES
Meso-Mediterranean formations dominated by *Calicotome spinosa.*

32.4A COMPOSITE GARRIGUES
Meso-Mediterranean garrigue formations dominated by members of various genera of the family Asteraceae.

32.4A1 ***Helichrysum, Santolina, Phagnalon* garrigues**
Usually low, open garrigues formed by dwarf, shrubby composites, often with small grey or whitish leaves and showy yellow bloom, of genera *Helichrysum, Staehelina (S. dubia), Phagnalon (P. rupestre), Santolina, Scorzonera.*

32.4A2 ***Artemisia* garrigues**
Formations dominated by the usually small-leaved and inconspicuously flowering species of genus *Artemisia.*

32.4A3 **Aromatic inula garrigues**
Formations dominated by the invasive *Inula viscosa.*

32.4A4 **Medium-tall composite garrigues**
Formations dominated by other large composites.

32.4B *ERICA* GARRIGUES
Meso-Mediterranean formations dominated by the calciphile heathers *Erica multiflora or E. manipuliflora.*

32.4C *GLOBULARIA* GARRIGUES
Formations dominated by *Globularia alypum.*

32.4D *HELIANTHEMUM* AND *FUMANA* GARRIGUES
Formations dominated by small or dwarf shrubs of the genera *Helianthemum* (e.g. *H. asperum, H. pilosum, H. oelandicum, H. marifolium, H. cinereum, H. lavandulifolium, H. nummularium, H. caput-felis)* or *Fumana* (e.g. *F. ericoides, F. laevipes, F. thymifolia).*

32.4E GROMWELL GARRIGUES
Formations dominated by *Lithodora (Lithospermum) fruticosa* of Spain and southern France.

32.4F *THYMELAEA* GARRIGUES
Meso-Mediterranean formations rich in shrubs of genus *Thymelaea* (e.g. *T. tinctoria, T. nitida, T. pubescens).*

32

32.4G *BUPLEURUM* GARRIGUES
Often tall, sometimes very tall, dense formations dominated by *Bupleurum fruticosum*.

32.4H GORSE GARRIGUES
Meso-Mediterranean formations dominated by *Ulex parviflorus*.

32.4I RESTHARROW GARRIGUES
Formations dominated by *Ononis fruticosa* of Iberia.

32.4J *ANTHYLLIS* GARRIGUES
Formations of *Anthyllis cytisoides*.

32.4K *DICTAMNUS* GARRIGUES
Formations of *Dictamnus albus (D. hispanicus)* of stony terrains of eastern Spain.

32.5 **EASTERN GARRIGUES**
Micromerietea p.
Shrubby formations, often low, of the meso-, thermo- and occasionally supra-Mediterranean zones of Greece. Included here are all sclerophyllous formations, regardless of substrate, except those with conspicuous cushion structure (phryganas *s.s.*, listed in 33, and hedgehog-heaths, listed in 31.7), those with abundant *Pistacia lentiscus, Myrtus communis* or other thermo-Mediterranean brush elements (*Phillyrea spp., Erica manipuliflora, Styrax officinalis, Genista fasselata, Euphorbia dendroides, Calicotome villosa, Sarcopoterium spinosum*) listed in 32.2 and high maquis with *Erica arborea* and *Arbutus spp.*, listed in 32.3. The subdivisions proposed are based on the physiognomically most significant dominants; co-dominance can be indicated by use of multiple codes.
(Rechinger, 1951; Horvat *et al.*, 1974; Huxley and Taylor; 1977; Ozenda *et al.*, 1979; Reisigl *et al.*, 1980; Polunin, 1980; Quézel, 1981; Polunin and Walters, 1985)

32.51 EASTERN KERMES OAK GARRIGUES
Formations, usually relatively closed and tall, dominated by *Quercus coccifera* with little or no *Pistacia lentiscus* or other thermo-Mediterranean shrubs; kermes oak garrigues are by far the most widespread xerophyllous shrub formations in the eastern meso-Mediterranean zone. They are also well represented in the supra- Mediterranean and thermo-Mediterranean zones. Formations pertaining to the latter, when rich in other, more restrictively thermophile shrubs, have been listed as 32.2193.

32.52 EASTERN ROSEMARY GARRIGUES
Formations, usually relatively tall, dominated by *Rosmarinus officinalis*.

32.53 EASTERN *CISTUS* GARRIGUES
Formations dominated by, or rich in, *Cistus* species. Dense cistus fields can be identified by use of digit 1 in the fourth decimal place, digit 2 being reserved for more varied formations.

32.531 **Eastern *Cistus incanus* garrigues**
Low to medium-tall, large-flowered, pink *Cistus incanus* ssp. *incanus* or *C. incanus* ssp. *creticus* formations.

32.532 **Eastern *Cistus parviflorus* garrigues**
Usually low, small-flowered, deep pink *Cistus parviflorus* formations.

32.533 **Eastern *Cistus salvifolius* garrigues**
Low to medium-tall, white-flowered *Cistus salvifolius* formations.

32.534 **Eastern *Cistus monspeliensis* garrigues**
Usually medium-tall, white-flowered *Cistus monspeliensis* formations.

32.54 EASTERN SPURGE GARRIGUES
Formations dominated by bushy or robust perennial *Euphorbia* species.

32.541 **Eastern spiny spurge garrigues**
Formations rich in the spiny, cushion-forming *Euphorbia acanthothamnos*.

32

32.542 Eastern unarmed spurge garrigues
Formations with other, often woody-stocked, clump-forming *Euphorbia* species (e.g. *E. characias* ssp. *wulfenii, E. rigida*).

32.55 EASTERN PROSTRATE JUNIPER GARRIGUES
Garrigues dominated by low, shrubby *Juniperus oxycedrus, J. communis* or *J. phoenicea*.

32.56 EASTERN LAVENDER GARRIGUES
Garrigues rich in *Lavandula stoechas* or, occasionally, *L. angustifolia*.

32.57 EASTERN SAGE AND OTHER LABIATES GARRIGUES
Garrigues of which the main components are labiate shrubs or robust perennials (except *Lavandula* and *Rosmarinus*).

32.571 Tree germander garrigues
Tall or very tall *Teucrium fruticans* formations.

32.572 Jerusalem sage garrigues
Fairly tall formations dominated by *Phlomis fruticosa*. Very degraded habitats occupied by almost monospecific fields of this species can be listed under 32.9.

32.573 Eastern *Salvia* and *Stachys* garrigues
Fairly tall formations dominated by shrubs or woody perennials of genera *Salvia* (e.g. *S. triloba, S. argentea, S. eichlerana, S. pomifera), Stachys* (e.g. *S. cretica)* or others.

32.574 Eastern dwarf labiate garrigues
Low, open garrigues formed by dwarf shrubs or perennials of genera *Thymus* (e.g. *T. capitatus, T. teucrioides, T. atticus, T. sibthorpii, T. striatus, T. comptus), Teucrium* (e.g. *T. polium), Sideritis* (e.g. *S. syriaca, S. clandestina), Micromeria* (e.g. *M. juliana, M. graeca), Phlomis* (e.g. *P. cretica, P. floccosa, P. lanata)* or others.

32.58 CHRIST'S THORN GARRIGUES
Garrigues dominated by *Paliurus spina-christi*.

32.59 EASTERN BROOM GARRIGUES
Formations characterized by the abundance of broom-like shrubs of genera *Genista, Chamaecytisus, Teline* or others.

32.5A *EBENUS* BRUSHES
Formations of Crete dominated by *Ebenus cretica*.

32.5B EASTERN *HELICHRYSUM* AND OTHER COMPOSITE GARRIGUES
Usually low, open garrigues formed by dwarf, shrubby composites of genera *Helichrysum, Phagnalon (P. graecum), Scorzonera*.

32.5C EASTERN *ERICA* GARRIGUES
Meso-Mediterranean formations dominated by the heather *Erica manipuliflora*.

32.5D ANDRACHNE GARRIGUES
Garrigues characterized by richness in low bushes of *Arbutus andrachne*.

32.5E EASTERN *GLOBULARIA* GARRIGUES
Formations dominated by *Globularia alypum*.

32.5F EASTERN *HELIANTHEMUM* AND *FUMANA* GARRIGUES
Formations dominated by small or dwarf shrubs of the genera *Helianthemum* or *Fumana*.

32.5G EASTERN *THYMELAEA* GARRIGUES
Formations rich in shrubs of genus *Thymelaea* (e.g. *T. tartonraira*).

32.5H EASTERN *BUPLEURUM* GARRIGUES
Often tall, sometimes very tall, dense formations dominated by *Bupleurum fruticosum*.

32.6 SUPRA-MEDITERRANEAN GARRIGUES

Ononidion striatae p., Aphyllanthion p., Lavandulo-Genistion boissieri

Low shrub formations with pronounced Mediterranean affinities formed as a degradation stage of thermophile deciduous forests (*Quercion pubescentis, Ostryo-Carpinion*) or sometimes of *Quercus rotundifolia* forests in the supra-Mediterranean belt. Included here are only those formations that are characteristic of the supra-Mediterranean level; formations, particularly of the lower supra-Mediterranean, that are closely related to meso-Mediterranean communities have been included under 32.4 and 32.5.

(Duvigneaud, 1953; Delvosalle and Duvigneaud, 1962; Rivas Goday and Rivas-Martinez, 1968; Archiloque *et al.*, 1969; Braun-Blanquet, 1971; Bonin, 1971; Guinochet and Vilmorin, 1973; Ozenda, 1975, 1981, 1985; Molinier and Martin, 1980; Becker *et al.*, 1982; Pignatti, 1982; Lopez Gonzalez, 1982; Dupias, 1985; Gamisans, 1985; Fernandez Gonzalez, 1986)

32.61 TRUE-LAVENDER GARRIGUES

Lavandulo-Astragaletum

Montane formations dominated by *Lavandula angustifolia ('L. vera')* with *Genista cinerea* ssp. *cinerea, Buxus sempervirens* (both sometimes co-dominant), *Astragalus purpureus, Onobrychis supina, Satureja montana, Catananche caerulea, Aphyllanthes monspeliensis, Thymus vulgaris* characteristic of great surfaces of the supra-Mediterranean level of southern France.

32.62 *GENISTA CINEREA* GARRIGUES

Supra-Mediterranean garrigues or grasslands of the south-western Alps, Haute Provence, the southern Central Massif, the Corbières and the eastern Pyrenees dominated by *Genista cinerea* ssp. *cinerea*, including the broom-rich facies of the French lavender garrigues and the White Quercy broom-fields.

32.63 MONTANE THYME GARRIGUES

Aphyllantion p., Lavandulo-Genistion boissieri p.

Low formations of the supra-Mediterranean levels of the Iberian Meseta and its surrounding mountains and of northern Spain and southern France, rich in small labiate shrubs of genera *Thymus* (e.g. *T. serpolifolium, T. vulgaris, T. loscosii), Teucrium* (e.g. *T. aureum, T. aragonense, T. gnaphalodes, T. polium), Salvia* (e.g. *S. lavandulifolia, S. phlomoides), Satureja* (e.g. *S. montana), Sideritis* (e.g. *S. incana), Lavandula (L. angustifolia, L. lanata, L. latifolia)*, accompanied by leguminous shrubs (e.g. *Genista scorpius, G. pilosa, G. pseudopilosa, G. cinerea* ssp. *speciosa, Coronilla minima*) and various grasses (e.g. *Stipa spp., Brachypodium spp.*). In the north they often have an important, sometimes predominant, grass element and their impoverished shrub component is sometimes reduced to an almost monospecific *Thymus* formation; southwards, they become progressively more dominated by a richer constellation of shrub species.

32.64 SUPRA-MEDITERRANEAN BOX SCRUB

Box thickets of the supra-Mediterranean zone, occurring as facies within several formations of southern France such as French lavender garrigues and supra-Mediterranean steppic grassland complexes, in north-eastern Spanish ranges and in isolated stations of the Apennines.

32.65 ITALIAN SUPRA-MEDITERRANEAN GARRIGUES

In the supra-Mediterranean level of Italy and the large central Mediterranean islands, the substitution stages of the thermophile deciduous forests are mostly grasslands or shrubby grasslands, hedgehog-heaths, deciduous shrubs, semi-maquis or occasionally embryonic garrigues that differ little from those of the meso-Mediterranean level. A few formations, in particular with labiates of genera *Thymus, Teucrium, Salvia, Lavandula* and others, with *Helichrysum spp.* or with *Euphorbia spp.* may warrant separate listing under this heading.

32.7 PSEUDOMAQUIS

Shrub formations intermediate between Mediterranean maquis and schibljak, resulting from the degradation of the *Ostryo-Carpinion* of Greece, the Balkans and Italy, with a mixture of evergreen and deciduous bushes including *Quercus coccifera, Juniperus oxycedrus, Quercus trojana, Carpinus orientalis, Ostrya carpinifolia, Pistacia terebinthus, Buxus sempervirens.* Similar Iberian formations with *Amelanchier ovalis, Prunus lusitanica, Ilex aquifolium.* French and Italian formations with *Quercus pubescens* and *Quercus ilex.*

(Horvat *et al.*, 1974; Tomaselli, 1981a; Polunin and Walters, 1985)

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32.8 MACARONESIAN XEROPHYTIC COMMUNITIES

Kleinio-Euphorbietea canariensis

Xerophytic scrub formations of the lower slopes of the Canary Islands, Madeira and the Salvagen Islands, rich in succulents, in particular cactiform or dendroid spurges *Euphorbia spp.*, rosette-forming *Aeonium spp.* and composites.

(Delvolsalle, 1964; Duvigneaud, 1977; White, 1983; Bramwell and Bramwell, 1983; Hampshire, 1984; Wildpret de la Torre and del Arco Aguilar, 1987; Machado *in litt.* 1989)

32.81 WESTERN CANARIAN SPURGE COMMUNITIES

Open, varied formations of arid, stony slopes of the lower, 0-700 m, level of the western and central Canarian islands, characterized by the abundance of fleshy-stemmed, aphyllous, or small-leafed species, in particular *Euphorbia spp., Senecio kleinia, Periploca laevigata, Cneorum pulverulentum, Messerschmidia fruticosa, Echium giganteum, Convolvulus floridus, Allagopappus dichotomus, Rhamnus crenulata, Rubia fruticosa, Argyranthemum spp., Artemisia canariensis, Sonchus leptocephalus, Asparagus arborescens, Rumex lunaria, Micromeria spp., Paronychia canariensis.*

32.811 Cardonales

Formations dominated by the cactiform spurge *Euphorbia canariensis.*

32.812 Tabaibales

Formations dominated by the tree-like spurges *Euphorbia aphylla, E. obtusifolia, E. balsamifera, E. atropurpurea, E. bravoana, E. regis-jubae, E. bourgaeana.*

32.813 Kleinia tabaibales

Senecio kleinia (Kleinia neriifolia), Sonchus spp. or other composite-dominated formations.

32.814 Dragon tree communities

Formations in which the forest relict *Dracaena draco* is present.

32.815 *Cneorum* cushion communities

Cneorum pulverulentum formations.

32.816 *Plocama* communities

Formations with *Plocama pendula.*

32.82 WESTERN CANARIAN SAXICOLOUS FORMATIONS

Formations colonizing hard rock faces, lava flows and ravine walls within the xerophytic zone of the western and central Canary Islands.

32.821 Western Canarian saxicolous labiate communities

Formations of small ligneous plants colonizing hard, dry rocks with *Micromeria spp., Lavandula canariensis, L. pinnata*, and the fern *Notholaena vellea.*

32.822 Cardoncillo communities

Formations colonizing lava flows, with the succulent asclepiad cardoncillos *Ceropegia dichotoma* and *C. fusca, Phagnalon purpurascens* and *Sonchus leptocephalus.*

32.823 Western Canarian crassulid communities

Formations of dry, less sunny rocks dominated by succulent crassulids (*Aeonium spp., Greenovia spp.*) with *Sonchus gummifer, S. radiatus, Picridium ligulatum, Lavandula abrotanoides, Asparagus scoparius, Hypericum reflexum, Lavatera acerifolia, L. phoenicea, Vieraea laevigata* and many lichens.

32.83 EASTERN CANARIAN XEROPHYTIC COMMUNITIES

Open formations of semi-desertic Fuerteventura and Lanzarote, with high endemism; characteristic of various groupings are *Euphorbia obtusifolia, Senecio kleinia, Asparagus pastorianus, Echium bonnetii, Caralluma burchardii*, the cactiform spurge *Euphorbia handiensis, Pulicaria burchardii, P. canariensis, Argyranthemum winteri, Echium handiense, Bupleurum handiense, Sideritis massoniana, Asteriscus sericeus, A. schultzii, Minuartia platiphylla, Reichardia famarae, Aichryson tortuosum, Aeonium lancerottense, Aeonium balsamiferum, Limonium bourgaei, Echium decaisnei* ssp. *purpuriense, Argyranthemum ochroleucum, Helichrysum gossypium, H. monogynum, Ferula lancerottensis,*

Sedum lancerottense, Thymus origanoides, Lavandula pinnata, Echium pitardii, Limonium puberulum.

32.84 CANARIAN *LAUNAEA* SCRUB
Steppic grasslands of the Canary Islands invaded and dominated by *Launaea arborescens.*

32.85 MADEIRAN SPURGE FORMATIONS
Aeonio-Lytanthion p.
Shrubby formations of the low slopes (0-350 m) of Madeira with *Euphorbia piscatoria, Globularia salicina, Phyllis nobla, Myrtus communis, Chamaemeles coriacea, Rubus ulmifolius, Olea europea* ssp. *maderensis, Bencomia codata, Echium nervosum.*

32.86 MADEIRAN SAXICOLOUS FORMATIONS
Formations colonizing rocks and volcanic ash deposits in the xerophytic zone of Madeira, with *Aeonium glutinosum, Plantago arborescens ssp. maderensis, Helichrysum spp., Sonchus ustulatus, Phagnalon spp. Tolpis fruticosa, Sedum brissemoretii, Davallia canariensis* or *Musschia aurea* and *Aeonium glandulosum.*

32.87 DESERTAS DRY SCRUB
Formation with Madeiran endemics *Artemisia argentea, Calandula maderensis, Andryala glandulosa, Jasminum odoratissimum* and introduced plants.

32.9 **FIELDS OF ASPHODEL, *PHLOMIS*, THISTLE, *FERULA***
Over-browsed and over-grazed garrigues physiognomically transformed into fields of asphodel, *Phlomis*, thistle or *Ferula.*

32.A **SPANISH-BROOM FIELDS**
Formations of Spanish broom, *Spartium junceum*, in Mediterranean and sub-Mediterranean areas.

33

33 Phrygana

Cushion-forming thermo-Mediterranean sclerophyllous formations, often thorny and summer deciduous. They are best developed in the eastern Mediterranean, where they may occupy considerable surfaces in coastal areas and occasionally inland. They also include a few rare, relict associations of the west Mediterranean, mostly characteristic of the edge of seashores and of maritime cliffs, where they constitute an often narrow belt between the cliff communities and thermo-Mediterranean brushes, incorporating, in addition to characteristic, often endemic or very rare, hemispherical cushion-forming species, an admixture of species belonging to these two vegetation complexes.
(Rechinger, 1951; Molinier and Molinier, 1957; Bolos and Molinier, 1960; Laurentiades, 1969; Bolos *et al.*, 1970; Horvat *et al.*, 1974; Caniglia *et al.*, 1974-1975; Molinier *et al.*, 1976; Lavagne and Moutte, 1977; Molinier and Martin, 1980; Reisigl *et al.*, 1980; Nimis, 1981; Quézel, 1981; Pignatti, 1982; Gamisans, 1982; Géhu *et al.*, 1984; Chiappini, 1985 a, b.; Kassioumis, 1988; Camarda and Valsecchi, 1990)

33.1 **WEST MEDITERRANEAN CLIFFTOP PHRYGANAS**
Astragalo-Plantaginetum subulatae, Anthyllido-Thymelaeetum hirsutae, Thymelaeo-Helichrysetum, Armerietum ruscinonensis
Rare, extremely local and isolated associations of clifftops and adjacent areas dispersed along the coasts of Provence, Cap Corse, the Straits of Bonifacio, Catalonia (Cabo de Creus) and extreme south-western Portugal, characterized by the presence of *Astragalus massiliensis* or *Anthyllis hermanniae*, variously accompanied by *Thymelaea hirsuta, Helichrysum italicum, Plantago subulatum, Armeria ruscinonensis.*

33.11 CALCAREOUS PROVENCE PHRYGANA
Very rare formations of the Marseilles coast of Provence (les Goudes), with *Astragalus massiliensis, Thymelaea tartonraira* and *Plantago subulata.*

33.12 CRYSTALLINE PROVENCE PHRYGANA
Formations of the maritime façade of the Maures and the Estérel, with *Anthyllis barba-jovis* and *Thymelaea hirsuta.*

33.13 CAP CORSE PHRYGANA
Formations of Cap Corse, with *Anthyllis hermanniae.*

33.14 STRAITS OF BONIFACIO PHRYGANA
Formations of the southern tip of Corsica and the extreme northern coast of Sardinia, with *Astragalus massiliensis.*

33.15 CABO DE CREUS PHRYGANA
Isolated formation of the Cabo de Creus promontory in Catalonia, with *Astragalus massiliensis, Pistacia lentiscus, Cistus albidus, C. salvifolius, Phillyrea angustifolia, Juniperus oxycedrus.*

33.16 CABO DE SÃO VICENTE PHRYGANA
Very isolated formations of the Cabo de São Vicente and the Ponta de Sagres, with *Astragalus massiliensis* and *Crithmum maritimum.*

33

33.2 **SARDINIAN *CENTAUREA HORRIDA* PHRYGANAS**
Centaureetum horridae
Highly threatened formations of the promontories of northern Sardinia, limited to the peninsulas of Stintino and Capo Caccia and the islands of Asinara and Tavolara, dominated by the large, silvery-blue, hemispherical cushions of the endemic tertiary relict *Centaurea horrida*, associated with many other endemic or restricted relict species including *Astragalus massiliensis, Erodium corsicum, Limonium acutifolium, Nananthea perpusilla, Evax rotundata, Armeria pungens*.

33.3 **AEGEAN PHRYGANAS**
Cisto-Micromerietea, Sarcopoterietalia spinosi
Low, thorny formations of hemispherical shrubs of the coastal thermo-Mediterranean zone of Greece and its islands with *Sarcopoterium spinosum, Centaurea spinosa, Satureja thymbra, Thymus capitatus, Genista acanthoclada, Anthyllis hermanniae, Euphorbia acanthothamnos, Stachys spinosa, Ballota pseudodictamnus, B. acetabulosa, Erica manipuliflora, Rhamnus oleoides, Lithospermum hispidulum, Fumana arabica, F. thymifolia, Cistus creticus, C. parviflorus, C. salvifolius, Pistacia lentiscus, Teucrium brevifolium, T. divaricatum, T. polium, Calicotome villosa, Micromeria graeca, M. juliana, M. nervosa, Salvia triloba, Ononis spinosa, Helichrysum italicum* ssp. *microphyllum* and ssp. *italicum, Phagnalon graecum*, much more widespread and diverse than the western Mediterranean formations. The subdivisions proposed are based on physiognomically significant dominants; co-dominance can be indicated by use of multiple codes.

33.31 *SARCOPOTERIUM* PHRYGANAS
Sarcopoterium spinosum-dominated formations, by far the commonest phrygana facies, widespread in the Aegean archipelagoes and Crete, with local outposts in peninsular Greece and the Ionian islands.

33.32 MARITIME *CENTAUREA SPINOSA* PHRYGANAS
Rare, relict formations on coastal sands and gravels of Egina, Attica, Euboea, Skyros, Samos, Lesbos, Lemnos, Samothrace and Crete, dominated by the large, silvery hemispherical cushions of *Centaurea spinosa* ssp. *spinosa,* sometimes accompanied by *Sarcopoterium spinosum* or *Euphorbia acanthoclada.*

33.33 LESBIAN *CENTAUREA SPINOSA* PHRYGANAS
Phryganas often rich in *Centaurea spinosa* ssp. *spinosa,* mixed with *Sarcopoterium spinosum, Satureja timbra, Ballota acetabulosa* of Lesbos, extending from the coast to the highest hills in the arid western part of the island; covering a relatively vast expanse, they harbour a highly distinctive flora and fauna as well as remnants of fossil forest.

33.331 **Lesbian *Centaurea-Sarcopoterium* phryganas**
Sarcopoterium phrygana rich in *Centaurea spinosa*.

33.332 **Lesbian *Sarcopoterium* phryganas**
Sarcopoterium phrygana with little or no *Centaurea spinosa*.

33.333 **Lesbian steppe-phrygana**
Open, almost pure, stands of *Centaurea spinosa* on steppic hills.

33.34 CYCLADIAN *CENTAUREA* PHRYGANAS
Formations of the Cyclades, rich in *Centaurea spinosa* ssp. *cycladum*, extending from coastal areas to the highest elevations.

33.35 HEATHER PHRYGANAS
Phryganas in which *Erica manipuliflora* plays an important role, often associated with *Sarcopoterium spinosum, Genista acanthoclada, Pistacia lentiscus, Ballota acetabulosa, Cistus creticus, C. parviflorus, C. salvifolius,* a facies of the *Sarcopoterium* phrygana developing locally notably in eastern Crete and the Cyclades.

33.36 THYME PHRYGANAS
Phryganas dominated or formed by *Thymus capitatus*.

33.37 *GENISTA* PHRYGANAS
Genista acanthoclada formations of the thermo-Mediterranean zone.

33

33.38 SAVORY PHRYGANAS
Facies of the phryganas in which *Satureja thymbra* becomes locally dominant.

33.39 SPINY SPURGE PHRYGANAS
Euphorbia acanthothamnos-dominated formations.

33.3A GROMWELL PHRYGANAS
Lithospermum hispidulum-dominated phryganas, limited to south-eastern Aegean islands.

33.3B *ANTHYLLIS* PHRYGANAS
Anthyllis hermanniae-dominated or -rich phryganas, widespread, in particular in the northern Aegean.

33.4 **MID-ELEVATION PHRYGANAS OF CRETE**
Euphorbio-Verbascion, i.a.
Varied formations of supra- and oro-Mediterranean levels of Crete resulting from the broad contact between phryganas and hedgehog-heaths (32.7), with *Euphorbia acanthothamnos, Verbascum spinosum, Berberis cretica, Phlomis cretica, Satureja biroi, Sideritis syriaca, Hypericum empetrifolia, Origanum microphyllum, Micromeria juliana, Helichrysum italicum* ssp. *microphyllum, Genista acanthoclada*.

33.5 ***HYPERICUM* PHRYGANAS**
Extremely rare, local colonies of hemispherical shrubs of *Hypericum aegyptiacum* forming open phryganas on calcareous rocks by the sea in the Ionian islands, western Crete, Sardinia and Lampedusa.

33.6 **ITALIAN *SARCOPOTERIUM SPINOSUM* PHRYGANAS**
Very local, impoverished *Sarcopoterium spinosum* formations of Capo St. Elia (southern Sardinian coast) and of the Gulf of Taranto (Puglia, Calabria).

33.7 **SARDINIAN *GENISTA ACANTHOCLADA* PHRYGANA**
Very local *Genista acanthoclada* ssp. *sardoa*-dominated communities of north-western Sardinia.

33.8 **BALEARIC CLIFFTOP PHRYGANAS**
Launaeetum cervicornis
Formations of the coasts of Mallorca and Minorca dominated by the cushion-forming Balearic endemics *Launaea cervicornis, Astragalus balearicus, Centaurea balearica, Anthyllis fulgurans, A. hermanniae* ssp. *hystrix, Teucrium subspinosum*.

33.9 **CYRNO-SARDIAN *GENISTA* PHRYGANAS**
Thermo-Mediterranean formations of headlands and peninsulas of Corsica and Sardinia dominated by cushion-forming spiny *Genista corsica* or *G. morisii*. These endemic species participate in the constitution of hedgehog-heaths (31.75) as well as in that of the coastal formations listed here, which assume an evident phrygana appearance; they may also enter in the composition of mid-elevation formations of less distinctive appearance which can be listed under 32.482.

33.A **PANTELLERIA PHRYGANA**
Matthiolo-Helichrysetum errerae
Coastal formation of hemispherical shrubs with the Pantelleria endemics *Helichrysum saxatile* ssp. *errerae* and *Matthiola pulchella*, vicariant of the west Mediterranean, Balearic and Sardinian clifftop phryganas.

34 Dry calcareous grasslands and steppes

Dry thermophilous grasslands of the lowlands, hills and montane zone, on mostly calcareous soils, sands, decomposed rock surfaces; steppes; thermophile forest fringe formations

34

34.1 **MIDDLE EUROPEAN PIONEER SWARDS**
Sedo-Scleranthetea p.
Open, thermophile formations of sandy or rocky ground in non-Mediterranean lowland to montane areas.

34.11 MIDDLE EUROPEAN ROCK DEBRIS SWARDS
Alysso-Sedion albi, Sedo albi-Veronicion dillenii, Sedo-Scleranthion p., Sedion pyrenaici p.
Open lowland and hill formations of sub-oceanic climates, formed mostly by annuals and succulents or semi-succulents on decomposed rock surfaces of edges, ledges or knolls, with calcareous or siliceous soils frequently disturbed by erosion or rabbits. They comprise a great variety of distinct and often very local, isolated communities harbouring many characteristic species, among which numerous rare forms including both relict and evolutionarily recent taxa.
(Lebrun *et al.*, 1949; Ellenberg, 1963, 1988; Royer, 1977; Rivas-Martinez, 1977a; Schumacher, 1977; Guinochet and Vilmorin, 1983; Duvigneaud, ms, 1985; Parent, 1986; Duvigneaud and Saintenoy-Simon, 1988; Oberdorfer, 1990)

34.111 **Stonecrop swards**
Formations dominated by, or rich in, *Sedum album* or other *Sedum* species, commonest facies of most communities.

34.112 **Houseleek communities**
Formations harbouring often rare and local lowland forms of *Sempervivum spp.* or *Jovibarba spp.*

34.1121 ***Sempervivum tectorum* communities**
Formations with *Sempervivum tectorum*, of the Jura, the Lake Constance area, the Moselle Valley, Hesse.

34.1122 ***Jovibarba sobolifera* communities**
Formations with *Jovibarba sobolifera*, of Franconia, Rhine, southern Saxony and Brandenburg.

34.1123 **Amblève houseleek community**
The unique, and therefore highly vulnerable, formation of *Sempervivum funckii* var. *aqualiense* known from only one site on the cliffs of the Amblève Valley, northern Ardennes.

34.113 **Grassy rock debris communities**
Formations in which perennial grasses such as *Poa badensis, Melica ciliata* and *Festuca spp.* play an important physiognomic role.

34.114 **Middle European rock debris therophyte communities**
Formations in which small annuals predominate over sparser crassulids or perennial grasses.

34

34.12 CALCAREOUS SAND SWARDS

Koelerion glaucae, Sileno conicae-Cerastion semidecandri (Sedo-Cerastion) p.

Open grasslands of strongly to slightly calcareous inland sands with *Helichrysum arenarium, Silene otites, S. chlorantha, Dianthus deltoides, Astragalus arenarius, Onosma arenarium, Jurinea cyanoides, Koeleria glauca, Festuca psammophila, F. polesica, F. duvalii* and the Brandenburg endemic *Stipa borysthenica* ssp. *germanica*, sometimes interspersed with annual formations with *Cerastium semidecandrum, Vicia lathyroides, Silene conica, Phleum arenarium, Petrorhagia prolifera.* Dunal formations can be characterized by conjunction of this code with those of 64.

(Lebrun *et al.*, 1949; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Westhoff and den Held, 1975; Duvigneaud, ms, 1985; Parent, 1986; Oberdorfer, 1990)

34.2 **LOWLAND HEAVY METAL GRASSLANDS**

Dry, short grasslands, often rich in lichens and mosses, colonizing western and central European soils with a high content in heavy metals such as zinc and lead, and comprising uniquely adapted species, ecotypes or populations mostly related to, or derived from, otherwise montane, boreo-montane or steppic species.

(Lebrun *et al.*, 1949; Ellenberg, 1963, 1988; Lambinon and Auquier, 1964; Auquier, 1964; Maquinoy *et al.*, 1972; Westhoff and den Held, 1975; Richards and Swan, 1976; Schumacher, 1977; Noirfalise *et al.*, 1980; Sipkes, 1980; Duvigneaud, 1982d; Noirfalise and Dethioux, 1982; Drachenfels *et al.*, 1984; Duvigneaud, ms, 1985; Bradshaw, 1985; Oberdorfer, 1990)

34.21 BRITISH HEAVY METAL GRASSLANDS

Formations, in particular of Wales and the Pennines, developed in the vicinity of former mining operations or on river gravels, with *Minuartia verna, Thlaspi caerulescens, Armeria maritima, Viola lutea, Festuca ovina s.l., F. rubra s.l., Agrostis tenuis.*

34.22 CALAMINARIAN GRASSLANDS

Thlaspion calaminariae: Violetum calaminariae, Violetum guestphalicae

Open formations colonizing heavy metal soils, either natural or resulting from past mining operations, in rapid regression and limited to a few stations in eastern Belgium, western Rhineland, Westphalia and Lower Saxony, and to one station in the southern Netherlands, comprised of a highly specialized flora with the endemics *Viola calaminaria, V. guestphalica, Thlaspi caerulescens (= T. alpestre)* ssp. *calaminare* and *Festuca aquisgranensis* (*F. ophioliticola* ssp. *calaminaria*), with *Minuartia verna* var. *hercynica, Silene vulgaris* ssp. *humilis* and *Armeria halleri,* limited to this formation and the next, and with the steppic, central European *Festuca valesiaca.*

34.221 ***Viola calaminaria*** **grasslands**

Formations of eastern Belgium, the extreme southern Netherlands and the Aachen area, with the yellow-flowered *Viola calaminaria.*

34.222 ***Viola guestphalica*** **grasslands**

Formations of northern Westfalia and of southern Lower Saxony, with the purple-flowered *Viola guestphalica.*

34.223 **Eifel** ***Armeria halleri*** **grasslands**

Communities of the Eifel with *Armeria halleri* and without violets.

34.23 CENTRAL EUROPEAN HEAVY METAL GRASSLANDS

Armerion halleri: Armerietum halleri, Armerietum bottendorfensis, Armerietum hornburgensis

Formations of Saxony and of the Harz with the endemic or near endemic *Armeria halleri, A. bottendorfensis, A. hornburgensis* and with *Minuartia verna* var. *hercynica, Silene vulgaris* ssp. *humilis.*

34.3 **DENSE PERENNIAL GRASSLANDS AND MIDDLE EUROPEAN STEPPES**

Festuco-Brometea

Dry closed thermophilous grasslands of middle European or Mediterranean lowlands and hills, up to the montane zone, dominated by perennial grasses; steppic grasslands of continental middle European affinities.

34.31 SUB-CONTINENTAL STEPPIC GRASSLANDS

Festucetalia valesiacae

Open grasslands of sub-continental climates with *Festuca valesiaca, F. rupicola, F. pseudovina, F. duvalii, F. trachyphylla, Stipa capillata, S. joannis, S. pulcherrima, S. tirsa (= S. stenophylla), S. dasyphylla, Chrysopogon gryllus, Danthonia alpina, Koeleria macrantha, Agrostis capillaris, Poa bulbosa, P. molinerii (= P. badensis* var. *xerophila), P. perconcinna (= P. carniolica), Melica ciliata, Brachypodium pinnatum, Carex supina, C. stenophylla, C. humilis* and herbs such as *Adonis vernalis, Pulsatilla montana, P. pratensis, P. grandis, P. patens, P. pusilla, Veronica spicata, Allium flavum, A. sphaerocephalon, Silene otites, Artemisia campestris, Achillea collina, A. nobilis, A. setacea, Centaurea rhenana (C. stoebe), Inula spiraeifolia, Verbascum phoeniceum, Armeria alliacea, Kochia prostrata, Euphorbia seguieriana, E. cyparissias, Campanula sibirica, Iris pumila, I. variegata, Linum flavum, Onosma taurica, O. arenaria, Silene otites, Potentilla arenaria, P. cinerea, Aster linosyris, Onobrychis arenaria, Oxytropis pilosa, O. halleri, Ononis pusilla, O. cenisia, Astragalus onobrychis, A. exscapus, A. danicus, A. vesicarius, A. austriacus, A. alopecuroides, Eryngium campestre, Dianthus carthusianorum*, often of oriental, mostly sarmatic, affinities.

(Braun-Blanquet 1961, 1976; Ellenberg, 1963, 1988; Archiloque *et al.*, 1969; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Wolkinger and Plank, 1981; Duvigneaud, ms, 1985; Oberdorfer, 1990)

34.311 Greek sub-Mediterranean steppic grasslands

Chrysopogo-Danthonion, Festucion rupicolae, Saturejon montanae, Asplenion serpentini

Perennial, steppe-like grasslands of the sub-Mediterranean *Ostryo-Carpinion, Quercion frainetto* and *Fagion moesiacum* zones of Greece with, among others, *Chrysopogon gryllus, Festuca rupicola, Koeleria macrantha, Carex humilis, Stipa joannis, S. capillata, S. pulcherrima.*

34.312 Central European steppic grasslands

Festucion valesiacae, Cirsio-Brachypodion

Dry grasslands, developed in areas with a locally high degree of continentality, of Alsace, the upper Rhine valley and hills, Franconia, Thuringe, Saxony and Brandenburg.

34.3121 Xerophile Central European steppic grasslands

Festucion valesiacae: Potentillo-Stipetum capillatae, Allio-Stipetum capillatae

Dry formations.

34.3122 Mesophile Central European steppic grasslands

Cirsio-Brachypodion: Stipetum stenophyllae, Genisto-Stipetum stenophyllae, Adonido-Brachypodietum

More mesic formations.

34.3123 Central European Tor grass steppic grasslands

Brachypodium pinnatum-dominated facies of 34.3122.

34.313 Eastern inner Alpine arid grasslands

Stipo-Poion xerophilae

Formations of the isolated, low-precipitation, high insolation, high summer temperature, inner Alpine valleys of the Val Bregaglia, upper basin of the Adda, the Val Venosta (upper Adige), the middle Adige-Isarco basin, the Val Pusteria.

34.314 Western inner Alpine arid grasslands

Stipo-Poion carniolicae

Grasslands of the dry inner valleys of the south-western Alps in the upper basin of the Durance, the upper valley of the Romanche, the Maurienne and the Tarentaise, the basins of the Dora Riparia (Susa) and of the Chisone and the upper basin of the Dora Baltea (Aosta).

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34.32 SUB-ATLANTIC SEMI-DRY CALCAREOUS GRASSLANDS

Mesobromion (Seslerio-Mesobromion, Potentillo-Brachypodion pinnati)

More or less mesophile, closed formations dominated by perennial, tuft-forming grasses, colonizing relatively deep, mostly calcareous soils in the sub-Atlantic domaine of the *Quercion pubescenti-petraeae* and its northern irradiations and in the sub-Mediterranean mountains of the Italian peninsula, with *Bromus erectus, Brachypodium pinnatum, Koeleria pyramidata, Festuca guestfalica, F. lemanii, Avenula pubescens, Sesleria albicans, Briza media, Carex caryophyllea, C. flacca, Gentianella germanica, G. ciliata, Gentiana cruciata, Trifolium montanum, Lotus corniculatus, Ononis repens, Medicago lupulina, Ranunculus bulbosus, Sanguisorba minor, Cirsium acaule, Euphrasia stricta, Dianthus deltoides, Potentilla neumanniana, Anthyllis vulneraria, Galium verum, Euphorbia brittingeri (E. verrucosa), Hippocrepis comosa, Helianthemum nummularium, Thymus praecox, Salvia pratensis, Linum catharticum, Scabiosa columbaria, Centaurea scabiosa, Carlina vulgaris, Viola hirta, Plantago media, Primula veris* and numerous orchids such as *Coeloglossum viride, Ophrys apifera, O. holoserica, O. insectifera, O. sphegodes, Aceras anthropophorum, Himantoglossum hircinum, Anacamptis pyramidalis, Orchis morio, O. ustulata, O. militaris, O. simia, Gymnadenia conopsea, Platanthera chlorantha, Herminium monorchis, Dactylorhiza fuchsii.* Generally species-rich, these communities may be overwhelmed by the highly social *Brachypodium pinnatum*. Their range extends from the British Isles, Denmark, the Low Countries and northern Germany to the Cantabric range, the Pyrenees, Catalonia, the southern Alps, and the Central Apennines. Forming a bridge between the Mediterranean region and thermophile sites to the north, they can be identified by their high representation of Mediterranean species in the north and of Euro-Siberian ones in the south.

(Lebrun *et al.*, 1949; Vanden Berghen and Mullenders, 1957; Tüxen and Oberdorfer, 1958; Vanden Berghen, 1963; Ellenberg, 1963, 1988; Braun-Blanquet, 1963, 1967a, 1976; Sutter, 1967; Archiloque *et al.*, 1969; Petit and Ramaut, 1970, 1985; Guinochet and Vilmorin, 1973; Lambinon, 1974; Summerhayes, 1976; Schumacher, 1977; Rivas-Martinez, 1977a; Gruber, 1978; Bellot Rodriguez, 1979; Bournérias, 1979, 1984; Molinier and Martin, 1980; Sipkes, 1980; Wolkinger and Plank, 1981; Ozenda, 1981; Francalancia *et al.*, 1981; Noirfalise and Dethioux, 1982; Duvigneaud, 1982a, b, 1983a, b, ms 1985; Bouzillé, 1983; Guéry, 1983; Rivas-Martinez, Diaz *et al.*, 1984; Nordiska ministerradet, 1984; Polunin and Walters, 1985; Gauld and Robertson, 1985; Bradshaw, 1985; Dupias, 1985; Bobbink and Willems, 1987; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Bolos and Capdevila, 1987; Vigo and Ninot, 1987; Chas, 1989; Oberdorfer, 1990)

34.321 North-western semi-dry calcareous grasslands

Mesobromion grasslands of Denmark and the British Isles.

34.3211 Danish *Mesobromion*

Dry or mesophile calcareous grasslands of central Jutland and the Danish archipelago with *Festuca ovina, Avenula pratensis, A. pubescens, Galium verum, Plantago media, Pulsatilla vulgaris, Artemisia campestris, Geranium sanguineum, Potentilla argentea.*

34.3212 Irish *Mesobromion*

Calcareous grasslands of central and central-western Ireland.

34.3213 Scottish *Mesobromion*

Very local, dry or mesophile grasslands occupying isolated limestone outcrops or deposits of Scotland, in particular on the Durness limestone of the north-west, the Dalradian limestones of Perthshire and basalt hills of the east, with *Koeleria macrantha, Festuca ovina, F. rubra, Briza media, Avenula pratensis, Carex flacca, C. caryophyllea, C. capillaris, Helianthemum nummularium, Astragalus danicus, Thymus drucei.*

34.3214 Northern English *Mesobromion*

Grasslands of mostly carboniferous or magnesian limestone substrates in the Pennines of Derbyshire, Yorkshire and Lancashire, the Lake District and Durham, including Teesdale, rich in *Sesleria albicans* and with many isolated populations of restricted or rare plants including *Carex ericetorum, Viola rupestris, Gentiana verna.*

34.3215 Welsh *Mesobromion*

Grasslands of mostly carboniferous limestone outcrops of Wales and adjacent areas with *Koeleria macrantha, Avenula pubescens, A. pratensis.*

34.3216 **Southern English *Mesobromion***
Grasslands of the chalk downs and mainly Jurassic calcareous hills of southern and eastern England, with *Bromus erectus* and *Brachypodium pinnatum*, often very rich in orchids.

34.32161 **Southern English tall *Mesobromion***
Tall grasslands with *Bromus erectus, Brachypodium pinnatum, Arrhenatherum elatius, Avenula pratensis, A. pubescens.*

34.32162 **Southern English tor grass *Mesobromion***
Brachypodium pinnatum-dominated facies.

34.32163 **Southern English short *Mesobromion***
Short turfs with *Festuca ovina, F. rubra, Cynosurus cristatus, Koeleria macrantha.*

34.322 **Middle European *Bromus erectus* semi-dry grasslands**
Mesophile and meso-xerophile calcareous grasslands of the sub-Atlantic domain in the Low Countries, Germany, northern, central and western France and north-western Spain. They are faunistically and floristically rich and the highly discontinuous nature of their distribution gives rise to a considerable geographical variation in the composition of plant and animal communities, marked by the occurrence of numerous species of local or disjunct occurrence in addition to the basic cortège common to most of them. Besides this geographical variation, the nature of these grasslands also depends, to a great extent, on hydric regime, substrate characteristics and agro-pastoral treatment, notably on whether they are mowed or grazed and how intensively. In particular, the relative abundance of the main constituent grass species, *Bromus erectus, Brachypodium pinnatum s.l., Sesleria albicans* and *Koeleria pyramidata*, varies both geographically with climatic conditions and locally with topography and agro-pastoral regime. Thus, although separate geographical entities may differ in that relative abundance, similarly differing facies may also coexist locally, producing sharply distinct habitats. To accommodate for these concurrent axes of variation, formations dominated by *Brachypodium* or by *Sesleria*, as well as all semi-damp formations, are removed from this division and placed in 34.323, 34.324 and 34.325. Geographical subdivisions, most apt at identifying distinctive plant and animal communities, may be used in the four sections by addition of a fourth decimal digit common to all of them. The regions encompassed by the geographical subdivisions corresponding to each value of this fourth digit are in all cases described under this section although in some of them, or in parts of some of them, there may be no grasslands belonging to 34.322, but only grasslands belonging to units 34.323, 34.324 or 34.325; these cases have, as much as possible, been identified under each of the subdivisions below.

34.3221 **Mosan *Mesobromion***
Mesophile grasslands of the north-western Hercynian periphery, on mostly Devonian or carboniferous limestones or dolomitic limestones, occasionally on calcschists, in the Mosan district of Belgium and the French Meuse, with isolated stations in the Ardenne-Eifel of Luxembourg and Rhineland.

34.3222 **Low Meuse *Mesobromion***
Chalk grasslands of the Belgian low Meuse, extreme south-eastern Netherlands and Westphalia, generally without *Bromus erectus*, and alluvial *Mesobromion* grasslands of adjacent regions (these to be listed under 34.324).

34.3223 **Harz *Mesobromion***
Closed mesophile grasslands, on substrates derived from Mesozoic limestones, of the periphery of the Harz in Saxony, Thuringe, Hesse and the hills of Lower Saxony.

34.3224 **Oder *Mesobromion***
Closed mesophile calcareous grasslands of the Oder basin in Brandenbourg and Mecklenburg.

34

34.3225 **Paris basin Cretaceous *Mesobromion***
Mesophile grasslands of the Cretaceous north-western and western periphery of the Paris basin, the valleys of the Seine, Bray and Somme and adjacent Jurassic areas of Basse Normandie and the Boulonnais.

34.3226 **Parisian Tertiary *Mesobromion***
Mesophile calcareous grasslands of the Parisian Tertiary in the central Paris basin.

34.3227 **Paris basin Jurassic *Mesobromion***
Mesophile grasslands of the north-eastern, eastern and south-eastern Jurassic belt of the Paris basin and adjacent Cretaceous areas in Lorraine, Champagne, Haute-Marne, Burgundy, Haute-Saône.

34.3228 **Middle Rhine *Mesobromion***
Closed mesophile calcareous grasslands of the Rhine, Mainz, Moselle, Neckar, Nahe, Lahn in their crossing of the northern Hercynian ranges.

34.3229 **Upper Rhine *Mesobromion***
Closed mesophile calcareous grasslands of the upper Rhine rift and adjacent hills, in Alsace and Baden-Württemberg.

34.322A **Black Forest *Mesobromion***
Mesophile calcareous grasslands of the southern Black Forest.

34.322B **French Jura *Mesobromion***
Mesophile calcareous grasslands of the French Jura and adjacent areas.

34.322C **Swabian *Mesobromion***
Mesophile calcareous grasslands of the Swabian Alb and adjacent areas.

34.322D **Franconian *Mesobromion***
Closed mesophile calcareous grasslands of the Franconian Alb, Franconian plateaux and adjacent areas.

34.322E **North-western pre-Alpine *Mesobromion***
Hill and montane mesophile grasslands of the north-western calcareous pre-Alps.

34.322F **Bavarian *Mesobromion***
Hill and montane mesophile calcareous grasslands of the Isar valley, the Bavarian plateau and pre-Alps.

34.322G **Ligerian *Mesobromion***
Mesophile calcareous grasslands of the Ligerian basin in the southern Paris basin, Berry, Limagne and Forez.

34.322H **Aquitanian *Mesobromion***
Mesophile calcareous grasslands of south-western France in Charentes, Perigord and Aquitaine.

34.322I **Quercy *Mesobromion***
Closed mesophile calcareous grasslands of Quercy.

34.322J **Western Pyrenean *Mesobromion***
Hill and montane mesophile calcareous grasslands of the western Pyrenees.

34.322K **Western Iberian *Mesobromion***
Hill, montane and sometimes lower subalpine calcareous grasslands of the Picos de Europa, Cantabria, Asturias, Alava, Navarra dominated by *Brachypodium pinnatum* ssp. *rupestre* (to be listed as 34.323K) or by *Bromus erectus, Carex brevicollis, Sesleria argentea, Helictotrichon cantabricum, Avenula vasconica, A. marginata*, and often with *Seseli montanum, S. cantabricum, Chamaespartium sagittale, Pulsatilla rubra* ssp. *hispanica, Phyteuma orbiculare* ssp. *hispanicum, Carduus argemone.*

34

34.323 Middle European *Brachypodium*-dominated semi-dry grasslands

Brachypodium pinnatum ssp. *pinnatum* or *B. pinnatum* ssp. *rupestre* facies of 34.322. Geographical subdivisions can be introduced by use of the fourth decimal digit of 34.322 in the fourth place of 34.323. *Brachypodium*-dominated facies may form in all the regional types of grasslands inventoried in 34.322 as a result of nitrification or of dominance of grazing over mowing. Such processes are accompanied by a drastic reduction in species diversity. South-western grasslands of units H to K of 34.322 and 34.323 are, however, generally rich in *Brachypodium* even in the apparent absence of degradation processes.

34.324 Alluvial and humid *Mesobromion* grasslands

Closed grasslands rich in species of the *Mesobromion* and in particular *Bromus erectus*, developed on calcareous marls, on somewhat elevated expanses of alluvial plains and on other water retentive soils within the range of the grasslands listed under 34.322. They are transitional to humid grasslands (37) and are often marked by the abundance of *Carex flacca*. Among characteristic elements are also *Thalictrum minus* ssp. *majus, Peucedanum carvifolia, Silaum silaus, Festuca arundinacea*. Geographical subdivisions can be introduced by use of the fourth decimal digit of 34.322 in the fourth place of 34.324. Extensive examples are known in particular from the marls of Lorraine, the Belgian low Meuse and the great rivers of The Netherlands, Westphalia, the alluvial plains of the French Moselle and Meuse, the Rhine valley in Germany and Alsace, various valleys in southern Germany and the valley of the Sarthe.

34.325 Middle European *Sesleria*-dominated semi-dry grasslands

Sesleria albicans-dominated facies of 34.322, often rich in dealpine species, occurring in particular in the Alpine and Pyrenean periphery, but also occurring locally, farther from the immediate Alpine influence, in anomalous stations such as steep, more or less shaded slopes or cliffs; *Sesleria argentea*-dominated grasslands of Alava and Navarra. Geographical subdivisions can be introduced by use of the fourth decimal digit of 34.322 in the fourth place of 34.323.

34.326 Sub-Mediterranean *Mesobromion*

Closed mesophile grasslands, usually rich in *Bromus erectus* and orchids, of the periphery of the Mediterranean basin in Catalonia, the eastern Pyrenees, the Corbières, the Causses, Provence, the south-western Alps and the northern Apennines. Many are comparatively dry and have sometimes been included in the *Xerobromion*.

34.3261 Pyreneo-Catalonian *Mesobromion*

Formations of the supra-Mediterranean and montane zones of the mountains of Catalonia and of the supra-Mediterranean and montane zones of the Pyrenees, where the absence of *Brachypodium pinnatum* separates them from the more western formations of 34.322-34.323.

34.3262 Corbières *Mesobromion*

Widespread and diverse formations of the Corbières with, in particular, isolated populations of *Ophrys catalaunica* and *Dactylorhiza insularis*.

34.3263 Causses *Mesobromion*

Formations of the Causses; in the southern Causses they are mostly limited to the valleys where they occur at the base of slopes and, more rarely, on alluvial terraces; they also occupy the plateaux of the Causse de Sauveterre; the endemics *Ophrys aveyronensis* and *O. aymonini* find their optimal habitat in these communities (*Orchideto-Brometum*).

34.3264 Provence *Mesobromion*

Local formations of the Mediterranean region of France developed on high plateaux, north-facing slopes and in clearings of pubescent oak woodlands.

34.3265 South-western Alpine *Mesobromion*

Formations occupying considerable surfaces of the supra-Mediterranean and montane zones of the southern Alps, where their line of demarcation from the grasslands of 32.322 can be, somewhat arbitrarily, placed at the line which, through the Col de Rousset, the Col de la Croix Haute and the Col Bayard, separates the southern Alps, including the Diois, from the northern Alps, including the Vercors.

34

34.3266 **Northern Apennine *Mesobromion***
Local formations of the northern Apennines, in particular in Liguria and in Tuscany.

34.327 **Insubrian *Mesobromion* grasslands**
Carici humilis-Chrysopogetum grylli fumanetosum, Andropogonetum grylli insubricum orchidetosum, i.a.
Species-rich hill and montane grasslands of Lago di Garda, Lago di Como and neighbouring areas with *Chrysopogon gryllus, Bromus erectus, Festuca rubra s.l., Agrostis capillaris, Brachypodium pinnatum, Carex humilis* and many orchids including the endemic *Ophrys benacensis and Serapias vomeracea* ssp. *vomeracea.*

34.328 **Central Apennine *Mesobromion* grasslands**
Filipendulo vulgaris-Trifolietum montani i.a.
Closed mesophile grasslands of the piani of the beech level of the Monti Sibillini and adjacent regions of the central Apennines, with a rich floristic cortège including many higher altitude species and Apennine endemics, dominated by the grasses *Bromus erectus, Festuca circummediterranea, Brachypodium pinnatum, Poa pratensis, Briza media, Festuca pratensis*, with *Filipendula vulgaris, Alchemilla glaucescens, Scabiosa columbaria, Trifolium montanum, Lotus corniculatus, Thymus longicaulis, Rhinanthus personatus, Cerastium fontanum, Galium anisophyllum*, and with the central Italian endemic *Gentiana columnae* on summits and slopes, *Asphodelus albus* and *Fritillaria tenella* in plains and gullies.

34.33 SUB-ATLANTIC VERY DRY CALCAREOUS GRASSLANDS
Xerobromion (Seslerio-Xerobromion)
Xerophile, open formations dominated by perennial, tuft-forming grasses, often rich in chamaephytes, colonizing superficial calcareous soils, often on steep slopes, clifftops or hilltops, in the sub-Atlantic domain of the *Quercion pubescenti-petraeae* and its northern irradiations and in the sub-Mediterranean mountains of the northern Italian peninsula, with *Bromus erectus, Sesleria albicans, Koeleria vallesiana, Melica ciliata, Stipa pennata, S., bavarica, S. capillata, S. pulcherrima, Phleum phleoides, Brachypodium pinnatum, Carex humilis, Fumana procumbens, Globularia punctata, Ononis pusilla, Helianthemum apenninum, H. canum, H. nummularium, Linum tenuifolium, Teucrium chamaedris, Allium sphaerocephalon, Arabis hirsuta, Anthericum liliago, Aster linosyris, Pulsatilla vulgaris, Biscutella laevigata, Orobanche teucrii, Artemisia alba, Sedum album, S. acre, Acinos arvensis, Hippocrepis comosa, Sanguisorba minor, Potentilla neumanniana, Scabiosa columbaria, Astragalus monspessulanus, Teucrium pyrenaicum, Ononis spinosa, O. natrix.*
(Lebrun *et al.*, 1949; Tüxen and Oberdorfer, 1958; Vanden Berghen, 1963; Ellenberg, 1963, 1988; Archiloque *et al.*, 1969; Guinochet and Vilmorin, 1973; Rivas-Martinez, 1977; Wolkinger and Planck, 1981; Ozenda, 1981, 1985; Noirfalise and Dethioux, 1982; Bournérias, 1984; Biondi *et al.*, 1985; Dupias, 1985; Polunin and Walters, 1985; Duvigneaud, ms, 1985; Parent, 1986; Vigo and Ninot, 1987; Oberdorfer, 1990)

34.331 **British *Xerobromion* grasslands**
Very rare, local formations of Devon and Somerset.

34.332 **Middle European *Xerobromion* grasslands**
Formations of southern Belgium, Germany, France, northern Spain and the northern Apennines. Where they occur in the vicinity of communities of the *Festucetalia valesiacae*, the latter occupy sites with more continental microclimates than those inhabited by the formations of this group.

34.3321 **Mosan *Xerobromion***
Xerophile grasslands of the north-western Hercynian periphery, on mostly Devonian or carboniferous limestones, in the Mosan district of Belgium and the French Meuse, with outposts in the Ardenne-Eifel of Luxembourg and Rhineland; the stations are for the most part very limited in extent and widely isolated.

34.3322 **Harz *Xerobromion***
Xerophile grasslands, on substrates derived from Mesozoic limestones of the periphery of the Harz, notably in Thuringe.

34.3323 **Paris basin Cretaceous *Xerobromion***
Xerophile grasslands of rare localities of the Cretaceous north-western and western periphery of the Paris basin, in particular in the valleys of the Seine and Somme.

34.3324 **Parisian Tertiary *Xerobromion***
Xerophile calcareous grasslands of the Parisian Tertiary in the central Paris basin.

34.3325 **Paris basin Jurassic *Xerobromion***
Xerophile grasslands of the north-eastern, eastern and south-eastern Jurassic belt of the Paris basin and adjacent Cretaceous areas in Lorraine, Champagne, Haute Marne, Burgundy, Haute Saône.

34.3326 **Middle Rhine *Xerobromion***
Xerophile calcareous grasslands of the Rhine, Mainz, Moselle, Neckar, Nahe, Lahn in their crossing of the northern Hercynian ranges.

34.3327 **Upper Rhine *Xerobromion***
Xerophile calcareous grasslands of the upper Rhine rift and adjacent hills, in Alsace and Baden-Württemberg.

34.3328 **French Jura *Xerobromion***
Xerophile calcareous grasslands of the French Jura and adjacent areas.

34.3329 **Swabian *Xerobromion***
Xerophile calcareous grasslands of the Swabian Alb, Lake Constance region and adjacent areas.

34.332A **Franconian *Xerobromion***
Xerophile calcareous grasslands of the Franconian Alb, Franconian plateaux and adjacent areas.

34.332B **North-western pre-Alpine *Xerobromion***
Hill and montane xerophile grasslands of the north-western calcareous pre-Alps.

34.332C **Bavarian *Xerobromion***
Hill and montane xerophile calcareous grasslands of the Bavarian plateau.

34.332D **Ligerian *Xerobromion***
Xerophile calcareous grasslands of the southern Paris basin, Berry and Auvergne.

34.332E **Aquitanian *Xerobromion***
Xerophile calcareous grasslands of south-western France in Charentes, Perigord and Aquitaine.

34.332F **Quercy *Xerobromion***
Xerophile calcareous grasslands of Quercy.

34.332G **Pyrenean *Xerobromion***
Hill and montane xerophile calcareous grasslands of the Pyrenees and adjacent areas; in the pubescent oak level of the eastern part of the range *Xerobromion* grasslands with *Koeleria vallesiana, Festuca ovina s.l.* and *Bromus erectus* come in contact with *Aphyllanthion* formations occupying more humid soils and with closed postcultural *Brachypodium* grasslands of the *Brachypodion phoenicoidis*. On the south side of the range, xerophile pastures are represented in lower zones and on the protected south-facing slopes (adrets) by communities of the *Aphyllanthion*, of decidedly Mediterranean hue, while the formations of the *Xerobromion*, of more Euro-Siberian character, occupy the other situations. Chamaephytes such as *Helianthemum nummularium, Artemisia alba, Teucrium pyrenaicum, Ononis spinosa, O. natrix* are abundant alongside the gramineous *Phleum phleoides, Festuca ovina s.l.*, and *Carex humilis*.

34.332H **South-western Alpine *Xerobromion***
Xerobromion grasslands of the south-western Alps.

34.3321 **Northern Apennine *Xerobromion***

Coronillo minimae-Astragaletum monspessulani, Xerobrometum apenninum

Open, arid pastures developed in the thermophilous deciduous *Quercus cerris-Q. pubescens-Ostrya carpinifolia* belt of the northern Apennines, south approximately to the area of the Monte della Luna, south-eastern Tuscany, where they occupy arenaceous-marly substrates and come in contact with the grasslands of unit 34.74, located on limestones and much richer in Apennine endemics. At their southern limit, the northern formations are rich in chamaephytes, notably *Coronilla minima, Asperula purpurea, Fumana procumbens*, alongside *Astragalus monspessulanus, Bromus erectus, Brachypodium pinnatum* and *Festuca inops*.

34.34 CENTRAL EUROPEAN CALCARO-SILICEOUS GRASSLANDS

Koelerio-Phleion phleoidis (Armerion elongatae, Sedo-Cerastion p.)

Low-altitude xerophile, rupicoloussor psammophilous, grasslands of slightly calcareous substrates, with *Festuca heteropachys, F. trachyphylla, Koeleria macrantha (= K. gracilis), Phleum phleoides, Armeria elongata, Artemisia campestris, Aster linosyris, Lychnis viscaria, Silene otites, S. nutans, Chamaespartium sagittale, Campanula patula, Potentilla rupestris, Helianthemum nummularium* ssp. *obscurum, H. apenninum, Scleranthus perennis, Allium senescens* ssp. *montanum*.

(De Sloover and Lebrun, 1984; Van Dijk *et al.*, 1984; Duvigneaud, ms, 1985; Parent, 1986; Duvigneaud and Saintenoy-Simon, 1988; Ellenberg, 1988; Oberdorfer, 1990)

34.341 **Calcaro-siliceous rock grasslands**

Rupicolous communities, colonizing in particular deep cracks and ledges of calcaro-siliceous rocky slopes or cliffs, with, notably, *Festuca heteropachys, Artemisia campestris, Aster linosyris, Lychnis viscaria, Potentilla rupestris*. The range of these formations is centered on the Hercynian ranges of middle Germany (notably Rhine, Nahe, Moselle, Mainz valleys and Harz periphery), extending west to Alsace and to extremely rare and isolated outposts in Ardenne valleys of Luxembourg, Belgium and France, where they are represented by *Festuca heteropachys* or *Potentilla rupestris* grasslands.

34.342 **Slightly calcareous sands grasslands**

Closed, perennial communities of slightly calcareous sands, in particular of old riverine dunes, with *Armeria elongata, Sedum sexangulare, Carex ligerica, Helichrysum arenaria*. Mostly characteristic of central Europe, these formations extend west to the fluviatile district of the Netherlands.

34.35 PALE FESCUE GRASSLANDS

Festucion pallentis (Sesterio-Festucion pallescentis)

Xeric, thermophile grasslands of middle European calcareous rock cracks, mostly dominated by the strong tufts of the glaucous *Festuca pallens* and *F. pannonica* and of the green *Sesleria albicans*, and with *Dianthus gratianopolitanus, Melica ciliata, Aster alpinus, Artemisia campestris* ssp. *lednicensis, Hieracium spp., Biscutella laevigata* ssp. *varia, Teucrium botrys, Allium strictum*, locally distributed in the Rhenish Schist Massif, the Pfälzerwald, the Rhine-Nahe-Mainz valleys, the Rhön, the Harz and its periphery, the Black Forest foothills, the French, Swabian and Franconian Juras. The communities of the *Festucion pallescentis* often occupy isolated stations and include rare or relictual species which impart to many of them a distinctive biogeographical and physiognomic individuality. In particular, rare and highly disjunct western outposts occur in the Meuse basin of the Belgian and French Ardennes, harbouring, among others, very isolated populations of *Draba aizoides* var *montana, Artemisia alba* ssp. *saxatilis* and *Hieracium vogesiacum*.

(Schumacher, 1977; Duvigneaud, 1982c, ms 1985; Parent, 1986; Ellenberg, 1988; Oberdorfer, 1990)

34.36 PHOENICIAN TORGRASS SWARDS

Brachypodietalia phoenicoidis

Closed, dry perennial grasslands of eutrophic soils within the meso- and thermo-Mediterranean zones, often on post-cultural land, formed by relatively tall grasses and usually dominated by *Brachypodium phoenicoides*, with, among many others, *Phleum bertolonii (= P. nodosum, P. pratense), Elymus repens, Carex divisa, Carthamus lanatus, Diplotaxis viminea, Echinops ritro, Euphorbia serrata, Echium vulgare, E. pustulatum, Erodium acaule, Galactites tomentosa, Lepidium graminifolium, Medicago orbicularis, Salvia verbenaca, Foeniculum vulgare, Pallenis spinosa, Psoralea bituminosa, Seseli tortuosum, Tragopogon australis, Scabiosa atropurpurea, Verbascum sinuatum, Picris hieracioides, Calamintha nepeta, Centaurea aspera, Vicia hybrida, Phlomis herba-venti* and many orchids.

(Molinier, 1957; Archiloque *et al.*, 1969; Guinochet and Vilmorin, 1973; Rivas-Martinez, 1977a; Bellot Rodriguez, 1979; Molinier and Martin, 1980; Devaux *et al.*, 1983; Duvigneaud, ms, 1985; Martinez Parras and Peinado Lorca, 1987; Costa, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Martinez Parras *et al.*, 1987)

34.4 **THERMOPHILE FOREST FRINGES**

Trifolio-Geranietea

Woodland edge (hem) communities of warmth-requiring drought-resistant herbaceous perennials and frutescent vegetation forming a belt between dry or mesophile grasslands and the shrubby forest mantle, on the sunny side, where the nutrient supply is limited, or, sometimes, pioneering the woodland colonization into the grasslands.

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Schumacher, 1977; Vanden Berghen, 1982; Duvigneaud, ms, 1985; Oberdorfer, 1990)

34.41 XERO-THERMOPHILE FRINGES

Geranion sanguinei

Hems of xero-thermic mixed oak woods of the *Quercetalia pubescenti-petraeae* and related communities, with *Geranium sanguineum, Vincetoxicum hirundinaria, Tanacetum corymbosum, Bupleurum falcatum, B. longifolium, Origanum vulgare, Dictamnus albus, Anthericum ramosum, Fragaria viridis, Anemone sylvestris, Lathyrus pannonicus, Peucedanum officinale, P. cervaria, P. alsaticum, Laserpitium latifolium, Polygonatum odoratum, Rosa pimpinellifolia, Trifolium rubens, Clematis recta, Coronilla coronata, Melampyrum cristatum, Campanula bononiensis, C. rapunculoides, C. persicifolia, Veronica teucrium.*

34.42 MESOPHILE FRINGES

Trifolion medii

More mesophile hems of *Carpinion* and *Fagion* woods, developed on deeper soil, with *Trifolium medium, T. ochroleucum, Campanula baumgartenii, Origanum vulgare, Melampyrum nemorosum, M. pratense, Valeriana wallrothii, Agrimonia eupatoria, Vicia cassubica, V. dumetorum, V. orobus, V. sylvatica, Lathyrus latifolius, Teucrium scorodonia.*

34.5 **MEDITERRANEAN XERIC GRASSLANDS**

Thero-Brachypodietea

Meso- and thermo-Mediterranean xerophile, mostly open, short-grass perennial grasslands rich in therophytes; therophyte communities of oligotrophic soils on base-rich, often calcareous substrates.

(Rechinger, 1951; Duvigneaud, 1953; Molinier, 1957; Vanden Berghen, 1963, 1982; Archiloque *et al.*, 1969; Braun-Blanquet, 1971b, 1973; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Rivas-Martinez, 1975c, 1977a; Diez Garretas *et al.*, 1977; Sutter, 1977; Jovet and Vilmorin, 1979; Rivas-Martinez *et al.*, 1980; Molinier and Martin, 1980; Barbero *et al.*, 1982; Guéry, 1983; Devaux *et al.*, 1983; Terrisse, 1983; Peinado Lorca *et al.*, 1984; Brullo, 1985; Peinado Lorca and Rivas-Martinez, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Martinez Parras *et al.*, 1987)

34.51 WEST MEDITERRANEAN XERIC GRASSLANDS

Formations of Spain, southern France, the large west Mediterranean islands and Italy.

34.511 **Retuse torgrass swards**

Brachypodienion retusi (Brachypodietum retusi)

Grasslands dominated by *Brachypodium retusum* and with many therophytes and geophytes, often alternating in mosaic fashion with garrigues or occupying their clearings.

34.512 **Crau steppe**

Asphodeletum fistulosi

Open grasslands of the coussous still covering vast but dwindling expanses of the Crau, fossil delta of the Durance, with *Brachypodium retusum, Stipa capillata, Dichanthium ischaemum, Elymus caput-medusae, Thymus vulgaris, Bellis sylvestris, Asphodelus fistulosus, Euphorbia seguieriana, Linum gallicum, Salvia multifida, Bufonia macrosperma*; they support a fauna of exceptional originality.

34

34.513 Mediterranean annual communities of shallow soils

Brachypodietalia distachyae

Spring-blooming, summer-dessicated formations of therophytes developed on base-rich, often calcareous, superficial soils with annual grasses such as *Bromus fasciculatus, Brachypodium distachyum, Lagurus ovatus, Stipa capensis, Parapholis incurva, Hainardia cylindrica, Echinaria todaroana, Desmazeria marina, D. sicula, D. zwierleinii, Lamarckia aurea, Narduroides salzmannii, Vulpia unilateralis, Ctenopsis gypsophila*, a few perennial grasses (e.g. *Koeleria splendens, Dactylis hispanica*) and numerous flowering plants, many of them annuals, and a very significant number restricted endemics; among the characteristic species are *Silene tridentata, S. neglecta, S. sedoides, Paronychia argentea, Arenaria capillipes, Ionopsidium prolongoi, Erophila verna, Astragalus sesameus, Ononis ornithopodioides, O. oligophylla, O. sieberi, Onobrychis aequidentata, Trigonella monspeliaca, T. polycerata, Plantago albicans, P. coronopus, P. afra, P. amplexicaulis, P. notata, P. ovata, Polygala monspeliaca, Convolvulus lineatus, Eryngium dichotomum, E. triquetrum, E. ilicifolium, Hedysarum spinosissimum, Callipeltis cucullaris, Catananche lutea, Daucus aureus, D. lopadusanus, D. bocconei, Nigella arvensis, Scorzonera laciniata, Lavatera agrigentina, Scabiosa parviflora, Anthemis muricata, Senecio leucanthemifolius, Limonium calcarae, L. echioides, L. thouinii, Campanula fastigiata, C. erinus, Erodium pulverulentum, Iberis fontqueri, Viola demetria, Arabis verna, Brassica souliei, Aster sorrentinii, Asteriscus aquaticus, Echium parviflorum, Bellis annua, Matricaria aurea, Linaria reflexa, L. pseudolaxiflora, L. amethystea, L. huteri, L. platycalix, L. saturejoides, L. clementei, Filago cossyrensis, Valantia calva, Sedum litoreum, S. caeruleum, S. stellatum, Saxifraga tridactylites, Hornungia petraea, Parietaria cretica, Biscutella lyrata, Anagallis monelli, Fedia cornucopiae, Evax pygmaea, Jasione penicillata, Andryala ragusina, Allium pallens* ssp. *siciliense, A. agrigentinum, A. chamaemoly*. Various combinations of the species above enter in the constitution of numerous distinctive, often ephemeral and very local communities restricted to small surfaces among, or in clearings of, other formations. The more widespread pastures dominated by annual grasses are for the most part sub-nitrophilous and better classified under 34.8.

34.5131 Western Mediterranean calciphile annual communities

Thero-Brachypodion = Trachynion distachyae

Thermo-, meso- and occasionally supra-Mediterranean calciphile formations of Mediterranean France, Iberia and Italy.

34.5132 South-eastern Iberian pre-desert annual communities

Stipion capensis

Ephemereal formations of the arid Iberian South-east, appearing among the pre-desert scrub communities of 32.25.

34.5133 Iberian gypsum annual communities

Sedo-Ctenopsion gypsophilae

Formations of small annuals developing on gypsum soils of interior Iberia, among the gypsum-scrub communities of 15.19.

34.5134 Andalusian magnesium annual communities

Omphalodion brassicifoliae

Formations on dolomites, ophiolites, peridotites and serpentines of Andalusia, developing among garrigue communities of 32.28.

34.5135 Sicilian saxicolous annual communities

Plantagini-Catapodion marini

Formations of Sicily, Linosa, Lampedusa and Pantelleria, sometimes subhalophile, developed on steep slopes, exposed crests, coastal rocks and volcanic material, often among the rocky shore communities of 18.22 or the pre-desert scrub of 32.255.

34.5136 Northern Sicilian aster annual communities

Dauco-Catananchion luteae: Asteretum sorrentinii

Aster sorrentini formations of steep clay and marl slopes of northern Sicily.

34.5137 Calabro-Sicilian esparto annual communities

Dauco-Catananchion luteae p.

Annual formations accompanying the *Lygeum spartum* steppes of southern Calabria and Sicily.

34.514 **Causse dolomitic arenas**
Armerion junceae
Very open formations colonizing, within the supra-Mediterranean steppe zone of the Causses (34.71), local deposits of dolomitic sands, characterized by *Armeria girardii (=juncea)*, *Arenaria aggregata, Helianthemum pilosum, Sedum ochroleucum, Alkanna tinctoria, Alyssum serpyllifolium, Helichrysum stoechas, Silene otites, Aster alpinus, Festuca christianii-bernardii, Corynephorus canescens, Phleum arenarium.*

34.52 SOUTH-WESTERN MEDITERRANEAN PERENNIAL PASTURES
Poetea bulbosae
Iberian xerophile, intensively grazed pastures of both siliceous and calcareous substrates, dominated by short, perennial grasses, rich in specialized annuals, in particular peas and composites.

34.53 EAST MEDITERRANEAN XERIC GRASSLANDS
Brachypodio-Chrysopogonetea p.
Formations of continental, peninsular and insular Greece.

34.531 **Eastern retuse torgrass swards**
Grasslands dominated by *Brachypodium retusum* and with many therophytes and geophytes, often alternating in mosaic fashion with garrigues and phryganas or occupying their clearings.

34.532 **Eastern short-grass steppes and therophyte communities**
Open, short, grasslands of thermo- and meso-Mediterranean Greece and its islands with numerous annual grasses such as *Bromus fasciculatus, B. madritensis, B. intermedius, B. alopecuros, B. rubens, Brachypodium distachyum, Aegilops neglecta, A. geniculata, A. triuncialis, Avena sterilis, A. barbata, Lagurus ovatus, Cynosurus echinatus, Stipa capensis*, but sometimes with a strong representation of short or medium-sized perennial grasses such as *Hyparrhenia hirta, Andropogon distachyos, Cynodon dactylon, Dactylis hispanica*. They are very rich in annual flowering plants, among which of genera *Euphorbia, Silene, Nigella, Adonis, Papaver, Fumaria, Biscutella, Rapistrum, Althaea, Malva, Linum, Geranium, Astragalus, Ononis, Trigonella, Medicago, Melilotus, Trifolium, Lotus, Coronilla, Scorpiurus, Hedysarum, Onobrychis, Bupleurum, Daucus, Anagallis, Orobanche, Plantago, Centaurium, Galium, Evax, Filago, Pallenis, Anthemis, Chrysanthemum, Tragopogon,* suffrutescent labiates of genera *Teucrium, Thymus, Ballota, Phlomis, Micromeria, Salvia* and others, and geophytes such as *Urginea maritima, Asphodelus microcarpus, Lloydia graeca, Allium spp., Ornithogalum spp., Muscari spp., Romulea spp., Orchis spp., Ophrys spp., Anacamptis pyramidalis*. They constitute a wide array of distinctive communities, many of them very local and restricted to small surfaces. Many of the more extensive pastures, in particular those dominated by annual grasses, are sub-nitrophilous or nitrophilous and may be better classified under 34.8.

34.6 **MEDITERRANEAN TALL-GRASS STEPPES**
Lygeo-Stipetea, Rosmarinetalia p. Brachypdio-Cheysopogonetea p.
Meso-, thermo- and sometimes supra-Mediterranean formations physiognomically dominated by tall grasses, between which may grow communities of annuals or sometimes chamaephytes; they are most characteristic of the Iberian peninsula, with local representations in southern Provence, Sardinia, southern peninsular Italy, Sicily and Greece. They include silicicolous as well as basiphile formations.
(Rechinger, 1951; Braun-Blanquet and Bolos, 1954; Molinier, 1957; Delvosalle and Duvigneaud, 1962; Polunin and Smythies, 1973; Costa, 1973, 1974; Horvat *et al.*, 1974; Rivas-Martinez, 1975c, 1977a; Peinado Lorca, *et al.*, 1984; Brullo, 1985; Polunin and Walters, 1985; Peinado Lorca and Rivas-Martinez, 1987; Asensi Marfil and Diez Garretas, 1987; Martinez Parras and Peinado Lorca, 1987; Alcaraz Ariza and Peinado Lorca, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Martinez Parras *et al.*, 1987)

34.61 ALPHA STEPPES
Stipa tenacissima-dominated formations of Spain, distributed mostly on the Meseta, in the Maestrazgo, in the Guadalquivir basin, in Baetic regions and in the arid Iberian South-east.

34

34.62 ESPARTO STEPPES
Lygeum spartum-dominated formations of the Ebro basin, the arid Iberian South-east, the Guadalquivir basin, Sardinia, Sicily, southern Italy and Crete.

34.621 **Iberian esparto steppes**
Sometimes extensive *Lygeum spartum*-dominated formations of the Ebro basin, the arid Iberian South-east and the Guadalquivir basin.

34.622 **Central Mediterranean esparto steppes**
More restricted *Lygeum spartum*-dominated formations of Sardinia and Sicily.

34.623 **Cretan esparto steppes**
Rare and isolated *Lygeum spartum*-dominated formations of the south coast of Crete.

34.63 BERCEALES, FEATHERGRASS, DISS, ANDROPOGONID, FESCUE STEPPES
Other Mediterranean tall-grass steppes.

34.631 **Berceales**
Stipa gigantea-dominated formations of central and southern Spain, mostly on siliceous soils.

34.632 **Mediterranean feathergrass steppes**
Centaureo-Stipetum lagascae, Inulo-Oryzopsietum milliaceae i.a.
Meso- and thermo-Mediterranean formations of Spain, Italy, Greece and southern France, dominated by tall perennial grasses of genera *Stipa (S. lagascae, S. offneri i.a.)* or *Piptatherum (Oryzopsis)*, other than the very tall *Stipa tenacissima* or *S. gigantea.*

34.633 **Diss steppes**
Formations of Italy, Spain and Greece, dominated by *Ampelodesmos mauritanica*; many chamaephyte and diss formations have the physiognomy of a garrigue or a brush and have been listed under 32.23.

34.634 **Andropogonid grass steppes**
Lygeo-Stipetea p.: Hyparrhenietalia hirtae i.a.; Brachypodio-Chrysopogonetea p.
Meso- and thermo-Mediterranean steppes of Spain, Italy, Greece and southern France, constituted by cespitose andropogonid grasses such as *Hyparrhenia hirta, Andropogon distachyos, Heteropogon contortus, Dichanthium insculptum, D. ischaemum* or *Chrysopogon gryllus.*

34.635 **Andalusian fescue and oat grasslands**
Festucion scariosae
Meso- and supra-Mediterranean grasslands of the Baetic region dominated by the tall, cespitose *Festuca scariosa, F. capillifolia, Arrhenatherum album, Helictotrichon filifolium* and *H. sarracenorum.*

34.6351 **Calcicolous fescue and oat grasslands**
Helictotricho filifolii-Festucetum scariosae
Formations of calcareous and dolomitic soils of the Serrania de Ronda mountain system, the peripheral ranges of the Sierra Nevada and the Sierra de Alhamilla.

34.6352 **Silicicolous fescue and oat grasslands**
Dactylo hispanicae-Festucetum scariosae
Formations of siliceous soils of the Sierra Nevada, the Sierra de Cabrera and the Sierra de Alhamilla.

34.6353 **Carrascoy fescue and oat grasslands**
Daphno-Festucetum capillifoliae
Formations of siliceous soils of the Sierra de Carrascoy.

34.7 **MEDITERRANEO-MONTANE GRASSLANDS**

Ononido-Rosmarinetea p.

Open perennial grasslands, often rich in chamaephytes, most characteristic of the thermophilous oak level of Iberia, southern France, southern Italy and Greece. Some of the largest remaining expanses of unbroken grasslands in Europe, of evident importance as faunal habitats, belong to this division.

34.71 MEDITERRANEO-MONTANE STEPPES

Ononidion striatae

Sparse or discontinuous xerophile grasslands of *Stipa pennata, Festuca auquieri (F. duriuscula), F. hervieri, Koeleria vallesiana or Sesleria albicans* var. *elegantissima* with *Helianthemum apenninum, H. canum, Genista spp., Globularia spp., Ononis striata, Euphorbia seguieriana, Potentilla crantzii, Thymus dolomiticus, Plantago argentea, Rosa pimpinellifolia, Dianthus sylvestris, Lavandula angustifolia, Aster alpinus, Anthyllis spp., Carex humilis*, best developed in the Causses, but also present locally in Provence and Languedoc, from the Alps to Catalonia.

(Duvigneaud, 1953; Vanden Berghen, 1963; Rivas-Goday and Rivas-Martinez, 1968; Archiloque *et al.*, 1969; Braun-Blanquet, 1971b; Guinochet and Vilmorin, 1973; Girerd, 1978; Jovet and Vilmoran, 1979; Martin and Molinier, 1980; Ozenda, 1981; Barbero *et al.*, 1982; Bernard and Fabre, 1983; Guillot, 1983; Terrisse, 1983; Lahondère, 1983; Deschatres, 1983; Rivas-Martinez *et al.*, 1984; Polunin and Walters, 1985; Dupias, 1985; Peinado Lorca and Rivas-Martinez, 1987)

34.711 **Mediterraneo-montane *Stipa* steppes**

Stipo-Ononidetetum striatae p., Festucetum duriusculae calciense p., Potentillo velutinae-Ononidetum striatae

Steppes dominated by *Stipa pennata*, with *Festuca auquieri, Koeleria vallesiana, Brachypodium pinnatum, Ononis striata*, occupying vast expanses of the Causses, and locally represented on crests and plateaux of Haute Provence, the south-eastern Alps and the Corbières.

34.7111 **Causses *Stipa* steppes**

Stipo-Ononidetum striatae

Very extensive *Stipa* grasslands of the plateaux of the Causses.

34.7112 **Upper Provence *Stipa* steppes**

Mediterraneo-montane *Stipa*-rich grasslands of southern France outside of the Causses, for the most part occupying small surfaces interspersed with other formations, but sometimes constituting dominant habitats over very significant surfaces, such as the plateau of Caussols.

34.712 **Mediterraneo-montane *Sesleria* steppes**

Seslerio-Phyteumetum = Helianthemeto-Seslerietum; Conopodio-Seslerietum elegantissimae; Seslerieto-Gentianetum corbariensis, Seslerietum mediterraneo-montanum, Erysimeto–Seslerietum caeruleae

More closed *Sesleria albicans* var. *elegantissima*-dominated grasslands occupying usually exiguous surfaces of somewhat shaded slopes, ledges, rocky corridors and snow-retaining cliff-bases in the Causses and other low mountains of the Mediterranean periphery of southern France and Catalonia, in particular Montserrat, the Corbières, the Montagne d'Alaric and western Provence.

34.713 **Mediterraneo-montane *Festuca-Koeleria* steppes**

Mediterraneo-montane steppe-grasslands poor in *Stipa pennata*, for the most part *Festuca auquieri-, Koeleria vallesiana-* or *Carex humilis*-dominated facies of 34.711.

34.7131 **Causses short *Festuca* swards**

Festucetum duriusculae calciense p., Astero-Anthyllidetum p.

Short, very open grasslands of the Causses dominated by *Festuca auquieri, Ononis striata*, or *Thymus praecox.*

34.7132 **Causses *Carex-Anthyllis* swards**

Astero-Anthyllidetum montanae

Carex humilis-Anthyllis montana formations of small windswept buttes and stony knolls of the Causses with *Aster alpinus* var. *cebennensis* and *Festuca auquieri.*

34.7133 **Franco-Iberian Mediterraneo-montane steppes**
Other Mediterraneo-montane formations with *Ononis striata, Anthyllis montana, Festuca spp.* or *Koeleria vallesiana*, locally distributed in southern France and north-eastern Spain.

34.714 **Mediterraneo-montane *Artemisia* steppes**
Open formations with *Artemisia alba* and *Hyssopus officinalis*, rich in chamaephytes, of eroded steep slopes of the Causses, harbouring, in particular, *Convolvulus cantabricus* and *Allium flavum*; similar formations of the south-western Alps appear best included in the sub-continental steppe-grasslands (34.314).

34.72 *APHYLLANTHES* GRASSLANDS AND SUPRA-MEDITERRANEAN STEPPES
Aphyllanthion p.
Coarse or steppe-like grasslands rich in chamaephytes of pronounced Mediterranean affinities formed as a degradation stage of thermophile deciduous oak forests, or of *Quercus rotundifolia* forests, in the supra-Mediterranean belt of Iberia, southern France and Liguria; grassland facies of the supra-Mediterranean garrigues (32.6) and hedgehog-heaths (31.7).
(Duvigneaud, 1953; Vanden Berghen, 1963; Rivas-Goday and Rivas-Martinez, 1968; Guinochet and Vilmorin, 1973; Lapraz, 1976; Molinier and Martin, 1980; Ozenda, 1981; Guéry, 1983; Polunin and Walters, 1985; Dupias, 1985; Bolos and Capdevila, 1987; Vigo and Ninot, 1987)

34.721 ***Aphyllanthes* grasslands**
Supra- and upper meso-Mediterranean grasslands, often on compact calcareous marls, dominated by, or rich in, the rush-like lily *Aphyllanthes monspeliensis* and with *Catananche caerulea, Linum suffruticosum* ssp. *suffruticosum* and ssp. *salsoloides, L. narbonense, L. strictum, L. campanulatum, L. tenuifolium, Dorycnium suffruticosum, Staehelina dubia, Lavandula latifolia, Potentilla crantzii, Stipa offneri, S. iberica, Koeleria vallesiana, Brachypodium phoenicoides, Carex humilis* of southern France, northern and north-eastern Spain, and Liguria.

34.722 **Supra-Mediterranean feathergrass steppes**
Steppe-like *Stipa*-dominated supra-Mediterranean garrigues and hedgehog-heaths of the mountains and plateaux of eastern Spain; *Stipa*-dominated facies of *Aphyllanthes* grasslands.

34.73 IBERIAN FESCUE FROST-GRASSLANDS
Festuco-Poetalia ligulatae: Festuco-Poion ligulatae p., Festucion burnatii p.
Supra-Mediterranean and montane psychro-xerophile, open perennial grasslands of the Cantabrian and Iberian ranges particularly characteristic of frost-fashioned, snow-free, superficial soils of the *Juniperus thurifera* and *J. sabina* environments, rich in *Festuca hystrix, F. burnatii, Poa ligulata* and with, among others, *Armeria bigerrensis* ssp. *legionensis, Arenaria aggregata* ssp. *cantabrica, Centaurea janeri* ssp. *babiana, Draba cantabriae, Saxifraga conifera, Ononis striata, O. cristata, O. pusilla, Coronilla minima, Paronychia kapela* ssp. *serpyllifolia, Helianthemum canum, Carex humilis*. They ascend to the oro-Mediterranean level and extend south-east to the eastern Baetic chains.
(Rivas-Martinez, Diaz *et al.*, 1984; Navarro Andres and Valle Gutierrez, 1987; Martinez Parras and Peinado Lorca, 1987; Costa, 1987)

34.74 CENTRAL AND SOUTHERN APENNINE DRY GRASSLANDS
Crepido lacerae-Phleion ambigui
Open grasslands of calcareous substrates of the middle and southern Apennines, southern vicariant of the *Xerobromion*, with *Bromus erectus, Sideritis syriaca* and many Apennine endemics or subendemics such as *Crepis lacera, Centaurea rupestris* ssp. *ceratophylla, Phleum ambiguum, Carex macrolepis*. Many distinctive communities exist in this unit, home still covering vast expanses of land of exceptional biological significance such as Campo Imperatore in the Gran Sasso range; a few examples are cited below, others may be added.
(Bonin, 1971; Biondi and Blasi, 1982; Biondi *et al.*, 1985)

34.741 **Upper central Apennine dry grasslands**
Asperulo purpureae-Brometum erecti
Grasslands of the 350-1 350 m range of the central Apennines with *Asperula purpurea, Eryngium amethystinum, Crepis lacera, Allium sphaerocephalon, Teucrium montanum.*

34.742 **Lower central Apennine dry grasslands**
Trigonello monspeliacae-Sideritum syriacae
Grasslands of the lower sectors of the central Apennines (average 800 m) developed on well-exposed surfaces and somewhat marly calcareous soils with *Trigonella monspeliaca, T. gladiata, Sideritis syriaca, Ononis variegata.*

34.743 **Apennine brushy dry grasslands**
Saturejo montanae-Brometum erecti
Chamaephyte-rich grasslands of the central-southern and southern Apennines, generally below the level of 34.744, with *Satureja montana, Sideritis syriaca, Plantago sempervirens, Globularia punctata, Chamaecytisus spinescens, C. hirsutus, Scabiosa crenata, Helichrysum italicum, Lavandula angustifolia, Teucrium montanum, Asphodeline lutea, Stipa pennata, Bromus erectus, B. caprinus, Avenula pretutiana.*

34.744 **Apennine upper montane dry grasslands**
Seslerio nitidae-Brometum erecti
Grasslands of high montane zones (upper fringe of the beech zone, average 1 250 m) of the central and southern Apennines, transitional towards alpine grasslands (36), with *Sesleria nitida, S. tenuifolia, Festuca dimorpha, Potentilla cinerea, Carex macrolepis, Chamaecytisus polytrichus.*

34.75 EASTERN SUB-MEDITERRANEAN DRY GRASSLANDS
Brachypodio-Chrysopogonetea p.
Xeric grasslands of the sub-Mediterranean zones of Trieste and of the *Ostryo-Carpinion* zone of Greece, where they coexist with steppic grasslands of the *Festucetalia valesiacae* (34.311), developing in areas of lesser continentality than the latter, and incorporating a greater Mediterranean element than they do; like the steppic grasslands, however, they are often dominated by *Carex humilis* or *Festuca rupicola.*
(Horvat *et al.*, 1974)

34.8 **MEDITERRANEAN SUBNITROPHILOUS GRASSLANDS**
Brometalia rubenti-tectori i.a.
Formations composed mostly of annuals, in particular, grasses of genera *Bromus, Aegilops, Avena, Vulpia,* crucifers and leguminous plants, that occupy considerable expanses of the western, central and eastern meso- and thermo-Mediterranean zones on soils slightly enriched in nitrates. These communities develop as pioneers of bare soils slightly nitrified by aeration or organic addition, along roads, on land-fills and in interstitial spaces of cultivation. They also replace the oligotrophic annual communities included in the Mediterranean xeric grasslands (34.51, 34.53) under the influence of pastoral activities. They are widespread as post-cultural formations. They evolve through intensive grazing into perennial pastures of the *Poetalia bulbosae* and related communities (34.52), through increased nitrification into ruderal formations (87), through an increase in edaphic humidity into amphibious communities (22.3) and perennial andropogonid steppes (34.634) or Phoenician torgrass swards (34.36). Ligneous recolonization may lead either to halo-nitrophilous scrubs of the *Salsolo-Peganetalia* (15.17), or to maquis and garrigues of the *Rosmarinetalia, Lavanduletalia* or *Gypsophiletalia* (32, 15.19).
(Rechinger, 1951; Horvat *et al.*, 1974; Rivas-Martinez, 1975c; Izco, 1977; Peinado Lorca *et al.*, 1984; Herranz Sanz and Gomez Campo, 1986; Ladero Alvarez, 1987; Rivas-Martinez and Costa, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Martinez Parras *et al.*, 1987)

34.81 MEDITERRANEAN SUBNITROPHILOUS GRASS COMMUNITIES
Taeniathero-Aegilopion geniculatae, Brachypodio-Chrysopogonetea p.
Graminoid formations with *Bromus fasciculatus, B. madritensis, B. intermedius, B. alopecuros, B. rubens, B. hordeaceus, B. tectorum, Aegilops neglecta, A. geniculata, A. triuncialis, A. ventricosa, Taeniatherum caput-medusae, Avena sterilis, A. barbata, Lagurus ovatus, Lolium rigidum, Vulpia ciliata, V. bromoides, V. geniculata, Lamarckia aurea, Trisetum paniceum, Cynosurus echinatus, Stipa capensis,* and with *Scandix australis, Astragalus scorpioides, Trifolium cherleri, T. hirtum, T. striatum, T. campestre, T. arvense, T. glomeratum, Viccia lutea, Medicago rigidula, M. sativa, M. littoralis, Melilotus sulcata, Coronilla scorpioides, Filago minima, Paronychia argentea,* particularly widespread in Iberia, southern Italy and Greece where they may cover vast expanses of post-cultural or extensive pasture lands, also locally represented in southern France and coastal northern Italy.

34.82 MESETA SUBNITROPHILOUS CRUCIFER COMMUNITIES
Alysso-Brassicion barrelieri
Brassicoid formations of the Spanish Meseta with *Brassica barrelieri, Andryala arenaria, Alyssum granatense, Rhynchosinapsis hispida, Euphorbia matritensis, Sisymbrium contortum, Papaver argemone, Hirschfeldia incana, Capsella rubella.*

34.83 IBERIAN SOUTH-EASTERN SUBNITROPHILOUS HERB COMMUNITIES
Carrichtero-Amberboion
Formations of the arid Iberian South-east with *Astragalus longidentatus, Brassica cossoniana, Carrichtera annua, Euphorbia dracunculoides, Lasiopogon muscoides, Leontodon salzmannii, Lotus edulis, Lycocarpus fugax, Matthiola lunata, M. parviflora, Notoceras bicorne, Volutaria (Amberboa) lippii.*

34.84 EASTERN MEDITERRANEAN SUBNITROPHILOUS HERB COMMUNITIES
Annual herb formations of arid areas of the Aegean (e.g. eastern Crete), developed in particular as ultimate degradation of overgrazed phryganas.

35 Dry siliceous grasslands

Poor Atlantic and sub-Atlantic mat-grasslands of strongly acid soils; grasslands of decalcified sands; Mediterranean siliceous grasslands.

35.1 ATLANTIC MAT-GRASS SWARDS AND RELATED COMMUNITIES

Nardetalia: Violo-Nardion (Nardo-Galion saxatilis, Violion caninae)

Closed, dry or mesophile, perennial grasslands occupying acid soils in Atlantic or sub-Atlantic lowland, collinar and montane regions of middle Europe and western Iberia, with *Nardus stricta, Festuca filiformis (F. tenuifolia), F. ovina, F. rubra, Agrostis capillaris, Danthonia decumbens, Anthoxanthum odoratum, Deschampsia flexuosa, Poa angustifolia, Galium saxatile, Polygala vulgaris, Viola canina, Meum athamanticum, Arnica montana, Centaurea nigra, Dianthus deltoides, Gentianella campestris, Chamaespartium sagittale, Jasione laevis, Potentilla erecta, Carex pilulifera.* Any of the grasses listed can dominate or co-dominate distinctive facies; *Calamagrostis epigejos* or *Carex arenaria* also can invade and dominate some formations.

(Tüxen and Oberdorfer, 1958; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Schumacker, 1973; Barkman, 1973; Stieperaere, 1973; Westhoff and den Held, 1975; Sougnez, 1977; De Sloover *et al.*, 1978; Perkins, 1978; Noirfalise *et al.*, 1980, 1985; Ratcliffe, 1980; Bournérias, 1984; Rivas-Martinez, Diaz *et al.*, 1984; Polunin and Walters, 1985; Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Vigo and Ninot, 1987; Oberdorfer, 1990; Hill *in litt.*, 1990)

35.11 MAT-GRASS SWARDS

Mesophile and xerophile *Nardus stricta*-dominated or -rich formations.

35.12 *AGROSTIS-FESTUCA* GRASSLANDS

Closed mesophile grasslands formed by *Agrostis spp.* and *Festuca spp.*; in particular, widespread sheep-grazed upland pastures of the British Isles, and especially the Scottish Highlands, with abundant *Agrostis capillaris, A. canina, Festuca ovina*, and with *Anthoxanthum odoratum, Holcus lanatus, Carex pilulifera, Alchemilla alpina, Galium saxatile.*

35.13 *DESCHAMPSIA FLEXUOSA* GRASSLANDS

Communities dominated by *Deschampsia flexuosa* forming, in particular, as degradation stages of *Calluna* and other heaths.

35.14 WOOD SMALL-REED STANDS

Tall *Calamagrostris epigejos*-dominated facies of siliceous grasslands.

35.15 SAND SEDGE GRASSLANDS

Closed acidophilous grasslands on fixed sands dominated by *Carex arenaria.*

35.2 MEDIO-EUROPEAN OPEN SILICEOUS GRASSLANDS

Thero-Airion i.a.

Open formations of dry, siliceous soils, of Atlantic, sub-Atlantic and Mediterraneo-montane distribution, often species-poor and with a strong representation of annuals.

(Guinochet and Vilmorin, 1973; Barkman, 1973; Westhoff and den Held, 1975; Wattez, 1977; Royer, 1977; Géhu and Foucault, 1977; Rivas-Martinez, 1977a; Bournérias, 1979, 1984; Noirfalise *et al.*, 1980, 1985; Polunin and Walters, 1985; Rivas-Martinez *et al.*, 1987; Ellenberg, 1988; Oberdorfer, 1990)

35.21 DWARF ANNUAL SILICEOUS GRASSLANDS

Pioneer formations of typically dwarf annuals, often ephemeral and of very limited extent, characteristic in particular of fixed sands, with *Aira caryophyllea, A. praecox, Nardurus lachenalii, Vulpia bromoides, V. myuros, Trisetum ovatum, Filago arvensis, F. gallica, F. lutescens, F. minima, F. pyramidata, F. vulgaris, Spergularia morisonii, Hypochoeris glabra, Evax carpetana, Moenchia erecta, Scleranthus polycarpos, Teesdalia nudicaulis, Myosotis discolor, M. stricta, Linaria elegans, L. amethystea, Sedum lagascae, S. pedicellatum, Ornithopus perpusillus, Trifolium striatum, T. arvense, T. dubium, T. campestre, T. micranthum, Tuberaria guttata*; typical former crop-following species also find a refuge in these communities.

35.22 PERENNIAL OPEN SILICEOUS GRASSLANDS

Very open grasslands dominated by perennial grasses such as *Agrostis capillaris, A. vinealis, A. delicatula, A. durieui, A. castellana, Poa angustifolia, Anthoxanthum odoratum, Festuca filiformis, Corynephorus canescens, Calamagrostis epigejos* or *Carex arenaria*, forming a transition towards 35.1.

35.23 *CORYNEPHORUS* GRASSLANDS

Formations of sands with *Corynephorus canescens*; most are dunal and should be listed under 64 (Inland dunes).

35.3 **MEDITERRANEAN SILICEOUS GRASSLANDS**

Helianthemion guttati (Tuberarion guttatae)

West Mediterranean annual-rich grasslands of siliceous gravelly, sandy or silty, usually shallow, soils that remain cohesive during the dry season; characteristic are *Tuberaria guttata, Helianthemum sanguineum, Jasione montana, Paronychia cymosa, P. echinulata, Pterocephalus diandrus, Prolongoa pectinata, Senecio minutus, Tolpis barbata, Filago gallica, F. minima, Teesdalia coronopifolia, Sedum caespitosum, S. arenarium, S. andegavense, Crassula tillaea, Saxifraga carpetana, Radiola linoides, Silene gallica, S. psammitis, S. portensis, Linum gallicum, Linaria pelisseriana, L. arvensis, Plantago bellardi, Galium divaricatum, Trifolium cherleri, T. strictum, T. suffocatum, T. arvense, T. bocconei, T. purpureum, Lathyrus angulatus, Ornithopus pinnatus, O. sativus, Lupinus hispanicus, L. angustifolius, Anthyllis cornicina, Coronilla repanda* ssp. *dura* and the grasses *Corynephorus divaricatus, Aira cupaniana, A. tenorei, A. caryophyllea, Airopsis tenella, Molineria minuta, M. laevis, Vulpia geniculata, V. membranacea, V. bromoides, V. myuros, Briza maxima, Anthoxanthum aristatum, Micropyrum tenellum.*

(Duvigneaud, 1953; Molinier, 1957; Jasievicz, 1964; Aubert and Loisel, 1971; Guinochet and Vilmorin, 1973; Braun-Blanquet, 1977; Rivas-Martinez, 1977a; Lavagne and Moutte, 1977; Lapraz, 1978; Molinier and Martin, 1980; Devaux *et al.*, 1983; Ladero Alvarez, 1987; Rivas-Martinez and Costa, 1987; Asensi Marfil and Diez Garretas, 1987; Aparicio Martinez and Silvestre Domingo, 1987; Martinez Parras *et al.*, 1987)

35.4 **MEDITERRANEAN ANNUAL DEEP-SAND COMMUNITIES**

Malcolmietalia

Open, spring-blooming communities of annuals developed on deep sands of Iberia and very locally of southern France and Italy, with *Malcolmia lacera, M. ramosissima, Anthyllis hamosa, Maresia nana, Erodium laciniatum, E. cicutarium* ssp. *bipinnatum, Arenaria emarginata, Hymenostemma pseudoanthemis, Loeflingia baetica, L. spartea, L. tavaresiana, L. hispanica, Linaria donyana, L. pedunculata, Vulpia membranacea, Ononis variegata, O. baetica, O. cossoniana, O. subspicata, Coronilla repanda, Evax astericiflora, E. lusitanica, Leucojum trichophyllum*. Many are dunal and have been listed under 16.228.

(Aubert and Loisel, 1971; Diez *et al.*, 1975; Rivas-Martinez, 1977a; Rivas-Martinez *et al.*, 1980; Géhu *et al.*, 1984; Peinado Lorca *et al.*, 1984; Asensi Marfil and Diez Garretas, 1987; Alcaraz Ariza and Peinado Lorca, 1987)

35.5 **IBERIAN FESCUE-PLANTAIN SWARDS**

Corynephoro-Plantaginion radicatae

Open perennial formations colonizing arenaceous or skeletal, often unstable, siliceous soils of the supra-Mediterranean levels of Iberian mountains, rich in cushion-forming, rosette-leaved chamaephytes *(Jasione crispa* ssp. *sessiliflora, Plantago radicata, Scleranthus perennis)* and cespitose, rough perennial grasses *(Festuca costei, F. indigesta, F. summilusitana, Corynephorus canescens, Koeleria caudata* ssp. *crassipes)*. Various formations, characterized by, among others, *Hieracium castellanum, Leucanthemopsis pulverulenta, Dianthus merinoi, D. laricifolius, Armeria caballeroi, A. alliacea, Thymus serpylloides* ssp. *gadorensis, Teucrium aureum* are distributed in the Cantabrian range, the southern Galician

and Leonese mountains, the Iberian Range, the Cordillera Central, the Montes de Toledo, the Sierra Nevada.
(Rivas-Martinez, Diaz *et al.*, 1984; Penas and Diaz-Gonzalez, 1985; Navarro Andres and Valle Gutierrez, 1987; Martinez Parras and Peinado Lorca, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987; Martinez Parras *et al.*, 1987)

35.6 IBERIAN TALL FESCUE GRASSLANDS

Festucion elegantis

Perennial grasslands dominated by the tall cespitose *Festuca elegans* of the supra-Mediterranean *Quercus pyrenaica* level of the Cordillera Central and Sierra Nevada with, among others, *Geum heterocarpum, Trifolium ochroleucon* and *Paeonia coriacea* of deep, siliceous soils.
(Rivas-Martinez *et al.*, 1987; Martinez Parras *et al.*, 1987; Martinez Parras and Peinado Lorca, 1987)

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35.7 MEDITERRANEO-MONTANE MAT-GRASS SWARDS

Nardus stricta-dominated grasslands and related communities of the supra-Mediterranean level of the mountains of the Mediterranean peninsulas, either developed on siliceous soils, or, rarely, on calcareous substrates.

35.71 IBERIAN MONTANE MAT-GRASS SWARDS

Campanulo-Nardion p.

Supra-Mediterranean acidophilous communities rich in *Nardus stricta* with an accompanying cortège similar to that of the Iberian subalpine *Campanulo-Nardion* (36.36), rather than to that of the Atlantic and sub-Atlantic *Violion caninae* (35.1), occurring in particular in the *Quercus pyrenaica* level of the Cordillera Central.
(Rivas-Martinez *et al.*, 1987)

35.72 SOUTHERN ITALIAN MAT-GRASS SWARDS AND RELATED COMMUNITIES

Ranunculo-Nardion p.

Closed, mesophile grasslands of depressions, flats and snow patches of the beech level of the southern Apennines, with *Luzula multiflora, L. pindica, Anthoxanthum odoratum, Festuca rubra, F. varia, F. violacea, Bellardiochloa* (*Poa*) *violacea, Alopecurus gerardii, Danthonia decumbens, Phleum alpinum, Carex leporina, Hypochoeris laevigata, Dianthus deltoides, Nardus stricta, Crocus vernus, Sedum atratum, Euphrasia minima, Ajuga tenorei, Potentilla neumanniana* var. *rigoana, P. argentea* var. *calabra, Ranunculus sartorianus, R. polyanthemos* ssp. *thomasii, Meum athamanticum, Asphodelus albus* var. *pollinensis, Plantago brutia, Pedicularis petiolaris, Omalotheca sylvatica, Cirsium vallis-demoni, Viola calcarata, Armeria majellensis*; they are widespread in the siliceous Sila range and also occur on deep decalcified soils of the piani of the calcareous Pollino range.
(Bonin, 1972)

35.73 BALKANIC MONTANE MAT-GRASSLANDS

Closed *Nardus stricta*-dominated grasslands of the *Fagion moesiacum* zone of the Balkan peninsula.
(Horvat *et al.*, 1974)

36 Alpine and subalpine grasslands

Grasslands of the alpine and subalpine levels of the Alps, Pyrenees, Cantabrian range, Jura, Central Massif and northern Apennines, with very fragmentary outposts in the great Hercynian ranges of middle Europe, Bayerischer Wald, Harz, Black Forest, Erz-Riesengebirge and in the Caledonian system of Britain; grasslands of the oro- and cryoro-Mediterranean levels (*sensu* Peinado Lorca and Rivas-Martinez, 1987) or of the alti-Mediterranean level (*sensu* Ozenda, 1975, 1985) of the Iberian mountains, of the Apennines and of the Greek ranges.

36.1 **SNOW-PATCH COMMUNITIES**

Salicetea herbaceae

Vegetation of areas that retain late-lying snow. These formations are mostly characteristic of the alpine level of the Alps and Pyrenees; they extend to the Macedonian mountains and are represented by relict outposts in the Sierra Nevada, the Cordillera Central, the Monti Sibillini and Abruzzi; they occur locally in the Scottish Highlands.

(Braun-Blanquet, 1954, 1975a; Rivas-Martinez, 1963, 1975c; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Ozenda, 1975; Ratcliffe, 1980; Pignatti, 1982; Dupias, 1985; Martinez Parras *et al.*, 1987; Noirfalise, 1987; Oberdorfer, 1990; Jonglet, *in litt.*, 1990; Hill, *in litt.*, 1990)

36.11 ACID SNOW-PATCH COMMUNITIES

Salicetalia herbaceae

Snow-patch communities of acid soils.

36.111 **Alpine acid snow-patch communities**

Salicion herbaceae

Acid snow-patch communities of the Alps, the Pyrenees and high mountains of the Mediterranean peninsulas, with *Salix herbacea, Soldanella pusilla, Sibbaldia procumbens, Omalotheca (Gnaphalium) supina, Luzula alpino-pilosa, Cerastium cerastoides* and mosses.

36.1111 **Alpine acid moss snow-patch communities**

Polytrichetum sexangularis, Polytrichetum norvegici

Moss snow-patches of the Alps and Pyrenees, occupying areas free from snow for less than two months, with the mosses *Polytrichum sexangularis, P. juniperinum, Pohlia commutata, Kiaeria falcata (Dicranum falcatum),* the liverwort *Anthelia juratzkana* or sometimes lichens.

36.1112 **Alpine acid dwarf willow snow-patch communities**

Salicetum herbaceae, Anthelio-Salicetum herbaceae

Dwarf willow *(Salix herbacea)* snow-patches of the Alps and Pyrenees, occupying areas covered by snow for eight to ten months.

36.1113 **Alpine acid *Carex-Gnaphalium* snow-patch communities**

Caricetum foetidae, Alopecuro-Caricetum foetideae, Cardamino alpinae-Gnaphalietum supini, Cerastio-Mniobryetum, Gnaphalio-Sedetum candollei, Sedo-Gnaphalietum pusilli, Omalotheco pusillae-Lepidietum stylati i.a.

Communities of areas covered by snow for six to eight months, with *Carex foetida* (western Alps), *Alopecurus gerardii, Omalotheca (Gnaphalium) supina* (including *O. supina* var. *pusilla), Lepidium stylatum, Alchemilla pentaphylla, Sedum candollei (Mucizonia sedoides, Umbellicus sedoides), S. alpestre, Cardamine alpina, Carex pyrenaica*; they extend to the subalpine level and include the isolated cryoro-Mediterranean formations of the Cordillera Central and the Sierra Nevada.

36.112 **Boreo-alpine snow-patch communities**

Snow-patches of the high altitudes of the central and eastern Highlands of Scotland.

36.1121 **Highland moss snow-patch communities**
Moss snow-patches of the Scottish Highlands, formed of mats of mosses and lichens, with, in particular, *Polytrichum sexangularis, Kiaeria (Dicranum) starkei, K. falcatum.*

36.1122 **Highland dwarf willow snow-patch communities**
Moss and dwarf willow snow-patches of the Scottish Highlands, with *Salix herbacea, Saxifraga stellaris, Silene acaulis, Omalotheca supina, Luzula spicata* and mosses *Rhacomitrium heterostictum, R. fasciculare, Gymnomitrium concinnatum, Polytrichum norvegicum, Oligotrichum hercynicum, Nardia scalaris.*

36.1123 **Highland *Rhytidiadelphus-Deschampsia* snow-patch communities**
Rhytidiadelphus loreus-Deschampsia cespitosa snow-patches of the western central Highlands with *Rhytidiadelphus loreus, R. squarrosus, R. triquetrus, Deschampsia caespitosa, Anthoxanthum odoratum, Carex bigelowii, Galium saxatile, Alchemilla alpina.*

36.1124 **Highland *Silene-Festuca* snow-patch communities**
Species-rich *Silene-Festuca* snow-patch turf forming at the foot of cliffs in the central and eastern Highlands, with *Silene acaulis, Alchemilla alpina, Sibbaldia procumbens, Minuartia (Cherleria) sedoides, Cerastium alpinum, Festuca ovina, Anthoxanthum odoratum, Agrostis canina, A. capillaris.*

36.1125 **Highland fern snow-patch communities**
Fern snow-patch communities forming on screes with prolonged snow cover in the central and eastern Highlands, with *Cryptogramma crispa, Athyrium distentifolium (A. alpestre), Dryopteris oreades (D. abbreviata), D. expansa (D. assimilis), Galium saxatile, Barbilophozia floerkii, Polytrichum alpinum.*

36.12 CALCAREOUS SNOW-PATCH COMMUNITIES
Arabidetalia caeruleae: Arabidion caeruleae
Snow-patch communitites of calcareous soils with *Salix reticulata, S. retusa, Arabis caerulea, Carex atrata, Ranunculus alpestris, Saxifraga androsacea.*

36.121 **Calcareous *Arabis-Gnaphalium* snow-patch communities**
Arabidetum caeruleae, Potentillo-Gnaphalietum hoppeanae
Herbaceous snow-patch swards of humid, carbonated soils under snow for long periods, with *Ranunculus alpestris, Arabis caerulea, Omalotheca (Gnaphalium) hoppeana, Hutchinsia alpina, Potentilla brauniana (P. minima), Soldanella alpina.*

36.122 **Calcareous espalier willow snow-patch communities**
Salicetum retuso-reticulatae
Espalier willow communities of calcareous stone fields with the net-leaved willow, *Salix reticulata*, and the retuse-leaved willow, *Salix retusa*, and *Gentiana bavarica.*

36.2 **ALPINE WEATHERED ROCK AND OUTCROP COMMUNITIES**
Sedo-Scleranthion, Sedion pyrenaici p.
Stonecrop and houseleak communities colonizing both calcareous and siliceous rocky outcrops of the subalpine and alpine levels of higher mountains.
(Braun-Blanquet, 1955a; Rivas-Martinez, Diaz *et al.*, 1984; Ellenberg, 1988; Oberdorfer, 1990)

36.3 **ALPINE AND SUBALPINE ACIDOPHILOUS GRASSLANDS**
Caricetea curvulae
Alpine and subalpine grasslands developed over crystalline rocks and other lime-deficient substrates or on decalcified soils of the calcareous ranges, with *Armeria alpina, Armeria montana, Euphrasia minima, Gentiana alpina, Geum montanum, Juncus trifidus, Lychnis alpina, Pedicularis pyrenaica, Phyteuma hemisphaericum, Pulsatilla alpina* ssp. *sulfurea, Ranunculus pyrenaicus, Sempervivum montanum, Botrychium lunaria.*
(Ellenberg, 1963; Guinochet and Vilmorin, 1973; Ozenda, 1985; Jonglet, *in litt.*, 1990)

36.31 MAT-GRASS SWARDS AND RELATED COMMUNITIES

Nardion

Closed grasslands of deep, acid soils of the Alps, Pyrenees, northern Apennines, Jura and higher Hercynian ranges, developed mostly and abundantly in the subalpine level, dominated or co-dominated by *Nardus stricta, Festuca eskia, F. nigrescens, F. rubra, Alopecurus gerardii, Bellardiochloa (Poa) violacea, Carex sempervirens, Anthoxanthum odoratum.*
(Braun-Blanquet, 1953, 1954, 1969a; Ellenberg, 1963, 1988; Archiloque *et al.*, 1969; Berset, 1969; Guinochet and Vilmorin, 1973; Gruber, 1978; Ochsenbein, 1984; Dupias, 1985; Ozenda, 1985; Bolos y Capdevila, 1987; Vigo and Ninot, 1987; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.311 Pyreneo-Alpine mesophile mat-grasslands

Nardetum alpigenum = Geo montani-Nardetum, Aveno versicoloris-Nardetum, Leontodonto-Alchemilletum alpinae, Nardo strictae-Polygaletum cerpyllaceae, Alchemillo flabellatae-Nardetum strictae i.a.

Subalpine and lower alpine mesophile grasslands dominated by, or rich in, *Nardus stricta*, of the Alps, the Pyrenees and, very locally, the Central Massif, the Jura and the northern Apennines; for the most part, they are heavily grazed grasslands with much reduced species diversity and overwhelming dominance of mat-grass.

36.312 Pyreneo-Alpine hygrophile mat-grass swards

Selino pyrenaei-Nardetum strictae, Ranunculo pyrenaei-Nardetum strictae p., Nardetum alpigenum p.

Subalpine and alpine hygro-mesophile, chionophilous mat-grass swards of depressions and humid flats around lakes and marshes, where snow melts slowly.

36.313 Pyreneo-Alpine hygrophile foxtail swards

Trifolio alpini-Alopecuretum gerardii, Ranunculo pyrenaicae-Alopecuretum gerardii p.

Subalpine and alpine hygro-mesophile, chionophilous grasslands of depressions with prolonged snow cover dominated by *Alopecurus gerardii* and *Trifolium alpinum*; they constitute a transition between siliceous grasslands and snowpatch communities, which they often ring.

36.314 Pyrenean closed *Festuca eskia* grasslands

Subalpine and lower alpine closed mesophile *Festuca eskia* grasslands of north-facing slopes (ubacs) and depressions in the Pyrenees with *Arnica montana, Ranunculus pyrenaeus, Selinum pyrenaeum, Trifolium alpinum, Campanula barbata, Gentiana punctata, Leucorchis albida, Phyteuma betonicifolium.*

36.315 Pyrenean *Poa violacea* swards

Subalpine *Bellardiochloa (Poa) violacea*-dominated grasslands of the Pyrenees.

36.316 Hercynian summital mat-grass swards

Summital mat-grass swards of the greater Hercynian ranges.

36.3161 Hautes Chaumes summital mat-grass swards

Violo-Nardetum

Formations of the Hautes Chaumes (high Vosges), with *Gentiana lutea, Arnica montana, Pulsatilla alba, Viola lutea* ssp. *elegans, Selinum pyrenaeum, Leontodon pyrenaicus, Hieracium vogesiacum, H. olivaceum, H. alpinum* and abundant ericoid shrubs, *Erica tetralix, Vaccinium myrtillus, V. vitis-idaea.*

36.3162 Black Forest summital mat-grass swards

Leontodonto helvetici-Nardetum

Formations of the Black Forest.

36.3163 Harz summital mat-grass swards

Pulsatillo micranthae-Nardetum

Formations of the Harz.

36.3164 Bayerischer Wald summital mat-grass swards

Lycopodio-Nardetum

Formations of the Bayerischer Wald.

36.32 ORO-CALEDONIAN GRASSLANDS
Boreo-alpine formations of the higher summits of Scotland, Cumbria, northern England and northern Wales with *Juncus trifidus, Carex bigelowii*, mosses and lichens.
(Ratcliffe, 1977, 1980; Noirfalise, 1986, 1987; Hill, *in litt.*, 1990)

36.321 **Oro-Caledonian *Carex bigelowii* communities**
High-altitude formations dominated by *Carex bigelowii.* with *Dicranum fuscescens, Polytrichum alpinum, Cladonia uncialis, C. arbuscula, Galium saxatile* of the central and eastern highlands, with outliers in the northern Highlands and Cumbria (Cross Fell).

36.322 **Oro-Caledonian *Rhacomitrium* carpets**
Summital carpets of *Rhacomitrium lanuginosum* with *Carex bigelowii, Galium saxatile, Vaccinium myrtillus, Deschampsia flexuosa, Cladonia uncialis*, of Scotland, northern England and northern Wales.

36.3221 **Species-poor *Rhacomitrium* carpets**
Species-poor, nearly continuous carpets of *Rhacomitrium lanuginosum* characteristic of the Scottish Highlands, with outposts in the southern Uplands, northern England and northern Wales.

36.3222 **Grassy *Rhacomitrium* carpets**
Formations richer in grasses (*Festuca ovina, F. vivipara* and *Deschampsia flexuosa*) and with less *Rhacomitrium lanuginosum* of the southern Uplands, northern England and northern Wales.

36.3223 **Cushion-herb *Rhacomitrium* carpets**
Species-rich formations of the north-west Highlands, with cushion herbs including *Armeria maritima, Silene acaulis* and *Minuartia sedoides*, and sometimes with *Polygonum viviparum, Rhytidiadelphus loreus, Aulacomnium turgidum.*

36.323 **Highland *Juncus trifidus* formations**
Communities of the Scottish Highlands, limited to granitic summital plateaux, summit block detritus, steep block screes, summit ridges and very open ablation areas within *Rhacomitrium-Carex bigelowii* formations, with *Juncus trifidus, Rhacomitrium lanuginosum, Cetraria islandica, Cladonia sylvatica, C. uncialis, C. gracilis, C. arbuscula, Salix herbacea, Deschampsia flexuosa, Alchemilla alpina* and sometimes ericoid shrubs.

36.324 **Boreo-alpine mat-grass swards**
Nardus stricta communities developed in areas of prolonged snow cover in Scotland, Cumbria, the northern Pennines and north Wales, with *Carex bigelowii, Cetraria islandica, Rhacomitrium lanuginosum, Rhytidiadelphus loreus, Galium saxatile, Alchemilla alpina, Empetrum hermaphroditum.*

36.33 SUBALPINE THERMOPHILE SILICEOUS GRASSLANDS
Festucion variae, Festucion eskiae, Poion violaceae, Festucion spadiceae
Subalpine thermophile formations on often skeletal soils of the southern Alps, the Pyrenees and, very locally, the Central Massif and the Apennines.
(Braun-Blanquet, 1954, 1972; Ellenberg, 1963, 1988; Gruber, 1978; Dupias, 1985; Ozenda, 1981, 1985; Jonglet, *in litt.*, 1990; Salomez, *in litt.*, 1990)

36.331 ***Festuca paniculata* swards**
Festucion spadiceae: Festucetum spadiceae, Centaureo uniflorae-Festucetum spadiceae, Irido-Festucetum spadiceae, Scorzonero-Festucetum spadiceae, Hieracio-Festucetum spadiceae
Thermophile, luxuriant, relatively closed grasslands formed by the very tall, blue-grey *Festuca paniculata (F. spadicea)* on south-facing slopes (adrets) of the upper montane and lower subalpine levels of the Pyrenees, the southern Alps and, locally, the Central Massif and the Abruzzi; characteristic and often abundant accompanying species include *Centaurea uniflora, Silene nutans, Trifolium montanum, Hieracium peleterianum, Hypochoeris maculata, Potentilla grandiflora, Lilium martagon, Eryngium alpinum, Luzula pediformis, Meum athamanticum, Nigritella nigra, Helictotrichon parlatorei, Asphodelus albus, Iris xiphioides, Paradisea liliastrum, Dianthus monspessulanus, Carduus defloratus.* Many have been traditionally treated as hay meadows and are of extraordinary floristic richness; they are nowadays increasingly abandoned or left to grazing.

36.3311 **Xerophile rocky slope *Festuca paniculata* swards**
More xero-thermophile formations on siliceous, rocky soils of steep, warm slopes of the south-western Alps, Pyrenees, Central Massif and Abruzzi.

36.3312 **Mesophile deep soil *Festuca paniculata* swards**
More mesophile, dense formations on deep soils of gentler slopes, often over calcareous substrates with decalcified, slightly acid, topsoil; they are mostly characteristic of the south-western Alps with representation in the Pyrenees.

36.332 ***Festuca eskia* garland-grasslands**
Festucion eskiae
Open, thermophile, stripped grasslands organized in ribbons retaining stony, almost bare steps on the adrets of the upper subalpine and lower alpine zones in the Pyrenees, formed by the hard, sharp-pointed, slippery, bright green, tufted *Festuca eskia*, sometimes associated with *Carex sempervirens s.l.*

36.333 **Varicoloured fescue garland-grasslands**
Festucion variae: Festucetum variae, Festuco-Potentilletum valderiae
Open, thermophile, stripped grasslands of the adrets of the (mostly) southern Alps and Central Massif, formed by calcifuge species of the hard, sharp-pointed *Festuca varia* group (*F. varia, F. scabriculmis*), often associated with *Carex sempervirens s.l.*

36.34 CROOKED-SEDGE SWARDS AND RELATED COMMUNITIES
Caricion curvulae, Festucion supinae
Mostly closed *Carex curvula, Festuca spp., Oreochloa spp.* or *Juncus trifidus* grasslands on siliceous soils of the alpine level of the Alps and the Pyrenees, with very local outposts in the great Hercynian ranges and the Cantabrian Range. *Androsace obtusifolia, A. carnea* ssp. *laggeri, Campanula barbata, Juncus jacquinii, J. trifidus, Silene exscapa, Gentiana alpina, Achillea erba-rotta, Euphrasia minima, Luzula lutea, L. spicata, L. hispanica, Lychnis alpina, Minuartia recurva, M. sedoides, Pedicularis kerneri, P. pyrenaica, Phyteuma globulariifolium, Ph. hemisphaericum, Potentilla frigida, Armeria alpina, Senecio incanus, Trifolium alpinum, Veronica bellidioides, Ranunculus pyrenaicus* are characteristic.
(Braun-Blanquet, 1954, 1969a; Ellenberg, 1963, 1988; Gruber, 1978; Ozenda, 1981, 1985; Rivas-Martinez, Diaz *et al.*, 1984; Dupias, 1985; Vigo and Ninot, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.341 ***Carex curvula* grasslands**
Caricion curvulae: Caricetum curvulae, Primulo-Caricetum curvulae; Festucion supinae: Gentiano-Caricetum curvulae, Curvulo-Leontodetum pyrenaici
Formations of the upper and middle alpine levels of the Alps, of the upper alpine level of the eastern Pyrenees and of the alpine level of the central and western Pyrenees, to which the dominance of the crooked sedge, *Carex curvula*, with twisted leaves withering early at the tip, gives a highly distinctive texture and yellow-brown hue.

36.342 ***Festuca halleri* grasslands**
Caricion curvulae: Festucetum halleri
Formations of flats and gentle slopes of the lower alpine level of the Alps dominated by *Festuca halleri* and *Juncus trifidus,* particularly widespread in the south-western Alps.

36.343 ***Festuca airoides* grasslands**
Festucion supinae: Pumilieto-Festucetum supinae, Luzulo-Festucetum supinae
Low, fairly dry swards of the alpine zone of the eastern Pyrenees dominated by *Festuca airoides (F. supina), with Carex ericetorum, Avenula versicolor, Silene ciliata, Lychnis alpina, Arenaria grandiflora, Jasione humilis, Hieracium breviscapum (H. pumilum).*

36.344 ***Festuca borderi* swards**
Sub-nival formations of the Pyrenees with *Potentilla frigida, Erigeron uniflorus, Carex rupestris* and many cushion plants such as *Saxifraga bryoides, S. oppositifolia, Minuartia sedoides, Silene acaulis.*

36.345 **Allgau *Oreochloa disticha* swards**
Oreochloa disticha-dominated formations, developed in particular in the northern Alps (Allgau).

36.346 **Bayerischer Wald *Juncus trifidus* swards**
Formations of the Bayerischer Wald dominated by *Juncus trifidus*.

36.347 **Cantabrian *Oreochloa blanka* swards**
Festucion supinae: Junco trifidi-Oreochloetum blankae
Oreochloa blanka and *Juncus trifidus* formations of the alpine level of the Cantabrian Range.

36.35 CLOSED GRASSLANDS OF GREEK MOUNTAINS
Trifolion parnassi
Dense, closed, usually unsculptured, chionophilous grasslands of acid and often deep soils over siliceous or calcareous substrates of the higher Greek mountains; they develop on decalcified colluvions, on damp soils of seeps or poorly drained areas, and in depressions and other situations where snow lingers. Characteristic are *Alopecurus gerardii, Poa pumila, Anthoxanthum alpinum, Phleum alpinum, Nardus stricta, Bellardiochloa (Poa) violacea, Trisetum flavescens, Trifolium pallescens, T. parnassi, T. heldreichianum, T. alpestre, T. ottonis, Omalotheca supina, O. hoppeana, Herniaria parnassica, Ranunculus sartorianus, Lotus corniculatus, Thesium parnassi, Plantago lanceolata, P. atrata, P. holostea, Scleranthus perennis, Rorippa thracica, Erigeron epiroticus, Acinos alpinus, Luzula pindica, Crocus veluchensis, Scilla nivalis, Corydalis densiflora, C. parnassica, Beta nana, Trinia guicciardii, Botrychium lunaria.*
(Horvat *et al.*, 1974; Strid, 1980)

36.351 **Greek mat-grass swards**
Nardus stricta-dominated formations mostly occupying humid ground in the high ranges of, in particular, the Peloponnese, the central and northern Pindus and locally the southern Pindus.

36.352 **Greek *Poa violacea* swards**
Bellardiochloa violacea-dominated formations usually occupying slightly more basic soils, found, in particular, in the Pindus, on Olympus and in the Vermion.

36.353 **Greek foxtail swards**
Alopecurus gerardii-dominated formations mostly of areas of prolonged snow cover on Olympus, Taiyetos, Killini, Parnassus, and in the central and northern Pindus.

36.354 **Giona *Trisetum-Poa* swards**
Formations of Giona with *Trifolium heldreichianum, T. alpestre, T. parnassi, Plantago lanceolata* var. *capitata, Poa pratensis, Anthoxanthum odoratum, Phleum pratense, Trisetum flavescens.*

36.36 ACIDOPHILOUS GRASSLANDS OF HIGH IBERIAN MOUNTAINS
Nardetalia p., Festucetalia indigestae
Cryoro- and oro-Mediterranean grasslands of acid substrates in the higher mountain ranges of the Iberian peninsula.
(Tüxen and Oberdorfer, 1958; Duvigneaud and Delvosalle, 1962; Rivas-Martinez, 1963; Fernandez Casas, 1974; Gruber, 1978; Rivas-Martinez, Diaz *et al.*, 1984; Peinado Lorca and Rivas-Martinez, 1987; Martinez Parras *et al.*, 1987)

36.361 **Oro-Iberian acidophilous stripped grasslands**
Festucetalia indigestae
Thermophile, open, stripped and garland fescue grasslands of siliceous upper slopes and summits of the high Mediterranean mountains of the Iberian peninsula, locally extending into the Euro-Siberian domain in the subalpine level of the Cantabrian mountains.

36.3611 **Cantabrian acidophilous stripped grasslands**
Teesdaliopsio confertae-Festucetum indigestae, Teesdaliopsio confertae-Festucetum eskiae
Festuca indigesta and *Festuca eskia* grasslands of the oro- and cryoro-Mediterranean and subalpine levels of the Cantabrian mountains and other high mountains of the north-west.

36

36.3612 **Iberian Range acidophilous stripped grasslands**
Antennario dioicae-Festucetum indigestae
Festuca indigesta grasslands of the oro- and cryoro-Mediterranean levels of the Iberian Range.

36.3613 **Cordilleran *Festuca* stripped grasslands**
Hieracio castellanae-Festucetum indigestae, Hieracio myriadeni-Festucetum indigestae, Arenario querioidis-Festucetum summilusitanae
Festuca indigesta and *Festuca summilusitana* grasslands of the oro- and cryoro-Mediterranean levels of the Cordillera Central.

36.3614 **Cordilleran *Agrostis* stripped grasslands**
Agrostio rupestris-Armerietum bigerrensis
Agrostis rupestris grasslands of the cryoro-Mediterranean level of the Cordillera Central.

36.3615 **Nevadan *Festuca indigesta* stripped grasslands**
Arenario granatensis-Festucetum indigestae
Psychro-xerophile garland grasslands of *Festuca indigesta, Thymus serpylloides*, and *Arenaria tetraquetra* var. *granatensis*, widespread in the oro-Mediterranean level (2 000-2 900 m) of the Sierra Nevada.

36.3616 **Nevadan *Agrostis* stripped grasslands**
Armerio splendentis-Agrostietum nevadensis
Chionophilous grasslands with *Agrostis nevadensis* and *Armeria splendens* of depressions and sheltered areas within the oro-Mediterranean level of the Sierra Nevada, often in contact with, and forming a transition to, the closed mat-grass swards of 36.362.

36.3617 **Nevadan tall fescue stripped grasslands**
Festucetum spadiceo-pseudeskiae
Pioneer grasslands formed by the robust *Festuca pseudeskia* and *F. paniculata* on steep slopes submitted to intense insolation and severe erosion of the oro-Mediterranean and locally cryoro-Mediterranean levels of the Sierra Nevada.

36.3618 **Nevadan *Festuca clementei* stripped grasslands**
Erigeronto frigidi-Festucetum clementei
Psychro-xerophile grasslands of the cryoro-Mediterranean level (above 2 900 m) of the Sierra Nevada, formed by *Festuca clementei, Erigeron frigidus, Artemisia granatensis, Ptilotrichum purpureum, Papaver lapeyrousianum*, all, except the last, Sierra Nevada endemics.

36.3619 **Nevadan *Trisetum* stripped grasslands**
Galio pyrenaici-Trisetetum glacialis
Communities of wind-beaten crests of the Sierra Nevada, with *Trisetum glaciale* and *Galium pyrenaicum*.

36.362 **Oro-Iberian mat-grass swards**
Nardetalia strictae p. (Udo-Nardetalia): Campanulo-Nardion, Plataginion nivalis
Nardus-dominated and related, closed, dense grasslands of oro- and cryoro-Mediterranean levels of high Iberian mountains, characteristic of seeps, poorly drained soils and areas with prolonged snow cover.

36.3621 **Cantabrio-Cordilleran oro-Mediterranean mat-grass swards**
(Campanulo-Nardion p., Poo legionensis-Nardetum, Campanulo herminii-Trifolietum alpini, Luzulo carpetanae-Juncetum squarosi, Campanulo herminii-Festucetum ibericae, Campanulo herminii-Nardetum strictae
Hygrophile and chionophile, closed grasslands of the oro- and cryoro- Mediterranean levels of the Cordillera Central and of the high Orensano-Sanabrian mountains, and of the subalpine level of the Cantabrian mountains, with *Nardus stricta, Festuca iberica, Juncus squarrosus, Luzula campestris* ssp. *carpetana, Campanula herminii*.

36.3622 **Nevadan borreguiles**
Plantaginion nivalis: Nardo strictae-Festucetum ibericae, Ranunculo acetosellifolii-Vaccinietum uliginosi
Dense hygrophilous grasslands occupying humid flats around lakes, gullies, glacial basins, depressions at the oro- and cryoro-Mediterranean levels of the Sierra Nevada, with *Nardus stricta, Festuca hispanica, Agrostis nevadensis, Plantago nivalis, Carex intricata, Ranunculus acetosellifolius, Vaccinium uliginosum, Lotus glareosus, Leontodon microcephalus, Galium nevadense, Gentiana boryi, Meum nevadense, Jasione crispa* ssp. *amethystina*, many of which Sierra Nevada endemics.

36.37 GRASSLANDS OF HIGH CORSICAN MOUNTAINS
Grasslands of the subalpine (oro-Mediterranean) and alpine levels of the highest mountains of Corsica.
(Lambinon *et al.*, 1978; Gamisans, 1985)

36.371 **Corsican oro-Mediterranean stripped grasslands**
Stripped grasslands of adrets of the oro-Mediterranean level of Corsican mountains with *Plantago subulata* ssp. *insularis, Sagina pilifera, Armeria multiceps, Paronychia polygonifolia, Bellardiochloa violacea, Festuca indigesta*, associated with hedgehog-heaths (31.75).

36.372 **Corsican pozzine mat-grasslands**
Nardus stricta grasslands of the pozzines, wet depressions surrounding glacial lakes and basins, of the subalpine level of Corsican mountains.

36.373 **Corsican alpine adret grasslands**
Open grasslands of adrets and crests of the alpine level of high Corsican mountains with *Bellardiochloa violacea* and many endemics including *Erigeron paolii, Leucanthemopsis alpina* ssp. *tomentosa, Draba loiseleurii, Acinos corsicus, Myosotis corsicana.*

36.374 **Corsican alpine ubac grasslands**
Dense grasslands of ubacs of the alpine level of high Corsican mountains with *Phleum brachystachyum, Geum montanum, Sibbaldia procumbens, Veronica alpina.*

36.38 CLOSED GRASSLANDS OF THE HIGH APENNINES
Mesophile, closed, short turfs of the subalpine and alpine levels of the southern and central Apennines, developed locally above treeline, on both calcareous and siliceous substrates.
(Bonin, 1972; Pignatti, 1982; Ozenda, 1985; Rossi *et al.*, 1987)

36.381 **Subalpine southern Italian mat-grass swards**
Ranunculo-Nardion p.
Subalpine representative of the montane southern Italian mat-grass swards of 35.72, characteristic of karstic depressions at the highest altitudes of Pollino.

36.382 **Central Apennine closed grasslands**
Dense, closed, unsculptured, hygrophilous or chionophilous turfs of often deep soils over siliceous or calcareous substrates of the subalpine and alpine levels (mostly 1 800 to 2 100 m) of the central Apennines; they develop on colluvions, on damp soils of seeps or poorly drained areas, on moisture-retaining slopes and in depressions and other situations where snow lingers. Characteristic species include *Nardus stricta, Festuca violacea* ssp. *macrathera, Bellardiochloa (Poa) violacea, Phleum alpinum, Poa alpina, Luzula bulgarica, Carex laevis, Ranunculus montanus, R. oreophilus, Viola eugeniae, Dianthus deltoides, Potentilla crantzii, P. aurea, Geum montanum, Trifolium thalii, Anthyllis vulneraria* ssp. *vulnerarioides s.l., Crepis aurea, Plantago montana, P. serpentina, Erigeron uniflorus, E. epiroticus, Alchemilla colorata, Hieracium auricula, Armeria majellensis, Minuartia verna, Galium pumilum, Campanula scheuchzeri, Gentiana verna, G. nivalis, G. campestris* var. *neapolitana, G. lutea, Saxifraga adscendens, Omalotheca hoppeana, Euphrasia salisburgensis, Vaccinium myrtillus, Nigritella widderi, Coeloglossum viride, Botrychium lunaria.* Closed grasslands occur over both siliceous and calcareous substrates; on the latter their formation is usually accompanied by a decalcification of the topsoil linked to the hygric conditions necessary for their existence, and they may evolve into *Vaccinium myrtillus* dwarf heaths (31.4A). Thus, formations on siliceous and calcareous terrain are physiognomically similar, share many species and often grade into each other. *Nardus stricta* is present and often dominant in the more acidophilous variants, *Festuca violacea* ssp. *macrathera* and

Trifolium thalii in the more basiphilous ones. All may be conveniently referred here, though clearly calcicolous extremes may also, by analogy with similar Alpine formations, be listed under 36.41, as unit 36.4143.

36.4 ALPINE AND SUBALPINE CALCIPHILOUS GRASSLANDS

Elyno-Seslerietea

Alpine and subalpine grasslands of base-rich soils with *Dryas octopetala, Gentiana nivalis, G. campestris, Alchemilla hoppeana, A. conjuncta, A. flabellata, Anthyllis vulneraria, Astragalus alpinus, Aster alpinus, Draba aizoides, Globularia nudicaulis, Helianthemum nummularium* ssp. *grandiflorum, H. alpestre, Pulsatilla alpina* ssp. *alpina, Phyteuma orbiculare, Astrantia major, Polygala alpestris.*

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Ozenda, 1985; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.41 RUSTY SEDGE MEADOWS AND RELATED COMMUNITIES

Caricion ferrugineae, Primulion intricatae, Laserpitio-Ranunculion thorae, Caricion austroalpinae, Armerion cantabricae

Mesophile, mostly closed, vigorous, often grazed or mowed, grasslands on deep soils of the subalpine and lower alpine levels of the Alps, the Pyrenees and, locally, of the Apennines and the Jura.

(Braun-Blanquet, 1954, 1969a; Sutter, 1967; Berset, 1969; Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Delvosalle, 1977; Gruber, 1978; Ozenda, 1981, 1985; Barbero *et al.*, 1982; Rivas-Martinez *et al.*, 1984; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Vigo and Ninot, 1987; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.411 Mesophile evergreen sedge grasslands

Primulion intricatae p., Laserpitio-Ranunculion thorae

Mesophile grasslands of the south-western Alps and the Pyrenees, occupying gentle ubac slopes and humid flats on deep, often slightly acid, soils over calcareous substrates, with *Sesleria albicans, Carex sempervirens, Helictotrichon montanum, Arenaria ciliata, Draba aizoides, Globularia nana, Geranium cinereum, Ranunculus gouani, R. thora, Primula elatior* ssp. *intricata, Oxytropis triflora, Trifolium thalii, Anthyllis vulneraria* ssp. *pyrenaica, Alchemilla plicatula (A. asterophylla), Adonis pyrenaica, Horminium pyrenaicum, Geum pyrenaicum, Bartsia spicata, B. alpina, Scabiosa cinerea, Leuzea centauroides (Rhaponticum cynaroides), Fritillaria delphinensis, F. burnati, Crocus vernus, Bulbocodium vernum, Carex tendae, Salix pyrenaica.*

36.4111 Alpine evergreen sedge grasslands

36.4112 Pyrenean evergreen sedge grasslands

36.412 Northern rusty sedge grasslands

Caricion ferrugineae

Mesophile, often flower-rich grasslands of the northern Alps, occupying deep soils in the subalpine and lower alpine levels of the calcareous ranges, usually dominated by *Carex ferruginea* and with *Astragalus alpinus, A. frigidus, Hedysarum hedysaroides, Lathyrus laevigatus, Astrantia major, Centaurea montana, Anemone narcissiflora, Crepis pyrenaica, C. pontana, Pedicularis foliosa, Traunsteinera globosa, Phleum hirsutum, Agrostis agrostiflora.*

36.413 Southern rusty sedge grasslands

Caricion austroalpinae

Mesophile, flower-rich grasslands of the subalpine and lower alpine levels of the southeastern outer Alps (Insubria, Garda, Dolomites), usually dominated by *Carex ferruginea, C. austroalpina* or *C. sempervirens* with, in particular, *Horminium pyrenaicum, Pedicularis gyroflexa, P. foliosa, Knautia transalpina, Astrantia major, Asphodelus albus, Traunsteinera globosa* and many composites and peas.

36.414 **Violet fescue swards and related communities**
Caricion ferrugineae p.: Festuco-Trifolietum thalii, Primulion intricatae p.: Festuco rubrae-Trifolietum thalii
Closed grasslands of the subalpine and lower alpine levels dominated by *Festuca violacea* or *F. nigrescens* and *Trifolium thalii*, developed on deep, often superficially slightly acidified, soils.

36.4141 **Alpine violet fescue swards**
Alpine formations with *Festuca violacea, Trifolium thalii, T. badium, Trollius europaeus, Linum alpinum, Anemone narcissiflora, Onobrychis montana, Lathyrus laevigatus, Oxytropis campestris, O. triflora, Pedicularis verticillata, Phyteuma orbiculata*; usually grazed, they tend, with increased fertilization, towards the pastures of the *Poion alpinae* (36.52).

36.4142 **Pyrenean blackish fescue swards**
Eastern Pyrenean formations with *Festuca nigrescens (F. rubra* ssp. *commutata*) and *Trifolium thalii*.

36.4143 **Apennine violet fescue swards**
Calciphilous extremes of the closed Apennine grasslands, dominated by *Festuca violacea* ssp. *macrathera* and *Trifolium thalii* (see 36.382).

36.415 **Cantabrian thrift swards**
Armerion cantabricae: Pediculari fallaci-Armerietum cantabricae
Chionophilous grasslands of deep soils, somewhat decalcified at the surface, of the subalpine, and locally of the alpine or upper montane, levels of the calcareous Cantabrian mountains, dominated by *Armeria cantabrica, Carex sempervirens, Festuca glacialis* or *F. gautieri*, associated with *Sesleria albicans, Poa alpina, P. minor, Festuca burnatii, Bellardiochloa violacea, Agrostis schleicheri,* and with *Anemone baldensis* ssp. *pavoniana, Aquilegia pyrenaica* ssp. *discolor, Jasione cavanillesii, Pedicularis pyrenaica* ssp. *fallax, Draba aizoides* ssp. *cantabriae, Pimpinella siifolia, Oxytropis pyrenaica, O. halleri.*

36.416 **Jura summital swards**
Caricion ferrugineae: Laserpitio-Calamagrostietum variae
Localized mesophile grasslands of the subalpine level of the French and Swabian Juras, with *Calamagrostis varia, Laserpitium siler, L. latifolium, Dryas octopetala, Eryngium alpinum,* and very locally, *Carex ferruginea.*

36.42 WIND EDGE NAKED-RUSH SWARDS
Oxytropo-Elynion
Meso-xerophile, relatively closed and unsculptured swards of *Elyna myosuroides* forming on deep, fine soils of protruding ridges and edges exposed to strong winds in the alpine and nival levels of the Alps, Pyrenees, Cantabrian mountains and, very locally, the Abruzzi, with *Oxytropis jacquinii (O. montana), O. pyrenaica, O. carinthiaca, O. foucaudii, O. halleri, Antennaria carpatica, Dryas octopetala, Draba carinthiaca, D. siliquosa, D. fladnizensis, D. aizoides, Gentiana tenella, Erigeron uniflorus, Dianthus glacialis, D. monspessulanus* ssp. *sternbergii, Potentilla nivea, Saussurea alpina, Geranium argenteum, Sesleria sphaerocephala, Carex atrata, C. brevicollis, C. foetida, C. capillaris, C. nigra* and *C. curvula* ssp. *rosae.*
(Braun-Blanquet, 1954, 1969a; Ellenberg, 1963, 1988; Braun-Blanquet, Trepp *et al.*, 1964; Sutter, 1969; Guinochet and Vilmorin, 1973; Gruber, 1978; Ozenda, 1981, 1985; Barbero *et al.*, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Dupias, 1985; Vigo and Ninot, 1987; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.421 **Alpine naked-rush swards**
Elynetum, Caricetum curvulae elynetosum
Brown swards of Alpine crests and ridges submitted to extreme winds.

36.422 **Pyrenean naked-rush swards**
Oxytropido halleri-Elynetum, Carici brevicollis-Elynetum, Carici rosae-Elynetum myosuroidis
Relatively extensive formations of the calcareous ranges of the Pyrenees, where the *Elyna-Oxytropis* swards represent the main grassland formation of the alpine level.

36.423 **Cantabrian naked-rush swards**
Oxytropido pyrenaicae-Elynetum myosuroidis
Uncommon formations of the high summits of the Picos de Europa.

36.424 **Apennine naked-rush swards**
Very local formations of the high crests of the Abruzzi.

36.43 STEPPED AND GARLAND GRASSLANDS
Seslerietalia albicantis, Astragaletalia sempervirentis p., Festuco-Poetalia ligulatae p., Seslerietalia juncifoliae, Daphno-Festucetalia p.
Xero-thermophile, open, sculptured, stepped or garland grasslands of the Alps, the Pyrenees and the Mediterranean mountains, with very local outposts in the Jura.
(Braun-Blanquet, 1954, 1969a; Ellenberg, 1963, 1988; Braun-Blanquet, Trepp *et al.*, 1964; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Gruber, 1978; Ozenda, 1981, 1985; Dupias, 1985; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.431 **Blue moorgrass-evergreen sedge slopes**
Seslerion albicantis p.
Xero-thermophile stepped or garland, species-rich grasslands of the alpine and subalpine levels of the northern and south-eastern Alps, and locally, of the Jura, on slopes with shallow soil and snow-cover of short duration, with *Sesleria albicans, Carex sempervirens, C. humilis, Gentiana favrati, Helianthemum alpestre, H. nummularium* ssp. *grandiflorum, Phyteuma orbiculare, Leontopodium alpinum, Pedicularis rostrato- capitata, P. verticillata, Anthyllis vulneraria* ssp. *alpestris, Ranunculus thora.*
(Braun-Blanquet, 1954, 1969a; Ellenberg, 1963, 1988; Braun-Blanquet, Trepp et al., 1964; Berset, 1969; Guinochet and Vilmorin, 1973; Delvosalle, 1977; Gruber, 1978; Ozenda, 1981, 1985; Oberdorfer, 1990; Jonglet, *in litt.*, 1990)

36.4311 **Alpine blue moorgrass-evergreen sedge swards**
Seslerio-Caricetum sempervirentis = Seslerio-Sempervirentum
Widespread calciphilous formations of the Alps.

36.4312 **Jura blue moorgrass-evergreen sedge swards**
Laserpitio-Seslerietum
Very local formations of the high Jura.

36.432 **Southern Alpine oatgrass-blue moorgrass swards**
Avenion montanae, Avenion sempervirentis, Ononidion cenisiae
Xero-thermophile, open, stepped or garland, species-rich grasslands of the alpine and subalpine levels of the southern Alps, and particularly of the south-western Alps, similar to those of the previous unit (36.431), but in which *Carex sempervirens* is less prominent, while various oats, *Helictotrichon (Avena) sedenense (H. montanum, A. montana), H. sempervirens, H. parlatorei, H. setaceum*, or *Festuca dimorpha* become important components together with *Sesleria albicans*, and oro-Mediterranean species such as *Globularia nana, Hedysarum hedysarioides, Lilium pomponium, Centaurea triumfetti, Ononis cristata (O. cenisia), O. striata, Iberis sempervirens, Aethionema ovalifolium, Sempervivum calcareum, Arenaria cinerea, Galeopsis reuteri, Leuzea rhapontica (Rhaponticum scariosum)* ssp. *bicknellii* and the spiny *Astragalus sempervirens* appear; several of these species are local endemics of very restricted distribution.
(Braun-Blanquet, 1954; Guinochet and Vilmorin, 1973; Gruber, 1978; Ozenda, 1981, 1985; Barbero *et al.*, 1982; Pignatti, 1982; Jonglet, *in litt.*, 1990)

36.433 **Cushion sedge carpets**
Seslerion caeruleae: Caricetum firmae (Firmetum)
Open formations of the alpine level of the south-eastern Alps, and, to a lesser extent, of the north-eastern Alps, composed of cushions of *Carex firma* and other low-growing rosette or cushion plants among which *Saxifraga caesia, Gentiana clusii, G. froelichii, G. terglouensis, Crepis jacquinii, Pedicularis rosea, Saussurea pygmaea, Dianthus monspessulanus* ssp. *sternbergii, Primula wulfeniana, Chamorchis alpina, Sesleria albicans, Carex mucronata*, sometimes in association with mats of *Dryas octopetala.*
(Ellenberg, 1963, 1988; Braun-Blanquet, 1954, 1969a; Ozenda, 1981, 1985; Oberdorfer, 1990; Jonglet *in litt.*, 1990)

36.434 **Pyrenean *Festuca gautieri* grasslands**
Festucion scopariae, Thymelaeion nivalis, Saponarion caespitosae
Open, xeric, stepped, scraped, species-rich grasslands of calcareous adrets in the subalpine and lower alpine levels of the Pyrenees, formed by the smooth, sharp-pointed, often curved-leaved *Festuca gautieri* ssp. *scoparia* and often rich in small cushiony plants; characteristic elements include *Koeleria vallesiana, Helictotrichon sedense (Avena montana), Sesleria albicans, Sideritis hyssopifolia, S. endressii, Helianthemum oelandicum* var. *hirtum, Androsace villosa, Gypsophila repens, Acinos alpinus, Paronychia serpyllifolia, Anthyllis vulneraria, Arenaria grandiflora, Astragalus sempervirens, A. monspessulanus, Eryngium bourgati, Fritillaria pyrenaica, Teucrium pyrenaicum, Erigeron pyrenaicus, Ononis cristata (O. cenisia), Onosma fastigiatum, Saponaria caespitosa, Jurinea humilis, Seseli nanum, Arenaria tetraquetra, Scorzonera aristata, Thymelaea nivalis, Iberis bernardiana, Serratula nudicaulis, Asperula cynanchica, Polygala alpina, Oxytropis pyrenaica, Carex rupestris.*
(Gruber, 1978; Dupias, 1985; Ozenda, 1985; Bolos y Capdevilla, 1987; Vigo and Ninot, 1987)

36.435 **Oro-Iberian calciphilous stripped grasslands**
Festuco-Poetalia ligulatae p.
Thermophile, open, stripped and garland fescue grasslands of calcareous upper slopes and summits in the subalpine and oro-Mediterranean levels of the Cantabrian mountains, the Iberian Range and the calcareous Baetic ranges, dominated by *Festuca hystrix, F. burnatii, Poa ligulata* or *Oreochloa confusa*. They are closely allied to the Iberian fescue frost-grasslands (34.73) of the supra-Mediterranean and montane levels of the same mountains.
(Rivas-Martinez, Diaz *et al.*, 1984; Martinez Parras *et al.*, 1987, Loidi Arregui, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Peinado Lorca and Martinez Parras, 1987)

36.436 **Apennine stripped grasslands**
Seslerietalia juncifoliae
Open, xerophile, stripped, stepped, scraped and garland grasslands of alpine and subalpine slopes and summits of the central and southern Apennines, dominated by *Sesleria tenuifolia (S. juncifolia), S. nitida, S. italica, Festuca dimorpha, Carex kitaibeliana (C. laevis).*
(Bonin, 1971, 1972; Biondi and Blasi, 1982; Pignatti, 1982; Biondi *et al.*, 1985; Ozenda, 1985)

36.437 **Greek stripped grasslands**
Daphno-Festucetalia p.
Open, scraped, stepped and garland grasslands of the alpine and subalpine levels of the calcareous mountains of Greece, dominated by *Sesleria korabensis, S. coerulans, Festuca graeca, Carex kitaibeliana, Stipa pulcherrima* with *Viola heterophylla* ssp. *graeca, Minuartia verna, Paronychia rechingeri, Silene ciliata, Dianthus minutiflorus, Draba athoa, Iberis sempervirens, Anthyllis vulneraria* ssp. *pulchella, Acinos alpinus, Edraianthus graminifolius, Centaurea pindicola, Galium anisophyllum, Morina persica, Bornmuellera baldaccii, B. tymphaea, Poa pirinica, P. thessala, Festuca olympica*, and a few woody species, in particular *Daphne oleoides* and *Juniperus nana.*
(Horvat *et al.*, 1974; Strid, 1980; Ozenda, 1985)

36.44 ALPINE HEAVY METAL COMMUNITIES
Violetalia calaminariae: Galio anisophylli – Minuartion vernae i.a.
Formations of heavy metal soils of the alpine and subalpine levels, with, among others, *Dianthus sylvestris, Galium anisophyllum, Poa alpina* and the very restricted southern Alpine endemic *Viola dubyana.*
(Pignatti, 1982; Ellenberg, 1988)

36.5 **ALPINE AND SUBALPINE FERTILIZED GRASSLANDS**
Arrhenatheretalia elatioris p.
Enriched hay meadows and pastures of the subalpine and lower alpine levels.
(Ellenberg, 1988; Oberdorfer, 1990)

36.51 SUBALPINE YELLOW OATGRASS HAY MEADOWS

Polygono-Trisetion p.

Trisetum flavescens-dominated grasslands of the subalpine level. Yellow oatgrass hay meadows are typically montane and have been listed and described under 38.3; subalpine representatives may, however, be coded under this unit when useful to preserve the unity of subalpine habitat complexes.

36.52 ROUGH HAWKBIT PASTURES

Poion alpinae

Species-poor manured cattle pastures of the subalpine and lower alpine levels, with *Agrostis alpina, Phleum alpinum, Poa alpina, Cerastium fontanum, Crepis aurea, Leontodon hispidus, Trifolium badium, T. thalii.*

37 Humid grasslands and tall herb communities

Unimproved or lightly improved wet meadows; tall herb communities.

37.1 **MEADOWSWEET STANDS AND RELATED COMMUNITIES**

Filipendulion ulmariae i.a.

Hygrophile tall herb strips of fertile alluvial stream banks, often dominated by *Filipendula ulmaria*, and tall herb stands (*F. ulmaria, Angelica sylvestris*) colonizing humid hay meadows and pastures after more or less long discontinuation of mowing or grazing; characteristic species are *Filipendula ulmaria, Achillea ptarmica, Angelica sylvestris, Cirsium palustre, Deschampsia cespitosa, Epilobium hirsutum, Geranium palustre, Veronica longifolia, Scutellaria hastifolia, Eupatorium cannabinum, Lysimachia vulgaris, Lythrum salicaria, Phalaris arundinacea, Polygonum bistorta, Valeriana officinalis.*

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Westhoff and den Held, 1975; Mériaux, 1976; De Sloover and Lebrun, 1976; Noirfalise *et al.*, 1980; Gorissen *et al.*, 1983; Rivas-Martinez *et al.*, 1987; Oberdorfer, 1990)

37.2 **EUTROPHIC HUMID GRASSLANDS**

Molinietalia: Calthion palustris, Bromion racemosi, Deschampsion cespitosae, Juncion acutiflori, Cnidion dubii; Agrostietalia stoloniferae: Agropyro-Rumicion p.

Meadows developed on moderately to very nutrient-rich, alluvial or fertilized, wet or damp soils, often inundated at least in winter, and relatively lightly mowed or grazed, in lowland, collinar and montane western and central Europe, south to western Iberia. They form a transition between the false oatgrass mesophile meadows, the oligotrophic *Molinion* formations and the small sedge and large sedge communities. They include a large number of distinctive and often species-rich communities, many of which harbour specialized, rare and threatened species of plants and animals.

(Tüxen and Oberdorfer, 1958; Sougnez and Limbourg, 1963; Ellenberg, 1963, 1988; Braun-Blanquet, 1967a; Archiloque *et al.*, 1969; Noirfalise and Dethioux, 1972; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Westhoff and den Held, 1975; Delpech, 1976; O'Sullivan, 1976; Schumacker, 1976; Duvigneaud, 1976; Frileux, 1976; Sissingh, 1976; Bournérias *et al.*, 1976; Delpech and Frileux, 1976; Wattez, 1976; Rose, 1976; De Sloover and Lebrun, 1976; Brasseur *et al.*, 1978; Bournérias, 1979, 1984; Noirfalise *et al.*, 1980, 1985; De Sloover *et al.*, 1980; Rivas-Martinez *et al.*, 1980; Gorissen *et al.*, 1983; Dethioux *et al.*, 1983; Diaz Gonzalez and Fernandez Prieto, 1987; Navarro Andres and Valle Gutierrez, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987; Oberdorfer, 1990)

37.21 ATLANTIC AND SUB-ATLANTIC HUMID MEADOWS

Calthion palustris, Bromion racemosi, Deschampsion cespitosae

Lightly managed hay meadows and pastures on both basocline and acidocline, nutrient-rich soils of middle European lowlands, hills and low mountains under Atlantic or sub-Atlantic climatic conditions. Among the characteristic plant components of the highly diverse communities forming this unit are *Caltha palustris, Cirsium palustre, C. rivularis, C. oleraceum, Epilobium parviflorum, Lychnis flos-cuculi, Mentha aquatica, Scirpus sylvaticus, Stachys palustris, Bromus racemosus, Crepis paludosa, Fritillaria meleagris, Geum rivale, Polygonum bistorta, Senecio aquaticus, Trollius europaeus, Lotus uliginosus, Trifolium dubium, Equisetum palustre, Myosotis palustris, Deschampsia cespitosa, Angelica sylvestris, Oenanthe silaifolia, Gratiola officinalis, Inula salicina, Succisella inflexa, Dactylorhiza majalis, Ranunculus acris, Rumex acetosa, Holcus lanatus, Alopecurus pratensis, Festuca pratensis, Juncus effusus, J. filiformis.*

37.211 **Cabbage thistle meadows**

Angelico-Cirsietum oleracei i.a.

Cabbage thistle meadows and related species-rich communities, characteristic of base-rich soils in lowland valleys.

37.212 **Globe flower-brook thistle meadows**

Trollio-Cirsietum rivularis i.a.

Globe flower-brook thistle meadows and related communities, replacing the cabbage thistle meadows in montane areas.

37.213 **Tufted hairgrass meadows**
Deschampsietum cespitosae i.a.
Tufted hairgrass meadows and related communities, widespread in eastern and south-eastern Europe (northern Greece, in the *Quercion frainetto* and *Fagion moesiacum* zones).

37.214 **Marsh ragwort meadows**
Senecionetum aquatici i.a.
Marsh ragwort meadows and related communities, mostly developed on lowland acidocline soils.

37.215 **Bistort meadows**
Deschampsio cespitosae-Polygonetum bistortae i.a.
Bistort meadows and related communities, occupying acidocline soils of montane and sub-montane regions.

37.216 **Thread rush meadows**
Juncetum filiformis i.a.
Thread rush meadows and related communities.

37.217 **Soft rush meadows**
Epilobio-Juncetum effusi i.a.
Soft rush meadows and related communities.

37.218 **Blunt-flowered rush meadows**
Juncetum subnodulosi i.a.
Blunt-flowered rush meadows and related communities, characteristic of very wet calcareous soils or soils flushed by calcareous waters, transitional to the small sedge fens of the *Caricion davallianae* (54.2), surviving mostly in the British Isles and in the Alpine foothills; many formations are rather oligotrophic and could equally be listed under 37.3.

37.219 **Wood clubrush meadows**
Scirpetum sylvatici i.a.
Wood clubrush meadows and related communities.

37.22 SHARP-FLOWERED RUSH MEADOWS
Juncion acutiflori
Humid meadows dominated by, or rich in, *Juncus acutiflorus*. They are floristically and phytosociologically very varied and many are as related to the oligotrophic *Molinion* communities of 37.3 as to the more eutrophic *Calthion* ones of 37.2. Sharp-flowered rush meadows are particularly characteristic of the oceanic and suboceanic regions of the western seaboard of Europe from north-western Iberia to the Low Countries.

37.23 SUBCONTINENTAL CNIDIUM MEADOWS
Cnidion dubii
Moist-soil, flood-subjected meadows of river valleys under continental or subcontinental climatic conditions, with *Cnidium dubium, Viola persicifolia, Allium angulosum, Iris sibirica, Oenanthe lachenalii, O. silaifolia, Gratiola officinalis, Juncus atratus, Leucojum aestivum, Carex praecox* var. *suzae, Lythrum virgatum.*

37.24 FLOOD SWARDS AND RELATED COMMUNITIES
Agropyro-Rumicion crispi p.
Grasslands of occasionally flooded river and lake banks, of depressions where rain water collects, of disturbed humid areas and of pastures submitted to intensive grazing.

37.241 **Tall rush pastures**
Rush (*Juncus effusus, J. conglomeratus, J. inflexus*) colonies of intensively grazed pastures.

37.242 **Creeping bent and tall fescue swards**
Flood swards with *Agrostis stolonifera, Carex hirta, Festuca arundinacea, Juncus inflexus, Alopecurus geniculatus, Rumex crispus, Mentha longifolia, M. pulegium, Potentilla anserina, P. reptans, Ranunculus repens.*

37.25 TRANSITIONAL TALL HERB HUMID MEADOWS

Calthion palustris p. i.a.

Recently abandoned hay meadows evolving towards 37.1 or towards woodland, with invasion of *Polygonum bistorta, Filipendula ulmaria, Phragmites communis*, may, if useful, be coded under this subunit instead of 37.21.

37.3 **OLIGOTROPHIC HUMID GRASSLANDS**

Molinion caeruleae, Juncion squarrosi

Humid grasslands of middle Europe and north-western Iberia, on soils very poor in nutrients.

37.31 PURPLE MOORGRASS MEADOWS AND RELATED COMMUNITIES

Molinietalia: Molinion caeruleae

Humid grasslands of soils poor in nutrients, unfertilized and with a fluctuating water level, with *Molinia caerulea, Succisa pratensis, Deschampsia cespitosa, Potentilla erecta, Allium angulosum, A. suaveolens, Betonica officinalis, Cirsium dissectum, C. tuberosum, Dianthus superbus, Trollius europaeus, Galium boreale, Gentiana asclepiadea, G. pneumonanthe, Gladiolus palustris, Silaum silaus, Selinum carvifolia, Inula salicina, Iris sibirica, Laserpitium prutenicum, Lathyrus pannonicus, Tetragonolobus maritimus, Serratula tinctoria, Carex tomentosa, C. panicea, C. pallescens, Parnassia palustris, Platanthera bifolia, Colchicum autumnale, Ophioglossum vulgatum, Dactylorhiza maculata.*

(Tüxen and Oberdorfer, 1958; Ellenberg, 1963, 1988; Sougnez and Limbourg, 1963; Guinochet and Vilmorin, 1973; De Foucault, 1976; O'Sullivan, 1976; Sougnez, 1977; De Sloover *et al.*, 1978; Gruber, 1978; Brasseur *et al.*, 1978; Bournérias, 1979, 1984; De Sloover *et al.*, 1980; Noirfalise *et al.*, 1982; Dethioux *et al.*, 1983; Oberdorfer, 1990)

37.311 **Calcareous purple moorgrass meadows**

Eu-Molinion

More species-rich variant, on calcareous soils, with *Silaum silaus, Sanguisorba officinalis, Selinum carvifolia, Betonica officinalis, Cirsium tuberosum, Carex tomentosa, Tetragonolobus maritimus, Stachys officinalis, Galium boreale, Serratula tinctoria, Inula salicina, Dianthus superbus, Colchicum autumnale* (abundant).

(Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Noirfalise *et al.*, 1982)

37.312 **Acid purple moorgrass meadows**

Junco-Molinion

Less species-rich formations of acid soils with *Viola persiciflora, V. palustris, Galium uliginosum, Cirsium dissectum, Crepis paludosa, Luzula multiflora, Juncus subuliflorus (= J. conglomeratus), Ophioglossum vulgatum, Inula britannica, Lotus uliginosus, Dianthus deltoides, Potentilla erecta, P. anglica, Carex pallescens.*

(Ellenberg, 1963, 1988; Westhoff and den Held, 1975; Noirfalise *et al.*, 1982)

37.32 HEATH RUSH MEADOWS AND HUMID MAT-GRASS SWARDS

Nardetalia: Juncion squarrosi

Humid, often peaty or semipeaty swards with *Nardus stricta, Juncus squarrosus, Festuca ovina, Gentiana pneumonanthe, Pedicularis sylvatica, Scirpus cespitosus* and sometimes *Sphagnum spp.*

(Tüxen and Oberdorfer, 1958; Schumacker, 1973; Sougnez, 1977; De Sloover *et al.*, 1978; Noirfalise *et al.*, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Dias Gonzalez and Fernandez Prieto, 1987; Ellenberg, 1988; Oberdorfer, 1990)

37.4 **MEDITERRANEAN TALL HUMID GRASSLANDS**

Holoschoenetalia: Molinio-Holoschoenion

Mediterranean humid grasslands of tall grasses and rushes with *Scirpus holoschoenus (Holoschoenus vulgaris), Agrostis stolonifera, A. reuteri, Galium debile, Molinia caerulea, Briza minor, Melica cupanii, Cyperus longus, Linum tenue, Trifolium resupinatum, Schoenus nigricans, Peucedanum hispanicum, Carex mairii, Juncus maritimus, J. acutus, Asteriscus aquaticus, Hypericum tomentosum, H. tetrapterum, Inula viscosa, Oenanthe pimpinelloides, O. lachenalii, Eupatorium cannabinum, Prunella vulgaris, Pulicaria dysenterica, Tetragonolobus maritimus, Orchis laxiflora, Dactylorhiza elata, Succisa pratensis, Sonchus maritimus* ssp. *aquatilis, Silaum silaus, Sanguisorba officinalis, Serratula tinctoria, Genista tinctoria, Cirsium monspessulanum, C. pyrenaicum, Senecio doria, Dorycnium rectum, Erica terminalis, Euphorbia pubescens, Lysimachia ephemerum.*

(Donker and Stivelink, 1962; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Pedrotti, 1976; Gruber, 1978; Rivas-Martinez *et al.*, 1980; Molinier and Martin, 1980; Bolos y Capdevila, 1987; Costa, 1987; Alcaraz Ariza and Peinado Lorca, 1987; Rivas-Martinez *et al.*, 1987; Ladero Alvarez, 1987; Martinez Parras *et al.*, 1987; Asensi Marfil and Diez Garretas, 1987)

37.5 **MEDITERRANEAN SHORT HUMID GRASSLANDS**

Holoschoenetalia: Deschampsion mediae

Very short grasslands of impermeable compact soils or marls, wet for a large part of the year, and dessicated in summer, with *Deschampsia media, Centaurium pulchellum, Lotus tenuis, Trifolium lappaceum, Prunella hyssopifolia, Plantago serpentina, Centaurea timbali.*

(Archiloque *et al.*, 1969; Guinochet and Vilmorin, 1973; Molinier and Martin, 1980)

37.6 **EASTERN SUPRA-MEDITERRANEAN HUMID MEADOWS**

Trifolio-Hordeetalia: Trifolion resupinati, Ranunculion velutini

Humid meadows rich in clover of the Balkan peninsula and the Apennines, mostly developed at collinar levels.

(Horvat *et al.*, 1974; Pedrotti, 1976)

37.61 GREEK SUPRA-MEDITERRANEAN HUMID MEADOWS

Trifolion resupinati

Meso-hygrophile grasslands of alluvial and other high water-table sites of the *Ostryo-Carpinion* zone of Greece, particularly of Macedonia and Thrace, with *Trifolium resupinatum*, and several other *Trifolium* species, *Alopecurus utriculatus, Hordeum murinum, Ranunculus marginatus, R. velutinus, Cirsium canum* var. *macedonicum, Narcissus poeticus, Leucojum aestivum.*

(Horvat *et al.*, 1974)

37.62 APENNINE HUMID MEADOWS

Ranunculion velutini

Permanent humid grasslands of Apennine karstic basins, with *Ranunculus velutinus, Bromus racemosus, Hordeum secalinum, Trifolium dubium, T. resupinatum, T. micranthum, T. patens, T. fragiferum, T. pratense, T. repens, Carex distans, Deschampsia cespitosa, Gaudinia fragilis, Ophioglossum vulgatum, Centaurea jacea, Holcus lanatus, Alopecurus utriculatus, Orchis laxiflora, Colchicum lusitanica.*

(Pedrotti, 1976)

37.7 **HUMID TALL HERB FRINGES**

Convolvuletalia sepium, Glechometalia hederaceae p. (Calystegio-Alliarietalia)

Watercourse veil and shady woodland edge communities

(Ellenberg, 1963, 1988; Duvigneaud, 1967; Guinochet and Vilmorin, 1973; Géhu and Géhu, 1976; Géhu, 1984; Drachenfels *et al.*, 1984; Oberdorfer, 1990)

37.71 WATERCOURSE VEILS

Senecion fluviatilis (Calystegion sepium), Convolvulion sepium p., Aegopodion podagrariae p.

Screens or veils of perennial tall herbs, small bushes and lianas (*Calystegia sepium, Cuscusta europaea*) lining lowland watercourses, and sometimes other water bodies, with many ruderal and introduced plants (*Aster spp., Rudbeckia spp., Solidago spp., Helianthus spp., Impatiens spp., Reynoutria japonica*).

37.711 ***Angelica archangelica* fluvial communities**
Angelica archangelica ssp. *littoralis* formations of great northern rivers, presently rare and threatened.

37.712 ***Angelica heterocarpa* fluvial communities**
Angelica heterocarpa formations of tidal estuaries of the Loire, the Charente and the Gironde; the species is a rare and very narrow endemic of south-western France.

37.713 **Marsh mallow screens**
Althaea officinalis formations of river banks and marsh edges, particularly on somewhat saline soils.

37.714 **Butterbur riverine communities**
Formations of *Petasites hybridus* and *Cirsium oleraceum* of the banks of small streams.

37.715 **Mixed riverine screens**
Formations of *Senecio fluviatilis, Calystegia sepium, Eupatorium cannabinum, Epilobium hirsutum, Sonchus palustris, Urtica dioica* and other species, lining lowland water courses.

37

37.72 SHADY WOODLAND EDGE FRINGES
Aegopodion podagrariae p., Alliarion (Geo-Alliarion, Lapsano-Geranion robertiani)
Nitro-hygrophilous communities of usually large-leaved herbs developing along the shaded side of wooded stands and hedges, with *Galium aparine, Glechoma hederacea, Geum urbanum, Aegopodium podagraria, Silene dioica, Carduus crispus, Chaerophyllum hirsutum, Lamium album, Alliaria petiolata, Lapsana communis, Geranium robertianum, Viola alba, V. odorata.*

37.8 **SUBALPINE AND ALPINE TALL HERB COMMUNITIES**
Betulo-Adenostyletea p.; Rumicion alpini
Luxuriant tall herb formations of deep, humid soils in the montane to alpine, but mostly subalpine, levels of the higher mountains, with *Cicerbita alpina, C. plumieri, Cirsium helenioides, C. spinosissimum, C. flavispina, Geranium sylvaticum, Polygonatum verticillatum, Ranunculus platanifolius, Aconitum vulparia, A. napellus, A. nevadense, Adenostyles alliariae, Senecio elodes, Veratrum album, Trollius europaeus, Peucedanum ostruthium, Doronicum austriacum, Pedicularis foliosa, Eryngium alpinum, Centaurea rhapontica, Valeriana pyrenaica, Tozzia alpina.* Groupings of these plants can invade the *Aceri-Fagion* and reappear, along streams, lower down in montane beech forests. If useful, their presence can be noted by combining a code of 37.8 with the appropriate forest code.
(Ellenberg, 1963, 1988; Braun-Blanquet, 1969b, 1972a, 1976; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Gruber, 1978; Sutter, 1978; Rivas-Martinez, Diaz *et al.*, 1984; Ozenda, 1985; Noirfalise, 1986; Martinez Parras *et al.*, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Oberdorfer, 1990)

37.81 HERCYNIO-ALPINE TALL HERB COMMUNITIES
Adenostylion alliariae
Subalpine and alpine meso-hygrophile tall herb formations of moist hollows and gullies of the Alps, the Jura, the great Hercynian ranges, the Central Massif and the Apennines.

37.82 SUBALPINE SMALL REED MEADOWS
Calamagrostion arundinaceae
Thermophile, meso-xerophile species-rich formations of steep adrets of the subalpine level of the Alps, the Jura, the great Hercynian ranges and the Central Massif, mostly dominated by *Calamagrostis arundinacea*, associated with plants such as *Senecio doronicum, Digitalis grandiflora, Hieracium aurantiacum, Aconitum vulparia, Geranium sylvaticum, Bupleurum longifolium, Sorbus spp.*

37.83 PYRENEO-IBERIAN TALL HERB COMMUNITIES
Adenostylion pyrenaicae
Subalpine and alpine meso-hygrophile tall herb formations of the Pyrenees, the Cantabrian mountains, the Cordillera Central, the Iberian Range, with *Valeriana pyrenaica* and *Adenostyles alliariae* ssp. *pyrenaica (hybrida).*

37.84 SOUTHERN IBERIAN TALL HERB COMMUNITIES
Cirsion flavispinae
Subalpine and alpine meso-hygrophile tall herb communities of the Sierra Nevada and other southern Iberian mountains, with the endemic *Cirsium flavispina, Aconitum nevadense, Senecio elodes.*

37.85 CORSICAN *CYMBALARIA* TALL HERB COMMUNITIES
Cymbalarion hepaticifoliae
Formations of rocky or grassy corridors in Corsica.

37.86 CORSICAN *DORONICUM* TALL HERB COMMUNITIES
Doronicion corsici
Riparian formations of Corsica.

37.87 GREEK TALL HERB COMMUNITIES
Cirsion appendiculati, Geion coccinei
Montane riparian and spring-edge vegetation of Greek mountains, with *Cirsium appendiculatum, Angelica sylvestris, Heracleum sphondylium, Geum coccineum.*

37.88 ALPINE DOCK COMMUNITIES
Glechometalia hederaceae: Rumicion alpini
Alpine and subalpine nitrophilous tall herb formations characteristic of the vicinity of cattle and game resting places, with *Rumex alpinus, Senecio alpinus, Cirsium spinosissimum, Peucedanum ostruthium.*

38 Mesophile grasslands

Lowland and montane mesophile pastures and hay meadows.

38.1 **MESOPHILE PASTURES**
Cynosurion
Regularly grazed mesophile pastures, fertilized and on well-drained soils, with *Lolium perenne, Cynosurus cristatus, Poa* ssp., *Festuca* ssp., *Trifolium repens, Leontodon autumnalis, Bellis perennis, Ranunculus repens, R. acris, Cardamine pratensis*; they are most characteristic of the Euro-Siberian zone, but extend to Atlantic Iberia and the Cordillera Central, the Apennines and the supra-Mediterranean zone of Greece.
(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Noirfalise *et al.*, 1980, 1982; Fuller, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Rivas-Martinez *et al.*, 1987; Loidi Arregui, 1987; Oberdorfer, 1990)

38.11 UNBROKEN PASTURES
Continuous pastureland, unrelieved by networks of ditches.

38.111 **Ryegrass pastures**
Lolio-Cynosuretum cristati
Relatively species-poor grasslands, dominated by *Lolium perenne*, often with *Cynosurus cristatus*.

38.112 ***Cynosurus-Centaurea* pastures**
Centaureo-Cynosuretum cristati
More species-rich grasslands dominated by *Cynosurus cristatus* and with many flowering herbs, notably *Centaurea nigra*.

38.12 DITCH-BROKEN PASTURES
Grasslands drained by a network of ditches, fleets, streams or pools.

38.13 OVERGROWN PASTURES
Abandoned grasslands with ruderal species.

38.2 **LOWLAND HAY MEADOWS**
Arrhenatherion, Brachypodio-Centaureion nemoralis
Mesophile hay meadows of low altitudes, fertilized and well-drained, with *Arrhenatherum elatius, Trisetum flavescens, Anthriscus sylvestris, Heracleum sphondylium, Daucus carota, Crepis biennis, Knautia arvensis, Leucanthemum vulgare, Pimpinella major, Trifolium dubium, Geranium pratense*; they are most characteristic of the Euro-Siberian zone, but extend to Atlantic Iberia, the Cordillera Central and Montseny, to the Apennines and to the supra-Mediterranean zone of Greece.
(Sougnez, 1951; Ellenberg, 1963, 1988; Ilijanic, 1965; Archiloque *et al.*, 1969; Guinochet and Vilmorin, 1973; Horvat *et al.*, 1974; Westhoff and den Held, 1975; Bournérias, 1979, 1984; Noirfalise *et al.*, 1980, 1982; Rivas-Martinez, Diaz *et al.*, 1984; Rivas-Martinez *et al.*, 1987; Diaz Gonzalez and Fernandez Prieto, 1987; Bolos y Capdevila, 1987; Oberdorfer, 1990)

38.21 ATLANTIC HAY MEADOWS
Brachypodio-Centaureion nemoralis
Atlantic formations with *Centaurea nemoralis, Rhinanthus lanceolatus, Oenanthe pimpinelloides, Brachypodium pinnatum*.

38.22 MEDIO-EUROPEAN LOWLAND HAY MEADOWS
Arrhenatherion s.s.
Typical medio-European formations.

38.23 MEDIO-EUROPEAN SUBMONTANE HAY MEADOWS
Medio-European formations of mid-elevations, characteristic in particular of higher elevations of the lesser Hercynian ranges, intermediate between this unit and 38.3.

38.3 **MOUNTAIN HAY MEADOWS**

Polygono-Trisetion (Triseto-Polygonion bistorti)

Species-rich mesophile hay meadows of the montane and subalpine levels (mostly above 600 m) usually dominated by *Trisetum flavescens* and with *Heracleum sphondylium, Viola cornuta, Astrantia major, Carum carvi, Crepis mollis, C. pyrenaica, Polygonum bistorta, Silene dioica, S. vulgaris, Campanula glomerata, Salvia pratensis, Centaurea nemoralis, Anthoxanthum odoratum, Crocus albiflorus, Geranium phaeum, G. sylvaticum, Narcissus poeticus, Malva moschata, Valeriana repens, Trollius europaeus, Pimpinella major, Muscari botryoides, Lilium bulbiferum, Thlaspi caerulescens, Viola tricolor* ssp. *subalpina, Phyteuma halleri, P. orbiculare, Primula elatior, Chaerophyllum hirsutum* and many others.

(Ellenberg, 1963, 1988; Guinochet and Vilmorin, 1973; Gruber, 1978; Oberdorfer, 1990)

38.4 **IBERIAN VALLICARES**

Agrostietalia castellanae

Summer pastures of the Iberian peninsula, submitted to poor drainage, brief flooding and rapid dessication with the first heat, constituted by perennial and annual grasses, most commonly by *Agrostis castellana, A. pourretii (A. salmantica), Gaudinia fragilis, Festuca ampla, Periballia involucrata, Vulpia ciliata, V. myuros, V. bromoides, Holcus setiglumis, Molineriella minuta, Anthoxanthum aristatum, A. ovatum* and often with *Juncus capitatus* and clovers such as *Trifolium campestre.*

(Bellot Rodriguez, 1979; Rivas-Martinez *et al.*, 1980; Martinez Parras *et al.*, 1987; Rivas-Martinez *et al.*, 1987; Asensi Marfil and Diez Garretas, 1987)

38.41 PERENNIAL VALLICARES

Perennial *Agrostis castellana*-dominated grasslands.

38.42 ANNUAL VALLICARES

Annual *Agrostis pourretii*-dominated grasslands.

38.43 ANDALUSIAN THRIFT VALLICARES

Armeria gaditana, Gaudinia fragilis, Centaurea exarata and *Asphodelus aestivus* grasslands of south-western Iberia.

38.5 **MACARONESIAN MESOPHILE GRASSLANDS**

Secondary grasslands of the highest levels of the Atlantic islands.

(Machado Carrillo, *in litt.*, 1989)