



**INTERPRETATION
MANUAL
OF
EUROPEAN UNION
HABITATS**

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EUROPEAN COMMISSION
DG ENVIRONMENT
Nature and biodiversity

- * The Interpretation Manual of European Union Habitats - EUR25 is a scientific reference document. It is based on the version for EUR15, which was adopted by the Habitats Committee on 4. October 1999 and consolidated with the new and amended habitat types for the 10 accession countries as adopted by the Habitats Committee on 14 March 2002.

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WHY THIS MANUAL?

Historical review

The "Habitats" Directive¹ is a Community legislative instrument in the field of nature conservation that establishes a common framework for the conservation of wild animal and plant species and natural habitats of Community importance; it provides for the creation of a network of special areas of conservation, called Natura 2000, to "maintain and restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest".

Animal and plant species names are clearly presented in the Directive and, despite minor misspellings or use of synonyms, no major additional work needs to be done to allow a correct interpretation of Annex II. In contrast, the development of a common agreed definition appeared to be essential for the different habitat types of Annex I.

Annex I lists today 218 European natural habitat types, including 71 priority (i.e. habitat types in danger of disappearance and whose natural range mainly falls within the territory of the European Union). Annex I is based on the hierarchical classification of European habitats developed by the CORINE Biotopes project² since that was the only existing classification at European level. A draft list of habitat types for Annex I was therefore drawn up on the basis of this classification by Professor A. Noirfalise and submitted to the national experts preparing the Directive as a working document in August 1989. Numerous discussions with the national experts then took place between 1989 and 1991, culminating in the version of Annex I published in the Official Journal in May 1992.

In December 1991, while the Directive was being adopted, a thorough revision of the CORINE classification was published³. This revision introduced numerous changes within codes and habitat types, in particular involving the division of the latter into sub-types. Definitions had been prepared for the various categories. Consequently, the Annex I codes no longer corresponded fully to the codes and descriptive content of the various categories of CORINE, resulting in considerable ambiguities in the interpretation of Annex I on the basis of the CORINE classification. The Task Force/European Environment Agency thus produced a paper establishing the correspondence between the habitat codes of Annex I and those of the 1991 version of the CORINE classification⁴. This paper also included the description proposed in the 1991 CORINE version for the various habitat types of Annex I.

¹ Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild fauna and flora, O.J. L206, 22.07.92

² CORINE Biotopes - Technical Handbook, volume 1, p. 73-109, Corine/Biotopes/89-2.2, 19 May 1988, partially updated 14 February 1989.

³ CORINE Biotopes manual, Habitats of the European Community. EUR 12587/3, Office for Official Publications of the European Communities, 1991.

⁴ Relation between the Directive 92/43/EEC Annex I habitats and the CORINE habitat list 1991 (EUR 12587/3). Version 1 - Draft, November 1992. CEC-DG XI, Task Force Agency (EEA-TF).

The manual

Having in mind all these difficulties of classification, the Scientific Working Group, set up by the Habitats Committee (established by Directive 92/43/EEC), expressed in May 1992 the need to prepare a manual for the interpretation of Annex I. Following a call for proposals the Commission charged Professor Thanghe from the Université Libre de Bruxelles to prepare a draft manual⁵.

Following several meetings of the Scientific Working Group, the Commission agreed the two following points with the national experts:

- (1) The interpretation work on Annex I should primarily focus on the priority habitat types.
- (2) The CORINE classification (1991 version) provides a basis for a description of the Annex I habitat types; where the experts feel that it is not suitable, an operational scientific description should be produced from the contributions of the national experts.

In September 1993 the Université Libre de Bruxelles finalised the study relating to the interpretation of Annex I priority habitat types. This study focused on the drafting of an eight field descriptive sheet drawn up on the basis of written and oral scientific contributions from the national experts. Each sheet gathers the information on national and regional particularities, as well as types of associated habitats. The manual for the interpretation of Annex I priority habitat types of the Council Directive 92/43/EEC was compiled by the Commission (DG XI), based on the study of the Université Libre de Bruxelles, the contributions of the national experts, and the CORINE classification (1991 version); this document was approved by the Habitats Committee in February 1994 (Doc. HABITATS 94/3 FINAL).

Following the adoption of the priority habitats manual, the experts identified a set of 36 non priority habitat types also causing interpretation problems. An interpretation document was drafted by the Université Libre de Bruxelles, discussed in a meeting of the Scientific Working Group (December 1994) and revised accordingly⁶.

On April 1995 the Habitats Committee approved the EUR12 version of the 'Interpretation Manual of European Union Habitats'⁷, which incorporated:

- i) the descriptive sheets for priority habitats⁸, which establish clear, operational scientific definitions of habitat types, using pragmatic descriptive elements (e.g. characteristic plants), and taking into consideration regional variation;
- ii) the descriptive sheets of 36 non priority habitats similar to those used for priority habitats;
- iii) the CORINE Biotopes definitions³ for the remaining non priority habitats; these definitions should be considered 'a minimal interpretation', not exclusive; some CORINE definitions do not take account of sub-types, regional varieties and/or do not cover all the geographical range of an habitat type - this fact should be recognised, thus allowing a certain flexibility in the interpretation of these Annex I habitat types.

The contents of the manual did not take into account the accession of Austria, Finland and Sweden, which has resulted in the inclusion of a new biogeographical region (the Boreal region) in the Directive. These new Member States have asked for the introduction in Annex I of several priority habitat types that are restricted or only apply to them. In order not to delay the distribution of the manual, the Commission has decided to publish

⁵ Étude relative au projet de manuel technique d'interprétation de l'Annexe I de la Directive habitats 92/43/CEE. Rapport final, September 1993. Université Libre de Bruxelles (contrat n° 4-3040(92)15504).

⁶ Étude relative au projet de manuel technique d'interprétation de l'Annexe I de la Directive habitats 92/43/CEE - Types d'habitats non prioritaires. Rapport final, Janvier 1995. Université Libre de Bruxelles (contrat n° B4-3040/94/000212/MAR/B2).

⁷ Also available in French under the title 'Manuel d'interprétation des habitat de l'Union européenne'

⁸ From Doc. HABITATS 94/3 FINAL

that first version (EUR12) and envisaged the preparation of a second version (EUR15) in order to incorporate new information (mainly on distribution and regional sub-types).

THE EUR15 VERSION

The prime objective of the EUR15 version was to update the old EUR12 version. Descriptive sheets were added for the 11 priority types attached to Annex I when Austria, Finland and Sweden joined the Union⁹; it further incorporates comments for other Annex I habitats occurring in those Member States, and corrects, or adds, newly acquired information.

The 1991 classification (Habitats of the European Community) was extended in 1993 to the whole Palaearctic region¹⁰, namely with the inclusion of the Nordic vegetation classification; this classification was supplemented in 1995 with text descriptions, phytosociological units and references; a computer database tool (PHYSIS¹¹) was developed to support this work. The EUR15 version updated the definitions of those habitat types for which the CORINE 1991 has been used, on the basis of the information contained in the PHYSIS database. Accordingly, the CORINE codes are also replaced by the 'Palaearctic codes'. In situations where ambiguities exist between the definitions contained in this manual and those of the Palaearctic habitats classification or PHYSIS data base, it is intended that the definitions of this manual should take precedence. This work was adopted by the Habitats Committee on 13.9.1996. The 2nd edition adopted on the 4th October 1999 included amendments for the Boreal biogeographical region to the Annex I¹² and the removal of the reference to the geographical distribution of habitats (which is included in the reference lists of the habitats types by biogeographic region).

THE EUR25 VERSION

The EUR25 version of the Interpretation Manual includes descriptions of new habitats and amendments to some existing habitats resulting from the expected addition of 10 new Member states in May 2004.

After extensive discussions among Member States, Accession Countries and the European Commission, 20 new habitat types were accepted to be added to Annex I, and respective descriptions of these new types were adopted by the Habitats Committee on 14 March 2002. Additionally several of the habitat types proposed have been agreed to be variations of existing habitats and therefore some amendments to existing habitats were necessary in order to reflect the habitats as found in the EU25 area. In the frame of the Accession Treaty 2003, signed in April 2003 in Athens, new consolidated annexes were prepared including the 20 new habitat types.

The descriptions of new habitats have been prepared by the European Topic Centre on Nature Protection and Biodiversity using the PHYSIS database as the main source. This description was then compared with the information given in the proposal from accession countries and if judged necessary amended. The lists of plants in particular are usually a composite of both sources. In a second step, comments from both Accession Countries and Member States were taken into account, which led to the new definitions enclosed.

The fact that many of the habitat types of Annex I are qualified by biogeographical terms such as Mediterranean, Alpine, Medio-European, etc., meaning that they have their main occurrence in a given biogeographical region, does not exclude the possibility of finding the same habitat types in other biogeographical regions. In fact, these often isolated occurrences have a major scientific and conservation

⁹ Accession Act of Austria, Finland and Sweden (OJ L1,1.1.1995, p.135)

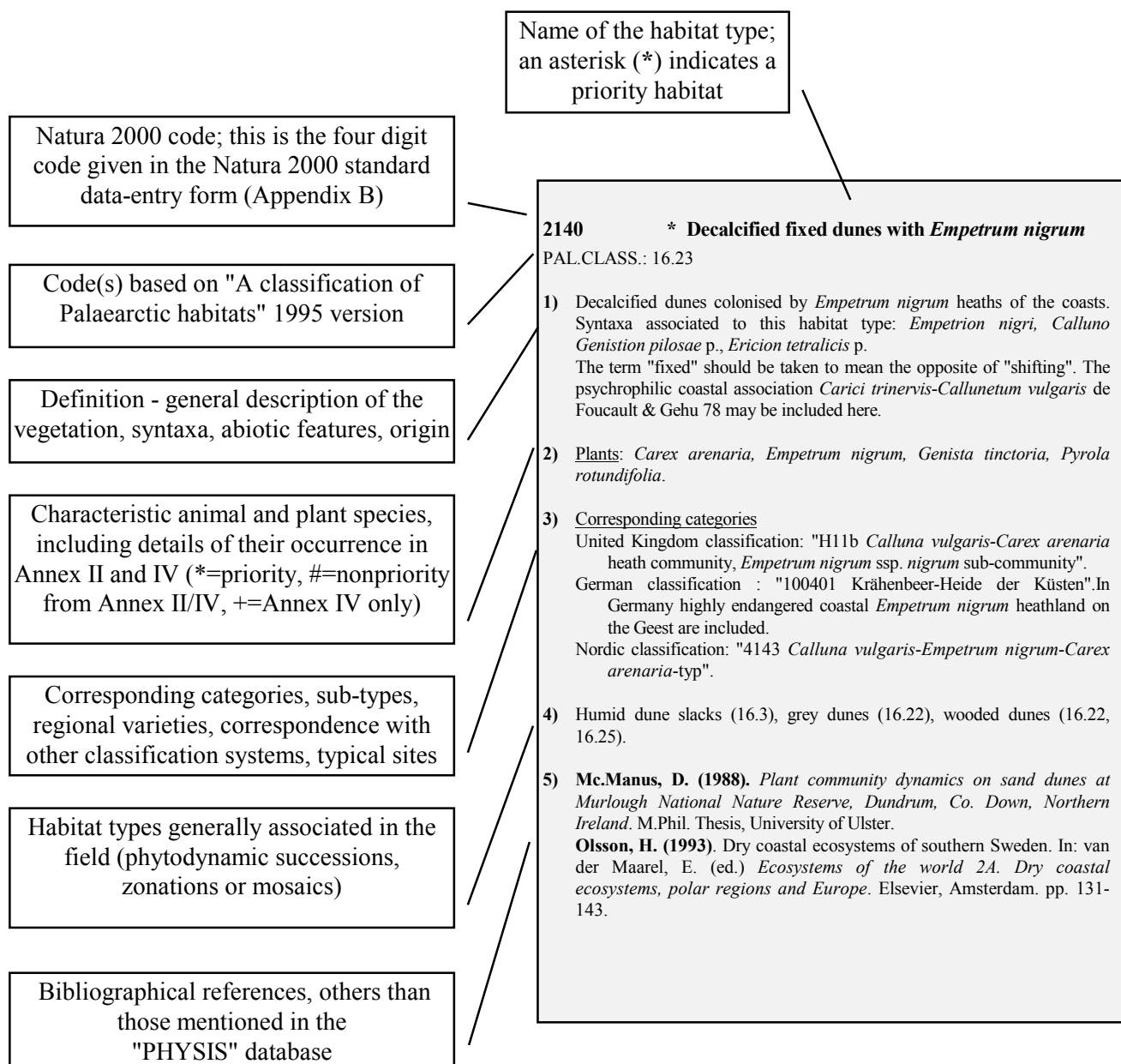
¹⁰ Devillers, P. & Devillers-Terschuren, J. (1993). A classification of Palaearctic habitats. Strasbourg: Council of Europe Institut Royal des Sciences Naturelles de Belgique

¹² Council Directive 97/62/EC of 27 October 1997 adapting to technical and scientific progress Directive 92/43/EC on the conservation of natural habitats and of wild fauna and flora, O.J. L305, 8.11.1997.

value. The users of the manual will need to employ a certain flexibility of interpretation, particularly in those areas where the habitat types are very fragmentary and influenced by human activities.

Explanatory Notes

The habitat types are grouped and sorted according to Annex I of the Directive.



COASTAL AND HALOPHYTIC HABITATS

Open sea and tidal areas

1110 Sandbanks which are slightly covered by sea water all the time

PAL.CLASS.: 11.125, 11.22, 11.31

- 1) Sublittoral sandbanks, permanently submerged. Water depth is seldom more than 20 m below Chart Datum. Non-vegetated sandbanks or sandbanks with vegetation belonging to the *Zosteretum marinae* and *Cymodoceion nodosae*.
- 2) Plants: *Zostera marina*, free living species of the *Corallinaceae* family. In the Baltic Sea also *Potamogeton pectinatus*, *Ruppia cirrhosa* and *Tolypella nidifica*. Around Tenerife, *Halophila decipiens* communities
Animals: Important wintering habitat for many bird species, in particular *Melanitta nigra* but also *Gavia stellata* and *Gavia arctica*. Resting places for seals. Invertebrate communities of sandy sublittoral (e.g. polychaetes).
- 3) Corresponding categories :
German classification : "040202a Sandbank der Ostsee (ständig wasserbedeckt)", "030202a Sandbank der Nordsee (ständig wasserbedeckt)".
Nordic classification : "4411 *Zostera marina*-typ", "4412 *Ruppia maritima*-typ".
- 4) These sandbanks can be found in association with mudflats and sandflats (1140).
- 5) **Ericson, L. & Wallentinus, H.-G. (1979)**. Sea-shore vegetation around the Gulf of Bothnia. Guide for the International Society for Vegetation Science, July-August 1977. *Wahlenbergia* 5:1-142.
Lappalainen, A., Hällfors, G. & Kangas, P. (1977). *Littoral benthos of the northern Baltic Sea*. IV. Pattern and dynamics of macrobenthos in a sandy bottom *Zostera marina* community in Tvärminne.

1120 * Posidonia beds (*Posidonion oceanicae*)

PAL.CLASS.: 11.34

- 1) Beds of *Posidonia oceanica* (Linnaeus) Delile characteristic of the infralittoral zone of the Mediterranean (depth: ranging from a few dozen centimetres to 30 - 40 metres). On hard or soft substrate, these beds constitute one of the main climax communities. They can withstand relatively large variations in temperature and water movement, but are sensitive to desalination, generally requiring a salinity of between 36 and 39‰.
- 2) Plants: *Posidonia oceanica*.
Animals: Molluscs- #*Pinna nobilis*; Echinoderms- *Asterina pancerii*, *Paracentrotus lividus*; Fish- *Epinephelus guaza*, *Hippocampus ramulosus*.

- 5) **Belsher, T. et al (1987).** *Livre rouge des espèces menacées de France - tome 2, espèces marines et littorales menacées*, Ed. F. de Beaufort. Museum National d'Histoire Naturelle - Paris.
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1130

Estuaries

PAL.CLASS.: 13.2, 11.2

- 1) Downstream part of a river valley, subject to the tide and extending from the limit of brackish waters. River estuaries are coastal inlets where, unlike 'large shallow inlets and bays' there is generally a substantial freshwater influence. The mixing of freshwater and sea water and the reduced current flows in the shelter of the estuary lead to deposition of fine sediments, often forming extensive intertidal sand and mud flats. Where the tidal currents are faster than flood tides, most sediments deposit to form a delta at the mouth of the estuary.
Baltic river mouths, considered as an estuary subtype, have brackish water and no tide, with large wetland vegetation (helophytic) and luxurious aquatic vegetation in shallow water areas.
- 2) Plants: Benthic algal communities, *Zostera* beds e.g. *Zostera noltii* (*Zosteretea*) or vegetation of brackish water: *Ruppia maritima* (= *R. rostellata* (*Ruppietea*)); *Spartina maritima* (*Spartinetea*); *Sarcocornia perennis* (*Arthrocnemetea*). Both species of fresh water and brackish water can be found in Baltic river mouths (*Carex* spp., *Myriophyllum* spp., *Phragmites australis*, *Potamogeton* spp., *Scirpus* spp.).
Animals: Invertebrate benthic communities; important feeding areas for many birds.
- 3) Corresponding categories
German classification : "D2a Ästuarie (Fließgewässermündungen mit Brackwassereinfluß u./od. Tidenhub eingeschlossen werden", "050105 Brackwasserwatt des Ästuarie an der Nordsee", "050106 Süßwasserwatt im Tideeinfluß des Nordsee".
- 4) An estuary forms an ecological unit with the surrounding terrestrial coastal habitat types. In terms of nature conservation, these different habitat types should not be separated, and this reality must be taken into account during the selection of sites.
- 5) **Brunet, R. et al.** *Les mots de la géographie-dictionnaire critique*. Ed. Reclus.
Gillner, W. (1960). Vegetations- und Standortsuntersuchungen in den Strandwiesen der schwedischen Westküste. *Acta Phytogeogr. Suec.* 43:1-198.
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1140

Mudflats and sandflats not covered by seawater at low tide

PAL.CLASS.: 14

- 1) Sands and muds of the coasts of the oceans, their connected seas and associated lagoons, not covered by sea water at low tide, devoid of vascular plants, usually coated by blue algae and diatoms. They are of particular importance as feeding grounds for wildfowl and waders. The diverse intertidal communities of invertebrates and algae that occupy them can be used to define subdivisions of 11.27, eelgrass communities that may be exposed for a few hours in the course of every tide have been listed under 11.3, brackish water vegetation of permanent pools by use of those of 11.4.

Note: Eelgrass communities (11.3) are included in this habitat type.

1150

*** Coastal lagoons**

PAL.CLASS.: 21

- 1) Lagoons are expanses of shallow coastal salt water, of varying salinity and water volume, wholly or partially separated from the sea by sand banks or shingle, or, less frequently, by rocks. Salinity may vary from brackish water to hypersalinity depending on rainfall, evaporation and through the addition of fresh seawater from storms, temporary flooding of the sea in winter or tidal exchange. With or without vegetation from *Ruppia maritima*, *Potamogeton*, *Zostera* or *Chara* (CORINE 91: 23.21 or 23.22).
 - Flads and gloes, considered a Baltic variety of lagoons, are small, usually shallow, more or less delimited water bodies still connected to the sea or have been cut off from the sea very recently by land upheaval. Characterised by well-developed reedbeds and luxuriant submerged vegetation and having several morphological and botanical development stages in the process whereby sea becomes land.
 - Salt basins and salt ponds may also be considered as lagoons, providing they had their origin on a transformed natural old lagoon or on a saltmarsh, and are characterised by a minor impact from exploitation.

 - 2) Plants: *Callitriche* spp., *Chara canescens*, *C. baltica*, *C. connivens*, *Eleocharis parvula*, *Lamprothamnion papulosum*, *Potamogeton pectinatus*, *Ranunculus baudotii*, *Ruppia maritima*, *Tolypella n. nidifica*. In flads and gloes also *Chara* ssp. (*Chara tomentosa*), *Lemna trisulca*, *Najas marina*, *Phragmites australis*, *Potamogeton* ssp., *Stratiotes aloides*, *Typha* spp.
Animals: Cnidaria- *Edwardsia ivelli*; Polychaeta- *Armandia cirrhosa*; Bryozoa- *Victorella pavida*; Rotifera - *Brachionus* sp.; Molluscs- *Abra* sp., *Murex* sp.; Crustaceans- *Artemia* sp.; Fish- *Cyprinus* sp., *Mullus barbatus*; Reptiles- *Testudo* sp.; Amphibians- *Hyla* sp.

 - 3) Corresponding categories
German classification : "0906 Strandsee", "240601 Brackwassersee im Ostseeküstenbereich".

 - 4) Saltmarshes form part of this complex.

 - 5) **Bamber et al. (1992)**. On the ecology of brackish lagoons in Great Britain. *Aquatic conservation: marine and freshwater ecosystems*, 2, 65-94.
Barnes, R.S.K. (1988). The faunas of landlocked lagoons: chance differences and problems of dispersal. *Estuarine and Coastal Shelf Science*, 26, 309 - 18.
Munsterhjelm, R. (1995). The aquatic macrophyte vegetation of flads and gloes, S coast of Finland. *Acta Bot. Fennica* (in print).
Palmer, M.A., Bell, S.L., Butterfield, I. (1992). A botanical classification of standing waters: Applications for conservation and monitoring. *Aquatic conservation: marine and freshwater ecosystems*, 2, 125-143.
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1160

Large shallow inlets and bays

PAL.CLASS.: 12

- 1) Large indentations of the coast where, in contrast to estuaries, the influence of freshwater is generally limited. These shallow¹³ indentations are generally sheltered from wave action and contain a great diversity of sediments and substrates with a well developed zonation of benthic communities. These communities have generally a high biodiversity. The limit of shallow water is sometimes defined by the distribution of the *Zosteretea* and *Potametea* associations.
Several physiographic types may be included under this category providing the water is shallow over a major part of the area: embayments, fjards, rias and voes.
- 2) Plants: *Zostera* spp., *Ruppia maritima*, *Potamogeton* spp. (e.g. *P. pectinatus*, *P. praelongus*), benthic algae.
Animals: Benthic invertebrate communities.
- 3) Corresponding categories
German classification : "B31 naturnaher Boddengewässerkomplex", "B32 Boddengewässerkomplex, geringe Belastung", "A2a Flachwasserzonen der Nordsee (Meeresarme u. -buchten, incl. Seegraswiesen)".
- 5) **Luther, (1951)**. Verbreitung und Ökologie der höheren Wasserpflanzen im Brackwasser der Ekenäs-Gegend in Süd-Finnland. I. Allgemeiner Teil. ABF 49, 1-232. II Spezieller Teil. ABF 50, 1-370.

1170

Reefs

PAL.CLASS.: 11.24, 11.25

- 1) Submarine, or exposed at low tide, rocky substrates and biogenic concretions, which arise from the sea floor in the sublittoral zone but may extend into the littoral zone where there is an uninterrupted zonation of plant and animal communities. These reefs generally support a zonation of benthic communities of algae and animals species including concretions, encrustations and corallogenic concretions.
- In northern Baltic areas, the upper shallow water filamentous algal-zone with great annual succession is normally well developed on gently sloping shores. *Fucus vesiculosus* is submerged at depth of 0.5-6 m in the sublittoral zone. A red algae zone occurs below the *Fucus* zone at depths of about 5 to 10 m.
- 2) Plants: Brown algae (species of the *Fucus*, *Laminaria* and *Cystoseira* genus, *Pilayella littoralis*), red algae (e.g. species of the *Corallinaceae*, *Ceramiceae* and *Rhodomelaceae* families), green algae. Other plant species: *Dictyota dichotoma*, *Padina pavonica*, *Halopteris scoparia*, *Laurencia obtusa*, *Hypnea musciformis*, *Dasycladus claviformis*, *Acetabularia mediterranea*.
Animals: Mussel beds (on rocky substrates), invertebrate specialists of hard marine substrates (sponges, *Bryozoa* and cirripedian *Crustacea* for example).

¹³ National experts consider inappropriate to fix a maximum water depth, since the term 'shallow' may have different ecological interpretations according to the physiographic type considered and geographical location.

- 3) Corresponding categories
 German classification : 010204a Riffe der Nordsee (Benthal mit Hartsystrat, ohne Muschelbänke u. Sabellaria)", "020204a Riffe der Ostsee (Benthal mit Hartsystrat)", "030207 Miesmuschelbank des Sublitorals der Nordsee", "030208 Austernbank des Sublitorals der Nordsee", "030209 Sabellaria-Riff des Sublitorals der Nordsee".
- 4) Where an uninterrupted zonation of sublittoral and littoral communities exist, the integrity of ecological unit should be respected in the selection of sites.
- 5) **Kautsky, N. (1974)**. Quantitative investigations of the red algae belt in the Askö area, Northern Baltic proper. *Contrib. Askö Lab. Univ. Stockholm* 3:1-29.
Ravanko, O. (1968). Macroscopic green, brown and red algae in the south-western archipelago of Finland. *Acta Bot. Fennica* 79:1-50.
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1180

Submarine structures made by leaking gases

PAL.CLASS.: 11.24

- 1) Spectacular submarine complex structures, consisting of rocks, pavements and pillars up to 4 m high. These formations are due to the aggregation of sandstone by a carbonate cement resulting from microbial oxidation of gas emissions, mainly methane. The methane most likely originated from the microbial decomposition of fossil plant materials. The formations are interspersed with gas vents that intermittently release gas. These formations shelter a highly diversified ecosystem with brightly coloured species.
- 2) Animals: Porifera- *Cliona celata*; Anthozoa - *Metridium senile*, *Tealia felina*, *Alcyonium digitatum*; Polychaeta- *Pomatoceros triqueter*, *Dodocaceria concharum*; Gastropoda- *Cingula striata*, *Alvania punctura*, *Rissoa albella*, *R. parva*; Decapoda- *Porcellana longicornis*, *Cancer pagurus*; Echinodermata- *Ophiotrix fragilis*.
- 5) **Jensen, P. et al. (1992)** - "Bubbling reef" in the Kattegat: submarine landscapes of carbonate-cemented rocks support a diverse ecosystem at methane seeps. *Mar. Ecol. Prog. Ser.*, vol. 83:103-112.
-

Sea cliffs and shingle or stony beaches

1210

Annual vegetation of drift lines

PAL.CLASS.: 17.2

- 1) Formations of annuals or representatives of annuals and perennials, occupying accumulations of drift material and gravel rich in nitrogenous organic matter (*Cakiletea maritima* p.).
- 2) Plants: *Cakile maritima*, *Salsola kali*, *Atriplex* spp. (particularly *A. glabriuscula*), *Polygonum* spp., *Euphorbia peplis*, *Mertensia maritima*, *Elymus repens*, *Potentilla anserina*, and, particularly in Mediterranean formations, *Glaucium flavum*, *Matthiola sinuata*, *M. tricuspidata*, *Euphorbia*

paralias, *Eryngium maritimum*. In Cyprus this habitat includes endemics such as *Taraxacum aphrogenes* & *Taraxacum hellenicum*.

3) Corresponding categories

United Kingdom Classification: "SD2 *Honkenya peploides-Cakile maritima* strandline community" and "SD3 *Matricaria maritima-Galium aparine* shingle beach community".

Nordic classification : "4213 *Elytrigia repens*-typ", "4214 *Atriplex* spp.-*Polygonum aviculare*-typ" and "4215 *Cakile maritima*-typ".

In Azores , the corresponding association is *Caliketum edentulae* Conrad.

5) **Olsson, H. (1974)**. Studies on South Swedish sand vegetation. *Acta phytogeogr. suec.* 60.

1220 Perennial vegetation of stony banks

PAL.CLASS.: 17.3

- 1) Perennial vegetation of the upper beaches of great shingle banks, formed by *Crambe maritima*, *Honkenya peploides* and other perennial species. A wide range of vegetation types may be found on large shingle structures inland of the upper beach. On more mature, stable, shingle coastal forms of grassland, heath and scrub vegetation may develop. Some areas of unusual vegetation dominated by lichens and bryophytes are found on more mature shingle.

Sub-types

17.31 - Baltic sea kale communities: *Elymo-Crambetum*

17.32 - Channel sea kale communities: *Lathyro-Crambetum*

17.33 - Atlantic sea kale communities: *Crithmo-Crambetum*

- 2) Plants: *Crambe maritima*, *Honkenya peploides*, *Leymus arenarius* (17.31), *Lathyrus japonicus* (17.32), *Crithmum maritimum* (17.33).

3) Corresponding categories

Nordic classification : 17.31 - "4112 *Crambe maritima-Elytrigia repens*-typ", "4113 *Achillea millefolium-Angelica archangelica*-typ".

United Kingdom classification: 17.32 -" SD1 *Rumex crispus-Glaucium flavum* shingle beach community".

- 5) **Cramer, W. (1993)**. Dry coastal ecosystems of the northern Baltic sea. In: van der Maarel, E. (ed.) *Ecosystems of the world 2A. Dry coastal ecosystems, polar regions and Europe*. Elsevier, Amsterdam, pp. 95-107.
Sneddon, P. & Randall, R.E. (1993). *Coastal vegetated shingle structures of Great Britain: main report*. Peterborough, Joint Nature Conservation Committee.
-

1230 Vegetated sea cliffs of the Atlantic and Baltic coasts

PAL.CLASS.: 18.21

- 1) Vegetated cliffs exhibit a complex pattern of variation reflecting the degree of maritime exposure, geology and geomorphology, biogeographical provenance and pattern of human management. Typically, on the most exposed cliffs there is a zonation from crevice and ledge communities of the

steepest slopes beside the sea (*Crithmo-Armerietalia*, Géhu 1964) through to closed maritime grasslands on upper cliff slopes, cliff tops and cliff ledges where there is deeper accumulation of soils (*Silenion maritimae*, Malloch 1973). Further inland and on more sheltered cliffs, these grade into a complex assemblage of maritime and paramaritime types of heath, calcareous grassland, acid grassland, therophyte, tall herb, scrub and wind-pruned woodland vegetation, each enriched by floristic elements characteristic of coastal habitats. On soft coasts with much active movement, complex assemblages of maritime and non-maritime vegetation occur.

- 2) Plants: *Crithmum maritimum*, *Armeria maritima*, *Limonium* spp., *Brassica oleracea*, *Silene maritima*, *Cochlearia officinalis*, *Plantago maritima*, *Festuca rubra* ssp. *pruinosa*, *Daucus* spp., *Matricaria maritima*, *Asplenium marinum*, *Spergularia rupicola*, *Inula crithmoides*, *Sedum anglicum*, *Rhodiola rosea*, *Lavatera arborea*, *Scilla verna*.
- 3) Corresponding categories
 United Kingdom Classification: " MC1 *Crithmum maritimum*-*Spergularia rupicola* maritime rock crevice", "MC2 *Armeria maritima*-*Ligusticum scoticum* maritime rock crevice community", "MC3 *Rhodiola rosea*-*Armeria maritima* maritime cliff ledge community", "MC4 *Brassica oleracea* maritime cliff ledge", "MC5 *Armeria maritima*-*Cerastium diffusum* maritime therophyte community", "MC6 *Atriplex hastata*-*Beta vulgaris* ssp. *maritima* seabird cliff community", "MC7 *Stellaria media*-*Rumex acetosa* seabird cliff community", "MC8 *Festuca rubra*-*Armeria maritima* maritime grassland", "MC9 *Festuca rubra*-*Holcus lanatus* maritime grassland", "MC10 *Festuca rubra*-*Plantago* spp. maritime grassland", "M11 *Festuca rubra*-*Daucus carota* ssp. *gummifer* maritime grassland", "M12 *Festuca rubra*-*Hyacinthoides non-scripta* maritime grassland", "H6 *Erica vagans*-*Ulex europaeus* heath", "H7 *Calluna vulgaris*-*Scilla verna* heath", "H8 *Calluna vulgaris*-*Ulex gallii* heath".
 Nordic classification : "4111 *Matricaria maritima*-*Silene uniflora*-typ".
- 5) **Englund, B. (1942)**. Die Pflanzenverteilung auf den Meeresufern von Gotland. *Acta Bot. Fenn.* 32:1-282.

1240 **Vegetated sea cliffs of the Mediterraneancoasts with endemic *Limonium* spp.**

PAL.CLASS.: 18.22

- 1) Vegetated cliffs and rocky shores of the Mediterranean, of the Mediterraneo-temperate eastern Atlantic (south-western Iberia) and of the Black Sea. *Crithmo-Limonietaalia*
- 2) Plants: *Crithmum maritimum*, *Plantago subulata*, *Silene sedoides*, *Sedum litoreum*, *Limonium* spp., *Armeria* spp., *Euphorbia* spp., *Daucus* spp., *Asteriscus maritimus*. Many *Limonium* species, in particular, are endemics of extremely local occurrence.

1250 **Vegetated sea cliffs with endemic flora of the Macaronesian coasts**

PAL.CLASS.: 18.23 and 18.24

- 1) Aerohaline communities of the sea-cliffs of the Canaries and Madeira (*Frankenio-Astidamietaalia latifoliae*); communities of the sea-cliffs of the Azores (*Festucion petraeae*) dominated by the endemic *Festuca petraea*.

- 2) Plants: 18.23 - *Crithmum maritimum*, *Astydamia latifolia*, *Schizogyne sericea*, *Andryala glutinosa*, *Plantago coronopus*, *Tolpis fruticosa*, *Aizoon canariense*, *Campylanthus salsoloides*, *Limonium pectinatum*, *Frankenia ericifolia*, *Reichardia ligulata*, *Argyranthemum frutescens*, *Lotus* spp., *Asplenium marinum*. 18.24 - *Festuca petraea*, *Plantago coronopus*, *Daucus carota* ssp. *azorica*, *Azorina vidalii*, *Euphorbia azorica*, *Lotus subbiflorus*, *Polypogon maritimus*, *Asplenium marinum*, *Frankenia* spp.
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Atlantic and continental salt marshes and salt meadows

1310 *Salicornia* and other annuals colonising mud and sand

PAL.CLASS.: 15.1

- 1) Formations composed mostly or predominantly of annuals, in particular Chenopodiaceae of the genus *Salicornia* or grasses, colonising periodically inundated muds and sands of marine or interior salt marshes. *Thero-Salicornietea*, *Frankenietea pulverulentae*, *Saginetea maritima*.

Sub-types

15.11 - Glasswort swards (*Thero-Salicornietalia*): annual glasswort (*Salicornia* spp., *Microcnemum coralloides*), seablite (*Suaeda maritima*), or sometimes salwort (*Salsola* spp.) formations colonising periodically inundated muds of coastal saltmarshes and inland salt-basins.

15.12 - Mediterranean halo-nitrophilous pioneer communities (*Frankenion pulverulentae*): formations of halo-nitrophilous annuals (*Frankenia pulverulenta*, *Suaeda splendens*, *Salsola soda*, *Cressa cretica*, *Parapholis incurva*, *P. strigosa*, *Hordeum marinum*, *Sphenopus divaricatus*) colonising salt muds of the Mediterranean region, susceptible to temporary inundation and extreme drying;

15.13 - Atlantic sea-pearlwort communities (*Saginion maritima*): formations of annual pioneers occupying sands subject to variable salinity and humidity, on the coasts, in dune systems and saltmarshes. They are usually limited to small areas and best developed in the zone of contact between dune and saltmarsh.

15.14 Central Eurasian crypsoid communities : Sparse solonchak formations of annual grasses of genus *Crypsis* (*Heleochloa*) colonizing drying muds of humid depressions of the salt steppes and saltmarshes (15.A) of Eurasia, from Pannonia to the Far East.

- 2) Plants: 15.11 - *Salicornia* spp., *Microcnemum coralloides*, *Suaeda maritima*; 15.12 - *Frankenia pulverulenta*, *Suaeda splendens*, *Salsola soda*, *Cressa cretica*, *Parapholis incurva*, *P. strigosa*, *Hordeum marinum*, *Sphenopus divaricatus*; 15.13 - *Sagina maritima*, *S. nodosa*, *Cochlearia danica*, *Gentiana littorale*, *Bupleurum tenuissimum* ; 15.14 - *Crypsis* spp, *Cyperus pannonicus*, *Spergularia media*, *Spergularia marina*, *Salicornia* spp., *Lepidium latifolium*, *Chenopodium* spp., *Atriplex* spp.

- 3) Corresponding categories

United Kingdom classification: "SM7 *Arthrocnemum perenne* stands", "SM8 Annual *Salicornia* saltmarsh", "SM9 *Suaeda maritima* saltmarsh" and "SM27 Ephemeral saltmarsh vegetation with *Sagina maritima*".

Nordic classification: 15.11 - "4233 *Salicornia strictissima*-typ", "4252 *Salicornia europaea*-typ", "4253 *Spergularia salina*-typ".

- 5) **Ericson, L. & Wallentinus, H.-G. (1979)**. Sea-shore vegetation around the Gulf of Bothnia. Guide for the International Society for Vegetation Science, July-August 1977. *Wahlenbergia* 5:1-142.
Sanda V. & Popescu A. (1991). La cénotaxonomie des phytocénoses halophyles (*Puccinellio-Salicornietrea* Topa, 39) de Roumanie. (II). *Rev.Roum de Biol., Sér.Bot.*,

1320

Spartina swards (*Spartinion maritimae*)

PAL.CLASS.: 15.2

- 1) Perennial pioneer grasslands of coastal salt muds, formed by *Spartina* or similar grasses. When selecting sites, preference should be given to those areas supporting rare or local *Spartina*.

Sub-types

15.21 - Flat-leaved cordgrass swards: perennial pioneer grasslands of coastal salt muds, dominated by flat-leaved *Spartina maritima*, *S. townsendii*, *S. anglica*, *S. alterniflora*.

15.22 - Rush-leaved cordgrass swards: perennial pioneer grasslands of southern Iberian coastal salt muds, dominated by the junciform-leaved *Spartina densiflora*.

- 2) Plants: 15.21 - *Spartina maritima*, *S. alterniflora*; 15.22 - *Spartina densiflora*.

- 3) Corresponding categories

United Kingdom classification: "SM4 *Spartina maritima* saltmarsh" and "SM5 *Spartina alterniflora* saltmarsh".

1330

Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

PAL.CLASS.: 15.3

- 1) Salt meadows of Baltic, North Sea, English Channel and Atlantic shores. *Aster tripolium* can be present or abundant in most subdivisions.

- 2) Plants: 15.31 - *Puccinellia maritima*; 15.32 - *Halimione portulacoides*, *Halimione pedunculata*, *Aster tripolium*; 15.33 - *Armeria maritima*, *Glaux maritima*, *Plantago maritima*, *Frankeniana laevis*, *Artemisia maritima*, *Festuca rubra*, *Agrostis stolonifera*, *Juncus gerardii*, *Carex extensa*, *Blysmus rufus*, *Eleocharis* spp.; 15.34 - *Spergularia marina*, *Puccinellia distans*, *P. fasciculata*, *P. retroflexa*, *P. maritima*, *Triglochin maritima*, *Potentilla anserina*, *Halimione portulacoides*; 15.35 - *Elymus pycnanthus* (= *Agropyron pungens*) or *E. repens*; 15.36 - *Atriplex littoralis*, *A. hastata*, *Beta maritima*, *Matricaria maritima*.

- 3) Corresponding categories

United Kingdom classification: "SM10 Transitional low-marsh vegetation", "SM11 *Aster tripolium* var. *discooides* saltmarsh", "SM12 Rayed *Aster tripolium* saltmarsh", "SM13 *Puccinellia maritima*-*Triglochin maritima* saltmarsh", "SM14 *Halimione portulacoides* saltmarsh", "SM15 *Juncus maritimus*-*Triglochin maritima* saltmarsh", "SM16 *Festuca rubra* saltmarsh community", "SM17 *Artemisia maritima* community", "SM18 *Juncus maritimus* community", "SM19 *Blysmus rufus* saltmarsh community" and "SM20 *Eleocharis uniglumis* community".

Nordic classification : 15.32 - "4231 *Puccinellia maritima*-typ", 15.33 - "422 Övre landstrandens vegetation".

- 5) **Burd, F. (1989).** *The saltmarsh survey of Great Britain*. Peterborough, Nature Conservancy Council. Research and survey in nature conservation, no. 17.

Johansson, D., Ekstam, U. & Forshed, N. (1986). *Havstrandängar*. LTs förslag, Stockholm, 96 pp.

1340*** Inland salt meadows**

PAL.CLASS.: 15.4

- 1) Non-coastal natural salt basins made up of different habitat types consisting of zones of seepage of saline water, running or stagnant saline water, with typical halophilous vegetation and of reed beds at the edge of brackish waters.
Artificial or partly artificial sites should only be considered here in specific cases where they harbour a species listed in Annex II of the Directive, or where there are no remaining natural (primary) examples of the habitat at regional or national level.
- 2) Plants: *Aster tripolium*, *Atriplex hastata*, *Elymus atherica* (= *E. pungens*, *E. pycnanthus*), *Halimione pedunculata*, *Juncus gerardii*, *Plantago maritima*, *Puccinellia distans*, *Salicornia* spp., *Spergularia salina*, *Suaeda maritima*, *Triglochin maritima*.
- 3) Corresponding categories
United Kingdom classification: "SM23 *Spergularia marina*-*Puccinellietalia distans* community".
German classification : "350301 naturnahe Salzrasen des Binnenlandes", "2206 Salz- oder Solquelle", "230405 Salzbach", "230602 salzhaltiges stehendes Gewässer (Binnenlandsalzstellen)".
- 4) Brackish-water reed beds, salt springs, *Salicornia* swards and, less frequently, small salt water courses.

Mediterranean and thermo-Atlantic saltmarshes and salt meadows

1410**Mediterranean salt meadows (*Juncetalia maritimi*)**

PAL.CLASS.: 15.5

- 1) Various Mediterranean communities of the *Juncetalia maritimi*. The different associations are described under point 2) with their characteristic plant species.
Sub-types :
15.51 - tall rush saltmarshes dominated by *Juncus maritimus* and/or *J. acutus*
15.52 - short rush, sedge and clover saltmarshes (*Juncion maritimi*) and humid meadows behind the littoral, rich in annual plant species and in *Fabacea* (*Trifolium squamosi*)
15.53 - mediterranean halo-psammophile meadows (*Plantaginion crassifoliae*)
15.54 - Iberian salt meadows (*Puccinellion fasciculatae*)
15.55 - halophilous marshes along the coast and the coastal lagoons (*Puccinellion festuciformis*)
15.57 - humid halophilous moors with the shrubby stratum dominated by *Artemisia coerulescens* (*Agropyro-Artemision coerulescentis*).
Cyprus subtypes¹⁴ - Halophytic vegetation periodically inundated by saline or brackish water
- 2) Plants : *Juncus maritimus*, *J. acutus*, *Carex extensa*, *Aster tripolium*, *Plantago cornuti*, *Scorzonera parviflora* (15.51); *Hordeum nodosum*, *H. maritimum* *Trifolium squamosum*, *T. michelianum*, *Alopecurus bulbosus*, *Carex divisa*, *Ranunculus ophioglossifolius*, **Linum maritimum* (15.52);

¹⁴ A revised version of the Palaearctic classification which will include a better coverage of Cyprus is expected to be available in December 2001, this section may then need amending.

Plantago crassifolia, *Blackstonia imperfoliata*, *Centaurium tenuiflorum*, *Orchis coriophora* ssp. *fragrans* (15.53); *Puccinellia fasciculata*, *Aeluropus littoralis*, *Juncus gerardii* (15.54); *Puccinellia festuciformis* (15.55); *Artemisia coerulescens* (15.57). *Eleocharis palustris*, *Puccinellia gigantea*, *Arthrocnemum macrostachyum*, *Aeluropus littoralis*, *Centaurium spicatum*, *Cressa cretica*, *Crypsis factorofskyi*, *Crypsis schoenoides*, *Glinus lotoides*, *Limonium echioides*, *Parapholis marginata*, *Schoenoplectus litoralis*, *Spergularia marina* (= *S. salina*), *Sphenopus divaricatus*, *Suaeda vera* (Cyprus)

1420

**Mediterranean and thermo-Atlantic halophilous scrubs
(*Sarcocornetea fruticosi*)**

PAL.CLASS.: 15.6

- 1) Perennial vegetation of marine saline muds (schorre) mainly composed of scrub, essentially with a Mediterranean-Atlantic distribution (*Salicornia*, *Limonium vulgare*, *Suaeda* and *Atriplex* communities) and belonging to the *Sarcocornetea fruticosi* class.
 - 2) Plants: *Halimione portulacoides*, *Inula critmoides*, *Suaeda vera* and shrubby *Sarcocornia*.
Vegetation of lower topographic level (*Sarcocornetea*): *Sarcocornia perennis*, *S. alpini*, *S. fruticosa*, *Arthrocnemum macrostachyum* (= *A. glaucum*), *Halocnemum strobilaceum*.
Vegetation of higher topographic level (*Limonietalia confusi*): *Limonium virgatum*, *L. diffusum*, *L. ferulaceum*, *L. densissimum*, *L. girardianum*, *L. bellidifolium*, *L. gmelinii*, *Aeluropus littoralis*, *Aster tripolum*, *Limoniastrum monopetalum*, *Artemisia gallica*.
 - 3) Corresponding categories
United Kingdom classification: "SM 21 *Suaeda vera*-*Limonium binervosum* saltmarsh community", "SM25 *Sueda vera* saltmarsh community" and "SM7 *Arthrocnemum perenne* stands".
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1430

Halo-nitrophilous scrubs (*Pegano-Salsoletea*)

PAL.CLASS.: 15.72

- 1) Halo-nitrophilous scrubs (matorrals) belonging to the *Pegano-Salsoletea* class, typical of dry soils under arid climates, sometimes including taller, denser bushes.
- 2) Plants: *Peganum harmala*, *Artemisia herba-alba*, *Lycium intricatum*, *Capparis ovata*, *Salsola vermiculata*, *S. genistoides*, *S. oppositifolia*, *Suaeda pruinosa*, *Atriplex halimus*, *A. glauca*, *Camphorosma monspeliaca*, *Haloxylum articulatum*.

Salt and gypsum inland steppes

1510 * Mediterranean salt steppes (*Limonietalia*)

PAL.CLASS.: 15.8

- 1) Associations rich in perennial, rosette-forming (*Limonium* spp.) or esparto grass (*Lygeum spartum*), occupying, along Mediterranean coasts and on the fringes of Iberian salt basins, soils temporarily permeated (though not inundated) by saline water and subject to extreme summer drying, with formation of salt efflorescence. Characteristic syntaxa are *Limonietalia*, *Arthrocnemetalia*, *Thero-Salicornietalia* and *Saginetalia maritimae*.
- The following syntaxa correspond to regional varieties of this habitat type; *Arthrocnemetalia*: *Suaedion braunblanquetii* (continental Iberian peninsula), *Arthrocnemion glauci*. *Limonietalia*: *Limonium catalaunico-viciosoi* (Aragon), *Lygeo-Limonium furfuracei* (SE Iberian peninsula), *Lygeo-Lepidion cardamines* (Castilla-La-Mancha). *Thero-Salicornietalia*: *Microcnemion coralloidis* (continental Iberian peninsula), *Salicornion patulae*. *Saginetalia maritimae*: *Frankenion pulverulentae*, *Thero-Suaedion*.
- 2) Plants: *Halopeplis amplexicaulis*, *Hymenolobus procumbens*, **Limonium* spp., *Lygeum spartum*, *Microcnemion coralloides*, *Salicornia patula*, *Senecio auricula*, *Sphenopus divaricatus*.
- 5) **Rivas-Martínez, S. (1991)**. Sintaxonomía de la clase *Thero-Salicornietea* en Europa occidental. *Ecol.Medit.* (Marseille) 16: 359 - 364.

1520 * Iberian gypsum steppes (*Gypsophiletalia*)

PAL.CLASS.: 15.9

- 1) Garrigues occupying gypsum-rich soils of the Iberian peninsula, usually very open and floristically characterised by the presence of numerous gypsophilous species. Characteristic syntaxa are *Lepidion subulati*, *Gypsophilion hispanicae* and *Thymo-Teucrium verticillati*.
- 2) Plants: *Centaurea hyssopifolia*, *Gypsophila hispanica*, *G. struthium*, *Helianthemum squamatum*, *Herniaria fruticosa*, *Lepidium subulatum*, *Ononis tridentata*, *Reseda stricta*, *Teucrium libanitis*. They are often rich in thymes (*Thymus*), germanders (*Teucrium*), rockroses (*Helianthemum*) and composites (*Centaurea*, *Jurinea*, *Santolina*, *Frankenia*).

1530 * Pannonic salt steppes and salt marshes

PAL.CLASS.: 15.A1, 15.A2

- 1) Salt steppes, salt pans, salt marshes and shallow salt lakes, which are highly influenced by a pannonic climate with extreme temperatures and aridity in summer. The enrichment of salt in the soil is due to high evaporation of ground water during summer. These habitat types are partly of natural origin and partly under a distinct influence of cattle grazing.
The halophytic vegetation consists of plant communities on dry saltpans and steppes, humid salt meadows and annual plant communities of periodically flooded salt lakes with typical zonation.

- 2) Plants: *Artemisia santonicum*, *Suaeda corniculata*, *S. pannonica*, *Lepidium crassifolium*, *Puccinellia peisonis*, *Aster tripolium*, *Salicornia prostata*, *Camphorosma annua*, *Plantago tenuiflora*, *Juncus gerardii*, *Plantago maritima*, *Cyperus pannonicus*, *Pholiurus pannonicus*, *Festuca pseudovina*.
Animals: Molluscs- **Helicopsis striata austriaca*; Insects- **Callimorpha quadripunctaria*, #*Lycaena dispar*; Mammals- +*Microtus oeconomus mehelyi*, #*Spermophilus citellus*; Birds- *Botaurus stellatus*, *Platalea leucorodia*, *Porzana parva*, *Ixobrychus minutus*, *Acrocephalus melanopogon*, *Aythya nyroca*, *Ardea purpurea*, *Panurus biarmicus*.
- 5) **Mucina, L., Grabherr, G., Ellmauer, T. (1993)**. Die Pflanzengesellschaften Österreichs, Teil 1.
Soo, R. (1957). Systematische Übersicht pannonischer Pflanzengesellschaften, *Acta Bot. Acad. Sci. Hung., Budapest*, 3:317-373.
Wendelberger, G. (1954). *Steppen, Trockenrasen und Wälder des pannonischen Raumes*. Angew. Pflanzensoziol., Wien, Festschrift Aichinger: 573-634.

Boreal Baltic archipelago, coastal and landupheaval areas

1610 Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation

PAL.CLASS.: 11.22, 11.23, 11.27, 11.28, 11.29, 16.122, 16.13, 16.132, 16.133, 17.21, 17.31, 19, 42C51 (1997 version)

- 1) Glaciofluvial islands consisting mainly of relatively well sorted sand, gravel or less commonly of till. May also have scattered stones and boulders. The vegetation of esker islands is influenced by the brackish water environment and often by the ongoing land upheaval, which causes a succession of different vegetation types. Several rare vegetation types (heaths, sands and gravel shores) and threatened species occur.
- 2) Plants: *Artemisia campestris*, *Cakile maritima*, *Calluna vulgaris*, *Empetrum nigrum*, *Honkenya peploides*, *Juniperus communis*, *Lathyrus japonicus* subsp. *maritimus*, *Leymus arenarius*, *Pinus sylvestris*, *Potamogeton filiformis*, *Potamogeton pectinatus*, *Potamogeton perfoliatus*, *Myriophyllum sibiricum*, *Salsola kali*. Algae: *Ceramium tenuicorne*, *Chorda filum*, *Chara aspera*, *Cladophora glomerata*, *Fucus vesiculosus*, *Pilayella littoralis*
Animals: Insects- *Athetis lepigone*, *Simyra albovenosa*, *Actebia praecox*; Molluscs- *Cerastoderma glaucum*, *Mya arenaria*.
- 4) These esker islands can be found in association with the following habitat types: Sandbanks which are slightly covered by sea water all the time (1110), Annual vegetation of drift lines (1210), Perennial vegetation of stony banks (1220), Vegetated sea cliffs of the Atlantic and Baltic coasts (1230) and Boreal Baltic sandy beaches with perennial vegetation (1640).
- 5) **Eklund, O. (1921)**.- Vegetationen på Vidskär och Jurmo (Ab Korpo). *Meddelanden af Societas pro Fauna et Flora Fennica*, 47:178-215.
Syrjänen, K. (1995).- Meriotakilokki Korppoon Jurmossa. *Metsähallituksen luonnonsuojelujulkaisuja. Sarja A*, 51: 1-49.

1620

Boreal baltic islets and small islands

PAL.CLASS.: 11.23, 11.28, 11.29, 18.14, 18.2124, 19 (1997 version)

- 1) Groups of skerries, islets or single small islands, mainly in the outer archipelago or offshore areas. Composed of Precambrian, metamorphic bedrock, till or sediment. The vegetation of boreal Baltic islets and small islands is influenced by the brackish water environment, the ongoing land upheaval (in areas with intense land upheaval) and the climatic conditions. The vegetation types are influenced by wind, dry weather, salt and many hours of sunlight. Land-upheaval causes a succession of different vegetation types. Bare bedrock is common. A lot of small islands have no trees. The vegetation is usually very sparse and consists often of mosaic-like pioneer vegetation communities. On some islands the species diversity is increased by nitrogenous excrement from birds. Many of the plants are xerophytic and lichens are common. Temporary or permanent rockpools are common and these are inhabited by a variety of aquatic plant and animal species. Boreal Baltic islets and small islands are important nesting sites for birds and resting sites for seals. The surrounding sublittoral vegetation is also included in the type 1620.
- 2) Plants: *Agrostis stolonifera*, *Allium schoenoprasum*, *Angelica archangelica* spp. *litoralis*, *Cochlearia danica*, *Juniperus communis*, *Lemna minor*, *Puccinellia distans* ssp. *borealis*, *Sedum acre*, *Sedum telephium*, *Silene viscosa*, *Viola tricolor*. Algae: *Ceramium tenuicorne*, *Chorda filum*, *Cladophora glomerata*, *Cladophora rupestris*, *Fucus vesiculosus*, *Furcellaria lumbricalis*, *Pilayella littoralis*.
Animals: Mammals- *Halichoerus grypus*, *Phoca hispida*; Birds- *Alca torda*, *Arenaria interpres*, *Cephus grylle*, *Larus fuscus*, *Stercorarius parasiticus*, *Sterna caspia*, *Uria aalge*; Crustaceans- *Balanus improvisus*, *Idothea* sp; Molluscs- *Mytilus edulis*
- 4) Often associated with the habitat type: Reefs (1170) and Perennial vegetation of stony banks (1220).
- 5) **Eklund, O. (1931)**. -Über Ursachen der Regionalen Verteilung der Schärenflora Südwest-Finnlands. *Acta Botanica Fennica* 8: 5-133.
Hällfors, G. (1976).- The plant cover of some littoral biotopes at Krunnit (NE Bothnian Bay). *Acta Univ. Oul. A*, 42: 87-95.
Luther, H. (1961).- Veränderungen in der Gefäßpflanzenflora der Meeresfelsen von Tvärminne. *Acta Botanica Fennica*, 62: 1-100.
Vartiainen, T. (1980).- Succession of island vegetation in the land uplift area of the northernmost Gulf of Bothnia, Finland. *Acta Botanica Fennica*, 115: 1-105.
Waern, M. (1952)- Rocky-shore algae in the Öregrund archipelago. *Acta Phytogeogr.Suecica* 30: 1-298.

1630

* Boreal baltic coastal meadows

PAL.CLASS.: 15.33, 15.34 (1997 version)

- 1) Coastal meadows, mostly with low growing plant communities in the geolittoral zone, sometimes interspersed with salt patches, salinity is low (brackish water), tide hardly exists but there can be influence from land upheaval. Most of the areas were traditionally used for mowing or grazing, thus enlarging the areas and keeping the vegetation low, rich in vascular plants and suitable for nesting waders. Characteristically the vegetation occurs in distinct zones, with saline vegetation closest to the sea.
- 2) Plants: *Agrostis stolonifera*, *Blysmus rufus*, *Bolboschoenus maritimus*, *Calamagrostis stricta*, *Carex nigra*, *C. paleacea*, *Centaurium littorale*, *C. pulchellum*, *Eleocharis uniglumis*, *E. parvula*, *Festuca*

rubra, *Juncus gerardii*, *Odontites litoralis*, *Ophioglossum vulgatum*, *Plantago maritima*, *Puccinellia distans* subsp. *borealis*, *Salicornia europaea*, *Spergularia salina*, *Triglochin maritima*. Specially on the shores of the Gulf of Bothnia some phytogeographically interesting arctic relict species occur e.g. *Primula sibirica* and some endemic taxa (races). Boreal species: *Alisma wahlenbergii*, *Arctophila fulva*, *Carex glareosa*, *C. halophila*, *C. mackenziei*, *C. paleacea*, *Deschampsia bottnica*, *Euphrasia bottnica*, *Hippuris tetraphylla*, *Odontites litoralis* subsp. *fennica*, *Primula nutans*, *Puccinellia phryganoides*.

Animals: Birds- *Calidris alpina* subsp. *schinzii*, *Tringa totanus*.

Corresponding categories

Nordic classification: 4221 *Juncus gerardii-Festuca rubra* -type, 4224 *Blysmus rufus-Carex viridula-Centaurium* spp. -type, 4226 *Carex aquatilis-Calamagrostis stricta* -type, 4241 *Eleocharis uniglumis-Agrostis stolonifera* -type, 4251 *Agrostis stolonifera-Triglochin palustre* -type, 4253 *Spergularia salina* -type, 4321 *Eleocharis parvula* -type, 4322 *Eleocharis acicularis* -type

- 5) **Siira, J. (1970)**.- Studies in the ecology of the sea-shore meadows at the Bothnian Bay with special reference to the Liminka area. *Aquilo Ser. Bot.* 9.
Siira, j. (1984).- The vegetation and ecology of the primary saline soils of the Bothnian Bay. *Aquilo Ser. Bot.* 20.

1640

Boreal Baltic sandy beaches with perennial vegetation

PAL.CLASS.: 16.1222, 16.132, 16.133, 16.2133 (1997 version)

- 1) Sheltered to exposed, gently sloping sand beaches influenced by wave action, but less influenced by tides than on the Atlantic coast, giving a higher representation of perennial plant_species. Sand beaches along the Finnish and Swedish Baltic coast are relatively uncommon and usually small. Occasional stones or boulders may be scattered along the beach. The vegetation is often sparse and large areas of bare sand are common especially in the part closest to the shore. Sand-binding plants are common. The insect fauna on sand beaches is conspicuous. Drift belts of organic matter are often present
- 2) Plants: *Ammophila arenaria*, *Lathyrus japonicus* ssp. *maritimus*, *Leymus arenarius*, *Atriplex littoralis*, *Salsola kali*, *Crambe maritima*, *Honkenya peploides*, *Cakile maritima*, *Elytrigia juncea* ssp. *boreoatlantica*.
Animals: Insects- *Spingonotus coerulans*, *Catoptria fulgidella*, *Chomoderus affinis*, *Psylloides marcida*, *Pterophorus tridactylus*, *Euxoa cursoria*, *Photedes elymi*, *Apamea ophiogramma*, *Actebia praecox*, *Sphingonotus coerulans*; Birds- *Charadrius hiaticula*, *Calidris temminckii* (in Sweden only in the northern part).
- 3) Corresponding categories
 Nordic classification : 4131 *Ammophila arenaria-Leymus arenarius* -type, 4215 *Cakile maritima* – type
- 4) Associated with the following habitat types: Annual vegetation of drift lines (1210), Sandbanks which are slightly covered by sea water all the time (1110), in some cases also Baltic esker islands with sandy, rocky and shingle beach vegetation and sublittoral vegetation (1610).
- 5) **Skytén, R. (1978)**- Sand- och dynsträndernas vegetations och dess nedslitning. *Nordenskiöldsamfundets tidskrift* 38: 37-49.

1650**Boreal Baltic narrow inlets**

PAL.CLASS.: 12.51 (1997 version)

- 1) Long and narrow bays in the Boreal Baltic sea area, which are partly separated from the open sea by a submerged sill. These inlets consist usually of soft mud. The salinity varies depending on the freshwater contribution or the salinity value of the Baltic Sea. The low tidal range and low salinity of the Baltic Sea creates an ecology that is different from that of the North Atlantic coasts.
- 2) Plants: *Ceratophyllum demersum*, *Hippuris vulgaris*, *Myriophyllum spicatum*, *Phragmites australis*, *Potamogeton perfoliatus*, *Sagittaria sagittifolia*, *Schoenoplectus lacustris*, *Schoenoplectus tabernaemontani* Algae: *Cladophora aegagropila*, *Nitellopsis obtusa*
Animals:. Birds- *Anas crecca*, *Anas platyrhynchos*, *Circus aeruginosus*, *Cygnus olor*, *Podiceps cristatus*; Insects- *Chironomus plumosus coll.*; Crustaceans- *Monoporeia affinis*; Molluscs- *Macoma baltica*, *Nucula tenuis*, *Syndosmya nitida*, *Thyasira flexuosa*; Polychaeta- *Maldane sarsi* Sponges: *Axinella rugosa*, *Phakellia spp.*, *Mycale lingua*, *Polymastica spp.*, *Vosmeria spp.*
- 4) A river discharge to the innermost end of the bay is common, resulting in a density stratification of the water column. Narrow inlets unaffected or almost unaffected by man are very rare.
- 5) **Lindholm, T. (1991).**- Från havsvik till insjö. *Miljöförlaget*. Åbo, 160 pp.
Luther, H. (1951).- Verbreitung und ökologie der höheren Wasserpflanzen im Brackwasser der Ekenäs-Gegend in Süd-Finnland. I. Allgemeiner Teil. *Acta Bot. Fennici*, 49:1-232. & II. Spezieller Teil. *Acta Bot. Fennici*, 50:1-370.
Mathiessen, H. & Mathiessen, L. (1992).- Floristic aspects of one coastal inlet in the Verkviken, northern Åland. *Acta Phytogeogr. Suecic.*, 78: 101-110.
Niemi, Å. (1978).- Ecology of phytoplankton in the Tvärminne area, SW coast of Finland. III. Environmental conditions and primary production in Pojoviken in the 1970s. *Acta Bot. Fennici*, 106:1-28.

COASTAL SAND DUNES AND INLAND DUNES**Sea dunes of the Atlantic, North Sea and Baltic coasts**

2110**Embryonic shifting dunes**

PAL.CLASS.: 16.211

- 1) Formations of the coast representing the first stages of dune construction, constituted by ripples or raised sand surfaces of the upper beach or by a seaward fringe at the foot of the tall dunes.
- 2) Plants: 16.2111 - *Elymus farctus* (*Agropyron junceum*), *Leymus arenarius*, *Honkenya peploides*; 16.2112 - *Sporobolus pungens*, *Euphorbia peplis*, *Otanthus maritimus*, *Medicago marina*, *Anthemis maritima*, *A. tomentosa*, *Eryngium maritimum*, *Pancratium maritimum*.
- 3) Corresponding categories:
United Kingdom classification: "SD4 *Elymus farctus* ssp. *boreali-atlanticus* foredune community".
Nordic classification: 16.2111 - "4121 *Elytrigia juncea*-typ".

- 5) **Pettersson, B. (1965).** Maritime sands. *Acta Phytogeogr. Suec.* 50:105-110.
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2120 **Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes)**

PAL.CLASS.: 16.212

- 1) Mobile dunes forming the seaward cordon or cordons of dune systems of the coasts (16.2121, 16.2122 and 16.2123). *Ammophilion arenariae*, *Zygophyllion fontanesii*.
- 2) Plants: 16.2121- *Ammophila arenaria*, *Eryngium maritimum*, *Euphorbia paralias*, *Calystegia soldanella*, *Otanthus maritimus*, *Leymus arenarius*; 16.2122 - *Ammophila arenaria*, *Echinophora spinosa*, *Eryngium maritimum*, *Euphorbia paralias*, *Cutandia maritima*, *Medicago marina*, *Anthemis maritima*; 16.2123 - *Zygophyllum fontanesii*, *Euphorbia paralias*, *Polycarpaea nivea*, *Cyperus capitatus*, *Ononis natrix*, **Convolvulus caput-medusae*, *Polygonum maritimum*, **Androcymbium psammophilum*.
- 3 Corresponding categories
United Kingdom classification: " SD6 *Ammophila arenaria* mobile dune community".
Nordic classification : 16.2121 - "4131 *Ammophila arenaria*-*Leymus arenarius*-typ".
- 5) **Willers, T. (1988).** Die Vegetation der finnischen Küstendünen. *Norden* 6:41-88.
-

2130 ***Fixed coastal dunes with herbaceous vegetation (grey dunes)**

PAL.CLASS.: 16.221 to 16.227

- 1) Fixed dunes, stabilised and colonised by more or less closed perennial grasslands and abundant carpets of lichens and mosses, from the Atlantic coasts (and the English Channel) between the Straits of Gibraltar and Cap Blanc Nez, and the shores of the North Sea and the Baltic. In the case of the thermo-Atlantic coast, it is logical to include *Euphorbio Helichryson* (code 16.222 - thermo Atlantic as far as Brittany) and *Crucianellion maritimae* (code 16.223 - Strait of Gibraltar as far as the southern Atlantic near Cape Prior in Galicia).
- Sub-types
- 16.221 - Northern grey dunes with grass communities and vegetation from *Galio-Koelerion albescentis* (*Koelerion albescentis*), *Corynephorion canescentis* p., *Sileno conicae-Cerastion semidecandri*.
- 16.222 - Biscay grey dunes (*Euphorbio-Helichryson stoechadis*): dunes on stabilised humus soil infiltrated by dwarf bushes, with *Helichrysum stoechas*, *Artemisia campestris* and *Ephedra distachya*.
- 16.223 - Thermo-Atlantic grey dunes (*Crucianellion maritimae*): suffrutescent communities on more or less stabilised soils low in humus of the thermo-Atlantic coasts with *Crucianella maritima* and *Pancratium maritimum*.
- 16.225 - Atlantic dune (*Mesobromion*) grasslands: various sandy coastal sites characterised by herbaceous vegetation in the form of calcicole mesoxerocline grasslands, poor in nitrogen, corresponding to the communities of *Mesobromion* found by the sea (penetration of aero haline species); dunal grasslands composed of species characteristic of dry calcareous grasslands (34.32).

16.226 - Atlantic dune thermophile fringes: *Trifolio-Geranietea sanguinei*: *Galio maritimi-Geranium sanguinei*, *Geranium sanguineum* formations (34.4) on neutro basic soils rich in calcium and poor in nitrogen.

16.227 - Dune fine-grass annual communities: sparse pioneer formations (35.2, 35.3) of fine grasses rich in spring-blooming therophytes characteristic of oligotrophic soils (nitrogen poor sand or very superficial soils, or on xerocline to xerophile rocks) (*Thero-Airion* p., *Nardo-Galium saxatile* p., *Tuberarion guttatae* p.)

The vegetation may be a closed cover of grassland, sparse annual grassland on sand or dominated by mosses and lichen; the content of limestone (Ca²⁺) may vary greatly and is generally diminishing with age and succession towards brown dune systems (dune heathland).

2) Plants: *Aira* spp., *Anacamptis pyramidalis*, *Bromus hordeaceus*, *Carex arenaria*, *Cerastium* spp., *Corynephorus canescens*, *Erodium glutinosum*, *E. lebelii*, *Galium verum*, *Gentiana campestris*, *G. cruciata*, *Koeleria* spp., *Milium scabrum*, *Myosotis ramosissima*, *Ononis repens*, *Phleum arenarium*, *Polygala vulgaris* var. *dunensis*, *Silene conica*, *S. otites*, *Trifolium scabrum*, *Tuberaria guttata*, *Viola curtisii*, *V. rupestris* var. *arenaria*; Mosses- *Tortula ruraliformis*; Lichens- *Cladonia* spp.

3) Corresponding categories

United Kingdom classification: 16.221 - "SD12 *Carex arenaria-Festuca ovina-Agrostis capillaris* grassland", "SD8 *Festuca rubra-Galium verum* fixed dune grassland", "SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community" and "SD11 *Carex arenaria-Cornicularia aculeata* dune community". 16.226 - "SD9b *Ammophila arenaria-Arrhenatherum elatius* dune grassland *Geranium sanguineum* sub-community". 16.227 - most likely, certain sub-communities of the type "SD7 *Ammophila arenaria-Festuca rubra* semi-fixed dune community" and "SD11 *Carex arenaria-Cornicularia aculeata* dune community".

German classification: "1003 Dünenrasen (Graudüne)", "1003a Dünenpionierflächen mit einjähr. Vegetation (Thero-Airion)", "1003b Dünenrasen mit geschlossener Narbe u. überwieg. ausdauernden Arten (Graudüne)".

Nordic classification: "4141 *Corynephorus canescens*-typ" and "4142 *Festuca rubra-Hieracium umbellatum*-typ".

4) There is a transition towards communities of *Mesobromion* (34.31 - 34) in the following cases: old mesophile grasslands of dune slacks and inner dunes (*Anthyllido Thesietum*), frequently in mosaic with communities of *Salix repens* and particularly developed on the west face of the dunes; grasslands with *Himantoglossum hircinum* of the dunes in the De Haan area.

Dune scrubs (16.25) and humid dune slacks (16.3) with distinct vegetation form closely knit complexes with grey dunes devoid of ligneous vegetation.

5) **Andersson, D. (1950)**. The Scanian sand vegetation - a survey. *Bot. Not.* 1950:145-172.

Curtis, T.G.F. (1991). The flora and vegetation of sand dunes in Ireland. In: *A Guide to the Sand Dunes of Ireland* (M.B. Quigley, Ed.). 42-46. European Union for Dune Conservation and Coastal Management.

Dargie, T.C.D. (1993). *Sand dune vegetation survey of Great Britain*. Part II Scotland. JNCC, Peterborough.

Doody, J.P. (1991). *Sand Dune Inventory of Europe*. JNCC, Peterborough and EUCC.

Rivas-Martínez, S., Lousã, M., Díaz, T.E., Fernández-González, F. & Costa, J.C. (1990). La vegetación del sur de Portugal (Sado, Alentejo y Algarve). *Itinera Geobot.* 3. 5 - 126.

2140

* Decalcified fixed dunes with *Empetrum nigrum*

PAL.CLASS.: 16.23

- 1) Decalcified dunes colonised by *Empetrum nigrum* heaths of the coasts. Syntaxa associated to this habitat type: *Empetrium nigri*, *Calluno Genistion pilosae* p., *Ericion tetralicis* p.
- The term "fixed" should be taken to mean the opposite of "shifting". The psychrophilic coastal association *Carici trinervis-Callunetum vulgaris* de Foucault & Gehu 78 may be included here.
- 2) Plants: *Carex arenaria*, *Empetrum nigrum*, *Genista tinctoria*, *Pyrola rotundifolia*.
- 3) Corresponding categories
United Kingdom classification: "H11b *Calluna vulgaris-Carex arenaria* heath community, *Empetrum nigrum* ssp. *nigrum* sub-community".
German classification : "100401 Krähenbeer-Heide der Küsten". In Germany highly endangered coastal *Empetrum nigrum* heathland on the Geest are included.
Nordic classification: "4143 *Calluna vulgaris-Empetrum nigrum-Carex arenaria*-typ".
- 4) Humid dune slacks (16.3), grey dunes (16.22), wooded dunes (16.22, 16.25).
- 5) **Mc.Manus, D. (1988)**. *Plant community dynamics on sand dunes at Murlough National Nature Reserve, Dundrum, Co. Down, Northern Ireland*. M.Phil. Thesis, University of Ulster.
Olsson, H. (1993). Dry coastal ecosystems of southern Sweden. In: van der Maarel, E. (ed.) *Ecosystems of the world 2A. Dry coastal ecosystems, polar regions and Europe*. Elsevier, Amsterdam. pp. 131-143.

2150

* Atlantic decalcified fixed dunes (*Calluno-Ulicetea*)

PAL.CLASS.: 16.24

- 1) Decalcified dunes of France, Belgium and Britain, colonised by heaths of the alliances *Calluno-Genistion* or *Ulicion minoris*, and of Iberia, colonised by heaths of the alliance *Ericion umbellatae*.
- 2) Plants: *Calluna vulgaris*, *Carex arenaria*, *C. trinervis*, *Erica ciliaris*, *E. cinerea*, *E. scoparia*, *Festuca vasconensis*, *Pseudoarrhenatherum longifolium* (*Arrhenatherum thorei*), *Ulex australis*.
- 3) Corresponding categories
United Kingdom classification: "H11a *Calluna vulgaris-Carex arenaria* heath-*Erica cinerea* sub-community" and "H11c *Calluna vulgaris-Carex arenaria* species poor sub-community" and "H1d *Calluna vulgaris-Festuca ovina* heath *Carex arenaria* sub-community".
- 4) Pioneer phase of this habitat: decalcified fixed dunes colonised by *Corynephorus canescens* and *Cladonia* spp. (64.1 x 35.2).

2160**Dunes with *Hippophae rhamnoides***

PAL.CLASS.: 16.251

- 1) Sea-buckthorn formations of forest colonisation in both dry and humid dune depressions.
 - 2) Plants: *Hippophae rhamnoides*.
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2170**Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*)**

PAL.CLASS.: 16.26

- 1) *Salix repens* communities (*Salicion arenariae*), colonising wet dune slacks. Following the lowering of the ground water table or accumulation of drift sand, these communities may develop into mesophilous communities as the *Pyrolo-Salicetum* (with *Pyrola rotundifolia*, *Viola canina*, *Monotropa hypopitys*) or, into xerophilous *Salix* communities (with *Carlina vulgaris*, *Thalictrum minus*) or into *Salix repens* communities with *Mesobromion* elements.
 - 2) Plant species: *Salix repens* ssp. *argentea* (i.e. *Salix arenaria*).
 - 3) Corresponding categories
United Kingdom classification : "SD16 *Salix repens*-*Holcus lanatus* dune slack".
German classification : "1006b Kriechweiden-Teppiche der Dünen".
 - 4) This habitat forms mosaics with other dune slack vegetation containing *Salix arenaria* but which is rich in bryophytes and referable to the *Caricion davallianae* (16.33), as well as mosaics with dune grasslands and with thickets with *Rosa pimpinellifolia*. This habitat is often invaded by *Hippophae rhamnoides* and *Ligustrum vulgare*.
 - 5) **Anon. (1977).** *A study of the Raven*, Co. Wexford. An Foras Forbartha/Forest and Wildlife Service, Dublin.
Cotton, J. (1974). *Pyrola rotundifolia* L. in Co. Wexford (H12). *Ir. Nat. J.* 18, 44-46.
Olsson, H. (1993). Dry coastal ecosystems of southern Sweden. In: van der Maarel, E. (ed.) *Ecosystems of the world 2A. Dry coastal ecosystems, polar regions and Europe*. Elsevier, Amsterdam, pp. 131-143.
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2180 Wooded dunes of the Atlantic, Continental and Boreal region

PAL.CLASS.: 16.29

- 1) Natural or semi-natural forests (long established) of the Atlantic, Continental and Boreal region coastal dunes with a well developed woodland structure and an assemblage of characteristic woodland species. It corresponds to oak groves and beech-oak groves with birch (*Quercion robori-petraeae*) on acid soils, as well as forests of the *Quercetalia pubescenti-petraeae* order. Pioneer stages are open forests with *Betula* spp. and *Crataegus monogyna*, mixed forests with *Fraxinus excelsior*, *Quercus robur*, *Ulmus*

minor and *Acer pseudoplatanus* or, in wet dune slacks, pioneer forests with *Salix alba* which develop into humid mixed forests or marsh forests. On southern atlantic coasts, it mainly corresponds to mixed *Pinus pinaster-Quercus ilex* forests, forests of *Quercus suber* and *Quercus robur* or forest stage with *Quercus robur* or *Quercus pubescens*. On Baltic coasts also pioneer forests of *Alnus* spp. or *Pinus sylvestris*.

- 2) Plant species are highly varied and depend on local site conditions
 - 3) Corresponding categories
German classification: "430804 Buchenbuschwald (auf Ostseedünen)", "430801 Traubeneichen-Hainbuchenwald (küstennah, gischtbeeinflußt, F02)", "43080501 Eichen-Trockenwald lalkarmer Standorte (küstennah, gischtbeeinflußt, F02)", "440202 trockener Sandkiefernwald (küstennah, gischtbeeinflußt, F02)".
 - 4) This habitat type include semi-natural forests with a typical undergrowth, spontaneously developed from old plantations. These forests are generally associated with dune scrubs (preforest stages-16.25), dune moors, grey dunes (16.22) and wet dune slacks (16.3).
 - 5) **Kielland-Lund, J. (1967)**. Zur Systematik der Kiefernwälder Fennoscandiensis. *Mitt. Flor.-Soz. Arbeitsgem.N.F.* 11/12:127-141.
-

2190 Humid dune slacks

PAL.CLASS.: 16.3 = 16.31 to 16.35

- 1) Humid depressions of dunal systems. Humid dune-slacks are extremely rich and specialised habitats very threatened by the lowering of water tables.
Sub-types :
 - 16.31 - Dune-slack pools (*Charetum tomentosae*, *Elodeetum canadense*, *Hippuridetum vulgaris*, *Hottonietum palustris*, *Potametum pectinati*): fresh-water aquatic communities (cf. 22.4) of permanent dune-slack water bodies.
 - 16.32 - Dune-slack pioneer swards (*Juncenion bufonii* p.: *Gentiano-Erythraetum littoralis*, *Hydrocotylo-Baldellion*): pioneer formations of humid sands and dune pool fringes, on soils with low salinity.
 - 16.33 - Dune-slack fens: calcareous and, occasionally, acidic fen formations (cf. 54.2, 54.4, in particular 54.21, 54.2H, 54.49), often invaded by creeping willow, occupying the wettest parts of dune-slacks.
 - 16.34 - Dune-slack grasslands: humid grasslands and rushbeds (see 37.31, 37.4) of dune-slacks, also often with creeping willows (*Salix rosmarinifolia*, *S. arenaria*).
 - 16.35 - Dune-slack reedbeds, sedgebeds and canebeds: reedbeds, tall-sedge communities and canebeds (cf. 53.1, 53.2, 53.3) of dune-slacks.
- 3) Corresponding categories
United Kingdom classification: "SD13 *Salix repens-Bryum pseudotriquetrum* dune slack community", "SD14 *Salix repens-Campylium stellatum* dune slack community", "SD15 *Salix repens-Calliargon cuspidatum* dune slack community", "SD16 *Salix repens-Holcus lanatus* dune slack community" and "SD17 *Potentilla anserina-Carex nigra* dune slack community".
- 5) **Olsson, H. (1993)**. Dry coastal ecosystems of southern Sweden. In: van der Maarel, E. (ed.) *Ecosystems of the world 2A. Dry coastal ecosystems, polar regions and Europe*. Elsevier, Amsterdam, pp. 131-143.

21A0 Machairs (* in Ireland)

PAL.CLASS.: 1A

- 1) Complex habitat comprised of a sandy coastal plain resulting partially from grazing and/or rotational cultivation, in an oceanic location with a cool, moist climate. The wind blown sand has a significant percentage of shell derived material, forming a lime rich soil with pH values normally greater than 7. Vegetation is herbaceous, with a low frequency of sand binding species.
- 2) Plants: *Cochlearia scotica*, *Dactylorhiza fuchsii* ssp. *hebridensis*, *Euphrasia marshallii*, *Festuca rubra*, *Galium verum*, *Lotus corniculatus*, *Plantago lanceolata*, *Poa pratensis*, *Trifolium repens*.
- 4) Lakes (ponds and small lakes in Scotland) of widely varying salinity, pH and chemical composition, transitions to saltmarsh and blanket bog are associated habitats. In the United Kingdom, twelve different types of vegetation under the National Vegetation Classification can be identified.
- 5) **Bassett, A. & Curtis, T.G.F. (1985)**. The nature and occurrence of sand-dune machair in Ireland. *Proceedings of the Royal Irish Academy*. 85B: 1 - 20.
Curtis, T.G.F. (1991). The flora and vegetation of sand dunes in Ireland. In: *A Guide to the Sand Dunes of Ireland* (M.B. Quigley, Ed.). 42-46. European Union for Dune Conservation and Coastal Management.
Ritchie, W. (1975). The meaning and definition of machair. *Transactions of the Botanical Society of Edinburgh*, 42, 431-440.

Sea dunes of the Mediterranean coast

2210 *Crucianellion maritimae* fixed beach dunes

PAL.CLASS.: 16.223

- 1) Fixed dunes of the western and central Mediterranean, of the Adriatic, of the Ionian Sea and North Africa with *Crucianella maritima*, *Pancratium maritimum*.
- 2) Plants: *Crucianella maritima*, *Pancratium maritimum*.

2220 Dunes with *Euphorbia terracina*

PAL.CLASS.: 16.224

- 1) Coastal dune grassland communities, with, among others, *Euphorbia terracina*, *Silene nicaeensis*, *Ephedra distachya* and *Silene subconica*.
 - 2) Plants: *Euphorbia terracina*, *Ephedra distachya*, *Silene nicaeensis*, *S. subconica*.
-

2230***Malcolmietalia* dune grasslands**

PAL.CLASS.: 16.228

- 1) Associations with many small annuals and often abundant ephemeral spring bloom, with *Malcolmia lacera*, *M. ramosissima*, *Evax astericiflora*, *E. lusitanica*, *Anthyllis hamosa*, *Linaria pedunculata*, of deep sands in dry interdunal depressions of the coasts. They are dunal representatives of 35.4.
 - 2) Plants: *Malcolmia lacera*, *M. ramosissima*, *Evax astericiflora*, *E. lusitanica*, *Anthyllis hamosa*, *Linaria pedunculata*.
-

2240***Brachypodietalia* dune grasslands with annuals**

PAL.CLASS.: 16.229

- 1) Dunal formations of 6220 - Pseudo-steppe with grasses and annuals of the 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.
 - 2) Plants: *Brachypodium* spp.
-

2250*** Coastal dunes with *Juniperus* spp.**

PAL.CLASS.: 16.27 and 64.613

- 1) Juniper formations [*Juniperus turbinata* ssp. *turbinata* (= *J. lycia*, *J. phoenicea* ssp. *lycia*), *J. macrocarpa*, *J. navicularis* (= *J. transtagana*, *J. oxycedrus* ssp. *transtagana*), *J. communis*] of Mediterranean and thermo-Atlantic coastal dune slacks and slopes (*Juniperion lyciae*). *Juniperus communis* formations of calcareous dunes. This habitat type includes the communities of *J. communis* from the calcareous dunes of Jutland and the communities of *J. phoenicea* ssp. *lycia* in Rièges woods in the Camargue.
 - 2) Plants: *Juniperus turbinata* ssp. *turbinata*, *J. macrocarpa*, *J. navicularis*, *J. communis*, *J. oxycedrus*.
 - 4) In the Mediterranean and Atlantic coasts of the Iberian peninsula this habitat type is associated with dune scrubs of *Corema album* (*Rubio-Coremion albi*) and substitution matorral of the *Halimium halimifolium* dune scrubs (*Stauracantha-Halimietalia*)
 - 5) **Franco, A.J. (1986)**. *Juniperus* L. In: *Flora Iberica* 1: 181 - 188. Madrid
Rivas-Martínez, S.; Lousã, M.; Díaz, T.E.; Fernández-González, F. & Costa, J.C. (1990). La vegetación del sur de Portugal (Sado, Alentejo y Algarve). *Itinera Geobot.* 3. 5 - 126.
Rivas-Martínez, S.; Wildpret, W. & Pérez de Paz, P.L. (1993). Datos sobre *Juniperus phoenicea* aggr. (Cupressaceae). *Itinera Geobot.* 7: 509 - 512.
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2260***Cisto-Lavenduletalia* dune sclerophyllous scrubs**

PAL.CLASS.: 16.28

- 1) Sclerophyllous or lauriphyllous scrubs established on dunes of the Mediterranean and Warm-Temperate Humid regions. Codes of 32 may be used in addition to 16.28 to precise the habitat. Also

similar sclerophyllous dune vegetation included in 16.28 of the *Pistacio-Rhamnetalia* and *Cisto-Micromeritia*.

2270 * **Wooded dunes with *Pinus pinea* and/or *Pinus pinaster***

PAL.CLASS.: 16.29 x 42.8

- 1) Coastal dunes colonised by Mediterranean and Atlantic thermophilous pines, corresponding to the substitution facies or in some stations climax formations of evergreen oak of artificial origin (*Quercetalia ilicis* or *Ceratonio-Rhamnetalia*).
 - 2) Plants: *Pinus pinea*, *P. pinaster*, *P. halepensis*, *Juniperus macrocarpa*, *J. turbinata* ssp. *turbinata*.
 - 4 Long-established plantations of these pines, within their natural area of occurrence, and with an undergrowth basically similar to that of paraclimatic formations, are included in this habitat type
-

Inland dunes, old and decalcified

2310 **Dry sand heaths with *Calluna* and *Genista***

PAL.CLASS.: 64.1 x 31.223

- 1) Dunes of the North Sea and Baltic plains, formed of quartzic sands originating in redeposited and reworked glacial drift and outwash. They are highly siliceous in the Netherlands, northern Belgium and north-western Germany, progressively slightly less oligotrophic and with a more continental species assemblage in north-eastern Germany, Poland and the eastern Baltic plain. The dune systems, particularly the large ones, harbour a unique ensemble of interacting communities and harbour many specialised and localised organisms. They have considerably regressed and the remaining examples are fragile and often threatened. Vegetation is dominated by heaths with *Calluna* and *Genista*.
 - 2) Plants: *Calluna vulgaris*, *Genista anglica*, *G. pilosa*.
 - 3) Corresponding categories
Nordic classification: "5114 *Genista* spp.-*Calluna vulgaris*-typ", "5115 *Calluna vulgaris*-typ".
 - 5) **Malmer, N. (1965)**. The south-western dwarf shrub heaths. *Acta Phytogeogr. Suec.* 50:123-130.
-

2320 **Dry sand heaths with *Calluna* and *Empetrum nigrum***

PAL.CLASS.: 64.1 x 31.227

- 1) Coastal non-dunal *Calluna vulgaris* and *Empetrum nigrum* heaths, formed on quartzic sands originating in redeposited and reworked glacial drift and outwash.
- 2) Plants: *Calluna vulgaris*, *Empetrum nigrum*.

- 3) Corresponding categories
Nordic classification : "4143 *Calluna vulgaris*-*Empetrum nigrum*-*Carex arenaria*-typ".
- 5) **Malmer, N. (1965)**. The south-western dwarf shrub heaths. *Acta Phytogeogr. Suec.* 50:123-130.
-

2330 **Inland dunes with open *Corynephorus* and *Agrostis* grasslands**

PAL.CLASS.: (64.11 or 64.12) x 35.2

- 1) Open formations found on inland dunes with dry siliceous soils, of Atlantic, sub-Atlantic and Mediterraneo-montane distribution, often species-poor and with a strong representation of annuals. It includes formations of unstable Germano-Baltic fluvio-glacial inland sands with *Corynephorus canescens*, *Carex arenaria*, *Spergula morisonii*, *Teesdalia nudicaulis* and carpets of fruticose lichens (*Cladonia*, *Cetraria*) (64.11) and other grasslands of more stabilised Germano-Baltic fluvio-glacial inland dune systems with *Agrostis* spp. and *Corynephorus canescens* or other acidophilous grasses (64.12).
- 2) Plants: 64.11 - *Corynephorus canescens*, *Carex arenaria*, *Spergula morisonii*, *Teesdalia nudicaulis*, *Cladonia*, *Cetraria*; 64.12 - *Agrostis* spp., *Corynephorus canescens*.
- 3) Corresponding categories
United Kingdom classification : "SD11 *Carex arenaria*-*Cornicularia aculeata* dune community p.p." and "SD12 *Carex arenaria*-*Festuca ovina*-*Agrostis capillaris* grassland p.p."
Nordic classification : "4141 *Corynephorus canescens*-typ".
- 5) **Olsson, H. (1974)**. Studies on South Swedish sand vegetation. *Acta Phytogeogr. Suec.* 60:1-170.
-

2340 *** Pannonic inland dunes**

PAL.CLASS.: 64.71

- 1) Inland dunes of the Pannonic plain and of neighbouring basins. In former days widely distributed as a result of hay harvesting and grazing. Good examples exist in mosaics of different habitats with open sand, dune lichen communities, pioneer swards with many therophytes, open and closed swards. Only these habitat complexes should be considered under this title. For steppes and meadow-steppes on stabilised sand or sandy soils, not associated with dune complexes, see habitat 6260 (34.A1).
- 2) Plants: *Cladonia convoluta*, *C. furcata*, *Corynephorus canescens*, *Thymus serpyllum*, *Viola tricolor* ssp. *tricolor*, *Cerastium semidecandrum*, *Spergularia morisonii*, *Alyssum montanum* ssp. *gmelinii*, *Bassia laniflora*, *Cynodon dactylon*.
- 3) Corresponding categories
Austrian syntaxa: *Thymo angustifolii*-*Corynephorum canescentis* (fragmentary in disturbed sites).
- 4) Habitat complexes with a variety of particular plant communities and microsites.
- 5) **Mucina, L., Grabherr, G., Ellmauer, T. (1993)**. *Die Pflanzengesellschaften Österreichs, Teil 1. Anthropogene Vegetation*. Gustav Fischer, Jena.Stuttgart. New York. pp 578.

FRESHWATER HABITATS

Standing water

3110 Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*)

PAL.CLASS.: 22.11 x 22.31

- 1) Shallow oligotrophic waters with few minerals and base poor, with an aquatic to amphibious low perennial vegetation belonging to the *Littorelletalia uniflorae* order, on oligotrophic soils of lake and pond banks (sometimes on peaty soils). This vegetation consists of one or more zones, dominated by *Littorella*, *Lobelia dortmana* or *Isoetes*, although not all zones may not be found at a given site.
- 2) Plants: *Isoetes lacustris*, *I. echinospora*, *Littorella uniflora*, *Lobelia dortmanna*, *Deschampsia setacea*, *Subularia aquatica*, *Juncus bulbosus*, *Pilularia globulifera*, *Luronium natans*, *Potamogeton polygonifolius*; in the Boreal region also *Myriophyllum alterniflorum*, *Drepanocladus* spp., *Warnstorfia* spp. and *Fontinalis* spp.
- 3) Corresponding categories
German classification : "24020201 kalkarmer, oligotropher See des Tief- und Hügellands", "24020301 kalkarmes, oligotrophes, sich selbst überlassenes Abbaugewässer".
Nordic classification: "6413 *Lobelia dortmanna-Isoetes* spp.typ", "6414 *Littorella uniflora-Lobelia dortmanna*-typ". In the Boreal region this habitat is particularly found on glacio fluvial soil and with usually dense isoetid vegetation, sparse reedbeds, helophytic vegetation and carpets of submerged bryophytes.
- 4) This habitat is found in association with heath (31.1) and *Nanocyperion* (22.32) communities. In France and Ireland this habitat occurs, in particular, in heathland of sandy plains on podzols, where the water table occurs at the surface
- 5) **Mäkirinta, U. (1978)**. *Die Pflanzensoziologische Gliederung der Wasservegetation im See Kukkia, Südfinnland*. Acta Univ. Ouluensis Ser. A. Scientiae Rerum Naturalium Nr. 75, biologica Nr.5.
Thunmark, S. (1931). Der See Fiolen und seine Vegetation. *Acta Phytogeogr. Suecica*. II:1-198.

3120 Oligotrophic waters containing very few minerals generally on sandy soils of the West Mediterranean with *Isoetes* spp.

PAL.CLASS.: 22.11 x 22.34

- 1) Dwarf amphibious vegetation of oligotrophic waters with few minerals, mostly on sandy soils of the Mediterranean region and some irradiations in the thermo-Atlantic sector, and belonging to the *Isoeto-Nano-Juncetea*. Short grasslands of temporary ponds (the Annex I priority habitat type 3170) is a particular subtype (temporary and very shallow waters).

2) Plant species: high level - *Isoetes velata*, *I. setacea*, *Pilularia minuta*, #*Marsilea strigosa*; low level - *Isoetes histrix*, *I. durieui*, *Serapias* spp. (*Serapion*).

3) Correspondances:

In the Azores the corresponding association is *Anthemido-Menthetum pulegii* Lüp., with *Anthemis nobilis*, *Mentha pulegium*, *Juncus bulbosus*, *Hypericum humifusum*, *Scirpus setacea*, *Peplis portula*, *Isoetes azorica*

3130

Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or *Isoeto-Nanojuncetea*

PAL.CLASS.: 22.12 x (22.31 and 22.32)

- 1) 22.12 x 22.31 - aquatic to amphibious short perennial vegetation, oligotrophic to mesotrophic, of lake, pond and pool banks and water-land interfaces belonging to the *Littorelletalia uniflorae* order.
22.12 x 22.32 - amphibious short annual vegetation, pioneer of land interface zones of lakes, pools and ponds with nutrient poor soils, or which grows during periodic drying of these standing waters: *Isoeto-Nanojuncetea* class.
These two units can grow together in close association or separately. Characteristic plant species are generally small ephemerophytes.
 - 2) Plants: 22.12 x 22.31: *Littorella uniflora*, #*Luronium natans*, *Potamogeton polygonifolius*, *Pilularia globulifera*, *Juncus bulbosus* ssp. *bulbosus*, *Eleocharis acicularis*, *Sparganium minimum*.
22.12 X 22.32 : #*Lindernia procumbens*, *Elatine* spp., *Eleocharis ovata*, *Juncus tenageia*, *Cyperus fuscus*, *C.flavescens*, *C.michelianus*, *Limosella aquatica*, *Schoenoplectus supinus*, *Scirpus setaceus*, *Juncus bufonius*, *Centaureum pulchellum*, *Centunculus minimus*, *Cicendia filiformis*.
 - 3) Corresponding categories
German classification : "240301 mesotropher See (Bleisee) (mit Zwergbinsenfluren -wechselnass-, P143)", "240306 meso- bis eutrophes, sich selbst überlassenes Abbaugewässer (mit Zwergbinsenfluren -wechselnass-, P143)".
Nordic classification : "6411 *Eleocharis acicularis*-typ", "6412 *Ranunculus reptans*-*Subularia aquatica*-typ".
in the Azores the corresponding association is *Isoetetum azorica* Lüp.
 - 4) This habitat type could also develop in wet dune slacks (see 16.32 in 2190, included in Annex I).
In the Atlantic region, such lakes can shelter glacial relict species, e.g. fish such as *Selvelinus alpinus*.
Areas with a variable hydrological system, periodically lacking vegetation due to trampling, should not be included.
 - 5) **Jenssen, S. (1979)**. Classification of lakes in southern Sweden on the basis of their macrophyte composition by means of multivariate methods. *Vegetatio* 39:129-146.
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3140 Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.

PAL.CLASS.: (22.12 or 22.15) x 22.44

- 1) Lakes and pools with waters fairly rich in dissolved bases (pH often 6-7) (21.12) or with mostly blue to greenish, very clear, waters poor (to moderate) in nutrients, base-rich (pH often >7.5) (21.15). The bottom of these unpolluted water bodies are covered with charophyte, *Chara* and *Nitella*, algal carpets. In the Boreal region this habitat type includes small calcareous-rich oligo-mesotrophic gyttja pools with dense *Chara* (dominating species is *C. strigosa*) carpets, often surrounded by various eutrophic fens and pine bogs.
 - 2) Plants: *Chara* spp., *Nitella* spp.
 - 3) Corresponding categories
Nordic classification : "633 Långskottsvegetation med kransalger", "6421 *Littorella uniflora-Chara* spp. -typ"
 - 5) **Lundh, A. (1951)**. Studies on the vegetation and hydrochemistry of Scanian lakes. III. Distribution of macrophytes and some algal groups. *Bot. Not. Suppl.* 3(1):1-138.
Rintanen, T. (1982). Botanical lake types in Finnish Lapland. *Ann. Bot. Fennici* 19:247-274.
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3150 Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation

PAL.CLASS.: 22.13 x (22.41 or 22.421)

- 1) Lakes and ponds with mostly dirty grey to blue-green, more or less turbid, waters, particularly rich in dissolved bases (pH usually > 7), with free-floating surface communities of the *Hydrocharition* or, in deep, open waters, with associations of large pondweeds (*Magnopotamion*).
 - 2) Plants: *Hydrocharition* - *Lemna* spp., *Spirodela* spp., *Wolffia* spp., *Hydrocharis morsus-ranae*, *Stratiotes aloides*, *Utricularia australis*, *U. vulgaris*, *Aldrovanda vesiculosa*, Ferns (*Azolla*), Liverworts (*Riccia* spp., *Ricciocarpus* spp.); *Magnopotamion* - *Potamogeton lucens*, *P. praelongus*, *P. zizii*, *P. perfoliatus*.
 - 3) Corresponding categories
Nordic classification : "632 *Potamogeton* spp.-huvudtyp", "6511 *Lemna minor-Spirodela polyrrhiza*-typ".
 - 5) **Dahl, E., Kalliola, R., Marker, E. & Persson, Å. (1971)**. Nordisk vegetationsklassificering för kartläggning. In: *IBP i Norden 7*. Universitetsforlaget, Oslo, pp. 3-12.
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3160 Natural dystrophic lakes and ponds

PAL.CLASS.: 22.14

- 1) Natural lakes and ponds with brown tinted water due to peat and humic acids, generally on peaty soils in bogs or in heaths with natural evolution toward bogs. pH is often low, 3 to 6. Plant communities belong to the order *Utricularietalia*.

- 2) Plants: *Utricularia* spp., *Rhynchospora alba*, *R. fusca*, *Sparganium minimum*, *Sphagnum* species. In the Boreal region also *Nuphar lutea*, *N. pumila*, *Carex lasiocarpa*, *C. rostrata*, *Nymphaea candida*, *Drepanocladus* spp., *Warnstorfia trichophylla*, *W. procera*.
Animals: Odonata (dragonflies and damselflies)
- 3) Corresponding categories
German classification: "240101 natürliches, dystrophes Gewässer (z. B. Kolk, Moorauge, Randlagg).
Nordic classification : "6211 *Nuphar*-typ", "652 Vattenmossvegetation".

3170

* Mediterranean temporary ponds

PAL.CLASS.: 22.34

- 1) Very shallow temporary ponds (a few centimetres deep) which exist only in winter or late spring, with a flora mainly composed of Mediterranean therophytic and geophytic species belonging to the alliances *Isoetion*, *Nanocyperion flavescens*, *Preslion cervinae*, *Agrostion salmanticae*, *Heleochloion* and *Lythrion tribracteati*.
- 2) Plants: *Agrostis pourretii*, *Centaureum spicatum*, *Chaetopogon fasciculatus*, *Cicendia filiformis*, *Crypsis aculeata*, *C. alopecuroides*, *C. schoenoides*, *Cyperus flavescens*, *C. fuscus*, *C. michelianus*, *Damasonium alisma*, *Elatine macropoda*, *Eryngium corniculatum*, *E. galioides*, *Exaculum pusillum*, *Fimbristylis bisumbellata*, *Glinus lotoides*, *Gnaphalium uliginosum*, *Illecebrum verticillatum*, #*Isoetes boryana*, *I. delilei*, *I. duriei*, *I. heldreichii*, *I. histrix*, #*I. malinverniana*, *I. velata*, *Juncus buffonius*, *J. capitatus*, *J. pygmaeus*, *J. tenageia*, *Lythrum castellanum*, **L. flexuosum*, *L. tribracteatum*, #*Marsilea batardae*, #*M. strigosa*, *Mentha cervina*, *Ranunculus dichotomiflorus*, *R. lateriflorus*, *Serapias lingua*, *S. neglecta*, *S. vomeracea*.
- 3) Corresponding categories
In the Azores the corresponding association is *Anthemido-Menthetum pulegii* Lüp., with *Anthemis nobilis*, *Mentha pulegium*, *Juncus bulbosus*, *Hypericum humifusum*, *Scirpus setacea*, *Peplis portula*, *Isoetes azorica*.

3180

* Turloughs

PAL.CLASS.: 22.5

- 1) Temporary lakes principally filled by subterranean waters and particular to karstic limestone areas. Most flood in the autumn and then dry up between April and July. However, some may flood at any time of the year after heavy rainfall and dry out again in a few days; others, close to the sea, may be affected by the tide in summer. These lakes fill and empty at particular places. The soils are quite variable, including limestone bedrock, marls, peat, clay and humus, while aquatic conditions range from ultra oligotrophic to eutrophic. The vegetation mainly belongs to the alliance *Lolio-Potentillion anserinae* Tx. 1947, but also to the *Caricion davallianae* Klika 1934.
- 2) Plants: *Cinclidotus fontinaloides*, *Fontinalis antipyretica* (Bryophyta).
Animals: *Tanymastix stagnalis* (wet phase) and the beetles *Agonum lugens*, *A. livens*, *Badister meridionalis*, *Blethisa multipunctata* and *Pelophila borealis* (dry phase)¹⁵.

¹⁵ The animals listed should not be regarded as characteristic in any strict sense; both fauna and flora of turloughs are characteristic of intermittently flooded zones.

- 5) **Coxon, C.E. (1986).** *A study of the hydrology and geomorphology of turloughs*. Ph.D. Thesis, Trinity College, Dublin.
Coxon, C.E. (1987). The spatial distribution of turloughs. *Irish Geography*. 20: 11 - 23.
Goodwillie, R. (1992). *Turloughs over 10 ha: vegetation survey and evaluation*. A report for the National Parks and Wildlife Service of the Office of Public Works (unpublished).
Macgowran, B. (1985). *Phytosociological and ecological studies on turloughs in the west of Ireland*. Ph.D. Thesis, National University of Ireland, Dublin.
Praeger, R.L. (1932). The flora of turloughs: a preliminary note. *Proceedings of the Royal Irish Academy*. 41B: 37 - 45.
Sykora, K.V. (1982). Lolio-Potentillion Communities in Ireland. *Acta Botanica Neerlandica*. 31(3): 185 - 199.
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3190

Lakes of gypsum karst

PAL.CLASS.: 22.12p

- 1) Small permanent lakes that have developed in springs or spring complexes of active gypsum karst areas. These water bodies are characterised by large fluctuations of water level (up to 2.5 m) which is related with the level of the underlying water table and amount of precipitation. Maximum depth of the pools does not exceed 7 m, but the stratification is well-expressed. Intensive gypsum solution leads to high saturation of Ca²⁺ and SO₄²⁻ ions in water. The unusual conditions allow unique colonies and mats of green and purple sulphurous bacteria to develop in the lakes. Communities of *Charetea*, *Lemnetea* and *Potamogetonion* are the dominant elements of the water vegetation.
- 2) Plants: *Lemna trisulca*, *Chara globularis*, *Chara contraria*, *Warnstorfia exannulata*, *Ceratophyllum demersum*, *Potamogeton pectinatus*, *Potamogeton lucens*, *Schoenoplectus lacustris*, *Sparganium erectum*
- 4) These lakes are similar in some respects to 3180 Turloughs but that habitat is found in limestone not gypsum areas and does not support mats of green and purple bacteria
-

31A0

*Transylvanian hot-spring lotus beds

PAL.CLASS.: 22.43113

- 1) Formations of *Nymphaea lotus* of geo-thermal waters (unit 66.94) of Petea Lake, western Romania.
- 2) Plants: *Nymphaea lotus*
- 5) **Olteanu-Cozma, C. (1959).** Biologia si ecologia plantei *Nymphaea lotus* L. var. *thermalis* (DC.)Tusz. de la Baile 1 Mai - Oradea. *Ocr.Nat.*, 4
- 6) Hungarian examples (e.g. Budapest) are introductions.

Running water

Sections of water courses with natural or semi-natural dynamics (minor, average and major beds) where the water quality shows no significant deterioration

3210

Fennoscandian natural rivers

PAL.CLASS.: -

- 1) Boreal and hemiboreal natural and near-natural river systems or parts of such systems containing nutrient-poor water. The water level shows great amplitude, up to 6 m during the year. Especially during the spring, the water level is high. The water-dynamics can vary and contain waterfalls, rapid streams, calm water, and small lakes adjacent to the river. The water erosion causes a higher amount of nutrients towards the river-mouth, where sedimentation starts. In higher levels the rivers are characterized by great, very cold water flows, coming from glaciers, deep snowbeds and large snow-covered areas in mire- and woodlands. In addition the water surface in placid river sections is frozen to ice every winter. These circumstances create ecosystems unique to this part of Europe.
- 2) Plants. *Salix daphnoides*, *Myricaria germanica*, *Taraxacum crocodes*, *Cinna latifolia*, *Sagittaria natans x sagittifolia*, *Matteuccia struthiopteris*, *Stellaria nemorum* ssp. *nemorum*, *Sparganium glomeratum*, *Carex aquatilis*, *Hygrohypnum ochraceum*
Animals : Molluscs- # *Margaritifera margaritifera*. Insects- *Plecoptera* spp., *Baetis* spp., *Centroptilum* spp., Fish- # *Salmo salar*, # *S. salar m. sebago*, *S. trutta trutta*, *S. trutta lacustris*, # *Petromyzon marinus*, # *Lampetra fluviatilis*, *Thymallus thymallus*, # *Cottus gobio* s. lat., *C. poecilobus*, *Leuciscus leuciscus*, *Phoxinus phoxinus*
- 5) **Ericsson, S. (1985)**.- Älvens miljöer. In: *Älvboken* . Fältbiologerna.
Nilsson, Ch. (1978).- Vegetationens överlevnadsekologi på Gardikens regleringsstränder - en problemorientering. *Svensk Bot. Tidskr.*, 72: 227.
Nilsson, Ch. (1979). - Floraförändringar vid kraftverksutbyggnad. *Ibid.* 73: 266.
Nilsson, Ch. (1979). - Vegetationförhållanden i kraftverksälvar. *Ibid.* 73: 257.
Sjörs, H. (1973). - Om botaniska skyddsvärden vid älvarna. *Rapport till SNV för Utredningen rörande vattenkraftsutbyggnader i södra Norrland och norra Svealand*. Växtbiol.inst.Uppsala.

3220

Alpine rivers and the herbaceous vegetation along their banks

PAL.CLASS.: 24.221 and 24.222

- 1) 24.221 - Open assemblages of herbaceous or suffrutescent pioneering plants, rich in alpine species, colonising gravel beds of streams with an alpine, summer-high, flow regime, formed in northern boreal and lower Arctic mountains, hills and sometimes lowlands, as well as in the alpine and subalpine zones of higher, glaciated, mountains of more southern regions, sometimes with abyssal stations at lower altitudes (*Epilobion fleischeri* p.).
24.222 - Open or closed assemblages of herbaceous or suffrutescent pioneering plants, colonising, within the montane or sub-montane levels, gravel beds of streams with an alpine, summer-high, flow regime, born in high mountains (*Epilobion fleischeri* p., *Calamagrostion pseudophragmitis*).

- 2) Plants: 24.221 - *Astragalus sempervirens*, *Dryas octopetala*, *Epilobium fleischeri*, *Gypsophila repens*, *Rhacomitrium canescens*, *Rumex cutatus*, *Saxifraga aizoides*, *S. bryoides*, *S. caerulea*, *Trifolium palescens*; 24.222 - *Chondrilla chondrilloides*, *Calamagrostis pseudophragmites*, *Erucastrum nasturtiifolium*, *Gypsophila repens*, *Dryas octopetala*, *Aethionema saxatile*, *Epilobium dodonaei*, *Erigeron acris*, *Leontodon berinii*, *Buphthalmum salicifolium*, *Euphorbia cyparissias*, *Fumana procumbens*, *Agrostis gigantea*, *Anthyllis vulneraria* ssp. *alpestris*, *Campanula cochleariifolia*, *Hieracium piloselloides*, *Calamagrostis pseudophragmites*, *Conyza canadensis*, *Pritzelago alpina*, and seedlings of *Salix elaeagnos*, *Salix purpurea*, *Salix daphnoides* and *Myricaria germanica*.
- 3) Corresponding categories
Nordic classification : "7211 *Calamagrostis stricta*-*Lotus corniculatus*-*Oxyria digyna*-typ", "7214 *Racomitrium canescens*-*Oxyria digyna* -typ", "7222 *Eriophorum scheuchzeri* -typ", "7223 *Calamagrostis stricta* -typ" and "7224 *Carex aquatilis*-*Equisetum fluviatile* -typ".
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3230 **Alpine rivers and their ligneous vegetation with *Myricaria germanica***

PAL.CLASS.: 24.223 x 44.111

- 1) Communities of low shrubby pioneers invading the herbaceous formations of 24.221 and 24.222 on gravel deposits rich in fine silt, of mountain and northern boreal streams with an alpine, summer-high, flow regime. *Myricaria germanica* and *Salix* spp. are characteristic (*Salici-Myricarietum*).
- 2) Plants., *Myricaria germanica*, *Salix elaeagnos*, *Salix purpurea* ssp. *gracilis*, *Salix daphnoides*, *Salix nigricans*.
- 3) Corresponding categories
Nordic classification : "7212 *Myricaria germanica*-typ".
-

3240 **Alpine rivers and their ligneous vegetation with *Salix elaeagnos***

PAL.CLASS.: 24.224 x 44.112

- 1) Thickets or woods of, among others, *Salix* spp., *Hippophae rhamnoides*, *Alnus* spp., *Betula* spp., on stream gravels of mountain and northern boreal streams with an alpine, summer-high, flow regime. Formations of *Salix elaeagnos*, *Salix purpurea* ssp. *gracilis*, *Salix daphnoides*, *Salix nigricans* and *Hippophae rhamnoides* of higher gravel shoals in Alpine and peri-Alpine valleys.
- 2) Plants: *Salix elaeagnos*, *Salix purpurea* ssp. *gracilis*, *Salix daphnoides*, *Salix nigricans* and *Hippophae rhamnoides*.

3250

Constantly flowing Mediterranean rivers with *Glaucium flavum*

PAL.CLASS.: 24.225

- 1) Communities colonising gravel deposits of rivers with a Mediterranean, summer-low, flow regime, with formations of the *Glaucium flavi*.
- 2) Plants: *Myricaria germanica*, *Erucastrum nasturtiifolium*, *Glaucium flavum*, *Oenothera biennis*.

3260

Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation

PAL.CLASS.: 24.4

- 1) Water courses of plain to montane levels, with submerged or floating vegetation of the *Ranunculion fluitantis* and *Callitricho-Batrachion* (low water level during summer) or aquatic mosses.
- 2) Plants: *Ranunculus saniculifolius*, *R. trichophyllus*, *R. fluitans*, *R. peltatus*, *R. penicillatus* ssp. *penicillatus*, *R. penicillatus* ssp. *pseudofluitantis*, *R. aquatilis*, *Myriophyllum* spp., *Callitriche* spp., *Sium erectum*, *Zannichellia palustris*, *Potamogeton* spp., *Fontinalis antipyretica*.
- 3) Corresponding categories
German classification : "23010101 naturnahes, kalkreiches Epi-/Metarhithral", "23010201 naturnahes, kalkarmes Epi-/Metarhithral", "23010301 naturnahes, kalkreiches Hyporhithral", "23010401 naturnahes, kalkarmes Hyporhithral", "23020101 naturnahes Epipotamal", "23010201 naturnahes Metapotamal", "23010301 naturnahes Hypopotamal" (mit flutenden Macrophyten, P138).
Nordic classification : "6621 *Myriophyllum alterniflorum*-*Potamogeton alpinus*-*Fontinalis antipyretica*-typ".
- 4) This habitat is sometimes associated with *Butomus umbellatus* bank communities. It is important to take this point into account in the process of site selection.
- 5) **Sjörs, H. (1967)**. *Nordisk växtgeografi. 2 uppl.* Svenska Bokförlaget Bonniers, Stockholm, 240 pp.

3270

Rivers with muddy banks with *Chenopodion rubri* p.p. and *Bidention* p.p. vegetation

PAL.CLASS.: 24.52

- 1) Muddy river banks of plain to submontane levels, with annual pioneer nitrophilous vegetation of the *Chenopodion rubri* p.p. and the *Bidention* p.p. alliances. During the spring and at the beginning of the summer, sites look like muddy banks without any vegetation (developes later in the year). If the conditions are not favourable, this vegetation has a weak development or could be completely absent.

- 2) Plants: *Chenopodium rubrum*, *Bidens frondosa*, *Xanthium* sp., *Polygonum lapathifolium*.
 - 3) Corresponding categories
German classification : "230605 zeitweilig trockenfallende Schlammfläche an fließenden Gewässern (krautreich, P026)", "230605 zeitweilig trockenfallende Schlammfläche an fließenden Gewässern (krautreich, P026)".
 - 4) This habitat is found in close association with dense populations of the genus *Bidens* or of neophitic species. In order to support the conservation of these communities, with a late or irregular annual development, it is important to take into account bank widths of 50 to 100 m and even parts without vegetation (24.51).
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3280 **Constantly flowing Mediterranean rivers with *Paspalo-Agrostidion* species and hanging curtains of *Salix* and *Populus alba***

PAL.CLASS.: 24.53

- 1) Nitrophilous annual and perennial grass and sedge formations of the alluvial banks of large Mediterranean rivers, with *Paspalum paspaloides*, *P. vaginatum*, *Polypogon viridis* (= *Agrostis semiverticillata*), *Cyperus fuscus*, and hanging curtains of *Salix* spp and *Populus alba*.
 - 2) Plants: *Paspalum paspaloides*, *P. vaginatum*, *Polypogon viridis* (= *Agrostis semiverticillata*), *Cyperus fuscus*, *Salix* spp., *Populus alba*.
-

3290 **Intermittently flowing Mediterranean rivers of the *Paspalo-Agrostidion***

PAL.CLASS.: 24.16 and 24.53

- 1) Intermittently flowing Mediterranean rivers with *Paspalo-Agrostidion* communities. They correspond to the river type 24.53, but with the particularity of an interrupted flow and a dry bed during a part of the year. The bed of the river can be completely dry or left with some pools.
- 2) Plants: *Polygonum amphibium*, *Ranunculus fluitans*, *Potamogeton natans*, *P. nodosus*, *P. pectinatus*.

TEMPERATE HEATH AND SCRUB

4010 Northern Atlantic wet heaths with *Erica tetralix*

PAL.CLASS.: 31.11

- 1) Humid, peaty or semi-peaty heaths, other than blanket bogs, of the Atlantic and sub-Atlantic domains.
- 2) Plants: *Erica tetralix*.
- 3) Corresponding categories
United Kingdom classification: "M14 *Schoenus nigricans-Narthecium ossifragum* heath p.p.", "M15 *Scirpus cespitosus-Narthecium ossifragum* mire", "M16 *Erica tetralix-Sphagnum compactum* wet heath" and "H5 *Erica vagans-Schoenus nigricans* heath".
Nordic classification: "5121 *Erica tetralix*-typ".

4020 * Temperate Atlantic wet heaths with *Erica ciliaris* and *Erica tetralix*

PAL.CLASS.: 31.12

- 1) Hygrophilous heaths of areas with a temperate oceanic climate, on semi-peaty or dried-out soils, with surface minerals in the case of peaty soils (hydromor), with vegetation of the alliances *Genistion micrantho-anglicae* and *Ulicion minoris*: *Ulici minoris-Ericetum ciliaris*, *Ulici gallii-Ericetum mackaiana*, *Ulici minoris-Ericetum tetralicis* (Schwickerath 33 Tuxen 37), *Cirsio filipenduli-Ericetum ciliaris*.
- 2) Plants: *Centaurea uliginosa*, *Erica ciliaris*, *E. mackaiana*, *E. tetralix*, *Euphorbia polygaliphylla*, *Genista anglica*, *G. carpetana*, *G. micrantha*, *Sphagnum* spp., *Ulex minor* var. *lusitanicus*.
- 3) Corresponding categories
United Kingdom classification: "H3 *Ulex minor-Agrostis* heath", "H4 *Ulex gallii-Agrostis* heath" and "M16 *Erica tetralix-Sphagnum compactum*" where these contain *Erica ciliaris*.

4030 European dry heaths

PAL.CLASS.: 31.2

- 1) Mesophile or xerophile heaths on siliceous, podsollic soils in moist Atlantic and sub-Atlantic climates of plains and low mountains of Western, Central and Northern Europe.
Sub-types:
31.21 - Sub-montane *Vaccinium-Calluna* heaths. *Calluno-Genistion pilosae* p.(*Vaccinion vitis-idaeae* p.):*Vaccinio myrtilli-Callunetum* s.l. i.a.

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 Carpathians, the Pyrenees and the Cordillera Cantabrica.

31.22 - Sub-Atlantic *Calluna-Genista* heaths. *Calluno-Genistion pilosae* p.

Low *Calluna* heaths often rich in *Genista*, mostly of the Germano-Baltic lowlands. Similar formations occurring in British upland areas, montane zones of high mountains of the western Mediterranean basin and high rainfall Adriatic influenced areas are most conveniently listed here.

31.23 - Atlantic *Erica-Ulex* heaths. *Ulicenion minoris*; *Daboecenion cantabricae* p.; *Ulicion maritimae* p.

Heaths rich in gorse (*Ulex*) of the Atlantic margins.

31.24 - Ibero-Atlantic *Erica-Ulex-Cistus* heaths. *Daboecenion cantabricae* p.; *Ericenion umbellatae* p., *Ericenion aragonensis*; *Ulicion maritimae* p.; *Genistion micrantho-anglica* 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).

31.25 - Boreo-Atlantic *Erica cinerea* heaths.

- 2) Plants: 31.21 - *Vaccinium* spp., *Calluna vulgaris*; 31.22 - *Calluna vulgaris*, *Genista anglica*, *G. germanica*, *G. pilosa*, accompanied by *Empetrum nigrum* or *Vaccinium* spp.; 31.23 - *Ulex maritimus*, *U. gallii*, *Erica cinerea*, *E. mackaiana*, *E. vagans*; 31.24 - *Erica umbellata*, *E. aragonensis*, *E. cinerea*, *E. andevalensis*, *Cistus salvifolius*, *Calluna vulgaris*; 31.25 - *Erica cinerea*.

3)

Corresponding categories

United Kingdom classification: "H1 *Calluna vulgaris-Festuca ovina* heath", "H2 *Calluna vulgaris-Ulex minor* heath", "H3 *Ulex minor-Agrostis curtisii* heath", "H4 *Ulex gallii-Agrostis curtisii* heath", "H7 *Calluna vulgaris-Scilla verna* heath", "H8 *Calluna vulgaris-Ulex gallii* heath", "H9 *Calluna vulgaris-Deschampsia flexuosa* heath", "H10 *Calluna vulgaris-Erica cinerea* heath", "H12 *Calluna vulgaris-Vaccinium myrtillus* heaths", "H16 *Calluna vulgaris-Arctostaphylos uva-ursi* heath", "H18 *Vaccinium myrtillus- Deschampsia flexuosa* heath" and "H21 *Calluna vulgaris- Vaccinium myrtillus-Sphagnum capillifolium* heath".

Nordic classification : "5111 *Rhacomitrium lanuginosum-Empetrum hermaphroditum*-typ", "5113 *Calluna vulgaris-Empetrum nigrum-Vaccinium vitis-idea*-typ", "5115 *Calluna vulgaris*-typ", "5116 *Vaccinium myrtillus- Calluna vulgaris*-typ", "5117 *Calluna vulgaris-Hieracium pilosella*-typ", "5131 *Deschampsia flexuosa-Galium saxatile*-typ", "5132 *Agrostis capillaris-Galium saxatile*-typ".

4040

* Dry Atlantic coastal heaths with *Erica vagans*

PAL.CLASS.: 31.234

- 1) Coastal heaths of temperate areas with *Erica vagans* and *Ulex europaeus* on well-drained soil, other than prostrate maritime formations.
- 2) Plants: *Erica vagans*, *Ulex europaeus*.
- 3) Corresponding categories
United Kingdom classification: "H6 *Erica vagans-Ulex europaeus* heath". The presence of *Ulex europaeus* is not obligatory.

4050*** Endemic macaronesian heaths**

PAL.CLASS.: 31.3

- 1) *Ericaceous* formations (low and medium-tall stages). *Andryalo-Ericetalia*: *Fayo-Ericion arboreae*, *Telino-Adenocarpion foliolosae* (Canaries); *Calluno-Ulicetalia*: *Daboecion azoricae*, *Ericetum azoricae*, *Daphno-Ericetum azoricae* (Azores).
 - 2) Plants: *Adenocarpus foliolosus*, *Calluna vulgaris*, *Chamaecytisus proliferus* ssp. *proliferus*, #*Cistus chinamadensis*, *Cletura arborea*, *Daboecia azorica*, *Erica arborea*, *E. maderensis*, *E. platycodon*, #*E. scoparia* ssp. *azorica*, *Ilex canariensis*, *Juniperus brevifolia*, *Laurus azorica*, *Luzula purpureo-splendens*, *Lysimachia azorica*, *Myrica faya*, *Pteridium aquilinum*, *Teline canariensis*, *T. splendens*, *T. stenopetala*, *Thymus caespititius*, *Vaccinium cylindraceum*.
 - 4) Macaronesian Laurel forests (45.6) and Canarian heath forests (49.9) are tall forest-like formations associated with this habitat type.
 - 5) **Rivas-Martínez, S., Wildpret, W., Arco, M., Rodríguez, O., Pérez de Paz, P.L., García Gallo, A., Acebes, J.R., Díaz, T.E. & Fernández-González, F. (1993).** Las comunidades vegetales de la isla de Tenerife (Islas Canarias). *Itinera Geobot.* 7: 169 - 374.
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4060**Alpine and Boreal heaths**

PAL.CLASS.: 31.4

- 1) Small, dwarf or prostrate shrub formations of the alpine and sub-alpine zones of the mountains of Eurasia dominated by ericaceous species, *Dryas octopetala*, dwarf junipers, brooms or greenweeds; *Dryas* heaths of the British Isles and Scandinavia.
Sub-types :
 - 31.41 - Alpidic dwarf ericoid wind heaths. *Loiseleurio-Vaccinion*.
Very low, single-stratum, carpets of trailing azalea, *Loiseleuria procumbens*, prostrate *Vaccinium* spp. or other prostrate ericoid shrublets, accompanied by lichen, of high windswept, mostly snowfree, localities in the alpine belt of the high mountains of the Alpine system.
 - 31.42 - Acidocline alpenrose heaths. *Rhododendro-Vaccinion*.
Rhododendron spp.-dominated heaths of acid podsols in the Alps, the Pyrenees, the Dinarids, the Carpathians, the Balkan Range, the Pontic Range, the Caucasus and the Himalayan system, often with *Vaccinium* spp., sometimes with dwarf pines.
 - 31.43 - Mountain dwarf juniper scrub. *Juniperion nanae*, *Pino-Juniperion sabinae* p., *Pino-Cytision purgantis* p.
Usually dense formations of prostrate junipers of the higher levels of southern Palaeartic mountains.
 - 31.44 - High mountain *Empetrum-Vaccinium* heaths. *Empetro-Vaccinietum uliginosi*.
Dwarf heaths dominated by *Empetrum hermaphroditum*, *Vaccinium uliginosum*, with *Arctostaphylos alpina*, *Vaccinium myrtillus*, *Vaccinium vitis-idaea* and lycopodes (*Huperzia selago*, *Diphasiastrum alpinum*), mosses (*Barbilophozia lycopodioides*, *Hylocomium splendens*, *Pleurozium schreberi*, *Rhythidiadelphus triquetrus*) and lichens (*Cetraria islandica*, *Cladonia arbuscula*, *Cladonia rangiferina*, *Cladonia stellaris*, *Cladonia gracilis*, *Peltigera aphthosa*) of the sub-alpine belt of the Alps, the Carpathians, the Pyrenees, the Central Massif, the Jura, the Northern Apennines, characteristic of relatively windswept, snow-free stations, in frost-exposure situations that are, however, less extreme than those prevailing where communities of 31.41 dominate. Unlike the formations of 31.41, those of 31.44 are clearly two-layered.
 - 31.45 - Boreo-alpine heaths

Alpine heaths of the highlands and islands of Scotland, alpine and lowland boreal heaths of Iceland, alpine heaths of boreal mountains, in particular of the mountains of Scandinavia, of the Urals, of the mountains of Siberia, alpine heaths of Far Eastern mountains at, or just south of, the limits of the boreal zone, with *Juniperus nana*, *Loiseleuria procumbens*, *Empetrum hermaphroditum*, *Arctostaphylos uva-ursi*, *Arctostaphylos alpina* and elements of Alpine flora.

31.46 - *Bruckenthalia* heaths: only outside the European Union.

31.47 - Alpine bearberry heaths. *Mugo-Rhodoretum hirsuti* p., *Juniperion nanae* p., i.a.

Mats of *Arctostaphylos uva-ursi* or *Arctostaphylos alpina* of the alpine, sub-alpine and locally, montane, belts of the Alps, the Pyrenees, the northern and central Apennines, the Dinarids, the Carpathians, the Balkan Range, the Rhodopides (south to the Slavianka-Orvilos, the Menikion, the Pangeon, the Falakron and the Rhodopi), the Moeso-Macedonian mountains (including Athos), the Pelagonides (south to the Greek Macedonian border ranges Tzena, Pinovon and Kajmakchalan) and Olympus, in the Thessalian mountains, mostly on calcareous substrates.

31.48 - Hairy alpenrose-erica heaths. *Mugo-Rhodoretum hirsuti* p.

Forest substitution heaths, treeline fringe formations and alpine heaths or mats of calcareous soils in the Alps and the Dinarides, with *Rhododendron hirsutum*, *Rhododendron intermedium*, *Rhodothamnus chamaecistus* and *Erica herbacea*, often accompanied by *Clematis alpina*, *Daphne striata*, *Daphne mezereum*, *Globularia cordifolia*, *Arctostaphylos uva-ursi*. *Rhododendron hirsutum* and, mostly in the Austrian Alps, *Erica herbacea* are the most frequent dominants; other shrubs can locally play that role. *Arctostaphylos* spp.-dominated facies have, however, been included in 31.47.

31.49 - Mountain avens mats

Dwarf heaths formed by mats of the woody *Dryas octopetala* in high Palaearctic mountains, in boreal regions and in isolated Atlantic coastal outposts.

31.4A - High mountain dwarf bilberry heaths

Vaccinium-dominated dwarf heaths of the sub-alpine belt of southern mountains, in particular, of the northern and central Apennines, the Balkan Range, the Helenides, the Pontic Range and the Caucasus, with *Vaccinium myrtillus*, *Vaccinium uliginosum* s.l., *Vaccinium vitis-idaea* and, locally, *Empetrum nigrum*. They are richer in grassland species than the communities of 31.44 and often take the appearance of alpine grassland with dwarf shrubs. *Vaccinium myrtillus* also plays a much more dominant role, in lieu of *Vaccinium uliginosum* and *Empetrum hermaphroditum*.

31.4B - High mountain greenweed heaths

Low *Genista* spp. or *Chamaecytisus* spp. heaths of the sub-alpine, low alpine or montane belts of high southern nemoral mountains, in particular of the southern Alps, the Apennines, the Dinarides, the southern Carpathians, the Balkan Range, the Moeso-Macedonian mountains, the Pelagonides, the northern Pindus, the Rhodopides, the Thessalian mountains.

- 2) Plants: 31.41 - *Loiseleuria procumbens*, *Vaccinium* spp.; 31.42 - *Rhododendron ferrugineum*; 31.44 - *Empetrum hermaphroditum*, *Vaccinium uliginosum*; 31.45 - *Juniperus nana*, *Loiseleuria procumbens*, *Empetrum hermaphroditum*, *Arctostaphylos uva-ursi*, *Arctostaphylos alpina*; in Fennoscandia also *Betula nana*, *Cassiope tetragona*, *Cornus suecica*, *Juniperus communis*, *Phyllodoce caerulea*, *Vaccinium myrtillus* and *Cladonia alpestris*; 31.47 - *Arctostaphylos uva-ursi*, *Arctostaphylos alpina*; 31.48 - *Rhododendron hirsutum*, *Rhododendron intermedium*, *Rhodothamnus chamaecistus* and *Erica herbacea*; 31.49 - *Dryas octopetala*; 31.4A - *Vaccinium myrtillus*, *Vaccinium uliginosum* s.l., *Vaccinium vitis-idaea*; 31.4B - *Genista radiata*, *G. holopetala*, *G. hassertiana*, *Chamaecytisus eriocarpus*, *C. absinthioides*.

3) Corresponding categories

United Kingdom classification: "H13 *Calluna vulgaris*-*Cladonia arbuscula* heath", "H14 *Calluna vulgaris*-*Racomitrium lanuginosum* heath", "H15 *Calluna vulgaris*-*Juniperus communis* ssp. *nana* heath", "H17 *Calluna vulgaris* *Arctostaphylos alpinus* heath", "H19 *Vaccinium myrtillus*-*Cladonia arbuscula* heath", "H20 *Vaccinium myrtillus*-*Racomitrium lanuginosum* heath" and "H22 *Vaccinium myrtillus*-*Rubus chamaemorus* heath".

Nordic classification: "11 Snöfria vindhedar", "121 Hedvegetation på fattigt underlag", "122 Hedvegetation på rikt/kalkrikt underlag", "1311 *Cassiope hypnoides*-*Salix herbacea* typ", "1321 *Salix polaris* typ".

- 5) **Haapasaari, M. (1988).** The oligotrophic heath vegetation of northern Fennoscandia and its zonation. *Acta Bot. Fennica* 135:1-219.
Oksanen, L. & Virtanen, R. (1995). Topographic, altitudinal and regional patterns in continental and suboceanic heath vegetation of northern Fennoscandia. *Acta Bot. Fennica* 153:1-80.

4070

* Bushes with *Pinus mugo* and *Rhododendron hirsutum* (*Mugo-Rhododendretum hirsuti*)

PAL.CLASS.: 31.5

- 1) *Pinus mugo* formations usually with *Rhododendron* spp of the dry eastern inner Alps, the northern and southeastern outer Alps, the southwestern Alps and the Swiss Jura, the eastern greater Hercynian ranges, the Carpathians, the Apennines, the Dinarides and the neighbouring Pelagonides, the Pirin, the Rila and the Balkan Range;
- 2) Plants: *Pinus mugo*, *Rhododendron hirsutum*, *R. ferrugineum*. *Rhodothamnus chamaecistus*
- 3) Corresponding categories
German classification: "6905 Alpenrosengebüsch", "6904 Latschengebüsch".

4080

Sub-Arctic *Salix* spp. scrub

PAL.CLASS.: 31.6211, 31.6214, 31.6215, 31.622

- 1) Subarctic and boreo-alpine willow formations of the Scottish Highlands, the mountains of Iceland and the mountains of Scandinavia (often along streams) and similar communities in the Alps, Pyrenees, Cantabrian Mountains, Carpathians, and associated massifs.
Subtypes :
 - 31.6211 - Alpigenous small willow brush
Subalpine, alpine and occasionally montane brushes and low scrubs of the Alps, the Apennines, the Jura and the western great Hercynian ranges, dominated by small shrubby (generally 0.5-2 metre tall) *Salix* species.
 - 31.6214 - Pyreneo-Cantabric willow brush
Subalpine, alpine and occasionally montane *Salix* dominated brushes and low scrubs of the Pyrenees and the Cordillera Cantabrica.
 - 31.6215 - Hercynio-Carpathian willow brush
Subalpine, alpine and occasionally montane *Salix* dominated brushes and low scrubs of the Carpathians and the eastern Hercynian ranges of the Sudeten (*Salicetum lapponum*, *Salici silesiaca*-*Betuletum carpaticae* [p.], *Piceo-Salicetum silesiaca* [i.a.]).
 - 31.622 - Boreo-Alpine willow brush
Subarctic willow formations of the Highlands of Scotland, of the mountains of Iceland and of the boreal mountains of Scandinavia.
- 2) Plants: *Salix lapponum*, *S. lanata*, *S. arbuscula*, *S. myrsinites*, *S. glauca*, *S. helvetica*, *S. bicolor*.
- 3) Corresponding categories

United Kingdom classification: "W20 *Salix lapponum-Luzula sylvatica* scrub".
Nordic classification: "127 Videvegetation".

4090

Endemic oro-Mediterranean heaths with gorse

PAL.CLASS.: 31.7

- 1) Primary cushion heaths of the high, dry mountains of the Mediterranean and Irano-Turanian regions, with low, cushion-forming, often spiny shrubs, such as *Acantholimon*, *Astragalus*, *Erinacea*, *Vella*, *Bupleurum*, *Ptilotrichum*, *Genista*, *Echinopartum*, *Anthyllis* and various composites and labiates; secondary, zoogenic cushion heaths of the same regions, either downslope extensions of the high-altitude formations, and dominated by the same species, or specifically montane or steppic, often *Genista*-dominated in the Mediterranean region. Excluded are cushion-heaths of thermo-Mediterranean lowlands (33) and of deserts and semideserts (7).
- Sub-types :
- 31.71 - Pyrenean hedgehog-heaths. *Junipero-Genistetum horridae*.
Echinopartum 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-Echinopartum barnadesii*, *Echinopartum pulviniformis-Cytisetum oromediterranei*, *Teucrii salviastri-Echinopartum pulviniformis*, *Genisto hystricis-Echinopartum lusitanici*
Formations of the Cordillera Central and adjacent areas dominated by diverse forms of *Echinopartum*.
- 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.
- 31.74 - Franco-Iberian hedgehog-heaths
Oro-Mediterranean and montane hedgehog-heaths of other Iberian ranges and of southern France.
- 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.
- 31.76 - Mount Etna hedgehog-heaths. *Astragaletum siculi*
Lava-colonising 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.
- 31.78 - Helleno-Balkan sylvatic *Astragalus* hedgehog-heaths
Hedgehog-heaths occupying situations peripheral to the main range of the alti- and oro-Mediterranean hedgehog-heath communities of high Hellenic mountains (31.79 and 31.7A), mostly dominated by *Astragalus angustifolius*, characteristic, in particular, of zoogenous clearings within the forest belt of southern Greek mountains and of regions of irradiation of Mediterranean communities within the hills and mountains of the Moesian zone.
- 31.79 - Hellenic oro-Mediterranean hedgehog-heaths. *Daphno-Festucetea: Eryngio-Bromion* p.
Hedgehog-heaths developed on relatively humus-rich rendzini-form soils at or above treeline, in the 1700-2200 m altitudinal range of high Greek mountains; hedgehog-heath 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.

- 31.7A - Hellenic alti-Mediterranean hedgehog-heaths. *Daphno-Festucetea: Astragalo-Seslerion*
Shrubby formations of the high mountains of the Peloponnese, of the southern mainland Greek mountains and of the Thessalian Olympus system, colonising 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 1700-2200 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.
- 31.7B - Cretan hedgehog-heaths. *Saturejetea spinosae*
Hedgehog-heaths of high mountains of Crete, in the 1500-2500 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*.
- 31.7C - Aegean summital hedgehog-heaths
Isolated, endemic-rich, mostly summital hedgehog-heaths of calcareous mountains of Aegean islands and Mount Athos.
- 31.7D - Southern Hellenic *Genista acanthoclada* hedgehog-heaths
Formations dominated by hemispherical shrubs of *Genista acanthoclada* of the middle levels (about 800 - 1200 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 sub-alpine heaths of 31.4 and the true Mediterranean hedgehog-heaths of 31.7.
- 31.7F - Canarian cushion-heaths. *Spartocytisium nubigeni*
Open formations dominated by broom-like plants of the montane zone (above 1900 m) of the Canary Islands, with many endemic species.

- 2) Plants: 31.71 - *Echinopartum horridum*; 31.72 - *Echinopartum lusitanicum* ssp. *barnadesii*, *E. ibericum* ssp. *pulviniformis*; 31.73 - *Erinacea anthyllis*, *Vella spinosa*, *Astragalus sempervirens* ssp. *nevadensis*, *A. granatensis* ssp. *granatensis* (*A. boissieri*), *Ptilotrichum spinosum*, *Bupleurum spinosum*, *Genista baetica*; 31.74 - *Erinacea anthyllis*, *Vella spinosa*, *Andryala agardhii*, *Convolvulus boissieri*, *Hippocrepis squamata* ssp. *eriocarpa*, *Pteroccephalus spathulatus*, *Thymus granatensis*; 31.75 - *Astragalus sirinicus* ssp. *genargenteus*, *Rosa seraphini*, *Anthyllis hermanniae*, *Thymus herba-barona*, *Cerastium boissieri*, *Genista salzmannii*, *G. corsica*, *Berberis aetnensis*, *Prunus prostrata*, *Daphne oleoides*; 31.76 - *Astragalus granatensis* ssp. *siculus*, *Berberis aetnensis*, *Juniperus hemisphaerica*, *Genista aetnensis*, *Adenocarpus bivonae*, *Viola aethnensis*; 31.77 - *Astragalus granatensis* ssp. *nebrodensis*, *A. parnassi* ssp. *calabrus*, *A. sirinicus* ssp. *sirinicus*, *Genista cupanii*, *G. sylvestris* ssp. *dalmatica*; 31.78 - *Astragalus angustifolius*; 31.79 - *Astragalus creticus* ssp. *rumelicus*, *A. parnassi*, *A. angustifolius*; 31.7A - *Astragalus angustifolius*, *Minuartia stellata*; 31.7B - *Astragalus creticus* ssp. *creticus*, *A. angustifolius*, *Chamaecytisus creticus*; 31.7C - *Astragalus creticus* var. *samius*, *A. pilodes*, *A. trojanus* var. *chius*, *A. parnassi*, *A. p.* var. *samothracious*, *A. monachorum*; 31.7D - *Genista acanthoclada*; 31.7E - *Astragalus sempervirens* ssp. *sempervirens*, *A. s.* ssp. *muticus*, *A. s.* ssp. *cephalonicus*; 31.7F - *Spartocytisium supranubius*, *Adenocarpus viscosus* var. *spartioides*.

40A0

* Subcontinental peri-Pannonic scrub

PAL.CLASS.: 31.8B12p

- 1) Low deciduous scrub with continental and sub mediterranean affinities of the Pannonic basin and neighbouring regions including the eastern Alpine periphery, the southern periphery of the North-western Carpathians, the Transylvanian plateau and the adjacent foothills and valleys of the Eastern and Southern Carpathians and the Apuseni mountains, the southern periphery of the Pannonic basin, with irradiations to the lower Danubian plain, to the Moravian plateau, to the Dobrogea and to the hills and valleys of the northern Balkan peninsula. Occurs on both calcareous and siliceous substrates forming mosaic-like vegetation with steppe grassland (6210) and forest-steppe elements or plants of the rupicolous Pannonic grasslands (6190) often along the fringes of woodlands.

Includes the following syntaxa:

Prunetum fruticosae Dziubaltovski 1926 (syn.: *Crataego-Prunetum fruticosae* de Sóo 1951)

Prunetum tenellae Soó 1947 (syn.: *Amygdaletum nanae* Soó 1951).

Coronillo-Prunetum mahaleb Gallandat 1972 (syn. *Cerasetum mahaleb* Oberdorfer and Th. Müller 1979)

Waldsteino-Spiraetum mediae Zólyomi 1936

Helleboro odori-Spiraetum mediae Borhidi et Morschhauser 1999

Syringo-Carpinion orientalis Jakucs 1959

- 2) Plants:

Amygdalus nana (syn *Prunus tenella*), *Cerasus fruticosa*, *C. mahaleb*, *Spiraea media*, *Rosa spinosissima*, *R. gallica*, *R. pimpinellifolia*, *Amelanchier ovalis*, *Cornus mas*, *Crataegus monogyna*, *Acer tataricum*, *Cotoneaster integerrimus*, *C. tomentosus*, *C. matrensis*, *C. niger*, *Allium sphaerocephalon*, *Anemone sylvestris*, *Asparagus officinalis*, *Buglossoides purpurcaerulea*, *Geranium sanguineum*, *Peucedanum carvifolia*, *Teucrium chamaedrys*, *Aster linosyris*, *Inula ensifolia*, *Inula hirta*, *Melica picta*, *Nepeta pannonica*, *Peucedanum cervaria*, *Phlomis tuberosa*, *Jurinea mollis*, *Vinca herbacea*, *Agropyron pectinatum*, *Verbascum austriacum*, *Salvia austriaca*, *Stipa dasyphylla*, *Aconitum anthora*, *Chrysanthemum corymbosum*, *Vincetoxicum hirundinaria*, *Waldsteinia geoides*. *Syringa vulgaris*

- 3) Corresponding categories

Hungarian classification: continental deciduous steppe thickets (identification code: M6), continental deciduous rock thickets (identification code: M7), white-oak shrub woodlands (identification code: M1)

- 5) **Borhidi, A. & Sánta, A. (eds.) (1999).** Vörös Könyv Magyarország növénytársulásairól. 1-2. (Red Book of Hungarian Plant Communities. Vols. 1-2). TermészetBÚVÁR Kiadó, Budapest, pp. 768 (in Hungarian)
- Zólyomi, B. (ed.) (1967).** Guide der Exkursionen des Internationalen Geobotanischen Symposium. Ungarn. Eger-Vácrátót, 95p.

SCLEROPHYLLOUS SCRUB (MATORRAL)

Sub-Mediterranean and temperate scrub

5110 Stable xerothermophilous formations with *Buxus sempervirens* on rock slopes (*Berberidion* p.p.)

PAL.CLASS.: 31.82

- 1) Stable xerothermophilous and calcicolous scrubs dominated by *Buxus sempervirens*, of hill and montane levels. These formations correspond to xerothermophilous *Buxus* thickets with their fringe associations of the *Geranion sanguinei* alliance on calcareous or siliceous substratum. They also constitute the natural woodland edge of calcareous dry forests rich with *Buxus*.
In the euro-siberian region, the more open formations are rich in submediterranean plant species.
Syntaxa: *Berberidion* p.p., *Amelanchiero-Buxion*
- 2) Plants: *Buxus sempervirens*, *Prunus spinosa*, *Prunus mahaleb*, *Cornus mas*, *Crataegus* spp., *Berberis vulgaris*, *Ligustrum vulgare*, *Viburnum lantana*, *Amelanchier ovalis*, *Geranium sanguineum*, *Dictamnus albus*.
- 3) Corresponding categories
German classification : "410103 Gebüsch trocken-warmer Standorte (Berberitzen-, Felsenmispel-, Felsenbirnen-, Sanddorngebüsch etc) (mit *Buxus sempervirens*, P036b).
- 4) Succession phase of calcareous grasslands toward mixed deciduous forests, for example with *Quercus pubescens* or continental pine forests with *Pinus sylvestris* (the word "stable" concerns those formations which are practically at climax stage, but on very superficial soils where natural succession towards forest can not take place).
These communities are associated with calcareous grasslands, mixed oak or *Quercus pubescens* groves, beech groves rich in orchid species or with *Pinus nigra* and *Pinus leucodermis* (e.g. in Greece).

5120 Mountain *Cytisus purgans* formations

PAL.CLASS.: 31.842

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

5130

Juniperus communis formations on heaths or calcareous grasslands

PAL.CLASS.: 31.88

- 1) Formations with *Juniperus communis* of plain to montane levels. They mainly correspond to phytodynamic succession of the following types of vegetation:
 - a) generally, mesophilous or xerophilous calcareous and nutrient poor grasslands, grazed or let lie fallow, of the *Festuco-Brometea* and *Elyno-Sesleretea*.
 - b) more rarely, heathlands of the *Calluna vulgaris-Ulicetea minoris* (31.2).
 - 2) Plants: *Juniperus communis*, *Crataegus* spp., *Rosa* spp., *Prunus spinosa*.
For a) typical species of the *Festuco-Brometea* and *Elyno-Sesleretea*.
For b) *Calluna vulgaris*, *Vaccinium myrtillus*, *Empetrum nigrum*, *Erica tetralix*, *Deschampsia flexuosa*, *Nardus stricta*.
 - 3) Corresponding categories
United Kingdom classification : "W19 - *Juniperus communis* ssp. *communis*-*Oxalis acetosella* woodland" and juniper rich facies of "W21 - *Crataegus monogyna*-*Hedera helix* scrub".
German classification: "340201 submediterrane Halbtrockenrasen auf karbonatischem Boden (mit Wacholdergebüschchen, P036a)", "340203 subkontinentale Halbtrockenrasen auf karbonatischem Boden (mit Wacholdergebüschchen, P036a)", "4003 Heiden auf sandigen Böden (Calluna-Heiden) (mit Wacholdergebüschchen, P036a)".
Nordic classification: "5115e *Juniperus communis*-*Calluna vulgaris* variant".
 - 5) **Rejmanek, M. & Rosen, E. (1988)**. The effects of colonizing shrubs (*Juniperus communis* and *Potentilla fruticosa*) on species richness in the grasslands of Stora Alvaret, Öland (Sweden). *Acta Phytogeogr. Suec.* 76:67-72.
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5140

* *Cistus palhinhae* formations on maritime wet heaths

PAL.CLASS.: 32.2B

- 1) Low scrub and garrigue formations of the dolomitic tableland, karsts, sands and terra-rosas, rich in endemics (*Ulicetum erinacei*, *Genisto triacanthi-Cistetum palhinhae*).
- 2) Plants: #*Biscutela vicentina*, #*Cistus palhinhae*, *Genista hirsuta* ssp. *algarbiensis*, *G. triacanthus*, *Juniperus turbinata*, *Serratula monardii* var. *algarbiensis*, *Sideritis arborescens* ssp. *lusitanica*, *Teucrium vinctinum*, *Ulex erinaceus*.
- 5) **Rivas-Martínez, S., Lousã, M., Díaz, T.E., Fernández-González, F. & Costa, J.C. (1990)**. La vegetación del sur de Portugal (Sado, Alentejo y Algarve). *Itinera Geobot.* 3: 5 - 126.

Mediterranean arborescent matorral

5210

Arborescent matorral with *Juniperus* spp.

PAL.CLASS.: 32.131 to 32.136

- 1) Mediterranean and sub-Mediterranean evergreen sclerophyllous scrub organized around arborescent junipers. Mixed dominance can be indicated by combination of codes.

Sub-types

32.131 - *Juniperus oxycedrus* arborescent matorral

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

32.132 - *Juniperus phoenicea* arborescent matorral

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

32.133 - *Juniperus excelsa* and *J. foetidissima* arborescent matorrals

Arborescent matorrals of Greece, Anatolia and the Near East, dominated by *Juniperus excelsa* or *J. foetidissima*.

32.134 - *Juniperus communis* arborescent matorral

Mediterranean formations dominated by *Juniperus communis*.

32.135 - *Juniperus drupacea* arborescent matorral

Formations derived from 42.A5¹⁶, limited to the Peloponnese and Asia Minor.

32.136 - *Juniperus thurifera* arborescent matorral

Formations derived from 42.A2¹⁷.

- 2) Plants: *Juniperus oxycedrus*, *J. phoenicea*, *J. foetidissima*, *J. excelsa*, *J. communis*, *J. drupacea*, *J. thurifera*.
-

5220

* Arborescent matorral with *Zyziphus*

PAL.CLASS.: 32.17

- 1) Pre-desert deciduous scrub of *Periploca laevigata*, *Lycium intricatum*, *Asparagus stipularis*, *A. albus*, *Withania frutescens* with tall *Zyziphus lotus*, confined to the arid Iberian South-west under a xerophytic thermo-Mediterranean bio-climate; corresponds to the mature phase or climax of climatophile and edapho-xero-psammophile vegetation series (*Periplocion angustifoliae*: *Ziziphetum loti*, *Zizipho-Maytenetum europaei*, *Mayteno-Periplocetum*).
- 2) Plants: *Asparagus albus*, *Calicotome intermedia*, *Chamaerops humilis*, *Maytenus senegalensis* ssp. *europaeus*, *Periploca laevigata* ssp. *angustifolia*, *Phlomis purpurea* ssp. *almeriensis*, *Rhamnus oleoides* ssp. *angustifolia*, *Withania frutescens*, *Zyziphus lotus*.
- 5) **Alcaraz, F., Díaz, T.E., Rivas-Martínez, S. & Sánchez Gómez, P. (1989).** Datos sobre la vegetación del sureste de España: provincia biogeográfica Murciano-Almeriense. *Itinera Geobot.* 2: 1 - 133.

¹⁶ 42.A5 - Syrian juniper woods : *Juniperus drupacea* woods of the northern slopes of Mount Parnon and of the Karlik mountain in Thrace, Greece. Part of the formation takes the appearance of an arborescent matorral, listed under 32.135.

¹⁷ 42.A2 - Spanish juniper woods (*Juniperion thuriferae*) : Forest formations dominated by *Juniperus thuriferae* of Spain, southern France and Corsica and North Africa. Many communities may be better described as arborescent matorrals, and listed under 32.136; geographical divisions can nevertheless be retained by appending the suffixes of 42.A2 to 32.136.

5230 * **Arborescent matorral with *Laurus nobilis***

PAL.CLASS.: 32.18

- 1) Humid arborescent matorral with tall laurel (*Laurus nobilis*).
 - 2) Plants: *Arbutus unedo*, *Ceratonia siliqua*, *Fraxinus ornus*, *Laurus nobilis*, *Olea europaea* var. *sylvestris*, *Phillyrea latifolia*, *Quercus ilex*, *Rubia peregrina* ssp. *longifolia*, *Smilax aspera* var. *altissima*, *Viburnum tinus*.
 - 3) Corresponding categories
The syntaxa of the Spanish types are: *Quercetea ilicis*, *Querco-Oleion sylvestris*: *Viburno tini-Fraxinetum ornii lauretosum nobilis* (southern mountains of Valencia); *Quercion ilicis*: *Lauro-Quercetum ilicis* facies of *Laurus nobilis* (from Asturias to the Basque Country).
-

Thermo-Mediterranean and pre-steppe brush

5310 ***Laurus nobilis* thickets**

PAL.CLASS.: 32.216

- 1) Lower facies of *Laurus nobilis* thickets described under 5230 code in the Annex I, generally of humid or cool stations.
 - 2) Plants: *Laurus nobilis*.
-

5320 **Low formations of *Euphorbia* close to cliffs**

PAL.CLASS.: 32.217

- 1) Low formations of *Helichrysum* (*H. italicum* ssp. *microphyllum*, *H. italicum* ssp. *italicum*) with spurges (*Euphorbia pithyusa*, i.a.), *Pistacia lentiscus*, *Camphorosma monspeliaca*, *Artemisia densiflora* or *Thymelaea passerina*, *T. hirsuta*, *T. tartonraira* in the immediate vicinity of sea cliffs, forming the transition between cliff vegetation or cliff-top phrygas and thermo-Mediterranean scrub.
 - 2) Plants: *Helichrysum italicum* ssp. *microphyllum*, *H. italicum* ssp. *italicum*, *Euphorbia pithyusa*, *Pistacia lentiscus*, *Camphorosma monspeliaca*, *Artemisia densiflora*, *Thymelaea passerina*, *T. hirsuta*, *T. tartonraira*.
-

5330 Thermo-Mediterranean and pre-desert scrub

PAL.CLASS.: 32.21G1, 32.22 to 32.26, 32.441p

- 1) Scrub 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 characterised, 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 phrygas, which, however, on account of their strong structural singularity, are listed separately under 33.

Sub-types :

32.21G - *Genista fasselata* brush

Brushes dominated by the tall, spiny *Genista fasselata* of very restricted distribution in the eastern Mediterranean basin.

31.8B5p - Xerophilous *Crataegus azarolus* var. *aronia* scrub.

Low to medium height scrub of the semi-arid zone of Cyprus characterised by *Crataegus azarolus* var. *aronia* with an abundance of herbs and grasses and belonging to the *Genisto-Ceratonietum*. It develops at low to medium altitudes (300-500 m) on calcareous substrates.

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, Isles 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, the Aegean archipelagos, and enclaves of the Mediterranean periphery of Anatolia and the Levant. Particularly extensive and robust stands occur in Sicily, Sardinia and Crete where they may extend to relatively high altitudes. Very local formations in Mediterranean North Africa occupy the steep rocky slopes of some coastal capes and isolated inland sites (Ichkeul).

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, in Sicily, in the Mediterranean zone and the less arid parts of the Saharo-Mediterranean transition zone of North Africa.

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 and Mediterranean North Africa, with more sporadic occurrences in the Guadalquivir basin, Sardinia, and the Tyrrhenian coasts and islands of peninsular Italy.

32.25 - Mediterranean pre-desert scrub. *Periplocion angustifoliae*, *Anthyllidetalia terniflorae*.

Shrub formations constituting, with the halo-nitrophilous scrubs (15.724) and the localised 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 risk¹⁸. Similar formations occur in the upper arid (Mediterranean arid) zone of North Africa. Outposts of these communities also exist in Sicily, the Egadi islands, the Pelagic islands, Malta and Pantelleria

32.26 - Thermo-Mediterranean broom fields (retamares)

¹⁸ Communities dominated by hummocks of very tall stands of Lotus tree *Zyziphius lotus*, are included in the Annex I priority habitat 'Matorral with *Zyziphius*' (32.17).

West Mediterranean formations dominated by retamas (*Lygos* spp.) or by large, non-spiny thermo-Mediterranean brooms of genera *Cytisus* and *Genista*, limited to the Iberian peninsula, the Balearics, Mediterranean North Africa, Sicily and its associated islands, the Cilento coast of Campania.

32.441p - Spiny spurge garrigues

Euphorbia melitensis garrigues of Malta

- 2) Plants: 31.21G - *G. fasselata*; 31.8B5p - *Crataegus azarolus* var. *aronia*; 32.22 - *Euphorbia dendroides*; 32.23 - *Ampelodesmos mauritanica*; 32.24 - *Chamaerops humilis*; 32.25 - *Ziziphus lotus*, *Maytenus senegalensis* var. *europaeus*, *Periploca laevigata* ssp. *angustifolia*, *Salsola webbii*, *Sideretis foetens*, *Ulex argentatus* ssp. *erinaceus*, *Genista umbellata*; 32.26 - *Lygos sphaerocarpa*, *L. monosperma*, *L. raetam* ssp. *gussonei*, *Genista cinerea* ssp. *speciosa*, *G. valentina*, *G. spartioides* ssp. *retamoides*, *G. s.* ssp. *pseudoretamoides*, *G. haenseleri*, *G. ramosissima*, *G. ephedroides*, *G. dorycnifolia*, *Cytisus aeolicus*. 32.441 – *Euphorbia melitensis*.

Phrygana¹⁹

5410 West Mediterranean clifftop phryganas (*Astragalo-Plantaginietum subulatae*)

PAL.CLASS.: 33.1

- 1) Rare, extremely local and isolated, cushion-forming thermo-Mediterranean sclerophyllous associations of clifftops and adjacent areas dispersed along the coasts, characterised by the presence of *Astragalus massiliensis* or *Anthyllis hermanniae*, variously accompanied by *Thymelaea hirsuta*, *Helichrysum italicum*, *Plantago subulatum*, *Armeria ruscinonensis*.
- 2) Plants: *Anthyllis hermanniae*, *Thymelaea hirsuta*, *Helichrysum italicum*, *Plantago subulatum*, *Armeria ruscinonensis*.

5420 *Sarcopoterium spinosum* phryganas

PAL.CLASS.: 33.3

- 1) Low, thorny formations of hemispherical shrubs of the coastal thermo-Mediterranean zone of Aegean islands, of mainland Greece and the Ionian islands, of coastal Anatolia, much more widespread and diverse than the western Mediterranean formations.
- 2) Plants: *Sarcopoterium spinosum*, *Centaurea spinosa*, *Satureja thymbra*, *Thymus capitatus*, *Genista acanthoclada*, *Anthyllis hermanniae*, *Euphorbia acanthothamnus*, *Stachys spinosa*, *Ballota pseudodictamnus*, *Ballota acetabulosa*, *Erica manipuliflora*, *Rhamnus oleoides*, *Lithospermum hispidulum*, *Fumana arabica*, *Fumana thymifolia*, *Cistus creticus*, *Cistus parviflorus*, *Cistus salvifolius*, *Pistacia lentiscus*, *Teucrium brevifolium*, *Teucrium divaricatum*, *Teucrium polium*,

¹⁹ 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.

Calicotome villosa, *Micromeria graeca*, *Micromeria juliana*, *Micromeria nervosa*, *Salvia triloba*, *Ononis spinosa*, *Helichrysum italicum* ssp. *microphyllum*, *Helichrysum italicum* ssp. *italicum*, *Phagnalium graecum*.

5430

Endemic phrygas of the *Euphorbio-Verbascion*

PAL.CLASS.: 33.4 to 33.A

- 1) Cushion-forming thermo-Mediterranean sclerophyllous formations, often thorny and summer deciduous.

Sub-types :

33.4 - Mid-elevation phrygas of Crete

Varied formations of supra- and oro- Mediterranean levels of Crete resulting from the broad contact between phrygas 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* phrygas

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

33.6 - Italian *Sarcopoterium* phrygas

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* phryga

Very local *Genista acanthoclada* ssp. *sardoa*-dominated communities of north-western Sardinia.

33.8 - Balearic clifftop phrygas

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* phrygas

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 phryga 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 phryga

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 phrygas.

- 2) Plants: 33.4 - *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 aegyptiacum*; 33.6 - *Sarcopoterium spinosum*; 33.7 - *Genista acanthoclada* ssp. *sardoa*; 33.8 - *Launaea cervicornis*, *Astragalus balearicus*, **Centaurea balearica*, *Anthyllis fulgurans*, *A. hermanniae* ssp. *hystrix*, *Teucrium subspinosum*; 33.9 - *Genista corsica*, *G. morisii*; 33.A - *Helichrysum saxatile* ssp. *errerae*, *Matthiola pulchella*.
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NATURAL AND SEMI-NATURAL GRASSLAND FORMATIONS

Natural grasslands

6110 * Rupicolous calcareous or basophilic grasslands of the *Alyso-Sedion albi*

PAL.CLASS.: 34.11

- 1) Open xerothermophile pioneer communities on superficial calcareous or base-rich soils (basic volcanic substrates), dominated by annuals and succulents of the *Alyso alyssoidis-Sedion albi* Oberdorfer & Müller in Müller 61.
Similar communities may develop on artificial substrates; these should not be taken into account.
 - 2) Plants: *Alyssum alyssoides*, *Arabis recta*, *Cerastium* spp., *Hornungia petraea*, *Jovibarba* spp., *Poa badensis*, *Saxifraga tridactylites*, *Sedum* spp., *Sempervivum* spp., *Teucrium botrys*.
 - 3) Corresponding categories
German classification: "320101 natürlicher Karbonatfels (Kalk, Dolomit) (lückige Vegetation, P002)".
Nordic classification: *Asplenium ruta-muraria-Asplenium trichomanes-Homalothecium sericeum*-variant of "*Sedum album-Tortella* spp.-typ".
 - 4) In some regions of Belgium and Germany this habitat is very closely linked with *Xerobromion* and *Mesobromion* associations.
-

6120 * Xeric sand calcareous grasslands

PAL.CLASS.: 34.12

- 1) Dry, frequently open grasslands on more or less calciferous sand with a subcontinental centre of distribution (*Koelerion glaucae*, *Silene conicae-Cerastion semidecandri*, *Sedo-Cerastion* p.).
- 2) Plants: *Allium schoenoprasum*, *Alyssum montanum* ssp. *gemelinii*, *Astragalus arenarius*, *Cardaminopsis arenosa*, *Carex ligerica*, *Carex praecox*, *Dianthus deltoides*, *Euphorbia seguieriana*, *Festuca psammophila*, *Gypsophila fastigiata*, *Helichrysum arenarium*, *Herniaria glabra*, *Koelerion glauca*, *Petrorhagia prolifera*, *Sedum reflexum*, *Silene chlorantha*.
- 3) Corresponding categories
German classification : "340403 ausdauernder Sandtrockenrasen mit geschlossener Narbe".
Nordic classification: "5141 *Koeleria glauca*-typ".
- 4) This habitat type occurs in association with non coastal dune complexes.
- 5) **Olsson, H. (1974)**. Studies on South Swedish sand vegetation. *Acta Phytogeogr. Suec.* 60:1-170.

6130

Calaminarian grasslands of the *Violetalia calaminariae*

PAL.CLASS.: 34.2, 36.44

- 1) Generally open natural or semi-natural grasslands 1) on natural rock outcrops, rich in heavy metals (e.g. zinc, lead), 2) river gravels and shingles, 3) on old terrils or spoil heaps around mines. These open grasslands are characterised by a highly specialised flora, with subspecies and ecotypes adapted to heavy metals. The threatened endemic taxa are generally absent from the pioneer vegetation of younger terrils. This pioneer vegetation is not considered to be a priority.
- 2) Plants: *Viola calaminaria* and metallophyte races of *Thlaspi caerulescens*, *Armeria maritima*, *Minuartia verna*, *Silene vulgaris*, *Festuca ophioliticola*, *Cochleria alpina* sensu lato.
- 3) Corresponding categories
German classification : "3405a natürliche und halbnatürliche Schwermetallrasen".
United Kingdom classification: "OV37 *Festuca ovina*-*Minuartia verna* community".
- 4) Seminatural sites are to be taken into account mainly if natural sites are very rare or absent from a region or, if these sites shelter characteristic or outstanding plant species.
- 5) **Birse E.L. (1982)**. Plant communities on serpentine in Scotland. *Vegetatio*, 49 141-162.

6140

Siliceous Pyrenean *Festuca eskia* grasslands

PAL.CLASS.: 36.314

- 1) Subalpine and lower alpine closed mesophile *Festuca eskia* grasslands of north-facing slopes (ubacs) and depressions in the Pyrenees with *Arnica montana*, *Ranunculus pyrenaicus*, *Selinum pyrenaicum*, *Trifolium alpinum*, *Campanula barbata*, *Gentiana punctata*, *Leucorchis albida*, *Phyteuma betonicifolium*.
- 2) Plants: *Festuca eskia*.

6150 Siliceous alpine and boreal grasslands

PAL.CLASS.: 36.11, 36.32, 36.34

- 1) Boreo-alpine formations of the higher summits of mountains in the Alps and Scandinavia with outliers elsewhere such as the Tatra, with *Juncus trifidus*, *Carex bigelowii*, mosses and lichens. Also included are associated snowbed communities.
- 2) Plants: *Juncus trifidus*, *Carex bigelowii*, *Cassiope tetragona*.
- 3) Corresponding categories
United Kingdom classification : "U7 *Nardus stricta*-*Carex bigelowii* grass heath", "U8 *Carex bigelowii*-*Polytrichum alpinum* sedge heath", "U9 *Juncus trifidus*-*Racomitrium lanuginosum* rush-heath", "U10 *Carex bigelowii*-*Racomitrium lanuginosum* moss heath", "U11 *Polytrichum sexangulare*-*Kiaeria starkei* snow-bed", "U12 *Salix herbacea*-

Racomitrium lanuginosum snow-bed" and "U14 *Alchemilla alpina*-*Sibbaldia procumbens* dwarf-herb community".

- 5) **Oksanen, L. & Virtanen, R. (1995).** Topographic, altitudinal and regional pattern in suboceanic and continental heath vegetation of northern Fennoscandia. *Acta Bot. Fenn.* 153:1-80.
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6160

Oro-Iberian *Festuca indigesta* grasslands

PAL.CLASS.: 36.361

- 1) Thermophile, open, stripped and garland fescue grasslands of siliceous upper slopes and summits of the high Mediterranean mountains, locally extending into the Euro-Siberian domain at the subalpine level (*Festucetalia indigestae*).
- 2) Plants: *Festuca indigesta*.
-

6170 Alpine and subalpine calcareous grasslands

PAL.CLASS.: 36.12, 36.41 to 36.43, 36.37, 36.38

- 1) 1) Alpine and subalpine grasslands of base-rich soils, with *Dryas octopetala*, *Gentiana nivalis*, *Gentiana campestris*, *Alchemilla hoppeana*, *Alchemilla conjuncta*, *Alchemilla flabellata*, *Anthyllis vulneraria*, *Astragalus alpinus*, *Aster alpinus*, *Draba aizoides*, *Globularia nudicaulis*, *Helianthemum nummularium* ssp. *grandiflorum*, *Helianthemum oelandicum* ssp. *alpestre*, *Pulsatilla alpina* ssp. *alpina*, *Phyteuma orbiculare*, *Astrantia major*, *Polygala alpestris* (36.41 to 36.43) of mountain ranges such as the Alps, Pyrenees, Carpathians and Scandinavia. Also included are the grasslands of the subalpine (oro-Mediterranean) and alpine levels of the highest mountains of Corsica (36.37), and the Mesophile, closed, short turfs of the subalpine and alpine levels of the southern and central Apennines, developed locally above treeline, on calcareous substrates (36.38). Can also include associated snowpatch communities (e.g. *Arabidion coeruleae*).

Sub-types :

36.41 - Closed calciphile alpine grasslands

Mesophile, mostly closed, vigorous, often grazed or mowed, grasslands on deep soils of the subalpine and lower alpine levels of the Alps, the Pyrenees, the mountains of the Balkan peninsula, and, locally, of the Apennines and the Jura.

36.42 - Wind edge naked-rush swards

Meso-xerophile, relatively closed and unsculptured swards of *Kobresia myosuroides* (*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, the Carpathians, the Pyrenees, the Cantabrian Mountains, Scandinavian mountains and, very locally, the Abruzzi and the mountains of the Balkan peninsula, with *Oxytropis jacquinii* (*Oxytropis montana*), *Oxytropis pyrenaica*, *Oxytropis carinthiaca*, *Oxytropis foucaudii*, *Oxytropis halleri*, *Antennaria carpatica*, *Dryas octopetala*, *Draba carinthiaca*, *Draba siliquosa*, *Draba fladnizensis*, *Draba aizoides*, *Gentiana tenella*, *Erigeron uniflorus*, *Dianthus glacialis*, *Dianthus monspessulanus* ssp. *sternbergii*, *Potentilla nivea*, *Saussurea alpina*, *Geranium argenteum*, *Sesleria sphaerocephala*, *Carex atrata*, *Carex brevicollis*, *Carex foetida*, *Carex capillaris*, *Carex nigra*, *Carex curvula* ssp. *rosae* and *Carex rupestris*.

Scandinavian *Kobresia* grasslands with *Carex rupestris* are included.

36.43 - Calciphilous stepped and garland grasslands

Xero-thermophile, open, sculptured, stepped or garland grasslands of the Alps, the Carpathians, the Pyrenees, the mountains of the Balkan peninsula and the Mediterranean mountains, with very local outposts in the Jura.

36.44 - Alpine heavy metal communities: included in habitat 6130 'Calaminarian grasslands (*Violetalia calaminariae*)',

36.37 - Oro-Corsican grasslands

Grasslands of the subalpine (oro-Mediterranean) and alpine levels of the highest mountains of Corsica.

36.38 - Oro-Appennine closed grasslands

Mesophile, closed, short turfs of the subalpine and alpine levels of the southern and central Appennines, developed locally above treeline, on calcareous substrates.

- 2) Plants: 36.41 to 36.43 - *Dryas octopetala*, *Gentiana nivalis*, *Gentiana campestris*, *Alchemilla hoppeana*, *Alchemilla conjuncta*, *Alchemilla flabellata*, *Anthyllis vulneraria*, *Astragalus alpinus*, *Aster alpinus*, *Draba aizoides*, *Globularia nudicaulis*, *Helianthemum nummularium* ssp. *grandiflorum*, *Helianthemum oelandicum* ssp. *alpestre*, *Pulsatilla alpina* ssp. *alpina*, *Phyteuma orbiculare*, *Astrantia major*, *Polygala alpestris*; 36.37 - *Plantago subulata* ssp. *insularis*, *Sagina pilifera*, *Armeria multiceps*, *Paronychia polygonifolia*, *Bellardiochloa violacea*, *Phleum brachyrachyum*, *Geum montanum*, *Sibbaldia procumbens*, *Veronica alpina*; 36.38 - *Festuca violacea* ssp. *macrathera*, *Trifolium thalii*.

3) Corresponding categories

United Kingdom classification: "CG12 *Festuca ovina*-*Alchemilla alpina*-*Silene acaulis* dwarf-herb heath", "CG13 *Dryas octopetala*-*Carex flacca* heath", "CG14 *Dryas octopetala*-*Silene acaulis* ledge community".

Nordic classification: "123 Lågörtvegetation på rikt/kalkrikt underlag".

- 5) **Bringer, K.-G. (1961)**. Den lågalpina *Dryas*-hedens differentiering och ståndortsekologi inom Torneträsk-området. 1-2. *Sven. Bot. Tidskr.* 55:349-375, 551-584.

6180

Macaronesian mesophile grasslands

PAL.CLASS.: 38.5

- 1) Secondary grasslands of the highest levels.
- 2) Plants: *Holcus rigidus*, *Festuca jubata*, *Deschampsia foliosa*, *Ranunculus cortusifolius*, *Rumex azorica*, *Cardamine caldeirarum*, *Dryopteris azorica*, *D. crispifolia*, *Euphrasia grandiflora*, *Lactuca watsoniana*, *Senecio malvifolius*, *Tolpis azorica*, *Bellis azorica*, *Sanicula azorica*, *Ammi* spp.

6190

Rupicolous pannonic grasslands (*Stipo-Festucetalia pallentis*)

PAL.CLASS.: 34.35

- 1) Open, pioneer rock sward associations occurring on steep, dry xeric slopes in medium altitude mountains of the Pannonic basin and adjacent regions at 150-900 m a.s.l.. The base rock is limestone, dolomite or calcareous volcanic rock (basalt, andesite, gabbro) and the soils are shallow rendzinas.

Sub types:

34.351 - Calci-orophile pale fescue grasslands (*Diantho lumnitzeri-Seslerion albicantis*, *Seslerion rigidae*)

Central European calcicolous subcontinental rock-ledge grasslands of orogenous affinities, montane or submontane with a strong representation of species characteristic of higher-altitude communities, often occupying stations with a comparatively cool microclimate.

34.3522 - Circum-Pannonic calcieline pale fescue grasslands (*Bromo pannonici-Festucion pallentis*)

Species-rich xerothermophile subcontinental rock-ledge grasslands of the western and southern periphery of the Carpathian arc, developed on rendzinas over limestones or dolomite on south-facing steep slopes with extreme conditions of insolation, temperature variation and evaporation.

34.353 - Acidocline pale fescue grasslands (*Asplenio septentrionalis-Festucion pallentis*, *Alyso saxatilis-Festucion pallentis*)

Central European subcontinental xerothermophile grasslands of siliceous collinear and montane rock ledges.

2) Plants:

Festuca pallens, *Bromus pannonicus*, *Stipa eriocalis*, *S. joannis*, *S. pulcherrima*, *Carex humilis*, *Chrysopogon gryllus*, *Iris pumila*, *Pulsatilla grandis*, *Alyssum montanum*, *Helianthemum nummularium* agg., *Globularia punctata*, *Anacamptis pyramidalis*, *Seseli leucospermum*, *Linum dolomiticum*, *Vincetoxicum pannonicum*, *Draba lasiocarpa*, *Dianthus regis-stephani*, *Biscutella laevigata* agg., *Polygala amara*, *Daphne cneorum*, *Paronychia cephalotes*, *Sesleria sadleriana*, *Festuca amethystina*

3) Corresponding categories

Hungarian classification: "Calcareous open rock grasslands (identification code: G2)", "Acidophilous open rock grasslands (identification code: G3)", "Closed rock grasslands (identification code: H1)".

4) Dolomitic grasslands are stable associations preserving many relict species, which may persist for several thousand years. They are in contact with karst shrub (*Cotino-Quercetum pubescentis*) and karstic beech woods (*Orno-Fagetum*). During primary succession the limestone and siliceous rock grasslands become closed and form transition to slope steppe vegetation (*Festucion rupicolae*), then rock shrub vegetation (*Spiraeion mediae*) and thermophile oak woods (*Corno-Quercetum*) and rock forests (*Tilio-Fraxinetum*).

5) **Borhidi, A. & Sánta, A. (eds.) (1999).** Vörös Könyv Magyarország növénytársulásairól. 1-2. (Red Book of Hungarian Plant Communities. Vols. 1-2. TermészetBÚVÁR Kiadó, Budapest, pp. 768 (in Hungarian)

Zólyomi, B. (1966). Neue Klassifikation der Felsenvegetation im pannonischen Raum und angrenzenden Gebiete. *Bot. Közlem.* **53**. 49-54

Semi-natural dry grasslands and scrubland facies

6210

Semi-natural dry grasslands and scrubland facies on calcareous substrates (*Festuco-Brometalia*) (* important orchid sites)

PAL.CLASS.: 34.31 to 34.34

1) Dry to semi-dry calcareous grasslands of the *Festuco-Brometea*. This habitat is formed on the one hand by steppic or subcontinental grasslands (*Festucetalia valesiacae*) and, on the other, by the grasslands of more oceanic and sub-Mediterranean regions (*Brometalia erecti*); in the latter case, a distinction is made between primary *Xerobromion* grasslands and secondary (semi-natural)

Mesobromion grasslands with *Bromus erectus*; the latter are characterised by their rich orchid flora. Abandonment results in thermophile scrub with an intermediate stage of thermophile fringe vegetation (*Trifolio-Geranietea*).

Important orchid sites should be interpreted as sites that are important on the basis of one or more of the following three criteria:

- (a) the site hosts a rich suite of orchid species
- (b) the site hosts an important population of at least one orchid species considered not very common on the national territory
- (c) the site hosts one or several orchid species considered to be rare, very rare or exceptional on the national territory.

- 2) Plants: *Mesobromion* - *Anthyllis vulneraria*, *Arabis hirsuta*, *Brachypodium pinnatum*, *Bromus inermis*, *Campanula glomerata*, *Carex caryophyllea*, *Carlina vulgaris*, *Centaurea scabiosa*, *Dianthus carthusianorum*, *Eryngium campestre*, *Koeleria pyramidata*, *Leontodon hispidus*, *Medicago sativa* ssp. *falcata*, *Ophrys apifera*, *O. insectifera*, *Orchis mascula*, *O. militaris*, *O. morio*, *O. purpurea*, *O. ustulata*, *O. mascula*, *Polygala comosa*, *Primula veris*, *Sanguisorba minor*, *Scabiosa columbaria*, *Veronica prostrata*, *V. teucrium*. *Xerobromion* - *Bromus erectus*, *Fumana procumbens*, *Globularia elongata*, *Hippocrepis comosa*. *Festucetalia valesiaca*: *Adonis vernalis*, *Euphorbia seguierana*, *Festuca valesiaca*, *Silene otites*, *Stipa capillata*, *S. joannis*.

Animals: *Papilio machaon*, *Iphiclides podalirius* (Lepidoptera); *Libelloides* spp., *Mantis religiosa* (Neuroptera).

3) Corresponding categories

United Kingdom classification : "CG1 *Festuca ovina*-*Carlina vulgaris* grassland", "CG2 *Festuca ovina*-*Avenula pratensis* grassland", "CG3 *Bromus erectus* grassland", "CG4 *Brachypodium pinnatum* grassland", "CG5 *Bromus erectus*-*Brachypodium pinnatum* grassland", "CG6 *Avenula pubescens* grassland", "CG7 *Festuca ovina*-*Hieracium pilosella*-*Thymus praecox/pulegioides* grassland", "CG8 *Sesleria albicans*-*Scabiosa columbaria* grassland", "CG9 *Sesleria albicans*-*Galium sternerii* grassland".

In France the following sub-types are found: 34.31 - Subcontinental (Euro-Siberian and eastern) grasslands of the inner Alps stretching perhaps to Alsace (*Stipo capillatae*-*Festucenea valesiaca* Gaultier 89 prov.); 34.32 - Sub-Atlantic xerocline calcicolous grasslands [*Mesobromenalia erecti* Royer 87 (IX 212: *Brometalia erecti* Br-Bl. 36)]; 34.33 - Sub-Atlantic xerophile calcicolous grasslands (*Xerobromenalia erecti* Royer 87); 34.34 - Central European calcareo-siliceous grasslands generally established on hyperxerothermophile sands, partly denuded (*Koelerio macranthae*-*Phleion phloeidis* Korneck 74 (*Koelerio macranthae*-*Phleonia phloeidis* (Korneck 74) Royer 87).

German classification: "340101 submediterranean Trockenrasen auf karbonatischem Untergrund", "34020301 subkontinentaler Halbtrockenrasen auf karbonatischem Boden, gemäht", "34020102 submediterranean Halbtrockenrasen auf karbonatischem Boden, beweidet Mähweide", "34020103 submediterranean Halbtrockenrasen auf karbonatischem Boden, brachgefallen", "340103 subkontinentaler Trockenrasen auf karbonatischem Untergrund", "34020101 submediterranean Halbtrockenrasen auf karbonatischem Boden, gemäht", "34020302 subkontinentaler Halbtrockenrasen auf karbonatischem Boden, beweidet Mähweide", "34020303 subkontinentaler Halbtrockenrasen auf karbonatischem Boden, brachgefallen", "3403 natürlicher Steppenrasen (kontinental, auf tiefgründigem Boden)".

Nordic classification: *Avenula pratensis*-*Artemisia oelandica*-variant of "5213 *Avenula pratensis*-*Fragaria viridis*-*Filipendula vulgaris*-typ"

- 4) Often in association with scrubland and thermophile forests and with dry pioneer *Sedum* meadows (*Sedo-Scleranthea*).
- 5) **Albertsson, N. (1950)**. Das grosse südliche Alvar der Insel Öland. Eine Pflanzensoziologische Übersicht. *Sven. Bot. Tidskr.* 44:269-331.

6220

*** Pseudo-steppe with grasses and annuals of the
*Thero-Brachypodietea***

PAL.CLASS.: 34.5

- 1) Meso- and thermo-Mediterranean xerophile, mostly open, short-grass annual grasslands rich in therophytes; therophyte communities of oligotrophic soils on base-rich, often calcareous substrates. Perennial communities - *Thero-Brachypodietea*, *Thero-Brachypodietalia: Thero-Brachypodion. Poetea bulbosae: Astragalo-Poion bulbosae* (basiphile), *Trifolio-Periballion* (silicolous). Annual communities - *Tuberarietea guttatae* Br.-Bl. 1952 em. Rivas-Martínez 1978, *Trachynietalia distachyae* Rivas-Martínez 1978: *Trachynion distachyae* (calciphile), *Sedo-Ctenopsion* (gypsophile), *Omphalodion commutatae* (dolomitic and silico-basiphile). In France a distinction can be made between: (a) annual herbaceous vegetation of dry, initial, low-nitrogen soils ranging from neutro-basic to calcareous: *Stipo capensis-Brachypodietea distachyae* (Br-Bl. 47) Brullo 85; (b) vegetation of more or less closed grasslands on deep, nitrocline and xerocline soil: *Brachypodietalia phoenicoidis* (Br-Bl. 31) Molinier 34.

In Italy this habitat mainly exists in the South and on the islands (*Thero-Brachypodietea, Poetea bulbosae, Lygeo-Stipetea*).

- 2) Plants: *Brachypodium distachyum, B. retusum*.
-

6230

*** Species-rich *Nardus* grasslands, on siliceous substrates
in mountain areas (and submountain areas, in
Continental Europe)**

PAL.CLASS.: 35.1, 36.31

- 1) Closed, dry or mesophile, perennial *Nardus* grasslands occupying siliceous soils in Atlantic or sub-Atlantic or boreal lowland, hill and montane regions. Vegetation highly varied, but the variation is characterised by continuity. *Nardetalia*: 35.1-*Violo-Nardion* (*Nardo-Galion saxatilis, Violion caninae*); 36.31-*Nardion*.

Species-rich sites should be interpreted as sites which are remarkable for a high number of species. In general, the habitats which have become irreversibly degraded through overgrazing should be excluded.

- 2) Plants: *Antennaria dioica, Arnica montana, Campanula barbata, Carex ericetorum, C. pallescens, C. panicea, Festuca ovina, Galium saxatile, Gentiana pneumonanthe, Hypericum maculatum, Hypochoeris maculata, Lathyrus montanus, Leontodon helveticus, Leucorchis albida, Meum athamanticum, Nardus stricta, Pedicularis sylvatica, Platanthera bifolia, Polygala vulgaris, Potentilla aurea, P. erecta, Veronica officinalis, Viola canina*.

Animals: *Miramella alpina*.

- 3) Corresponding categories

The habitat sub-types belonging to the *Nardion* alliance shows a strong regional differentiation: Alps and Pyrenees - *Geo-montani-Nardetum*, Black Forest - *Leontodonto-Nardetum*, Harz - *Pulsatillo micranthae-Nardetum*, Bayerischer Wald - *Lycopodio-Nardetum*. In the United Kingdom, the habitat covers the most species-rich sites of the types "CG10 *Festuca ovina-Agrostis capillaris-Thymus praecox*" and "CG11 *Festuca ovina-Agrostis capillaris-Alchemilla alpina* grass heath".

German classification : "34060101 gemähter Borstgrasrasen der planaren bis submontanen Stufe", "34060102 beweideter Borstgrasrasen der planaren bis submontanen Stufe (incl. Mähweide)",

"34060103 brachgefallener Borstgrasrasen der planaren bis submontanen Stufe", "34060201 gemähter Borstgrasrasen der montanen bis hochmontanen Stufe", "34060202 beweideter Borstgrasrasen der montanen bis hochmontanen Stufe (incl. Mähweide)", "34060203 brachgefallener Borstgrasrasen der montanen bis hochmontanen Stufe".

Nordic classification : "5133 *Nardus stricta*-typ" and "5233a *Carex nigra*-*Carex panicea*-*Nardus stricta*-variant".

- 5) **Sjörs, H. (1967).** *Nordisk växtgeografi. 2 uppl.* Svenska Bokförlaget Bonniers, Stockholm, 240 pp.
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6240

* Sub-pannonic steppic grasslands

PAL.CLASS.: 34.315

- 1) Steppic grasslands, dominated by tussock-grasses, chamaephytes and perennials of the alliance *Festucion valesiaca* and related syntaxa. These xerotherme communities are developed on southern exposed slopes with AC-soils on rocky substrate and on clay-sandy sedimentation layers enriched with gravels. They are partially of natural, partially of anthropogenic origin.
 - 2) Plants: *Festuca valesiaca*, *Allium flavum*, *Gagea pusilla*, *Hesperis tristis*, *Iris pumila*, *Ranunculus illyricus*, *Teucrium chamaedrys*, *Medicago minima*, *Globularia cordifolia*, *Helianthemum canum*, *Poa badensis*, *Scorzonera austriaca*, *Potentilla arenaria*, *Seseli hippomarathrum*, *Alyssum alyssoides*, *Artemisia austriaca*, *Chrysopogon gryllus*, *Astragalus austriacus*, *A. excapus*, *A. onobrychis*, *Oxytropis pilosa*, *Daphne cneorum*, *Iris humilis* ssp. *arenaria*, *Carex humilis*, *Festuca rupicola*, *Stipa capillata*, *S. joannis*, *Botriochloa ischaemum*.
 - 3) Corresponding categories
Syntaxa for Austria: *Astragalo austriaci-Festucetum sulcatae*, *Ranunculo illyrici-Festucetum valesiaca*, *Medicagini minima-Festucetum valesiaca*, *Poa-Festucetum valesiaca*, *Stipo joannis-Avenastretum besseri*, *Teucrio botryos-Andropogonetum ischaemi*.
 - 5) **Mucina, L., Grabherr, G., Ellmauer, T. (1993).** *Die Pflanzengesellschaften Österreichs, Teil 1.* Anthropogene Vegetation. Gustav Fischer, Jena.Stuttgart. New York. pp 578.
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6250

* Pannonic loess steppic grasslands

PAL.CLASS.: 34.91

- 1) Grassland communities rich in perennial grasses and herbs on loess deposits. Originally covering large areas, nowadays restricted to specific land forms like loess ridges formed by fluvial erosion and accumulation.
- 2) Plants: *Artemisia pontica*, *Astragalus vesicarius*, *A. austriacus*, *A. onobrychis*, *Crambe tatarica*, *Nonea pulla*, *Salvia nemorosa*, *Ornithogalum pannonicum*, *Agropyron pectinatum*, *Phlomis tuberosa*, *Bromus inermis*, *Festuca rupicola*, *Falcaria vulgaris*, *Peucedanum alsaticum*, *Elymus hispidus*, *Chamaecytisus supinus*, *Achillea pannonica*.
- 3) Geographical distribution: Austria.
Syntaxa for Austria: *Astragalo excapi-Crambetum tatarici*.

- 5) **Mucina, L., Grabherr, G., Ellmauer, T. (1993).** *Die Pflanzengesellschaften Österreichs, Teil 1. Anthropogene Vegetation.* Gustav Fischer, Jena.Stuttgart. New York. pp 578.
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6260 * Pannonic sand steppes

PAL.CLASS.: 34.A1

- 1) Formations dominated by medium or tall perennial tuft-forming grasses or suffrutescents, with lacunar ground cover, together with their associated therophyte communities developed on mobile or fixed sands (alluvial sands, subfossil dune systems) within the range of the Pannonic steppes (34.91), thus in the Pannonic basin and the areas dominated by its communities.
- 2) Plants: *Festuca vaginata*, *Helychrysum arenarium*, *Dianthus serotinus*, *Gypsophila fastigiata*, *G. paniculata*, *Koeleria glauca*, *Alyssum montanum* ssp. *gmelinii*, *Bassia laniflora*, *Centaurea scabiosa* ssp. *sadleriana*, *C. jacea* ssp. *angustifolia*, *Erysimum diffusum*, *Stipa capillata*, *S. pulcherrima*, *Cynodon dactylon*, *Festuca pseudovina*.
Animals: insects - *Gampsocleis glabra*, *Myrmeleotetrix antennatus*, **Callimorpha quadripunctaria*, *Cletis maculosa*, *Zygaena laeta*, *Z. punctum*, *Scythris kasyi*.
- 3) Geographical distribution: Austria, France, Italy.
Syntaxa for Austria: *Festucetum vaginatae*, *Brometum tectorum*, *Equisetetum ramosissimi*, *Potentillo arenariae-Festucetum pseudovinae*.
- 5) **Mucina, L., Grabherr, G., Ellmauer, T. (1993).** *Die Pflanzengesellschaften Österreichs, Teil 1. Anthropogene Vegetation.* Gustav Fischer, Jena.Stuttgart. New York. pp 578.
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6270 * Fennoscandian lowland species-rich dry to mesic grasslands

PAL.CLASS.: 35.1212, 35.1223, 38.22, 38.241 (1997 version)

- 1) This habitat type occurs in the Fennoscandian lowlands varying from dry to mesic grasslands mainly on siliceous substrates. The vegetation is formed by long-term continuous grazing and/or mowing. No fertilization may occur. Species composition varies in different geographical areas, on different soils and moisture regimes and different management regimes. Includes habitats which are still traditionally used and also recently abandoned habitats with a species-rich grassland vegetation. The habitat often supports species-rich vascular plant communities. Several endangered fungi-species also occur.
- 2) Plants: *Agrostis capillaris*, *Alchemilla* spp., *Antennaria dioica*, *Anthoxanthum odoratum*, *Bistorta vivipara*, *Botrychium* spp., *Dianthus deltoides*, *Euphrasia* spp., *Festuca ovina*, *F. rubra*, *Galium verum*, *Gentianella campestris*, *Gymnademina conopsea*, *Hypochoeris maculata*, *Leontodon hispidus*, *Lychnis viscaria*, *Plantago lanceolata*, *Primula veris*, *Ranunculus polyanthemos*, *Succisa pratensis*. Fungi: *Hygrocybe* spp., *Geoglossum* spp., *Entoloma* spp.
- 3) Corresponding categories
Nordic classification: 5212 *Festuca ovina-Lychnis viscaria*-type, 5213 *Avenula pratensis-Fragaria viridis-Filipendula vulgaris*-type, 5222 *Agrostis capillaris-Alchemilla* spp.- *Trifolium repens* -type, 5223 *Leucanthemum vulgare*-type, 5224 *Germanium sylvaticum*-type.

6280*** Nordic alvar and precambrian calcareous flatrocks**

PAL.CLASS.: 34.1151, 34.3171, 34.3173 (1997 version)

- 1) Nordic alvar and Precambrian calcareous flatrocks are very species-rich ecosystems, with an ecological character strongly influenced by winter climatic conditions. Where a thin soil layer exists, it is often frozen to ice and covered with snow. Plants and animals have special adaptations to these conditions. For example the invertebrates must have strategies for overwintering. Annual freezing and thawing give rise to movements at the soil surface creating small patches of bare soil occupied by annual plants, a number of which are rare. The flat rocks may be covered with a thin layer of soil, which is the product of weathering of the underlying rock. The flora and fauna is very rich in species and many of them are rare.

On Öland the Nordic alvar represents a subtype with dominating *Helianthemum oelandicum* and other endemic species. The ground is covered with a 5-30 cm deep crumbling soil. The inclination is near zero and the draining process is extremely slow. Freeze-thaw action creates soil polygons with a characteristic patterning of vegetation. In Nordic alvar there are also depressions, which sometimes are filled with water. In summertime those wetlands, on Öland and Gotland called "våtar", will dry up - completely or partially.

Nordic alvar is a habitat type of cambro-siluric or precambrian calcareous rocks.

- 2) Plants: *Androsace septentrionalis*, *Asperula tinctoria*, *Gentianella amarella*, *Linum catharticum*, *Melica ciliata*, *Potentilla tabernaemontani*, *Saxifraga adscendens*, *S. tridactylites*, *Sedum acre*, *S. album*, *Hornungia petraea*, *Festuca ovina*, *Geranium columbinum*, on Gotland e.g. *Fumana procumbens*, *Inula ensifolia*, *I. salicina*, *Arenaria gothica*, *Tragopon dubius*, *Pulsatilla patens*, *Crepis tectorum* ssp. *pumila*, on Öland also *Galium oelandicum*, *Allium schoenoprasum* var. *alvarense*, *Artemisia oelandica*, *Silene uniflora* var. *petraea*. Lichens- *Cetraria nivalis*, *Aspicilia calcarea*, *Fulgensia* spp., *Toninia caeruleonigricans*, *Cladonia pocillum*, *C. symphyocarpa*, Bryophytes- *Encalypta* spp., *Tortella tortuosa*, *Ditrichum flexicaule*, *Schistidium apocarpum*.

- 3) Corresponding categories

Nordic vegetation types: 5151 *Sedum album*-*Tortella* spp. -type, 5152 *Festuca ovina*-*Tortella* spp. -type and 5213c *Avenula pratensis*-*Artemisia oelandica* -variant

- 5) **Albertson, N. (1950).**- Das grosse südliche Alvar der Insel Öland. *Svensk Bot. Tidskrift*, 44: 269-331.

Pettersson, B. (1958).- Dynamik och konstans i Gotlands flora och vegetation. *Acta Phytogeogr. Suec.* 40.

Rosén, E.L (1982).- Vegetation development and sheep grazing in limestone grassland of south Öland, Sweden. *Acta Phytogeogr. Suec.*, nr 72.

62A0 Eastern sub-mediterranean dry grasslands (Scorzoneratalia villosae)

PAL.CLASS.: 34.75

- 1) Xeric grasslands of the sub-Mediterranean zones of Trieste, Istria and the Balkan peninsula, where they coexist with steppic grasslands of the *Festucetalia valesiacae* (6210), developing in areas of lesser continentality than the latter and incorporating a greater Mediterranean element. Includes the following communities; - *Carici humilis*-*Centaureetum rupestris*, *Genisto holopetalae*-*Caricetum mucronatae*, *Chrysopogono*-*Centaureetum cristatae* & *Danthonio*- *Scorzoneretum villosae*.

- 2) Plants: *Carex humilis*, *Bromus erectus*, *Centaurea rupestris*, *Leucanthemum liburnicum*, *Plantago argentea*, *Jurinea mollis*, *Iris cengialti*, *Pulsatilla vulgaris* ssp. *grandis*, *Genista holopetala*#,

Hladnikia pastinacifolia, *Euphrasia marchesettii*#, *Pedicularis friderici-augusti*, *Sesleria juncifolii*, *Gentiana lutea*#, *Gentiana clusii*, *Trinia glauca*, *Arctostaphylos uva-ursi*, *Euphorbia triflora*.

62B0 * Serpentinophilous grasslands of Cyprus

PAL.CLASS.:

- 1) Perennial herb communities restricted to ultramafic areas of Cyprus such as the Troodos mountains and the Akamas peninsula. The vegetation consists of small patches of sparse plant cover on rocky outcrops and stony places with a specialised flora, including several endemic species. Occurs at 700 to 1950 m in the central Troodos range although the most representative communities occur above 1700m. There are also similar communities at lower altitudes (350 –450m) on Akamas (western Troodos). The substrates are ultramafic rocks such as serpentinite, dunite, werhlite & hurzburgite.
 - 2) Plants:
High altitude form *Acinos troodi*, *Alyssum cypricum*, *Alyssum troodi*, *Anthemis plutonia*, *Corydalis rutifolia*, *Cynoglossum troodi*, *Dianthus strictus* ssp *troodi*, *Euphorbia cassia* ssp. *rigoii*, *Hypericum confertum* ssp. *stenobotrys*, *Lindbergella sintenissii*, *Onosma troodi* , *Ranunculus cadmicus* var *cypricus*
Low altitude form *Alyssum chondrogynum*, *A akamasicum*, *Centaurea cyprensis*, *Hyacinthella millingeni*, *Minuartia pichleri*, *Thymus integer*
-

Sclerophyllous grazed forests (dehesas)

6310

Dehesas with evergreen *Quercus* spp.

PAL.CLASS.: 32.11 x 91.2

- 1) A characteristic landscape of the Iberian peninsula in which crops, pasture land or Meso-Mediterranean arborescent matorral, in juxtaposition or rotation, are shaded by a fairly closed to very open canopy of native evergreen oaks (*Quercus suber*, *Q. ilex*, *Q. rotundifolia*, *Q. coccifera*). It is an important habitat of raptors, including the threatened Iberian endemic eagle (*Aquila adalberti*), of the crane (*Grus grus*), of large insects and their predators and of the endangered felid (**Lynx pardinus*)
- 2) Plants: *Quercus suber*, *Q. ilex*, *Q. rotundifolia*, *Q. coccifera*.

Semi-natural tall-herb humid meadows

6410 *Molinia* meadows on calcareous, peaty or clayey-silt-laden soils (*Molinion caeruleae*)

PAL.CLASS.: 37.31

- 1) *Molinia* meadows of plain to montane levels, on more or less wet nutrient poor soils (nitrogen, phosphorus). They stem from extensive management, sometimes with a mowing late in the year or, they correspond to a deteriorated stage of draining peat bogs.

Sub-types :

37.311: on neutro-alkaline to calcareous soils with a fluctuating water table, relatively rich in species (*Eu-molinion*). The soil is sometimes peaty and becomes dry in summer.

37.312: on more acid soils of the *Junco-Molinion* (*Juncion acutiflori*) except species-poor meadows or on degraded peaty soils.

- 2) Plants: 37.311 - *Molinia caerulea*, *Dianthus superbus*, *Selinum carvifolia*, *Cirsium tuberosum*, *Colchicum autumnale*, *Inula salicina*, *Silaum silaus*, *Sanguisorba officinalis*, *Serratula tinctoria*, *Tetragonolobus maritimus*; 37.312 - *Viola persiciflora*, *V. palustris*, *Galium uliginosum*, *Cirsium dissectum*, *Crepis paludosa*, *Luzula multiflora*, *Juncus conglomeratus*, *Ophioglossum vulgatum*, *Inula britannica*, *Lotus uliginosus*, *Dianthus deltoides*, *Potentilla erecta*, *P. anglica*, *Carex pallescens*.

- 3) Corresponding categories

United Kingdom classification: "M26 - *Molinia caerulea*-*Crepis paludosa* fen meadow" and "M24 - *Molinia caerulea*-*Cirsium dissectum* fen meadow type" ("M23 - *Juncus effusus/acutiflorus*-*Galium palustre* rush pasture" and "M25 - *Molinia caerulea*-*Potentilla erecta* mire" are excluded).

German classification: "35020102 Pfeifengraswiese auf kalkreichen Standort".

Nordic classification: "5233 *Carex nigra*-*Carex panicea*-*Molinia caerulea*-typ", "5234 *Carex flacca*-*Primula farinosa*-*Orchis* spp.-typ" and "5235 *Molinia caerulea*-typ".

- 4) In some regions, these grasslands are in close contact with *Nardetalia* communities. For the *Molinia* meadows of river valleys, a transition toward *Cnidion dubii* alliance is observed.
- 5) **Ekstam, U., Aronsson, N. & Forshed, N. (1988).** *Ängar*. Om naturliga slåttermarker i ängslandskapet. LTs förlag, Stockholm, 209 pp.

6420 Mediterranean tall humid herb grasslands of the *Molinio-Holoschoenion*

PAL.CLASS.: 37.4

- 1) Mediterranean humid grasslands of tall grasses and rushes, widespread in the entire Mediterranean basin, extending along the coasts of the Black Sea, in particular in dunal systems.

- 2) Plants: *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*.

6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels

PAL.CLASS.: 37.7 and 37.8

- 1) 37.7 - Wet and nitrophilous tall herb edge communities, along water courses and woodland borders belonging to the *Glechometalia hederaceae* and the *Convolvuletalia sepium* orders (*Senecion fluviatilis*, *Aegopodion podagrariae*, *Convolvulion sepium*, *Filipendulion*).
37.8 - Hygrophilous perennial tall herb communities of montane to alpine levels of the *Betulo-Adenostyletea* class.
- 2) Plants: 37.7 - *Glechoma hederacea*, *Epilobium hirsutum*, *Senecio fluviatilis*, *Filipendula ulmaria*, *Angelica archangelica*, *Petasites hybridus*, *Cirsium oleraceum*, *Chaerophyllum hirsutum*, *Aegopodium podagraria*, *Alliaria petiolata*, *Geranium robertianum*, *Silene dioica*, *Lamium album*, *Lysimachia punctata*, *Lythrum salicaria*, *Crepis paludosa*; 37.8 - *Aconitum lycoctonum* (*A. vulparia*), *A. napellus*, *Geranium sylvaticum*, *Trollius europaeus*, *Adenostyles alliariae*, *Peucedanum ostruthium*, *Cicerbita alpina*, *Digitalis grandiflora*, *Calamagrostis arundinacea*, *Cirsium helenioides*.
- 3) Corresponding categories
United Kingdom classification: "U17 - *Luzula sylvatica*-*Geum rivale* tall herb community".
German classification: "390101 krautiger Ufersaum an besonnten Gewässern", "39050101 feuchter Staudensaum der planaren bis submontanen Stufe", "390102 krautiger Ufersaum an beschatteten Gewässern (z.B. mit *Cardamine amara*, Bitteres Schaumkraut)", "35020203 nährstoffreiche, Feucht- bzw. Naßgrünlandbrache der planaren bis submontanen Stufe", "35020303 nährstoffreiche, Feucht- bzw. Naßgrünlandbrache der planaren bis hochmontanen Stufe", "39050201 montane bis hochmontane Hochstaudenflur", "39050202 montane bis hochmontane Hochgrasflur (*Calamagrostion arundinaceae*)", "6701 subalpine bzw. alpine Hochstaudenflur (Alpen)".
Nordic classification: "126 Högörtängsvegetation".
- 4) Similar communities to 37.8, with a weak development, occur at lower altitude along rivers and forest borders (in Wallonia -Belgium for example). Nitrophilous edge communities comprising only basal, common species in the region have no conservation priority. These tall herb communities could also develop in wet meadows, let lie fallow, without any cutting. Large areas of wet meadows let lie fallow and neophyte communities with *Helianthus tuberosus*, *Impatiens glandulifera*, should not be taken into account.
- 5) **Dahl, E. (1987).** Alpine-subalpine plant communities of South Scandinavia. *Phytocoenologia* 15:455-484.
Larsson, A. (1976). *Den sydsvenska fuktängen. Vegetation, dynamic och skötsel.* Medd. Avd. Ekol. Bot. Lund 31.

6440**Alluvial meadows of river valleys of the *Cnidion dubii***

PAL.CLASS.: 37.23

- 1) Alluvial meadows with natural flooding regime belonging to the *Cnidion dubii* alliance, under continental to subcontinental climatic conditions.
 - 2) Plants: *Cnidium dubium* (*C. venosum*), *Viola persicifolia*, *Scutellaria hastifolia*, *Allium angulosum*, *Oenanthe lachenalii*, *Gratiifolia officinalis*, *Carex praecox* var. *suzae*, *Juncus atratus*, *Lythrum virgatum*.
 - 3) Corresponding categories
German classification : "35020201 nährstoffreiche, extensive Feucht- bzw. Naßwiese der planaren bis submontanen Stufe", "35020202 nährstoffreiche, extensive Feucht- bzw. Naßwiese der planaren bis submontanen Stufe (incl. Mähweide)", "350204 Flutrasen".
 - 4) This is a transition habitat between wet and dry meadows and which cover small areas. This point has to taken into account during site selection.
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6450**Northern boreal alluvial meadows**

PAL.CLASS.: -

- 1) Along large rivers with placid river sections which are frozen every winter, the type is affected by flooding in spring. The traditional management as hay meadows has usually ceased. Type includes areas that are not yet severely overgrown with trees and bushes.
 - 2) Plants: *Carex acuta*, *C. aquatilis*, *C. canescens*, *Calamagrostis purpurea*, *Convallaria majalis*, *Deschampsia cespitosa*, *Elymus fibrosus*, *E. mutabilis*, *Festuca ovina*, *Equisetum fluviatile*, *Galium boreale*, *Molinia caerulea*, *Nardus stricta*, *Phalaris arundinacea*, *Salix triandra*, *Solidago virgaurea*, *Thalictrum simplex* subsp. *boreale*, *Trollius europaeus*.
 - 4) Includes several vegetation types which vary according to the moisture (flooding) gradient: *Equisetum fluviatile*-alluvial meadows, *Carex acuta* or *C. aquatilis*-alluvial meadows, *Calamagrostis*-alluvial meadows, *Phalaris*-alluvial meadows, *Deschampsia caespitosa*-alluvial meadows, tall-herb alluvial meadows, dry alluvial meadows.
 - 5) **Cajander, A. (1909).** - Beiträge zur Kenntniss der Vegetation der Alluvionen des Nördlichen Eurasiens. III. Die Alluvionen der Tornio- und Kemi -Thäler. *Acta Soc. Scient. Fenn.* 37(5):1-222.
Eurola, S. (1967).- Über die Vegetation der Alluvialwiesen im Gebiet der geplanted Stauseen von Lokka und Porttipahta im Finnischen Lappland. *Aquilo, Ser. Botanica.* 5:1-119.
Hanhela, P. (1994).- Oulangan kansallispuiston tulvaniityt. *Metsähallituksen luonnonsuojelujulkaisu.* Sarja A, 24:1-43.
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6460***Peat grasslands of Troodos**

PAL.CLASS.:

- 1) *Calamagrostis epipejeos* tall (c. 1m) meadows developing at an altitude of around 1650 m on seasonally inundated depressions, on serpentinised substrate with basic pH. The meadows are inundated from October-November until June-July, depending on the rainfall but even in summer the soil is wet and muddy. The vegetation cover is thick and the dominant graminoids *C. epipejeos* and *Juncus littoralis* and other herbs form a continuous mat on the soil. The floristic structure is characterised by species which occur only or mainly at this habitat in Cyprus, such as *C. epipejeos* and *Poa pratensis*, and by a few endemic species occurring only at the high altitude damp places in the Troodos mountains

 - 3) Plants:
Calamagrostis epigejeos, *Juncus littoralis*, *Poa pratensis*, *Polypogon semiverticillatus*, *Ornithogalum chionopilum*, *Pteridium aquilinum*, *Viola siechiana*, *Alyssum cypricum*, *Brachypodium firmifolium*, *Hypericum perforatum*, *Scirpoides holoschoenus*, *Crocus cyprius* (proposed for Annex II and IV), *Schoenus nigrigans*, *Carex divulsa*, *Carex distans*, *Taraxacum holmboei*.
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Mesophile grasslands**6510****Lowland hay meadows (*Alopecurus pratensis*,
Sanguisorba officinalis)**

PAL.CLASS.: 38.2

- 1) Species-rich hay meadows on lightly to moderately fertilised soils of the plain to submontane levels, belonging to the *Arrhenatherion* and the *Brachypodio-Centaureion nemoralis* alliances. These extensive grasslands are rich in flowers and are not cut before the grasses flower and then only one or two times per year.

- 2) Plants: *Arrhenatherum elatius*, *Trisetum flavescens* ssp. *flavescens*, *Pimpinella major*, *Centaurea jacea*, *Crepis biennis*, *Knautia arvensis*, *Tragopogon pratensis*, *Daucus carota*, *Leucanthemum vulgare*, *Alopecurus pratensis*, *Sanguisorba officinalis*, *Campanula patula*, *Leontodon hispidus*, *L. nudicaulis*, *Linum bienne*, *Oenanthe pimpinelloides*, *Rhinanthus lanceolatus*, *Malva moschata*, *Serapias cordigera*.

- 3) Corresponding categories
 United Kingdom classification: "MG4 -*Alopecurus pratensis*-*Sanguisorba officinalis* grassland".
 German classification: "34070101 artenreiche, frische Mähwiese der planaren bis submontanen Stufe",
 "34070102 artenreiche, frische Weide der planaren bis submontanen Stufe (incl. Mähweide)".
 Nordic classification: "5223 *Leucanthemum vulgare*-typ".

- 4) Wet to dry sub-types occur. If management practices become intensive with heavy applications of fertiliser, the species diversity rapidly declines.

- 5) **Buffa, G., Marchiori, S., Sburlino, G. (1988-1989).** Contributo alla conoscenza dei prati e prato-pascoli della Bassa Valsugana (Trento). *Not. FItosoc.*, 24: 125-134.

Ekstam, U, Aronsson, N. & Forshed, N. (1988). *Ängar*. Om naturliga slåttermarker i ängslandskapet. LTs förlag, Stockholm, 209 pp.

Pedrotti, F. (1963). I prati falciabili della Val di Sole (Trentino occidentale). *St. Trent. Sc. Nat.*, 40 (1): 3-122.

6520

Mountain hay meadows

PAL.CLASS.: 38.31

- 1) Species-rich mesophile hay meadows of the montane and sub-alpine levels (mostly above 600 metres) usually dominated by *Trisetum flavescens* and with *Heracleum sphondylium*, *Viola cornuta*, *Astrantia major*, *Carum carvi*, *Crepis mollis*, *C. pyrenaica*, *Bistorta major*, (*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.
 - 2) Plants: *Trisetum flavescens* and with *Heracleum sphondylium*, *Viola cornuta*, *Astrantia major*, *Carum carvi*, *Crepis mollis*, *C. pyrenaica*, *Bistorta major* (*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*, *Alchemilla* spp., *Cirsium heterophyllum*.
 - 3) Corresponding categories
United Kingdom classification : "'MG3 *Anthoxanthum odoratum*-*Geranium sylvaticum* grassland".
British types with *Geranium sylvaticum*.
Nordic classification : "5224 *Geranium sylvaticum*-typ", "5225 *Festuca ovina*-*Bistorta vivipara*-typ" and "5226 *Festuca rubra*-*Bistorta vivipara*-typ".
 - 5) **Sjörs, H. (1967).** *Nordisk växtgeografi. 2 uppl.* Svenska Bokförlaget Bonniers, Stockholm, 240 pp.
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6530

* Fennoscandian wooded meadows

PAL.CLASS.: -

- 1) A vegetation complex consisting of small copses of deciduous trees and shrubs and patches of open meadows. Ash (*Fraxinus excelsior*), birch (*Betula pendula*, *B. pubescens*) and *Quercus robur*, *Tilia cordata*, *Ulmus glabra* or *Alnus incana* are the common tree species. Nowadays very few areas are managed but traditionally these areas were managed by a combination of raking, hay-cutting, grazing of grassland and pollarding or lopping of trees. Species-rich vegetation complexes with rare and threatened meadow species and well developed epiphytic flora of mosses and lichens are characteristic. Many threatened species preferring old pollarded deciduous trees of semi-open habitats occur. The habitat type includes managed areas and overgrown areas with old pollarded or lopped deciduous trees. The type does not include abandoned meadows being invaded by trees.
- 2) Plants: (In addition to the above mentioned tree species), *Briza media*, *Corylus avellana*, *Cotoneaster scandinavicus*, *Crataegus* spp., *Cypripedium calceolus*, *Dactylorhiza fuchsii*, *D. Sambucina*, *Festuca ovina*, *Geranium sanguineum*, *Helianthemum nummularium*, *Listera ovata*,

Malus sylvestris, Orchis mascula, Plantago lanceolata, Polygala amarella, P. vulgaris, Primula farinosa, Primula veris, Ranunculus ficaria, Rosa spp., Sorbus hybrida, S. intermedia

- 5) **Hägström, C.-A. (1983).**- Vegetation and soil of the wooded meadows in Nåtö, Åland. *Acta Bot. Fennica*, 120:1-66.
Hägström, C.-A. (1988).- Protection of wooded meadows in Åland - problems, methods and perspectives. *Oulanka Reports*, 8:88-95.

RAISED BOGS AND MIRES AND FENS

Sphagnum acid bogs

7110 * Active raised bogs

PAL.CLASS.: 51.1

- 1) Acid bogs, ombrotrophic, poor in mineral nutrients, sustained mainly by rainwater, with a water level generally higher than the surrounding water table, with perennial vegetation dominated by colourful *Sphagna* hummocks allowing for the growth of the bog (*Erico-Sphagnetalia magellanici*, *Scheuchzerietalia palustris* p., *Utricularietalia intermedio-minoris* p., *Caricetalia fuscae* p.). The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming, but bogs where active peat formation is temporarily at a standstill, such as after a fire or during a natural climatic cycle e.g., a period of drought, are also included.
- 2) Plants: *Erico-Sphagnetalia magellanici*- *Andromeda polifolia*, *Carex pauciflora*, *Cladonia* spp., *Drosera rotundifolia*, *Eriophorum vaginatum*, *Odontoschisma sphagni*, *Sphagnum magellanicum*, *S. imbricatum*, *S. fuscum*, *Vaccinium oxycoccus*; in the Boreal region also *Betula nana*, *Chamaedaphne calyculata*, *Calluna vulgaris*, *Ledum palustre* and *Sphagnum angustifolium*. *Scheuchzerietalia palustris* p., *Utricularietalia intermedio-minoris* p., *Caricetalia fuscae* p.- *Carex fusca*, *C. limosa*, *Drosera anglica*, *D. intermedia*, *Eriophorum gracile*, *Rhynchospora alba*, *R. fusca*, *Scheuchzeria palustris*, *Utricularia intermedia*, *U. minor*, *U. ochroleuca*; in the Boreal region also *Sphagnum balticum* and *S. majus*.
Animals: Dragonflies- *Leucorrhinia dubia*, *Aeshna subartica*, *A. caerulea*, *A. juncea*, *Somatochlora arctica*, *S. alpestris*; Butterflies- *Colias palaeno*, *Boloria aquilonaris*, *Coenonympha tullia*, *Vacciniina optilete*, *Hypenodes turfosalis*, *Eugraphe subrosea*; Spiders- *Pardosa sphagnicola*, *Glyphesis cottonae*; Ants- *Formica transkaucaasia*; Cricket/Grasshopper- *Metrioptera brachyptera*, *Stethophyma grossum*.
- 3) Corresponding categories
United Kingdom classification: "M1 *Sphagnum auriculatum* bog pool community", "M3 *Eriophorum angustifolium* bog pool community", "M18 *Erica tetralix-Sphagnum papillosum* raised and blanket mire", "M20a *Eriophorum vaginatum* blanket and mixed mire - species poor sub community".
German classification: "360101 Hochmoor der planaren bis submontanen Stufe", "360102 Hochmoor der montanen bis hochmontanen Stufe".
Nordic classification: "312 Ristuvvegetation", "313 Fastmattevegetation", "314 Mjukmatte-och lösbottomvegetation" and "311 Skogmossvegetation" when comprising a part of the mire complexe.

- 4) In order to support the conservation of this ecosystem over its geographic range and its genetic diversity, marginal areas of lower quality as a result of damage or degradation which abut active raised bogs may need to be included, protected and, where practicable, regenerated. There are very few intact or near-intact raised bogs in Europe, except in Finland and Sweden where active raised bogs are the predominant mire complex type in hemiboreal and southern boreal regions.
- 5) **Curtis, J.R. (in press).** *The raised bogs of Ireland: their ecology, status and conservation.* Government Publications, Dublin.
Eurola, S., Hicks, S. & Kaakinen, E. (1984). *Key to Finnish Mire Types.*
Moore, J.J. (1968). A classification of the bogs and wet heaths of northern Europe (Oxycocco-Sphagnetea Br.-Bl. et Tx. 1943). In: *Pflanzensoziologische Systematik. Bericht über das internationale Symposium in Stolzenau/Weser 1964 der Internationale Vereinigung für Vegetationskunde* (R.Tuxen, Ed.). Junk, Den Haag. 306 - 320.
Nature Conservation Council (1989). *Guidelines for the selection of biological SSSI's.* Nature Conservation Council, Peterborough.
Oswald, H. (1923). Die Vegetation des Hochmoores Komosse. *Sv. Växtsociol. Sällsk. Handl.* 1:1-436.
Schouten, M.C.G. (1984). *Some aspects of the ecogeographical gradient in Irish ombrotrophic bogs.* Peat Congress, Dublin. 1: 414 - 432.
Tuxen, R., Miyawaki, A. & Fujiwara, K. (1972). Eine erweiterte Gliederung der Oxycocco-Sphagnetea. In: *Grundfragen und Methoden in der Pflanzensoziologie.* (R.Tuxen, Ed.). Junk, Den Haag. 500 - 520.

7120

Degraded raised bogs still capable of natural regeneration

PAL.CLASS.: 51.2

- 1) These are raised bogs where there has been disruption (usually anthropogenic) to the natural hydrology of the peat body, leading to surface desiccation and/or species change or loss. Vegetation on these sites usually contains species typical of active raised bog as the main component, but the relative abundance of individual species is different. Sites judged to be still capable of natural regeneration will include those areas where the hydrology can be repaired and where, with appropriate rehabilitation management, there is a reasonable expectation of re-establishing vegetation with peat-forming capability within 30 years. Sites unlikely to qualify as SACs are those that consist largely of bare peat, that are dominated by agricultural grasses or other crops, or where components of bog vegetation have been eradicated by closed canopy woodlands.
- 5) **Malmer, N. (1965).** The southern mires. *Acta Phytogeogr. Suec.* 50:149-158.

7130

Blanket bogs (* if active bog)

PAL.CLASS.: 52.1 and 52.2

- 1) Extensive bog communities or landscapes on flat or sloping ground with poor surface drainage, in oceanic climates with heavy rainfall, characteristic of western and northern Britain and Ireland. In spite of some lateral water flow, blanket bogs are mostly ombrotrophic. They often cover extensive areas with local topographic features supporting distinct communities [*Erico-Sphagnetalia magellanici*: *Pleurozio purpureae-Ericetum tetralicis*, *Vaccinio-Ericetum tetralicis* p.;

Scheuchzerietalia palustris p., *Utricularietalia intermedio-minoris* p., *Caricetalia fuscae* p.]. Sphagna play an important role in all of them but the cyperaceous component is greater than in raised bogs. The term "active" must be taken to mean still supporting a significant area of vegetation that is normally peat forming.

Sub-types in the British Isles

52.1 – HyperAtlantic blanket bogs of the western coastlands of Ireland, western Scotland and its islands, Cumbria, Northern Wales ; bogs locally dominated by sphagna (*Sphagnum auriculatum*, *S. magellanicum*, *S. compactum*, *S. papillosum*, *S. nemoreum*, *S. rubellum*, *S. tenellum*, *S. subnitens*), or, particularly in parts of western Ireland, mucilaginous algal deposits (*Zygogonium*).

52.2 – Blanket bogs of high ground, hills and mountains in Scotland, Ireland, Western England and Wales.

- 2) Plants: 52.1- *Calluna vulgaris*, *Campylopus atrovirens*, *Carex panicea*, *Drosera rotundifolia*, *Erica tetralix*, *Eriophorum vaginatum*, *Molinia caerulea*, *Myrica gale*, *Narthecium ossifragum*, *Pedicularis sylvatica*, *Pinguicula lusitanica*, *Pleurozia purpurea*, *Polygala serpyllifolia*, *Potentilla erecta*, *Racomitrium languginosum*, *Rhynchospora alba*, *Schoenus nigricans*, *Scirpus cespitosus*, *Sphagnum pulchrum*, *S. strictum*, *S. compactum*, *S. auriculatum*. 52.2 - *Calluna vulgaris*, *Diplophyllum albicans*, *Drosera rotundifolia*, *Empetrum nigrum*, *Erica tetralix*, *Eriophorum vaginatum*, *Myrica taylorii*, *Narthecium ossifragum*, *Rubus chamaemorus*, *Scirpus cespitosus*, *Vaccinium myrtillus*.

Animals: birds - *Pluvialis apricaria*, *Calidris alpina*.

3) Corresponding categories

United Kingdom classification: "M1 *Sphagnum auriculatum* bog pool community", "M15 *Scirpus cespitosus*-*Erica tetralix* wet heath", "M17 *Scirpus cespitosus*-*Eriophorum vaginatum* blanket mire", "M18 *Erica tetralix*-*Sphagnum papillosum* raised and blanket mire", "M19 *Calluna vulgaris*-*Eriophorum vaginatum* blanket mire", "M20 *Eriophorum vaginatum* blanket mire".

- 4) In the United Kingdom discrete areas of raised bog and blanket bog may occur in some districts, showing their characteristic differences. In many other areas, however, peatlands which may have begun as raised bog have become merged in a general expanse of blanket bog, losing their distinctive marginal features. Within these blanket bogs, there are other peat-forming systems which, strictly speaking, form part of various biotopes of aquatic and amphibious zones, fens and moorland.

- 5) **Doyle, G.J. & Moore, J.J. (1980)**. Western blanket bog (*Pleurozia purpureae*-*Ericetum tetralicis*) in Ireland and Great Britain. *Colloques Phytosociologiques*. VII: 213 - 223.

Moore, J.J. (1968). A classification of the bogs and wet heaths of northern Europe (Oxycocco-Sphagnetea Br.-Bl. et Tx. 1943). In: *Pflanzensoziologische Systematik. Bericht über das internationale Symposium in Stolzenau/Weser 1964 der Internationale Vereinigung für Vegetationskunde* (R.Tuxen, Ed.). Junk, Den Haag. 306 - 320.

Nature Conservation Council (1989). *Guidelines for the selection of biological SSSI's*. Nature Conservation Council, Peterborough.

Tuxen, R., Miyawaki, A. & Fujiwara, K. (1972). Eine erweiterte Gliederung der Oxycocco-Sphagnetea. In: *Grundfragen und Methoden in der Pflanzensoziologie*. (R.Tuxen, Ed.). Junk, Den Haag. 500 - 520.

7140

Transition mires and quaking bogs

PAL.CLASS.: 54.5

- 1) Peat-forming communities developed at the surface of oligotrophic to mesotrophic waters, with characteristics intermediate between soligenous and ombrogenous types. They present a large and

diverse range of plant communities. In large peaty systems, the most prominent communities are swaying swards, floating carpets or quaking mires formed by medium-sized or small sedges, associated with sphagnum or brown mosses. They are generally accompanied by aquatic and amphibious communities. In the Boreal region this habitat type includes minerotrophic fens that are not part of a larger mire complex, open swamps and small fens in the transition zone between water (lakes, ponds) and mineral soil.

These mires and bogs belong to the *Scheuchzerietalia palustris* order (oligotrophic floating carpets among others) and to the *Caricetalia fuscae* order (quaking communities). Oligotrophic water-land interfaces with *Carex rostrata* are included.

- 2) Plants: *Eriophorum gracile*, *Carex chordorrhiza*, *Carex lasiocarpa*, *Carex diandra*, *Carex rostrata*, *Carex limosa*, *Scheuchzeria palustris*, *Hammarbya paludosa*, *Liparis loeselii*, *Rhynchospora alba*, *R. fusca*, *Menyanthes trifoliata*, *Epilobium palustre*, *Pedicularis palustris*, *Sphagnum* sp. (*S. papillosum*, *S. angustifolium*, *S. subsecundum*, *S. fimbriatum*, *S. riparium*, *S. cuspidatum*, *Calliergon giganteum*, *Drepanocladus revolvens*, *Scorpidium scorpioides*, *Campylium stellatum*, *Aneura pinguis*.
- 3) Corresponding categories
 United Kingdom classification: "M4 - *Carex rostrata*-*Sphagnum recurvum* mire", "M5 - *Carex rostrata*-*Sphagnum squarrosum* mire", "M8 - *Carex rostrata*-*Sphagnum warnstofi* mire", "M9 *Carex rostrata*-*Calliergon cuspidatum/giganteum*", "S27 -*Carex rostrata*-*Potentilla palustris* fen".
 German classification: "360201 Übergangs- oder Zwischenmoor der planaren bis submontanen Stufe", "360202 Übergangs- oder Zwischenmoor der montanen bis hochmontanen Stufe".
 Nordic classification: "312 Ristuvvegetation", "32 Fattigkärrvegetation (except 321)", "314 Mjukmatte-och lösbottenvegetation på öppna mossar", "3321 *Trichophorum caespitosum*-*Molinia caerulea*-*Sphagnum* spp.-*Drepanocladus* spp.-typ", "3323 *Carex nigra*-*Drepanocladus exannulatus*-*Calliergon* spp.-typ", "*Trichophorum caespitosum*-*Drepanocladus revolvens*-variant of 3323", "3331 *Carex* spp.-*Sphagnum* spp.-*Drepanocladus* spp.-typ", "*Carex* spp.-*Sphagnum fallax*-*subsecundum*-variant of 3331", "3333 *Potentilla palustris*-*Carex* spp.-*Sphagnum* spp.- *Drepanocladus exannulatus*-typ", "3341 *Carex* spp.-*Phragmites*-*Iris pseudacorus*-*Sphagnum*-typ".
- 4) Associated with amphibious communities (22.3), fens (54.2 et 54.4), bogs (51.1-2) or humid grasslands (37.2-3).
- 5) **Du Rietz, G. E. (1949)**. Huvudenheter och huvudgränser i svensk myrvegetation. *Sven. Bot. Tidskr.* 43:274-309.

7150

Depressions on peat substrates of the *Rhynchosporion*

PAL.CLASS.: 54.6

- 1) Highly constant pioneer communities of humid exposed peat or, sometimes, sand, with *Rhynchospora alba*, *R. fusca*, *Drosera intermedia*, *D. rotundifolia*, *Lycopodiella inundata*, forming on stripped areas of blanket bogs or raised bogs, but also on naturally seep- or frost-eroded areas of wet heaths and bogs, in flushes and in the fluctuation zone of oligotrophic pools with sandy, slightly peaty substratum. These communities are similar, and closely related, to those of shallow bog hollows (51.122) and of transition mires (54.57).
- 2) Plants: *Rhynchospora alba*, *R. fusca*, *Drosera intermedia*, *D. rotundifolia*, *Lycopodiella inundata*.

7160**Fennoscandian mineral-rich springs and springfens**

PAL.CLASS.: 5411(1997 version)

- 1) Springs and springfens are characterized by continuous flow of ground-water. The water is cold, of even temperature, and rich in oxygen and minerals, due to the rapid percolation. Springs may have a basin where the water wells up and an adjacent outflow with typical vegetation. In springfens the water seeps up through the ground and the accumulated peat, enhancing the growth of specialized vegetation. Since the water originates from deeper layers, these springs often have running water during the winter even if the surrounding areas are frozen and snow-covered. The invertebrate fauna is often very specific to this habitat and the flora rich in northern species.
- 2) Plants: *Cardamine amara*, *Chrysosplenium* spp., *Carex appropinquata*, *C. capillaris*, *C. paniculata*, *Epilobium hornemanni*, *E. davuricum*, *E. laestadii*, *E. alsinifolium*, *Montia fontana*, *Poa alpigena*, *P. remota*, *P. trivialis*, *Ranunculus lapponicus*, *R. hyperboreus*, *Stellaria alsine*, *S. calycantha*, *S. nemorum*; Bryophytes- *Brachythecium rivulare*, *Bryum weigeli*, *B. pseudotriquetrum*, *B. schleicherii*, *Calliergon giganteum*, *C. sarmentosum*, *Philonotis* spp., *Pohlia wahlenbergii*, *Plagiomnium undulatum*, *Rhizomnium* spp., *Scapania* spp., *Warnstorfia exannulata*.
- 3) Corresponding categories
Nordic classification : 3511 *Sphagnum - Drepanocladus* -type, 3512 *Montia fontana-Epilobium hornemannii*-type, 3513 *Saxifraga stellaris-Philonotis fontana*-type, 3521 *Philonotis*-type, 3523 *Paludella*-type, 3432 *Filipendula ulmaria - Carex* spp. - *Drepanocladus* spp. - *Paludella squarrosa* -type
- 5) **Hedenäs, L. & Löfroth, M. (1992).**- Mossor som indikerar särskilt skyddsvärda våtmarksbiotoper. *Svensk Bot. Tidskrift*, 86.
Eurola, S. & Virtanen, R. (1991).- Key to the vegetation of northern Fennoscandian fjelds. *Kilpisjärvi Notes*, 12: 1-28.

Calcareous fens

7210***Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae***

PAL.CLASS.: 53.3

- 1) *Cladium mariscus* beds of the emergent-plant zones of lakes, fallow lands or succession stage of extensively farmed wet meadows in contact with the vegetation of the *Caricion davallianae* or other *Phragmition* species [*Cladietum marisci* (Allorge 1922) Zobrist 1935].
- 2) Plants: *Cladium mariscus*, #*Kosteletzka pentacarpus*.
- 3) Corresponding categories
United Kingdom classification: "S2 *Cladietum marisci*", "S24 *Peucedano-Phragmitetum australis*", "S25 *Phragmites australis-Eupatorium cannabinum* fen", "M9 *Carex rostrata- Calliergon* spp. mire", "M13 *Schoenus nigricans-Juncus subnodulosus* mire", "M14 *Schoenus nigricans-Narthecium ossifragum* mire", "M24 *Molinia caerulea-Cirsium dissectum* fen

meadow", "SD14 *Salix repens-Campylium stellatum* dune slack" and "SD 15 *Salix repens-Calliergon cuspidatum* dune slack".

German classification: "3804 Schneidenröhricht".

Nordic classification: "3441a *Cladium mariscus*-variant".

- 4) In contact with calcareous fens (7230), but also with acid fens, extensive wet meadows, other reed beds and tall sedge communities.
 - 5) **Sterner, R. (1926).** *Ölands växtvärld. Södra Kalmar län III.* Hjalmar Appeltoffts Bokhandel, Kalmar, 237 pp.
-

7220

* Petrifying springs with tufa formation (*Cratoneurion*)

PAL.CLASS.: 54.12

- 1) Hard water springs with active formation of travertine or tufa. These formations are found in such diverse environments as forests or open countryside. They are generally small (point or linear formations) and dominated by bryophytes (*Cratoneurion commutati*).
 - 2) Plants: *Arabis soyeri*, *Cochlearia pyrenaica* (in sites with heavy metals), *Pinguicula vulgaris*, *Saxifraga aizoides*. Mosses: *Catoscopium nigratum*, *Cratoneuron commutatum*, *C. commutatum* var. *falcatum*, *C. filicinum*, *Eucladium verticillatum*, *Gymnostomum recurvirostrum*. In the Boreal region also *Carex appropinquata*, *Epilobium davuricum*, *Juncus triglumis*, *Drepanocladus vernicosus*, *Philonotis calcarea*, *Scorpidium revolvens*, *S.cossoni*, *Cratoneuron decipiens*, *Bryum pseudotriquetum*.
 - 3) Corresponding categories
United Kingdom classification: "M37 *Cratoneuron commutatum-Festuca rubra* spring community" and "M38 *Cratoneuron commutatum-Carex nigra* spring community".
German classification: "220102 kalkreiche Sicker- und Sumpfquelle", "220302 kalkreiche Sturzquelle", "220402 kalkreiche, temporäre Sicker- und Stumpfquelle", "220502 kalkreiche, temporäre Sturzquelle".
Nordic classification: "3521 *Philonotis*-typ" and "3522 *Cratoneuron*-typ".
 - 4) Can form complexes with transition mires, fens, chasmophytic communities of cold and humid environments and heaths and calcareous grassland (*Festuco-Brometalia*).
In order to preserve this habitat of very limited expanse in the field, it is essential to preserve its surroundings and the whole hydrological system concerned.
 - 5) **Malmer, N. (1971).** Förslag till riktlinjer för en enhetlig klassificering av myrvegetation i Norden. In: *IBP i Norden 7*. Universitetsförlaget, Oslo, pp. 45-58.
-

7230 Alkaline fens

PAL.CLASS.: 54.2

- 1) Wetlands mostly or largely occupied by peat- or tufa-producing small sedge and brown moss communities developed on soils permanently waterlogged, with a soligenous or topogenous base-rich, often calcareous water supply, and with the water table at, or slightly above or below, the substratum. Peat formation, when it occurs, is infra-aquatic. Calciphile small sedges and other Cyperaceae usually dominate the mire communities, which belong to the *Caricion davallianae*,

characterised by a usually prominent "brown moss" carpet formed by *Campylium stellatum*, *Drepanocladus intermedius*, *D. revolvens*, *Cratoneuron commutatum*, *Acrocladium cuspidatum*, *Ctenidium molluscum*, *Fissidens adianthoides*, *Bryum pseudotriquetrum* and others, a grasslike growth of *Schoenus nigricans*, *S. ferrugineus*, *Eriophorum latifolium*, *Carex davalliana*, *C. flava*, *C. lepidocarpa*, *C. hostiana*, *C. panicea*, *Juncus subnodulosus*, *Scirpus cespitosus*, *Eleocharis quinqueflora*, and a very rich herbaceous flora including *Tofieldia calyculata*, *Dactylorhiza incarnata*, *D. traunsteineri*, *D. traunsteinerioides*, *D. russowii*, *D. majalis* ssp. *brevifolia*, *D. cruenta*, #*Liparis loeselii*, *Herminium monorchis*, *Epipactis palustris*, *Pinguicula vulgaris*, *Pedicularis sceptrum-carolinum*, *Primula farinosa*, *Swertia perennis*. Wet grasslands (*Molinietalia caerulea*, e.g. *Juncetum subnodulosi* & *Cirsietum rivularis*, 37), tall sedge beds (*Magnocaricion*, 53.2), reed formations (*Phragmition*, 53.1), fen sedge beds (*Cladietum mariscae*, 53.3), may form part of the fen system, with communities related to transition mires (54.5, 54.6) and amphibious or aquatic vegetation (22.3, 22.4) or spring communities (54.1) developing in depressions. The sub-units below, which can, alone or in combination, and together with codes selected from the categories just mentioned, describe the composition of the fen, are understood to include the mire communities *sensu stricto* (*Caricion davallianae*), their transition to the *Molinion*, and assemblages that, although they may be phytosociologically referable to alkaline *Molinion* associations, contain a large representation of the *Caricion davallianae* species listed, in addition to being integrated in the fen system; this somewhat parallels the definition of an integrated class *Molinio-Caricetalia davallianae* in Rameau *et al.*, 1989. Outside of rich fen systems, fen communities can occur as small areas in dune slack systems (16.3), in transition mires (54.5), in wet grasslands (37), on tufa cones (54.121) and in a few other situations. The codes below can be used, in conjunction with the relevant principal code, to signal their presence. Rich fens are exceptionally endowed with spectacular, specialised, strictly restricted species. They are among the habitats that have undergone the most serious decline. They are essentially extinct in several regions and gravely endangered in most.

- 2) Plants: *Schoenus nigricans*, *S. ferrugineus*, *Carex* spp., *Eriophorum latifolium*, *Cinclidium stygium*, *Tomentypnum nitens*.
- 3) Corresponding categories
Nordic classification : 34 Rikkärrvegetation-typ", "352 Rik källkärrvegetation".
- 5) **Sjörs, H. (1948)**. Myrvegetation i Bergslagen. *Acta Phytogeogr. Suec.* 21:1-299.

7240

*** Alpine pioneer formations of *Caricion bicoloris-atrofuscae***

PAL.CLASS.: 54.3

- 1) Alpine, peri-Alpine and northern British communities colonising neutral to slightly acid gravely, sandy, stony, sometimes somewhat argilous or peaty substrates soaked by cold water, in moraines and on edges of springs, rivulets, glacial torrents of the alpine or sub-alpine levels, or on alluvial sands of pure, cold, slow-flowing rivers and calm backwaters. A permanent or continuous soil frost over a long period is essential for the existence of this habitat type. Low vegetation composed principally of species of *Carex* and *Juncus* (*Caricion bicoloris-atrofuscae*).
- 2) Plants: *Carex atrofusca*, *C. bicolor*, *C. maritima*, *C. microglochis*, *C. vaginata*, *Juncus alpinoarticulatus*, *J. arcticus*, *J. castaneus*, *J. triglumis*, *Kobresia simpliciuscula*, *Typha lugdunensis*, *T. minima*, *T. shuttleworthii*, *Tofieldia pusilla*.
Animals: #*Vertigo geyeri*, #*V. genesii*.
- 3) Corresponding categories
German classification : "6402 Alpine Scwemmböden mit niedriger Vegetation".

Corresponding category of the Nordic vegetation types: "3422 *Carex atrofusca-Drepanocladus revolvens*-typ" and "3423 *Carex saxatilis-Drepanocladus revolvens*-typ".

- 4) Associated with humid meadows managed extensively, but also with communities of *Caricion davallianae*.
- 5) **Persson, Å. (1965).** Mountain mires. *Acta Phytogeogr. Suec.* 50:249-256.

Boreal mires

7310 * Aapa mires

PAL.CLASS.: 54.8

- 1) Mire complexes in southern, middle and northern boreal zones characterised by minerotrophic fen vegetation in the central parts of the complexes. Hydro-topographical mire-units are: mixed mires, string-fens, flark-fens, unraised *Sphagnum fuscum*-bogs, unpatterned topogenous or soligenous lawn-, carpet or mud-bottom fens. Poor *Sphagnum* fens are the most common vegetation types whilst brown moss fens can be common in some regions. In prealpine areas in Sweden and in hill regions of Kainuu and Kuusamo in eastern Finland, sloping fens (>5 grades) are typical variants of aapa mires. They occur rarely also in the Suomenselkä water divide region in western Finland as well in Lapland. In the mire margins, pine mires and spruce swamps and mires on thin peat of different types dominate. In some limited areas with calcareous bedrock rich fens dominate in the complexes.
- 2) Plants: *Chamaedaphne calyculata*, *Empetrum nigrum* (s.lato), *Betula nana*, *Thricophorum cespitosum*, *Eriophorum vaginatum*, *E. russeolum*, *Carex rostrata*, *C. lasiocarpa*, *C. rotundata*, *C. chordorriza*, *C. livida*, *Scheuchzeria palustris*, *Molinia caerulea*, *Rubus chamaemorus*, *Saxifraga hirculus*, *Dactylorhiza incarnata*; Mosses- *Sphagnum papillosum*, *S. jensenii*, *S. lindbergii*, *S. majus*, *S. aongstroemii*, *S. subsecundum*, *S. subfulvum*, *S. pulchrum*, *Warnstorfia exannulata* (*Drepanocladus exannulatus*), *Limprichtia revolvens* (*Drepanocladus revolvens*), *Drepanocladus* (s.lato) spp., *Scorpidium scorpioides*.
Animals: Butterflies - *Pyrgus centaureae*, *Erebia disa*; Moths: *Syngrapha diasema*, *Apamea maillardi*, *Nola karelica*, *Hypoxyxtis pluviaria*.
- 5) **Eurola, S., Hicks, S. & Kaakinen, E. (1984).** Key to Finnish mire types. In: Moore, P.D. (ed). *European mires*, 11-117. Academic Press, London.
Ruuhijärvi, R. (1983). The Finnish mire types and their regional distribution. In: Gore, A.J.P. (ed.). *Ecosystems of the world. 4B. Mires: Swamp, bog, fen and moor*. Regional studies, 47-97. Elsevier, Amsterdam.

7320 * Palsa mires

PAL.CLASS.: 54.9

- 1) Mire complexes in the northern boreal, orohemiarctic and alpine regions, where the climate is slightly continental and the mean annual temperature is below -1°. The mires are mainly minerotrophic, excluding the palsas, which are peat mounds with sporadic permafrost. The palsas are usually 2-4 metres high, but up to 7 metres high palsas have been found in Finland and Sweden.

- 2) Plants: *Eriophorum russeolum*, *Carex rotundata*, *C. saxatilis*, *Empetrum nigrum* ssp. *hermaphroditum*, *Ledum palustre*, *Betula nana*, *Vaccinium microcarpum*; Mosses- *Dicranum elongatum*; Lichens: *Ochrolechia* spp., *Cladonia* spp., *Cladina* spp.
- 5) **Eurola, S., Hicks, S. & Kaakinen, E. (1984)**. Key to Finnish mire types. In: Moore, P.D. (ed). *European mires*, 11-117. Academic Press, London.
Ruuhijärvi, R. (1983). The Finnish mire types and their regional distribution. In: Gore, A.J.P. (ed.). *Ecosystems of the world. 4B. Mires: Swamp, bog, fen and moor*. Regional studies, 47-97. Elsevier, Amsterdam.

ROCKY HABITATS AND CAVES

Scree

8110

Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*)

PAL.CLASS.: 61.1

- 1) This habitat consist of:
 a) communities of siliceous scree of the upper montane level to the permanent snow level, growing on more or less moving "cryoclastic systems" with variable granulometry and belonging to the order *Androsacetalia alpinae*.
 b) vegetation of the montane level of the west and centre of Europe growing on screes sometimes of artificial origin (extraction of materials). It consists of alpine communities often rich in bryophytes, lichens and sometimes in ferns (*Cryptogramma crispa*), belonging to the order *Galeopsietalia*.
- 2) Plants: a) *Androsacetalia alpinae*: *Androsacae alpina*, *Achillea nana*, *Oxyria digyna*, *Geum reptans*, *Saxifraga bryoides*, *Ranunculus glacialis*, *Linaria alpina*, *Cerastium uniflorum*, *Doronicum clusii*, *D. grandiflorum*, *Poa laxa*, *Viola valderia*, *Luzula alpinopilosa*, *Cryptogramma crispa*; b) *Galeopsietalia ladani*: *Galeopsis ladanum* ssp. *ladanum*, *Anarrhinum bellidiflorum*, *Cryptogramma crispa*, *Athyrium alpestre* (*A. distentifolium*).
- 3) Corresponding categories
 United Kingdom classification: "U21 *Cryptogramma crispa*-*Deschampsia flexuosa* community" and "U18 *Cryptogramma crispa*-*Athyrium distentifolium* snow bed".
 German classification: "6304 Silikatschutthalde der Alpen".
 Nordic classification: "1251a *Cryptogramma crispa*-variant", "7141 *Veronica fruticans* -typ" and "7142 *Veronica fruticans*-*Juniperus communis* -typ".
- 4) This habitat is generally in close association with the chasmophytic vegetation on siliceous rocky slopes (8220). In Ireland and the United Kingdom, sites sheltering rare arctic-alpine plants (post glacial remnants) have a high conservation value.
- 5) **Bringer, K.-G. (1965)**. Plant cover of the alpine regions. Chionophobic plant communities. *Acta Phytogeogr. Suec.* 50:257-262.

8120 Calcareous and calcschist screes of the montane to alpine levels (*Thlaspietea rotundifolii*)

PAL.CLASS.: 61.2

- 2) Calcschist, calcareous, or marl screes of the montane to alpine levels under cold climates, with the associations respectively of *Drabion hoppeanae*, *Thlaspion rotundifolii*, *Petasition paradoxo*.
- 2) Plants: *Drabion hoppeanae* (calcschist screes) : *Draba hoppeana*, *Artemisia genipi*, *Campanula cenisia*, *Saxifraga biflora*, *Herniaria alpina*, *Trisetum spicatum* ssp. *ovatipaniculatum*; *Thlaspion rotundifolii* (calcareous scree): *Thlaspi rotundifolium*, *Hutchinsia alpina*, *Papaver rhaeticum*, *Galium villarsi*, *Berardia subacaulis*, *Viola cenisia*, *Arabis alpina*; *Petasition paradoxo*, *Morina persica*, *Sideritis scardica* (marl screes): *Petasites paradoxus*, *Gypsophila repens*, *Valeriana montana*, *Leontodon hyoseroides*.
- 3) Corresponding categories
United Kingdom classification: "OV38 - *Gymnocarpium robertianum*-*Arrhenatherum elatius* community".
German classification: "6302 Kalkschutthalde der Alpen".
Nordic classification: "7143 *Arenaria norvegica*-typ".
- 4) In Ireland and United Kingdom preference should be given to sites sheltering rare arctic-alpine plants (post glacial remnants).
- 5) **Bringer, K.-G. (1965)**. Plant cover of the alpine regions. Chionophobic plant communities. *Acta Phytogeogr. Suec.* 50:257-262.

8130 Western Mediterranean and thermophilous scree

PAL.CLASS.: 61.3

- 1) Screes of warm exposures in the Alps and the Pyrenees, of calcareous substrates in the Pyrenees, of Mediterranean mountains, hills and lowlands and, locally, of warm, sunny middle European upland or lowland sites. The vegetation belongs to the *Androsacetalia alpinae* p., *Thlaspietalia rotundifolii* p., *Stipetalia calamagrostis* and *Polystichetalia lonchitis* orders.
Sub-types :
 - 61.31 - Peri-Alpine thermophilous screes. *Stipion calamagrostidis*, *Leontodontion hyoseroidis*.
Mostly coarse, unstabilized, sunny calcareous screes of the montane and sub-alpine levels of the Alps and of the uplands and lowlands of western and central middle Europe.
 - 61.32 - Provençal screes. *Pimpinello-Gouffeion*.
Screes of Mediterranean southern France, with *Gouffeia arenarioides*, *Ptychotis heterophylla*, *Linarium supina*, *Centranthus ruber*, *Crucianella latifolia*.
 - 61.33 - Pyreneo-Alpine thermo-siliceous screes. *Senecion leucophyllae*, *Taraxacion pyrenaici*.
Siliceous screes of warm slopes of the sub-alpine level of the Alps and of the alpine and sub-alpine levels of the Pyrenees, usually composed largely of big stones or boulders, with *Senecio leucophyllus*, *Taraxacum pyrenaicum*, *Galeopsis pyrenaica*, *Xatartia scabra*, *Armeria alpina*.
 - 61.34 - Pyrenean calcareous screes. *Iberidion spathulatae*.
Calcareous screes of the Pyrenees.
 - 61.35 - Oro-Cantabrian calcareous screes. *Linarion filicaulis*, *Saxifragion praetermissae*.
Basiphile screes of the Cordillera Cantabrica.

- 61.36 - Oro-Cantabrian siliceous screes. *Linarion filicaulis* p., *Linario-Senecion carpetani* p.
Siliceous screes of the Cordillera Cantabrica; floristically rich formations of the "dark" screes of the Cordillera are related to those of 61.351, though somewhat intermediate towards 61.38; other more species-poor ones, characterised by *Trisetum hispidum* and *Rumex suffruticosus*, belong to the latter.
- 61.37 - Iberian fern screes. *Dryopteridion oreadis*, *Dryopteridion submontanae*.
Fern-dominated chaotic, boulder fields of siliceous and calcareous Iberian mountains.
- 61.38 - Carpetano-Iberian siliceous screes. *Linario-Senecion carpetani*.
Screes of the Cordillera Central, the Iberian Range, the Leonese mountains, with *Linaria saxatilis*, *L. alpina*, *Digitalis purpurea* var. *carpetana*, *Senecio pyrenaicus* ssp. *carpetanus*, *Rumex suffruticosus*, *Santolina oblongifolia*, *Conopodium butinioides*, *Reseda gredensis*.
- 61.39 - Nevadan siliceous screes. *Holcicon caespitosae*.
Siliceous screes of the high levels of the Sierra Nevada, very rich in endemics.
- 61.3A - Southern Iberian calcareous screes. *Platycapno-Iberidion granatensis*, *Scrophularion sciaphilae*
Screes of the calcareous Baetic mountains of southern and south-eastern Iberia.
- 61.3B - Central Mediterranean screes
Screes of the Italian peninsula and of the large Mediterranean islands.

- 2) Plants: 61.31 - *Achnatherum calamagrostis*, *Galeopsis angustifolia*, *Gymnocarpium robertianum*, *Lentodon hyoseroides*, *Sisymbrium supinum*, *Linaria supina*; 61.32 - *Gouffea arenarioides*, *Ptychotis heterophylla*, *Centranthus ruber*, *Crucianella latifolia*; 61.33 - *Senecio leucophyllus*, *Taraxacum pyrenaicum*, *Xatartia scabra*, *Armeria alpina*; 61.34 - *Iberis spathulata*, *Papaver suaveolens*, *Galium cometerhizon*, *Plantago monosperma*, *Viola lapeyrousiana*, *Campanula jaubertiana*, *Crepis pygmaea*, *Doronicum grandiflorum*, *Campanula cochleariaefolia*, *Carduus carlinoides*, *Galium cespitosum*, *Festuca glacialis*, *Androsace ciliata*, *Saxifraga oppositifolia*, *Hutchinsia alpina*, *Galium pyrenaicum*, *Minuartia cerastiifolia*, *Saxifraga praetermissa*, *S. aizoides*, *Epilobium anagallidifolium*, *Veronica alpina*, *Taraxacum alpinum*, *Crepis pygmaea*; 64.35 - *Linaria filicaulis*, *Arabis cantabrica*, *Iberis lereschiana*, *Ranunculus parnassifolius* ssp. *favargerii*, *Crepis pygmaea*, *Iberis aperta*, *Rumex scutatus*, *Epilobium anagallidifolium*, *Doronicum grandiflorum* ssp. *braunblanquetii*, *Campanula arvatica*, *Saxifraga praetermissa*, *Arabis cantabrica*, *Ranunculus alpestris* ssp. *leroyi*, *Salix breviserrata*, *Galium pyrenaicum*; 61.38 - *Linaria saxatilis*, *L. alpina*, *Digitalis purpurea* var. *carpetana*, *Senecio pyrenaicus* ssp. *carpetanus*, *Rumex suffruticosus*, *Santolina oblongifolia*, *Conopodium butinioides*, *Reseda gredensis*; 61.39 - *Senecio tournefortii* var. *granatensis*, *Digitalis purpurea* var. *nevadensis*, *Cirsium gregarium*, *Solidago virgaurea* var. *alpestris*, *Holcus caespitosus*, *Crepis oporinoides*, *Eryngium glaciale*, *Linaria aeruginea* var. *nevadensis*, *Viola crassiuscula*, *Linaria glacialis*, *Rhynchosinapis cheiranthos* ssp. *nevadensis*, *Ranunculus glacialis*, *R. parnassifolius*, *Saxifraga oppositifolia*, *Papaver suaveolens*, *Holcus caespitosus*, *Crepis oporinoides*.

8140

Eastern Mediterranean screes

PAL.CLASS.: 61.4

- 1) Screes of the high Greek mountains with vegetation of the order *Drypetalia spinosae*.
Sub-types :
- 61.41 - Greek limestone screes. *Drypion spinosae* (*Silenion caesia*).
Formations of the higher mountains of Greece (Pindus, Olympus, Parnassus, Giona, Taygetos, Kilini), with *Drypis spinosa*, *Ranunculus brevifolius*, *Senecio thapsoides*, *Aethionema saxatile*.
- 61.42 - Greek serpentine screes. *Campanulion hawkinsoniana*.
Less widespread formations restricted to serpentines of the Pindus, with *Campanula hawkinsoniana*, *Arenaria serpentini*, *Cardamine glauca*, *Viola magellensis*, *Alyssum scardicum*, *Silene haussknechtii*.

- 2) Plants: 61.41 - *Drypis spinosa*, *Ranunculus brevifolius*, *Senecio thapsoides*, *Aethionema saxatile*; 61.42 - *Campanula hawkinsoniana*, *Arenaria serpentina*, *Cardamine glauca*, *Viola magellensis*, *Alyssum scardicum*, *Silene haussknechtii*.
-

8150

Medio-European upland siliceous screes

PAL.CLASS.: 61.12

- 1) Siliceous screes of hills of western and central Europe, with *Epilobium collinum*, *Galeopsis segetum*, *Senecio viscosus*, *Anarrhinum bellidifolium*, *Cryptogramma crispa*. Upland siliceous screes, often resulting from quarry activity, and colonised by very impoverished forms of the Alpine communities, usually rich in mosses, lichens and sometimes ferns, notably *Cryptogramma crispa*, are included, but should not be taken into account.
- 2) Plants: *Epilobium collinum*, *Galeopsis segetum*, *Senecio viscosus*, *Anarrhinum bellidifolium*, *Cryptogramma crispa*
-

8160

* Medio-European calcareous scree of hill and montane levels

PAL.CLASS.: 61.313

- 1) Calcareous or marly screes of the hill and montane levels extending into mountainous regions (subalpine and alpine), often in dry, warm stations in associations with *Stipetalia calamagrostis*. This habitat type should be clearly distinguished from 8130 - Western Mediterranean and thermophilous scree, a non-priority Annex I habitat type.
- 2) Plants: *Achnatherum calamagrostis*, *Dryopteris robertiana* (= *Gymnocarpium robertianum*), *Galeopsis angustifolia*, *Petasites paradoxus*, *Rumex scutatus*.
- 3) Corresponding categories
German classification: "320401 natürliche Schutthalde aus Karbonatgestein".
-

Rocky slopes with chasmophytic vegetation

8210

Calcareous rocky slopes with chasmophytic vegetation

PAL.CLASS.: 62.1

- 1) Vegetation of fissures of limestone cliffs, in the mediterranean region and in the euro-siberian plain to alpine levels, belonging essentially to the *Potentilletalia caulescentis* and *Asplenietalia glandulosi* orders. Two levels may be identified: a) thermo- and meso-Mediterranean (*Onosmetalia frutescentis*) with *Campanula versicolor*, *C. rupestris*, *Inula attica*, *I. mixta*, *Odontites luskii*; b) montane and oro-Mediterranean (*Potentilletalia speciosae*, including *Silenion auriculatae*, *Galion degenii* and

Ramondion nathaliae). This habitat type presents a great regional diversity, with many endemic plant species (indicated under point 2).

2) Plants:

62.11 - Western Mediterranean communities (*Asplenion petrarchae*): *Asplenium petrarchae*, *Asplenium trichomanes* ssp. *pachyrachis*, *Cheilanthes acrostica*, *Melica minuta*, *Hieracium stelligerum*, *Erodium petraeum*; Mesothermic shady fern groups of the supra-Mediterranean level (*Polypodium australis*): *Polypodium cambricum* ssp. *australe*, *Saxifraga corbariensis*, #*Asplenium jahandiezii*, *Asplenium sagittatum*, *Pteris cretica*, *Asplenium trichomanes* ssp. *inexpectans*.

62.12 - Central Pyrenean communities (*Saxifragion mediae*): *Asperula hirta*, +*Androsace cylindrica*, *Asplenium celtibericum*, *Saxifraga media*, *S. longifolia*, *S. aretioides*, *Potentilla alchimilloides*, *P. nivalis*, *Ramonda myconi*, *Ptilotrichum pyrenaicum*.

62.13 - Liguro-Apennine cliffs communities (*Saxifragion lingulatae*): *Saxifraga callosae* ssp. *lingulata*, *Primula marginata*, *P. allionii*, *Phyteuma cordatum*, *Ballota frutescens*, *Potentilla saxifraga*, *Silene campanula*, *Phyteuma charmelii*.

62.14 - Southern Italian communities (*Dianthion rupicolae*): #*Dianthus rupicola*, *Antirrhinum siculum*, *Cymbalaria pubescens*, *Scabiosa limonifolia*.

62.15 and 62.1B - Euro-Siberian communities and Mediterranean communities of the supra to oro-Mediterranean levels (*Potentilletalia caulescentis*):

-shady communities : *Cystopteris fragilis*, *Asplenium trichomanes*, *Asplenium viride*.

-xerophilous communities : *Ceterach officinarum*, *Asplenium ruta-muraria*, *Draba aizoides*, *Kernera saxatilis*, *Biscutella laevigata*.

-alpine level communities : *Androsace helvetica*, *Minuartia rupestris*, *Draba tomentosa*.

- Centre and Southern Italian communities (*Saxifragion australis*): *Saxifraga australis*, *Potentilla nebrodensis*, *Campanula tanfanii*, *Trisetum bertolonii*.

62.16, 62.17, 62.18, 62.19 and 62.1A - Greek and Southern Italian calcareous cliff communities (*Campanulion versicoloris*, *Cirsietalia chamaepeucis*, *Silenion auriculatae*, *Ramondion nathaliae*).

62.1C - Boreal communities with *Asplenium viride*, *Woodsia glabella*.

3) Corresponding categories

German classification : "320101 natürlicher Karbonatfels (Kalk, Dolomit)".

Nordic classification: "712 Klippvegetation på rika/kalkbergarter".

4) This habitat constitutes mosaics with *Xerobrometea* communities (34.1, 34.31-34.34), screes (61) and limestone pavements (62.4).

In Ireland and the United Kingdom: sites sheltering relict arctic-alpine flora and important bryophyte and/or lichen assemblages.

5) **Brullo S. & Marceno C. (1979).** *Dianthion rupicolae* nouvelle alliance sud-Tyrienne des *Asplenietalia glandulosi*. *Doc. Phytosoc.*, N.S. 6: 131-146.

Biondi E. & Ballelli (1982). La végétation des gorges calcaires des Apennins de l'Ombrie et des Marches. *Guide-itinéraire Exc. Int. Phytosoc. en Italie centrale* (2-11/7/1982): 189-201.

Karlsson, L. (1973). Autecology of cliff and scree plants in Sarek National Park, northern Sweden. *Växtekol. Stud.* 4:1-203.

Söyrinki, N. & Saari, V. (1980). *Die Flora von Oulanka Nationalpark, Nordfinnland*. *Acta Flor. Fennica* 154.

8220

Siliceous rocky slopes with chasmophytic vegetation

PAL.CLASS.: 62.2

- 1) Vegetation of fissures of siliceous inland cliffs, which presents many regional sub-types, described under point 2.
- 2) Plants: 62.21 - Alpine siliceous cliff vegetation (Pyrenees and Alps) and of Hercynian system and its periphery (*Androsacion vandellii*): *Androsace vandellii*, *Saxifraga retusa* ssp. *retusa*, *S. aspera*, *Phyteuma scheuchzeri*, *Primula hirsuta*, *Eritrichium nanum*; Communities of montane level of Pyrenees and Cevennes (*Asarinion procumbentis*: includes 62.26): *Asarina procumbens*, *Dianthus graniticus*, *Saxifraga continentalis*, *S. prostii*, *Anarrhinum bellidifolium*; Saxicolous communities of the plain to hill levels under Middle European climate (*Asplenion septentrionalis*) and communities of the plain level under oceanic climate (*Asplenion billotii-Umbilicarium rupestre*: 62.29 is included): *Asplenium septentrionale*, *A. adiantum-nigrum*, *A. billotii*, *A. foreziense*, *A. onopteris*. - Hercynian serpentine cliffs (*Asplenion cuneifolii*): *Asplenium cuneifolium*, *A. alternifolium*, *A. adulterinum*.
62.22 - high altitude siliceous cliff vegetation of Iberian mountains: - Central Iberian mountains (*Saxifragion willkommiana*): *Saxifraga willkommiana*, *S. orogredensis*, *Murbeckiella boryi*; - Sierra Nevada (*Saxifragion nevadensis*): *Saxifraga nevadensis*.
62.23 - South-western Alpine siliceous cliff vegetation (*Saxifragion pedemontana*): *Saxifraga pedemontana*, *S. florulenta*, *Galium tendae*, *Sempervivum montanum* ssp. *burnatii*, *Jovibarba allionii*.
62.24 - Cyno-Sardian siliceous montane cliff vegetation (*Potentillion crassinerviae*): *Potentilla crassinervia*, *Armeria leucocephala*, *Silene requientii*, *Saxifraga pedemontana* ssp. *cervicornis*.
62.25 - Northern Greek siliceous cliff vegetation (*Silenion lerchenfeldiana*): *Silene lerchenfeldiana*.
62.26 - see 62.21
62.27 - Western Iberian siliceous cliff vegetation of the submontane level (*Cheilanthion hispanica*): *Cheilanthes hispanica*, *C. tinaei*.
62.28 - Provenço-Iberian siliceous cliff vegetation on rock faces rich in basic silicates (basalts and peridots), of the thermo to meso-Mediterranean levels (*Phagnalo saxatilis-Cheilanthion maderensis*): *Cheilanthes maderensis*, *C. marantae*, *C. vellaea*, *Asplenium balearicum*.
62.29 : see 62.21.
62.2A - Boreal siliceous cliffs (rapakivi cliffs).
- 3) Corresponding categories
German classification: "320102 natürlicher Silikatfels (ohne Serpentin)", "320103 natürlicher Serpentinfels".
Nordic classification: "711 Klippvegetation på fattiga bergarter", "713 Klippvegetation på serpentinbergarter.
- 4) This habitat type is found in close association with siliceous scree (8110) and pioneer grassland (8230).

In Ireland and the United Kingdom: sites sheltering relict arctic-alpine flora and important bryophyte and/or lichen assemblages.
- 5) **Jalas, J. (1961)**. Regionale Züge in der Felsenvegetation und flora Ostfennoscandiens. *Arch. Soc. Vanamo*, 16 Suppl.:38-49.
Kallio, P. (1954). Züge aus der flora un vegetation der rapakivifelsen im südöstlichen teil des rapakivigebietes von Laitila in Südwestfinnland. *Ann. Univ. Turkuensis* A XVII:1-64.

8230**Siliceous rock with pioneer vegetation of the *Sedo-Scleranthion* or of the *Sedo albi-Veronicion dillenii***

PAL.CLASS.: 62.42

- 1) Pioneer communities of the *Sedo-Scleranthion* or the *Sedo albi-Veronicion dillenii* alliances, colonising superficial soils of siliceous rock surfaces.
As a consequence of drought, this open vegetation is characterised by mosses, lichens and *Crassulacea*.
- 2) Plants: *Sedo-Scleranthion*: *Sempervivum arachnoideum*, *Sempervivum montanum*, *Sedum annuum*, *Silene rupestris*, *Veronica fruticans*; *Sedo albi-Veronicion dillenii*: *Veronica verna*, *Veronica dillenii*, *Gagea bohemica*, *Gagea saxatiles*, *Riccia ciliifera*; Plant species belonging to the two syntaxa: *Allium montanum*, *Sedum acre*, *Sedum album*, *Sedum reflexum*, *Sedum sexangulare*, *Scleranthus perennis*, *Rumex acetosella*. Mosses- *Polytrichum piliferum*, *Ceratodon purpureus*.
- 3) Corresponding categories
German classification : "320102 natürlicher Silikatfels (ohne Serpentin) (lückige Vegetation, P002)".
Nordic classification : partly "711 Klippvegetation på fattiga bergarter" and "5211 *Sedum* spp.-*Viola tricolor*-*Aira praecox*-typ".
- 4) This habitat is associated with the 8220 type, and corresponds to the vegetation colonising siliceous rocks. The vegetation colonising calcareous rocks is included under 6110 "Rupicolous calcareous or basophilic grasslands of the *Alyso-Sedion albi*" and 8240 "Limestone pavements".
- 5) **Hallberg, H. P. & Ivarsson, R. (1965)**. Vegetation of coastal Bohuslän. *Acta Phytogeogr. Suec.* 50:111-122.

8240*** Limestone pavements**

PAL.CLASS.: 62.3

- 1) Regular blocks of limestone known as "clints" with loose flags separated by a network of vertical fissures known as "grykes" or "shattered pavements", containing more loose limestone rubble. The rock surface is almost devoid of overlying soils (considerably less than 50% cover) except for some patches of shallow skeletal or loessic soils, although more extensive areas of deeper soil occasionally occur; sometimes there is encroachment of peat. This morphology offers a variety of microclimates allowing the establishment of complex vegetation consisting of a mosaic of different communities. The fissures provide a cold humid microclimate where shade-tolerant vascular plants such as *Geranium robertianum* and *Ceterach officinale* occur, as well as formations of herbaceous species typical of calcareous woodland; the small pockets of soil are occupied by communities of *Mesobromion* (e.g. *Seslerio-Mesobromenion*); heath and scrub also occur (e.g. *Corylo-Fraxinetum*). Apart from areas of species rich scrub (generally *Prunetalia spinosae*), the ecosystem is maintained by grazing in some regions; this, combined with severe winds, means that isolated shrubs can only survive in prostrate growth form (e.g. *Dryas octopetala*); at the margins of ungrazed sites *Geranium sanguineum* occurs.
In Sweden, limestone blocks are larger and cracks are smaller. The species composition reflects a more continental, dryer and cooler climate. The pavements are mostly exposed with scattered cushions of bryophytes, more seldom covered by a thin layer of soil. The surface is covered by *Sedum album*, *Cerastium pumilum*, *C. semidecandrum*, lichens (*Aspicilia calcarea*, *Thamnolia vermicularis*,

Verrucaria nigrescens) and bryophytes (*Tortella tortuosa*, *Grimmia pulvinata*). The vegetation in the cracks contains *Gymnocarpium robertianum*, *Asplenium ruta-muraria*, *A. trichomanes* ssp. *quadrivalens* and, occasionally, bushes of *Prunus spinosa*, *Fraxinus excelsior*, *Cotoneaster* spp., *Rosa* spp.

Some sites in Ireland host an open *Taxus-Juniperus* scrub of major interest; certain arctic alpine species such as *Gentiana verna* and *Dryas octopetala* are characteristic and in The Burren, these species occur with Atlantic-Mediterranean species such as *Neotinea maculata*.

- 2) Plants: Britain and Ireland - *Asplenium* spp., *Ceterach officinale*, *Cystopteris fragilis*, *Dryas octopetala*, *Dryopteris villarii*, *Epipactis atrorubens*, *Gentiana verna*, *Polygonatum odoratum*, *Ribes spicatum*. Sweden - *Sedum album*, *Cerastium pumilum*, *C. semidecandrum*, *Aspicilia calcarea*, *Thamnia vermicularis*, *Verrucaria nigrescens*, *Tortella tortuosa*, *Grimmia pulvinata*, *Gymnocarpium robertianum*, *Asplenium ruta-muraria*, *A. trichomanes* ssp. *quadrivalens*.
- 3) Corresponding categories
United Kingdom classification : "W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland" and "W9 *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland".
Very locally in the United Kingdom, ancient woodland containing *Tilia cordata* occurs which is of great conservation importance.
Nordic classification: "5151b *Asplenium ruta-muraria-Asplenium trichomanes-Homalothecium sericeum*-variant" variant of "5151 *Sedum album-Tortella* spp. typ".
- 5) **Bobe, B. (1991)**. *Gefässpflanzenvegetation und Mikroklima der Karstspalten des Grossen Alvars auf Öland, Schweden*. Unpubl. diploma work, München.
Etherington, J.R. (1981). Limestone heaths in south-west Britain: their soils and the maintenance of their calcicole-calcifuge mixtures.
Kelly, D. & Kirby, E.N. (1982). Irish native woodlands over limestone. *J. Life Sci. R. Dubl. Soc.* 3, 181-198.
O' Sullivan, A.M. (1982). The lowland grasslands of Ireland. *J. Life Sci. R. Dubl. Soc.* 3, 131-142.
Ward, S.D. & Evans, D.F. (1976). Conservation assessment of British limestone pavements based upon floristic criteria. *Biological Conservation*, 9, 217-233.

Other rocky habitats

8310

Caves not open to the public

PAL.CLASS.: 65

- 1) Caves not open to the public, including their water bodies and streams, hosting specialised or high endemic species, or that are of paramount importance for the conservation of Annex II species (e.g. bats, amphibians).
- 2) Plants: mosses only (e.g. *Schistostega pennata*) and algal carpets at the entry of caves.
Animals: Very specialised and highly endemic cavernicolous fauna. It includes underground relic forms of a fauna which has been diversified outside. This fauna is mainly composed of invertebrates which exclusively live in caves and underground waters. The cavernicolous terrestrial invertebrates are mainly coleoptera, belonging to the *Bathysciinae* and *Trechinae* families in particular, which are carnivorous and have a very limited distribution. Cavernicolous aquatic invertebrates constitute a

highly endemic fauna, dominated by crustaceans (*Isopoda*, *Amphipoda*, *Syncarida*, *Copepoda*) and include many living fossils. Aquatic molluscs, belonging to the *Hydrobiidae* family are also found. With regard to vertebrates, caves constitute hibernation sites for most European bat species, among which many are threatened (see Annex II). Several species can live together in the same cave. Caves also shelter some very rare amphibious species like *Proteus anguinus* and several species of the *Speleomantes* genus.

3) Corresponding categories

German classification: "3101 natürliche Höhlen und Balmen", "310201 Balme (Halbhöhle) bzw. Eingangsbereich mit Tageslichteinfluß", "310202 natürliche Höhle (Bereiche ohne Tageslichteinfluß).

5) **De Broyer C.** Vers la conservation intégrée des habitats souterrains. *Naturopa*, nouvelles de l'environnement n° 94-5. *Conseil de l'Europe*, 1-4.

8320

Fields of lava and natural excavations

PAL.CLASS.: 66.1 to 66.6

1) Sites and products of recent volcanic activity harbouring distinct biological communities.

Sub-types :

66.1 - Teide violet community. *Violetea cheiranthifoliae*.

Very open formation of the summit of the Teide volcano of Tenerife, above (2700) 3000 metres, with *Viola cheiranthifolia* and a few individuals of *Silene nocteolens* and *Argyranthemum teneriffae*.

66.2 - Etna summital communities

Communities of Mount Etna, above the limit of hedgehog heaths.

66.3 - Barren lava fields

Almost bare lava formations of other volcanoes, and of lower altitudes on Etna and Teide, colonised by, besides communities related to ones covered in other sections, lichens (e.g. *Stereocaulon vesubianum*) and invertebrates.

66.4 - Volcanic ash and lapilli fields

66.5 - Lava tubes

Caves formed by hollow basaltic tubes resulting from the cooling of the surface of lava flows whose molten interior continued to flow. The very large tube created by the volcano La Corona of Lanzarote harbours unique communities of invertebrates, in particular, the decapode crustacean *Munidopsis polymorpha*, endemic to that locality, and several crustaceans of the genus *Speleonectes*.

66.6 - Fumaroles

Orifices in volcanic areas through which escape hot gases and vapours. Their very extreme environment is colonised by paucispecific but highly distinct communities.

2) Plants: *Viola cheiranthifolia*, *Silene nocteolens*, *Argyranthemum teneriffae*; Lichens: *Stereocaulon vesubianum*.

Animals: crustaceans: *Munidopsis polymorpha*, *Speleonectes* spp.

8330**Submerged or partially submerged sea caves**

PAL.CLASS.: 12.7, 11.26, 11.294

- 1) Caves situated under the sea or opened to it, at least at high tide, including partially submerged sea caves. Their bottom and sides harbour communities of marine invertebrates and algae.
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8340**Permanent glaciers**

PAL.CLASS.: 63.2 and 63.3

- 1) Rock and true glaciers.
-

FORESTS

(Sub)natural woodland vegetation comprising native species forming forests of tall trees, with typical undergrowth, and meeting the following criteria: rare or residual, and / or hosting species of Community interest²⁰

Forests of Boreal Europe

9010*** Western Taïga**

PAL.CLASS.: 41.B8, 41.C3, 41.D5, 42.C

- 1) Natural old forests as well as those young forest stages naturally developing after fire. Natural old forests represent climax or late succession stages with slight human impact or without any human impact. Present natural old forests are only minor remnants of those originally occurring in Fennoscandia. With intensive forestry, which is carried out practically throughout this region, the main features of natural old forests disappear, i.e. the considerable amount of dead and rotten wood, the great variation in tree age and length and species composition, the trees from previous generations, the more stable microclimate. Old natural forests are habitats of many threatened species, especially bryophytes, lichens, fungi, and invertebrates (mostly beetles). Some of the present old natural forests have human impact, but in spite of that they maintain many characteristics of the natural forests.

Because of the important role of fire, burned forest areas, and their young succession stages, have been naturally common in the boreal region. Nowadays they are extremely rare because of efficient fire protection and forestry. Natural recently burned forest areas are very important habitats for

²⁰ For forest habitat types the following additional criteria were accepted by the Scientific Working Group (21-22 June 1993):

- forests of native species;
- forests with a high degree of naturalness;
- forests of tall trees and high forest;
- presence of old and dead trees;
- forests with a substantial area;
- forests having benefited from continuous sustainable management over a significant period.

many endangered species. Typical of natural burned areas is a great amount of dead burned wood and a varying density of living trees which greatly conditions the regeneration of the forest.

The character of the forests vary with the different boreal zones (hemi-, southern, middle, northern) and different site types.

The following sub-types are distinguished, according to the main tree species and site type variation:

- natural old spruce forests
- natural old pine forests
- natural old mixed forests
- natural old deciduous forests
- recently burnt areas
- younger forests naturally developed after fire

- 2) Plants: Pine forests - *Pinus sylvestris*, *Vaccinium vitis-idaea*, *Calluna vulgaris*, *Empetrum nigrum*, *Pleurozium schreberi*, *Cladonia* spp.; Spruce and mixed forests - *Picea abies*, *Pinus sylvestris*, *Betula* spp., *Vaccinium myrtillus*, *Deschampsia flexuosa*, *Maianthemum bifolium*, *Oxalis acetosella*, *Trientalis europea*, *Dicranum* spp., *Pleurozium schreberi*, *Hylocomium splendens*; Deciduous forests - *Betula* spp., *Populus tremula*, *Deschampsia flexuosa*, *Vaccinium myrtillus*, *Agrostis capillaris*, *Equisetum sylvaticum*. Lichens - *Evernia divaricata*, *Lobaria pulmonaria*. Fungi - *Amylocystis lapponica*, *Gloiodon strigosum*, *Fomitopsis populicola*, *Skeletocutis odora*, *S. stellae*, *Phlebia centrifuga*, *Haploporus odoratus*, *Aporpium cargae*, *Gelatoporia pannocincta*, *Phellinus populicola*. Animals: Mammals - **Pteromys volans*, *Myopus schisticolor*, *Sorex minutus*; Birds - *Picoides tridactylus*, *Perisoreus infaustus*, *Dendrocopos leucotos*, *D. minor*; Beetles - *Tragosoma depsarium*, *Pytho kolwensis*, *P. abieticola*, *Cucujus cinnaberinus*, *Peltis grossa*, **Osmoderma eremita*. Originally natural old forests were found in the whole boreal and hemiboreal zones, except in the oro-hemiarctic treeless zone. In Finland nowadays most of the natural old forests are found in eastern and northern parts, in southern and western parts of the country only remnants of these forests remain. In Sweden most of the old natural forests are in the north and only some of them in the south.

- 5) **Kalela, A. (1961)**. Waldvegetationszonen Finnlands und ihre klimatischen paralleltypen. Arch. Soc. zool. bot. fenn. Vanamo 16 Suppl.:65-83.
- Kalliola, R. (1973)**. Suomen kasvimaantiede. Wsoy, Porvoo. 308 pp.
- Kielland-Lund, J. (1967)**. Zur systematik der Kiefenfelder Fennoscandiens. Mitt. flor.-soz. ArbGemein. 11/12:127-141.
- Kielland-Lund, J. (1981)**. Die Waldgesellschaften SO-Norwegens. Phytocoenolog. 9:53-250.
- Kujala, V. (1981)**. Suomen metsätyypit. Commun. Inst. For. Fenn., 92(8):1-45.
- Kuusinen, M. (1994)**. Epiphytic lichen diversity on *Salix caprea* in old-growth southern and middle boreal forests of Finland. Ann. Bot. Fennici, 31:77-92.
- Påhlsson, L. et al. (1995)**. Vegetationstyper i Norden. Nordiska Ministerrådet Tema Nord 1994:665 pp.
- Tanninen, T., Storränk, B., Haugen, I., Møller, P.F., Löfgren, R., Thorsteinsson, I. & Ragnarsson, H. (1994)**. Naturskogar i Norden. Nord 1994:7.
- Virkkala, R., Alanko, T., Laine, T. & Tiainen, J. (1993)**. Population contraction of the white-backed woodpecker *Dendrocopos leucotos* in Finland as a consequence of habitat alteration. Biological Conservation 66:47-53.

9020

*** Fennoscandian hemiboreal natural old broad-leaved deciduous forests (*Quercus*, *Tilia*, *Acer*, *Fraxinus* or *Ulmus*) rich in epiphytes**

PAL.CLASS.: 41.4151, 41.F2 (1997 version)

- 1) The hemiboreal natural old broad-leaved deciduous forest forms a transition between the Western Taiga and the nemoral forests. The most common tree species are *Quercus robur*, *Ulmus* spp., *Fraxinus excelsior*, *Tilia cordata* or *Acer platanoides*. There is typically a considerable amount of dead wood and a long continuity of woodland cover on the sites. The species-diversity of lichens, fungi, insects and soil-organisms is high. In many cases the forests have previously been used for grazing or mowing.
- 2) Plants : *Allium ursinum*, *Anemone nemorosa*, *Corylus avellana*, *Dentaria bulbifera*, *Hepatica nobilis*, *Lathyrus vernus*, *Mercurialis perennis*, *Milium effusum*, *Poa nemoralis*, *Polygonatum multiflorum*; Bryophytes- *Antitrichia curtipendula*, *Homalia trichomanoides*, *Orthotrichum* spp., *Porella platyphylla*, *Zygodon* spp.; Fungi- *Auricularia mesenterica*, *Ganoderma lipsiense*, *Eichomitus campestris*, *Mycena galericulata*, *Tricholoma album*, *T. sulphureum*; Lichens- *Arthonia vinosa*, *Biatorrella monasteriensis*, *Cliostomum corrugatum*, *Gyalecta flotowi*, *Lobaria pulmonaria*, *Phlyctis agelaea*
- 3) Corresponding categories
Nordic classification: “2233 *Ulmus glabra* –type” , “2234 *Fraxinus excelsior* –type” , “2235 *Tilia cordata* –type” and “2236 *Quercus robur-Ulmus glabra-Tilia cordata* –type”.
- 5) **Almgren, G. (1984).**- Ädellövskog - ekologi och skötsel. Skogsstyrelsen. Jönköping.
Kielland-Lund, J. (1973).- A classification of Scandinavian forest vegetation for mapping purposes. In: *IBP i Norden*, No 11. Universitetsforl. Oslo.
Pettersson, B. & Fiskesjö, A. (1991).- Lövnaturskogens flora och fauna. *Naturvårdsverket Rapport* 3991.
Samuelsson, J. & Ingelöf, T. (1996).- Den levande döda veden. Bevarande och nyskapande i naturen. ArtDatabanken. Uppsala.

9030

*** Natural forests of primary succession stages of landupheaval coast**

PAL.CLASS.: 31.8, 41.B8, 41.C3, 44.2 (1997 version)

- 1) This type includes different types of deciduous, coniferous and mixed natural thickets and forests developed on land upheaval coasts of the Baltic sea. Characteristic for these habitats are stages of primary succession from shore grassland vegetation to climax forests or various wetland types. Also soil horizons are poorly developed, although podsol soils are otherwise typical for boreal forest. The youngest pioneer forests near the sea are often low or tall herb deciduous forests, thickets or swamps. Vegetation succession can also proceed from willow swamps through forest swamps to mires. Alder and birch are dominant in the tree layer and willows are often common in the shrub layer. Grasses are abundant. Further inland the influence of the sea is weakened, the soils are often poor in nutrients and coniferous forests are typical. Pine, and often also spruce, dominates the tree layer and dwarf shrubs dominate in the field layer. In the ground layer mosses are common, but in many areas lichens are abundant.

- 3) Corresponding categories
 Nordic classification: “2215 *Betula pendula-Vaccinium myrtillus-Deschampsia flexuosa* –type”, “2216 *Betula pubescens-Molina caerulea-Sphagnum spp.* –type”, coastal variants, “7213 *Hippophaë rhamnoides*-type”. Many other units have unclassified and undescribed variants occurring in land upheaval areas.
- 5) **Havas, P. (1967).**- Zur ökologie der Laubwelder, insbesondere der Grauerlenwälder, an der Küste der Bottenwiek. *Aquilo, Ser. Bot.*, 6: 314-346.
Vartiainen, T. (1980).- Succession of island vegetation in the land uplift area of the northernmost Gulf of Bothnia, Finland. *Acta Botanica Fennica*, 115: 1-105

9040 **Nordic subalpine/subarctic forests with *Betula pubescens* ssp. *czerepanovii***

PAL.CLASS.: 41.B72 (1997 version)

- 1) Forests dominated by *Betula pubescens* ssp. *czerepanovii* (mountain birch), occurring and often dominating the subalpine belt of the Scandinavian mountain (fell) chain (“Fjällen”). Occur also in isolated northern Fennoscandian fells and in gently sloping or flat subarctic (hemiarctic) uplands, particularly in N Finland. Due to different ecological characteristics, vegetation varies from lichen poor and dwarf shrub dominated types to those rich-in-tall-herbs.
- 2) Plants : Poor types; *Cladonia* spp., *Dicranum* spp., *Empetrum hermaphroditum*, *Hylocomium splendens*, *Linnea borealis*, *Pleurozium schreberi*, *Stereocaulon paschale*, *Trientalis europaea*, *Vaccinium myrtillus*; Rich types; *Aconitum lycoctonum*, *Cicerbita alpina*, *Cornus suecica*, *Geranium sylvaticum*, *Gymnocarpium dryopteris*, *Hierochloë odorata*, *Melica nutans*, *Rubus saxatilis*, *Trollius europaeus*
- 3) Corresponding categories
 Nordic classification: 2211 *Betula pubescens* ssp. *czerepanovii-Empetrum hermaphroditum-Cladonia* ssp.-type, 2212 *Betula pubescens* ssp. *czerepanovii-Vaccinium myrtillus-Deschampsia* -type, 2213 *Betula pubescens* ssp. *czerepanovii-Geranium sylvaticum-Rubus saxatilis* -type, 2214 *Betula pubescens* ssp. *czerepanovii-Geranium sylvaticum-Aconitum lycoctonum*-type .
- 5) **Aune, E.I. (1973).**- Forest vegetation in Hemne, Sør-Trøndelag, Western Central Norway. *K. norske Vidensk. Selsk. Miscellanea*, 12.
Hämet-Ahti, L. (1963).- Zonation of the mountain birch forests in northernmost Fennoscandia. *Ann. Bot. Zool. Fenn. Vanamo Tom*, 34 (4), 127 pp.
Oksanen, L. & Virtanen, R. (1995).- Topographic, altitudinal and regional patterns in continental and suboceanic heath vegetation of northern Fennoscandia. *Acta Bot. Fennica* 153: 1-80.

9050 **Fennoscandian herb-rich forests with *Picea abies***

PAL.CLASS.: 42.C22, 42.C4, 42.C3 (1997 version)

- 1) This type occurs in areas of brown forest soils with mull, often in low-lying areas, ravines and slopes with fine sediment and a favourable water regime. The succession of this vegetation type normally leads to the dominance of spruce in the tree layer, although the broad-leaved trees often comprise a significant element. Tall herbs and ferns dominate, but the species composition varies greatly between northern, southern and western Fennoscandia. The forests are characterized by

distinct layers of vegetation. The bottom layer is covered unevenly by bryophytes, the field layer is dominated by herbs and grasses, the bush and tree layers are well developed including a variety of species. Several vegetation types have been described, the main groups being dry, mesic and moist grass-herb forests. Sometimes ground water is flowing near the ground surface, which give rise to a specific species rich "wet-forest" flora and invertebrate fauna.

- 2) Plants : *Actaea spicata*, *A. erythrocarpa*, *Botrychium virginianum*, *Calypso bulbosa*, *Carex remota*, *Cicerbita alpina*, *Crepis paludosa*, # *Cypripedium calceolus*, *Diplazium sibiricum*, *Epipogium aphyllum*, *Geranium sylvaticum*, *Impatiens noli-tangere*, *Matteuccia struthiopteris*, *Melica nutans*, *Milium effusum*, *Paris quadrifolia*, *Viola selkirkii*; Mosses- *Brachythecium* spp., *Cirriphyllum piliferum*, *Eurhynchium* spp., *Plagiomnium* spp.
- 3) Corresponding categories
Nordic classification: 2124 *Picea abies*-*Oxalis acetosella*-*Melica nutans* -type, 2125 *Picea abies*-*Dryopteris* spp.-type and 2126 *Picea abies*-*Geranium sylvaticum*-*Aconitum lycoctonum*-type .
- 5) **Mäkirinta, U. (1968).**- Haintypenuntersuchungen im mittleren Süd-Häme, Süd-Finnland. *Ann. ot. Fenn.*,5: 34-64.
Koponen, T. (1967).- On the dynamics of vegetation and flora in Karkali Nature Reserve, Southern Finland. *Ann. Bot. Fenn.*, 4:121-218.

9060

Coniferous forests on, or connected to, glaciofluvial eskers

PAL.CLASS.: -

- 1) This type includes Fennoscandian conifer forests found on or close to eskers. The top of an esker is often characterized by *Pinus sylvestris* and the slopes sometimes by *Picea abies*, although deciduous species may occur. Eskers are glaciofluvial gravel and sand formations which consist of relatively sorted material, often forming ridges over 20 meters high. In terms of ecological site factors they are more variable than the surrounding forest on flatter ground. In particular the microclimate differs notably between shaded and sunny slopes. Thus aspect and slope inclination, which reflect the effects of solar radiation and soil and air temperatures are important ecological factors. As a result of ecological characteristics, vegetation on sunny esker slopes is often relatively rich in species and particularly contains many leguminous plants as well as some eastern steppe plant species.
- 2) Plants : *Antennaria dioeca*, *Anthyllis vulneraria* subsp. *fennica*, *Astragalus alpinus*, *Brachypodium pinnatum*, *Calamagrostis arundinacea*, *Carex ericetorum*, *C. pediformis*, *Dianthus arenarius*, *Fragaria vesca*, *Hierochloë australis*, *Hypochoeris maculata*, *Juniperus communis*, *Lathyrus niger*, *L. vernus*, *Melica nutans*, *Oxytropis campestris*, *Pinus sylvestris*, *Polygonatum odoratum*, *Pulsatilla patens*, *P. vernalis*, *Pteridium aquilinum*, *Rubus saxatilis*, *Silene nutans*, *Thymus serpyllum*, *Vaccinium vitis-idaea* and *Viola rupestris* subsp. *rupestris*
- 3) Corresponding categories
Nordic classification: 2114b *Pinus sylvestris* - *Fragaria vesca* -variant, 2115 *Pinus sylvestris* - *Lathyrus* spp. - *Rubus saxatilis*-type .
- 4) Stands of esker forests on sunny slopes are often characterized by a relatively open tree structure and in addition the undergrowth often consists of species of warmer climate (e.g. *Carex pediformis*, *Pulsatilla patens*, *P. vernalis*, *Gypsophila fastigiata*) and some endangered butterfly species. About six different forest site types of eskers have been described, representing a gradient from xeric lichen rich forests to humid herb-rich forests.

- 5) **Heikkinen, R.K. (1991)** - Multivariate analysis of esker vegetation in southern Häme, S Finland. *Ann. Bot. Fenn.* 28: 201-224.
Jalas, J. (1961) - Besondere Züge der Vegetation und Flora auf der Osen. *Arch. Soc. Zool. Bot. Fenn. Vanamo*, 16 Suppl. 25-33.
Rajakorpi, A. (1987) - Topographic, microclimatic and edaphic control of the vegetation in the central part of the Hämeen kangas esker complex, western Finland. *Acta Bot. Fennica*, 134: 1-70.
Uotila, P. (1969) - Ecology and area of *Pulsatilla patens* (L.) Mill. in Finland. *Ann. Bot. Fenn.* 6:105-111.
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9070

Fennoscandian wooded pastures

PAL.CLASS.: -

- 1) A vegetation complex in which the tree layer varies from sparse forest to small copses of trees and shrubs and patches of open grassland. These habitats have a representative mosaic of copses of trees (usually deciduous trees) and grassland with a long continuity of grazing. The tree layer consists either of deciduous broad-leaved species such as *Quercus robur*, *Fraxinus excelsior*, *Tilia cordata*, *Betula* spp., *Alnus incana* or conifers (*Picea abies*, *Pinus sylvestris*). Particularly in Sweden there are pastures with old, large oaks. A rich assemblage of threatened lichens, fungi, and invertebrates are associated with the bark and dead or decaying wood. The type also includes (particularly in Finland) deciduous forests established after slash-and-burn cultivation, that was a characteristic feature of the former land use in Finland
 In Finland scattered in the whole of the country, mostly in Southern and Central Finland; very rare or extinct in northern boreal zone. In Sweden scattered over the whole country. Regional variation is considerable. Wooded pastures are usually dominated by birch, pine, alder (*Alnus incana*) or spruce (spruce-dominated are often degraded types); in hemiboreal zone there are also subtypes dominated by e.g. *Quercus*, *Fraxinus* and *Corylus*..
- 2) Plants : *Agrostis capillaris*, *Alnus incana*, *Antennaria dioica*, *Botrychium* spp., *Campanula persicifolia*, *Coeloglossum viride*, *Fragaria vesca*, *Geranium sylvaticum*, *Melampyrum cristatum*, *Prunella vulgaris*, *Ranunculus polyanthemus*, *Succisa pratensis*, *Veronica chamaedrys*, *V. officinalis*.
- 4) During recent decades the tree layer of wooded pastures has in many cases become thicker and the typical structure has then been obscured. In wooded pastures vegetation is dominated by grassland species with elements of grassland vegetation.
- 5) **Ekman, H. & Pettersson, B. (1987)**.- Ekarnas hagar. LT:s förlag.
Häggström, C.-A. (1987).- Den nordiska hagen. *Nordenskjölds Samfundets Tidskrift*, 47: 68-90.
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9080

*Fennoscandian deciduous swamp woods

PAL.CLASS.: 44.9112, 44.915, 44.A14 (1997 version)

- 1) Deciduous swamps are under permanent influence of surface water and usually flooded annually. They are moist or wet, wooded wetlands with some peat formation, but the peat layer is usually very thin. Ash (*Fraxinus excelsior*) in the hemiboreal zone and black alder (*Alnus glutinosa*) reaching the middle boreal zone are typical tree species. Gray alder (*Alnus incana*), silver birch (*Betula pubescens*) and willows (*Salix* spp.) are also common. A mosaic of patches with different water

level and vegetation is typical for the type. Around the tree stems are small hummocks, but wet flooded surfaces are dominant.

Deciduous swamp woods are most common in Finland in the southwestern archipelago and other coastal areas. On the mainland they are rare. In Sweden they are common throughout the whole region.

- 2) Plants : *Carex caespitosa*, *C. diandra*, *C. disperma*, *C. elongata*, *C. loliacea*, *C. rhynchospora*, *C. tenuiflora*, *Calamagrostis canescens*, *C. chalybea*, *C. stricta*, *Calla palustris*, *Glyceria lithuanica*, *Iris pseudacorus*, *Lycopus europaeus*, *Lysimachia thyrsiflora*, *Lythrum salicaria*, *Solanum dulcamara*, *Thelypteris palustris*; Mosses- *Calliergon cordifolium*, *Helodium blandowii*, *Pseudobryum cinclidioides*, *Spagnum squarrosum*, *S. teres*, *S. fimbriatum*, *S. riparium*
- 3) Corresponding categories
Nordic classification : 2241 *Alnus incana* -type, 2242 *Alnus glutinosa* - *Lycopus europaeus* - type, 2243 *Alnus* spp. - *Filipendula ulmaria* - *Carex elongata* -type, 3413 *Alnus* spp. - *Betula pubescens* - *Salix* spp. - *Filipendula ulmaria* -type.
- 4) Associated with the habitat type: Residual alluvial forests (91E0)
- 5) **Ruuhijärvi, R. (1983).**- The Finnish mire types and their regional distribution. In: Gore, A.J.P. (ed.) *Ecosystems of the World 4B. Mires: Swamp, bog, fen and moor. Regional studies*, 47-67. Elsevier, Amsterdam.
Eurola, S. & Kaakinen, E. (1984).- Key to Finnish mire types. In: Moore, P.D. (ed.). *European mires*, 11-117. Academic Press, London

Forests of temperate Europe

9110

Luzulo-Fagetum beech forests

PAL.CLASS.: 41.11

- 1) *Fagus sylvatica* and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on acid soils of the medio-European domain of central and northern Central Europe, with *Luzula luzuloides*, *Polytrichum formosum* and often *Deschampsia flexuosa*, *Calamagrostis villosa*, *Vaccinium myrtillus*, *Pteridium aquilinum*.
The following sub-types are included:
41.111 Medio-European collinar woodrush beech forests
Acidophilous *Fagus sylvatica* forests of the lesser Hercynian ranges and Lorraine, of the collinar level of the greater Hercynian ranges, the Jura and the Alpine periphery, of the western sub-Pannonic and the intra-Pannonic hills, not or little accompanied by self sown conifers, and generally with an admixture of *Quercus petraea*, or in some cases *Quercus robur*, in the canopy.
41.112 Medio-European montane woodrush beech forests
Acidophilous forests of *Fagus sylvatica*, *Fagus sylvatica* and *Abies alba* or *Fagus sylvatica*, *Abies alba* and *Picea abies* of the montane and high-montane levels of the greater Hercynian ranges, from the Vosges and the Black Forest to the Bohemian Quadrangle, the Jura, the Alps, the Carpathians and the Bavarian Plateau.
- 2) Plants: *Fagus sylvatica*, *Abies alba*, *Picea abies*, *Luzula luzuloides*, *Polytrichum formosum* and often *Deschampsia flexuosa*, *Calamagrostis villosa*, *Vaccinium myrtillus*, *Pteridium aquilinum*.
- 3) Corresponding categories

Nordic classification: "2221 *Fagus sylvatica-Deschampsia flexuosa-Vaccinium myrtillus*-typ"

- 5) **Lindgren, L. (1970).** Beech forest vegetation in Sweden - a survey. *Bot. Notiser* 123:401-421.
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9120 **Atlantic acidophilous beech forests with *Ilex* and sometimes also *Taxus* in the shrublayer (*Quercinion robori-petraeae* or *Ilici-Fagenion*)**

PAL.CLASS.: 41.12

- 1) Beech forests with *Ilex*, growing on acid soils, of the plain to montane levels under humid Atlantic climate. The acid substrate corresponds to alterations of acid rocks or to silt with flints more or less degraded or, to old alluvial deposits. The soils are of acid brown type, leaching or with an evolution towards podsol type. The humus is of moder to dysmoder type. These beech forests present different varieties:
 - a) subatlantic beech-oak forests of the plains and hill levels with *Ilex aquifolium*
 - b) hyper-Atlantic beech-oak forests of the plains and hill levels with *Ilex* and *Taxus*, rich in epiphytes
 - c) pure beech forests or acidophilous beech-fir forests of the montane level, with *Ilex aquifolium* in the field layer.
 - 2) Plants: *Ilex aquifolium*, *Taxus baccata*, *Ruscus aculeatus*, *Deschampsia flexuosa*, *Hieracium sabaudum*, *H. umbellatum*, *Pteridium aquilinum*, *Vaccinium myrtillus*, *Lonicera periclymenum*, *Melampyrum pratense*, *Teucrium scorodonia*, *Holcus mollis*.
 - 3) Corresponding categories
United Kingdom classification: "W14 *Fagus sylvatica-Rubus fruticosus* woodland" pp and "W15 *Fagus sylvatica-Deschampsia flexuosa* woodland p.p."
German classification: "43070502 bodensaurer Buchenwald der planaren Stufe".
 - 4) Oak may dominate in some of these forests due to the coppice-with-standards regime of the past centuries. If the intensity of the management decreases beech and also *Ilex* often regenerate spontaneously.
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9130 ***Asperulo-Fagetum* beech forests**

PAL.CLASS.: 41.13

- 1) *Fagus sylvatica* and, in higher mountains, *Fagus sylvatica-Abies alba* or *Fagus sylvatica-Abies alba-Picea abies* forests developed on neutral or near-neutral soils, with mild humus (mull), of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, characterised by a strong representation of species belonging to the ecological groups of *Anemone nemorosa*, of *Lamiasstrum* (*Lamium*) *galeobdolon*, of *Galium odoratum* and *Melica uniflora* and, in mountains, various *Dentaria* spp., forming a richer and more abundant herb layer than in the forests of 9110 and 9120.
Sub-types :
 - 41.131 - Medio-European collinar neutrophilous beech forests
Neutrocline or basicline *Fagus sylvatica* and *Fagus sylvatica-Quercus petraea-Quercus robur* forests of hills, low mountains and plateaux of the Hercynian arc and its peripheral regions, of

the Jura, Lorraine, the Paris basin, Burgundy, the Alpine piedmont, the Carpathians and a few localities of the North Sea-Baltic plain.

41.132 - Atlantic neutrophile beech forests

Atlantic beech and beech-oak forests with *Hyacinthoides non-scripta*, of southern England, the Boulonnais, Picardy, the Oise, Lys and Schelde basins.

41.133 - Medio-European montane neutrophilous beech forests

Neutrophile forests of *Fagus sylvatica*, *Fagus sylvatica* and *Abies alba*, *Fagus sylvatica* and *Picea abies*, or *Fagus sylvatica*, *Abies alba* and *Picea abies* of the montane and high-montane levels of the Jura, the northern and eastern Alps, the western Carpathians and the great Hercynian ranges.

41.134 - Bohemian lime-beech forests

Fagus sylvatica or *Fagus sylvatica-Abies alba* forests rich in *Tilia* spp., of the Bohemian basin.

41.135 - Pannonic neutrophilous beech forests

Neutrophilous beech forests of medio-European affinities of the hills of the Pannonic plain and its western periphery.

- 2) Plants: *Fagus sylvatica*, *Abies alba*, *Picea abies*, *Anemone nemorosa*, *Lamium* (*Lamium*) *galeobdolon*, *Galium odoratum*, *Melica uniflora*, *Dentaria* spp.
 - 3) Corresponding categories
United Kingdom classification: "W12 *Fagus sylvatica-Mercurialis perennis* woodland p.p." and "W14 *Fagus sylvatica-Rubus fruticosus* woodland p.p."
Nordic classification: "2222 *Fagus sylvatica-Lamium galeobdolon-Melica uniflora*-typ" and "2223 *Fagus sylvatica-Mercurialis perennis-Allium ursinum*-typ".
 - 5) **Bergendorff, C., Larsson, A. & Nihlgård, B. (1979)**. *Sydliga lövskogsbestånd i Sverige. Statens naturvårdsverk*. Rapport. SNV PM 1278, Solna, 68 pp.
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9140

Medio-European subalpine beech woods with *Acer* and *Rumex arifolius*

PAL.CLASS.: 41.15

- 1) *Fagus sylvatica* woods usually composed of low, low-branching trees, with much sycamore (*Acer pseudoplatanus*), situated near the tree limit, mostly in low mountains with oceanic climate of Western Europe and of central and northern Central Europe. The herb layer is similar to that of the forests of 9130 or locally of 9110 and contain elements of the adjacent open grasslands.
 - 2) Plants: *Fagus sylvatica*, *Acer pseudoplatanus*, *Rumex arifolius*.
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9150

Medio-European limestone beech forests of the *Cephalanthero-Fagion*

PAL.CLASS.: 41.16

- 1) Xero-thermophile *Fagus sylvatica* forests developed on calcareous, often superficial, soils, usually of steep slopes, of the medio-European and Atlantic domains of Western Europe and of central and northern Central Europe, with a generally abundant herb and shrub undergrowth, characterized by sedges (*Carex digitata*, *Carex flacca*, *Carex montana*, *Carex alba*), grasses (*Sesleria albicans*, *Brachypodium pinnatum*), orchids (*Cephalanthera* spp., *Neottia nidus-avis*, *Epipactis leptochila*, *Epipactis microphylla*) and thermophile species, transgressive of the *Quercetalia pubescenti-*

petraeae. The bush-layer includes several calcicolous species (*Ligustrum vulgare*, *Berberis vulgaris*) and *Buxus sempervirens* can dominate.

Sub-types :

41.161 - Middle European dry-slope limestone beech forests

Middle European sedge and orchid beech woods of slopes with reduced water availability.

41.162 - North-western Iberian xerophile beech woods

Fagus sylvatica forests of relatively low precipitation zones of the southern ranges of the Pais Vasco and of superficially dry calcareous soils of the Cordillera Cantabrica, with *Brachypodium pinnatum* ssp. *rupestre*, *Sesleria argentea* ssp. *hispanica*, *Carex brevicollis*, *Carex ornithopoda*, *Carex sempervirens*, *Carex caudata*, *Cephalanthera damasonium*, *C. longifolia*, *Epipactis helleborine*, *Epipactis microphylla*, *Neottia nidus-avis*.

2) Plants: *Fagus sylvatica*, *Carex digitata*, *C. flacca*, *C. montana*, *C. alba*, *Sesleria albicans*, *Brachypodium pinnatum*, *Cephalanthera* spp., *Neottia nidus-avis*, *Epipactis leptochila*, *Epipactis microphylla*, *Buxus sempervirens*.

3) Corresponding categories

Nordic classification: "2223 *Fagus sylvatica*-*Mercurialis perennis*-*Allium ursinum* -typ".

9160

Sub-Atlantic and medio-European oak or oak-hornbeam forests of the *Carpinion betuli*

PAL.CLASS.: 41.24

1) Forests of *Quercus robur* (or *Quercus robur* and *Quercus petraea*) on hydromorphic soils or soils with high water table (bottoms of valleys, depressions or in the vicinity of riparian forests). The substrate corresponds to silts, clayey and silt-laden colluvions, as well as to silt-laden alterations or to siliceous rocks with a high degree of saturation. Forests of *Quercus robur* or natural mixed forests composed of *Quercus robur*, *Quercus petraea*, *Carpinus betulus* and *Tilia cordata*. *Endymion non-scriptus* is absent or rare.

2) Plants: *Quercus robur*, *Carpinus betulus*, *Acer campestre*, *Tilia cordata*, *Stellaria holostea*, *Carex brizoides*, *Poa chaixii*, *Potentilla sterilis*, *Dactylis polygama*, *Ranunculus nemorosus*, *Galium sylvaticum*.

3) Corresponding categories

German classification: "430703 Stieleichen-Hainbuchenwald feuchter bis frischer Standorte".

Nordic classification: "2223 *Fagus sylvatica*-*Mercurialis perennis*-*Allium ursinum*-typ".

4) Not to be confused with forests of *Quercus robur* arising from the management of beech-oak forests as coppice or coppice-with-standards on well drained soils.

5) **Diekmann, M. (1994).** Deciduous forest vegetation in Boreo-nemoral Scandinavia. *Acta Phytogeogr. Suec.* 80:1-112.

9170 *Galio-Carpinetum* oak-hornbeam forests

PAL.CLASS.: 41.261, 41.262

- 1) *Quercus petraea-Carpinus betulus* forests of regions with sub-continental climate within the central European range of *Fagus sylvatica*, dominated by *Quercus petraea* (41.261). Also included are related lime-oak forests of eastern and eastern-central European regions with a continental climate, east of the range of *F. sylvatica* (41.262).
- 2) Plants: 41.261 - *Quercus petraea*, *Carpinus betulus*, *Sorbus torminalis*, *S. domestica*, *Acer campestre*, *Ligustrum vulgare*, *Convallaria majalis*, *Carex montana*, *C. umbrosa*, *Festuca heterophylla*; 41.262 - *Quercus petraea*, *Quercus robur*, *Tilia cordata*, *Acer platanoides*, *Carpinus betulus*.
- 3) Corresponding category
Nordic classification: "2224 *Carpinus betulus*-typ".

9180 * *Tilio-Acerion* forests of slopes, screes and ravines

PAL.CLASS.: 41.4

- 1) Mixed forests of secondary species (*Acer pseudoplatanus*, *Fraxinus excelsior*, *Ulmus glabra*, *Tilia cordata*) of coarse scree, abrupt rocky slopes or coarse colluvions of slopes, particularly on calcareous, but also on siliceous, substrates (*Tilio-Acerion* Klika 55). A distinction can be made between one grouping which is typical of cool and humid environments (hygroscopic and shade tolerant forests), generally dominated by the sycamore maple (*Acer pseudoplatanus*) - sub-alliance *Lunario-Acerenion*, and another which is typical of dry, warm screes (xerothermophile forests), generally dominated by limes (*Tilia cordata*, *T. platyphyllos*) - sub-alliance *Tilio-Acerenion*.
The habitat types belonging to the *Carpinion* should not be included here.
- 2) Plants: *Lunario-Acerenion* - *Acer pseudoplatanus*, *Actaea spicata*, *Fraxinus excelsior*, *Helleborus viridis*, *Lunaria rediviva*, *Taxus baccata*, *Ulmus glabra*. *Tilio-Acerenion* - *Carpinus betulus*, *Corylus avellana*, *Quercus* sp., *Sesleria varia*, *Tilia cordata*, *T. platyphyllos*.
- 3) Corresponding categories
United Kingdom classification: "W8 *Fraxinus excelsior-Acer campestre-Mercurialis perennis* woodland" and "W9 *Fraxinus excelsior-Sorbus aucuparia-Mercurialis perennis* woodland".
German classification: "430604 Sommerlinden-Begulmen-Blockschuttwald", "430603 Ahorn-Linden-Hangschuttwald (wärmere Standorte)", "430602 Eschen-Ahorn-Schlucht- bzw. -Hangwald (fleucht-kühle Standorte)", "430601 Sommerlinden-Hainbuchen-Schuttwald".
Nordic classification: "2233 *Ulmus glabra* -typ", "2235 *Tilia cordata* -typ" and "2236 *Quercus robur-Ulmus glabra-Tilia cordata*-typ". In Boreal region corresponding species-poor communities often with *Anemone nemorosa*, *Corydalis* spp., *Primula veris*.
- 4) Slight changes in the conditions of the substrate (especially "consolidated" substrate) or humidity produce a transition towards beech forests (*Cephalanthero-Fagenion*, *Luzulo-Fagenion*) or towards thermophile oak forests.
- 5) **Bergendorff, C., Larsson, A. & Nihlgård, B. (1979).** *Sydliga lövskogsbestånd i Sverige. Statens naturvårdsverk. Rapport. SNV PM 1278, Solna, 68 pp.*

9190**Old acidophilous oak woods with *Quercus robur* on sandy plains**

PAL.CLASS.: 41.51 and 41.54

- 1) 41.51 - Acidophilous forests of the Baltic-North Sea plain, composed of *Quercus robur*, *Betula pendula* and *Betula pubescens*, often mixed with *Sorbus aucuparia* and *Populus tremula*, on very oligotrophic, often sandy (or moraine) and podsolized or hydromorphic soils; the bush layer, poorly developed, includes *Frangula alnus*; the herb layer is formed by *Deschampsia flexuosa* and other grasses and herbs of acid soils (sometimes includes *Molinia caerulea*), and is often invaded by bracken. Forests of this type often prevail in the northern European plain and occupy more limited edaphic enclaves. Syntaxa: *Querco-Betuletum*, *Molino-Quercetum*, *Trientalo-Quercetum roboris*.
41.54 - Forests of *Quercus robur* and, sporadically *Quercus pyrenaica* or hybrids, on podzols, with a herb layer formed by the group of *Deschampsia flexuosa*, with *Molinia caerulea* and *Peucedanum gallicum*. Syntaxa: *Peucedano-Quercetum roboris*.
 - 2) Plants: *Quercus robur*, *Betula pendula*, *B. pubescens*, *Sorbus aucuparia*, *Populus tremula*.
 - 3) Corresponding categories
Nordic classification: "2231 *Quercus petraea/robur-Melampyrum pratense-Deschampsia flexuosa*-typ" and "2232 *Quercus robur-Melica* spp.-typ".
 - 5) **Rühling, Å. & Tyler, G. (1986)**. Vegetation i sydsvenska ekskogar-en regional jämförelse. *Sven. Bot. Tidskr.* 80:133-143.
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91A0**Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles**

PAL.CLASS.: 41.53

- 1) Acidophilous *Quercus petraea* woods, with low, low-branched, trees, with many ferns, mosses, lichens and evergreen bushes.
Sub-types :
41.531 - Irish sessile oak woods
Quercus petraea woods of Ireland, particularly rich in evergreen bushes, including *Arbutus unedo*.
41.532 - British sessile oak woods
Acidophilous *Quercus petraea* woods of western Britain, mostly found in Scotland, Wales, Northern England and South Western England.
 - 2) Plants: *Quercus petraea*, *Ilex aquifolium*, *Blechnum* ssp.
 - 3) Corresponding categories
United Kingdom classification: "W10 *Quercus* spp.-*Pteridium aquilinum-Rubus fruticosus* woodland p.p.", "W11 *Quercus petraea-Betula pubescens-Oxalis acetosella* woodland p.p." and "W17 *Quercus petraea-Betula pubescens-Dicranum majus* woodland p.p."
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91B0

Thermophilous *Fraxinus angustifolia* woods

PAL.CLASS.: 41.86

- 1) Non-alluvial, non-ravine formations dominated by *Fraxinus angustifolia*, often mixed with *Quercus pubescens* or *Q. pyrenaica*.
Sub-types :
 - 41.861 - Sicilian narrow-leaved ash woods
Fraxinus angustifolia woods of western Sicily.
 - 41.862 - Iberian narrow-leaved ash woods
Fraxinus angustifolia woods of the Iberian peninsula.
 - 2) Plants: *Fraxinus angustifolia*.
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91C0

* Caledonian forest

PAL.CLASS.: 42.51

- 1) Relict, indigenous pine forests of *Pinus sylvestris* var. *scotica*, endemic in the central and north eastern Grampians and the northern and western Highlands of Scotland and associated *Betula* and *Juniperus* woodlands of northern character within this area. They are mostly open and have a ground layer rich in ericaceous species and bryophytes, in particular *Hylocomium splendens*, and often harbouring abundant *Deschampsia flexuosa*, *Goodyera repens*, *Listera cordata*, *Corallorhiza trifida*, *Linnaea borealis*, *Trientalis europaea*, *Pyrola minor*, *Moneses uniflora*, *Orthilia secunda*. The dominant trees are: *Sorbus aucuparia*, *Betula pubescens*, *B. pendula*, *Juniperus communis*, *Ilex aquifolium*, *Populus tremula*.
 - 2) Plants: *Corallorhiza trifida*, *Deschampsia flexuosa*, *Goodyera repens*, *Linnaea borealis*, *Listera cordata*, *Moneses uniflora*, *Orthilia secunda*, *Pinus sylvestris* var. *scotica*, *Pyrola minor*, *Trientalis europaea*. Bryophytes- *Hylocomium splendens*, *Pleurozium schreberi*.
 - 3) Corresponding categories
United Kingdom classification: the majority of Caledonian forests belong to "W18 *Pinus sylvestris*-*Hylocomium splendens* woodland"; however, not all of these forests are semi-natural. Stands dominated by *Juniperus* belong to the category "W19 *Juniperus communis* ssp. *communis*-*Oxalis acetosella* woodland".
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91D0

* Bog woodland

PAL.CLASS.: 44.A1 to 44.A4

- 1) Coniferous and broad-leaved forests on a humid to wet peaty substrate, with the water level permanently high and even higher than the surrounding water table. The water is always very poor in nutrients (raised bogs and acid fens). These communities are generally dominated by *Betula pubescens*, *Frangula alnus*, *Pinus sylvestris*, *Pinus rotundata* and *Picea abies*, with species specific to bogland or, more generally, to oligotrophic environments, such as *Vaccinium* spp., *Sphagnum* spp., *Carex* spp. [*Vaccinio-Piceetea*: *Piceo-Vaccinienion uliginosi* (*Betulion pubescentis*, *Ledo-Pinion*) i.a.]. In the Boreal region, also spruce swamp woods, which are minerotrophic mire sites along margins of different mire complexes, as well as in separate strips in valleys and along brooks.
Sub-types :
 - 44.A1 - Sphagnum birch woods
 - 44.A2 - Scots pine mire woods

44.A3 - Mountain pine bog woods

44.A4 - Mire spruce woods

In most of the Irish sites, these forests represent sub types of raised bogs, generally degraded and invaded by commercial forestry species; however, those stands dominated by *Betula pubescens* or *Pinus sylvestris* may be of interest. In Greece, formations with *Pinus sylvestris* are confined to the northern mountains, where forests of *Picea abies* on a sphagnum rich ground layer also occur.

- 2) Plants: *Agrostis canina*, *Betula pubescens*, *B. carpatica*, *Carex canescens*, *C. echinata*, *C. nigra*, *C. rostrata*, *Frangula alnus*, *Juncus acutiflorus*, *Molinia caerulea*, *Trientalis europaea*, *Picea abies*, *Pinus rotundata*, *P. sylvestris*, *Sphagnum* spp., *Vaccinium oxycoccus*, *V. uliginosum*, *Viola palustris*; in spruce swamp woods also: *Carex disperma*, *C. tenuiflora*, *Diplazium sibiricum*, *Hylocomium umbratum* and *Rhytidiadelphus triquetrus*.

3) Corresponding categories

United Kingdom classification : "W4 *Betula pubescens*-*Molinia caerulea* woodland".

German classification: "430101 Birken-Moorwald", "440104 Latschen-Moorwald", "440101 Fichten-Moorwald", "440103 Spirken-Moorwald", "440102 Waldkiefern-Moorwald".

Nordic classification: "311 Skogsmossevegetation", "321 Skogs-och krattkärvegetation".

- 4) Forests on the edge of upland bogs or transition mires may form a transition towards swamp forests (*Alnetea glutinosa*, *Alno-Ulmion* pp.).
- 5) **Dierssen, B. & Dierssen, K. (1982)**. Kiefernreiche Phytocoenosen oligotropher Moore im mittleren und nordwestlichen Europa. Überlegungen zur Problematik ihrer Zuordnung zu höheren syn systematischen Einheiten. In: Dierschke, H. (ed.) *Struktur und Dynamic von Wäldern*. Ber. Intern. Symp. IVV 1982, pp. 299-331.

91E0

* Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Pandion*, *Alnion incanae*, *Salicion albae*)

PAL.CLASS.: 44.3, 44.2 and 44.13

- 1) Riparian forests of *Fraxinus excelsior* and *Alnus glutinosa*, of temperate and Boreal Europe lowland and hill watercourses (44.3: *Alno-Padion*); riparian woods of *Alnus incanae* of montane and sub-montane rivers of the Alps and the northern Apennines (44.2: *Alnion incanae*); arborescent galleries of tall *Salix alba*, *S. fragilis* and *Populus nigra*, along medio-European lowland, hill or sub-montane rivers (44.13: *Salicion albae*). All types occur on heavy soils (generally rich in alluvial deposits) periodically inundated by the annual rise of the river (or brook) level, but otherwise well-drained and aerated during low-water. The herbaceous layer invariably includes many large species (*Filipendula ulmaria*, *Angelica sylvestris*, *Cardamine* spp., *Rumex sanguineus*, *Carex* spp., *Cirsium oleraceum*) and various vernal geophytes can occur, such as *Ranunculus ficaria*, *Anemone nemorosa*, *A. ranunculoides*, *Corydalis solida*.
This habitat includes several sub-types: ash-alder woods of springs and their rivers (44.31 - *Carici remotae-Fraxinetum*); ash-alder woods of fast-flowing rivers (44.32 - *Stellario-Alnetum glutinosae*); ash-alder woods of slow-flowing rivers (44.33 - *Pruno-Fraxinetum*, *Ulmo-Fraxinetum*); montane grey alder galleries (44.21 - *Calamagrosti variaae-Alnetum incanae* Moor 58); sub-montane grey alder galleries (44.22 - *Equiseto hyemalis-Alnetum incanae* Moor 58); white willow gallery forests (44.13 - *Salicion albae*). The Spanish types belong to the alliance *Osmundo-Alnion* (Cantabric atlantic and southeast Iberia peninsula).
- 2) Plants: Tree layer - *Alnus glutinosa*, *Alnus incanae*, *Fraxinus excelsior*; *Populus nigra*, *Salix alba*, *S. fragilis*; *Betula pubescens*, *Ulmus glabra*; Herb layer - *Angelica sylvestris*, *Cardamine amara*, *C. pratensis*, *Carex acutiformis*, *C. pendula*, *C. remota*, *C. strigosa*, *C. sylvatica*, *Cirsium oleraceum*,

Equisetum telmateia, *Equisetum* spp., *Filipendula ulmaria*, *Geranium sylvaticum*, *Geum rivale*, *Lycopus europaeus*, *Lysimachia nemorum*, *Rumex sanguineus*, *Stellaria nemorum*, *Urtica dioica*.

- 3) Corresponding categories
United Kingdom classification: "W5 *Alnus glutinosa*-*Carex paniculata* woodland", "W6 *Alnus glutinosa*-*Urtica dioica* woodland" and "W7 *Alnus glutinosa*-*Fraxinus excelsior*-*Lysimachia nemorum* woodland".
German classification: "43040401 Weichholzaunenwald mit weitgehend ungetörter Überflutungsdynamik", "43040402 Weichholzaunenwald ohne Überflutung", "430403 Schwarzerlenwald (an Fließgewässern)", "430402 Eschenwald (an Fließgewässern)", "430401 Grauerlenauenwald (montan, Alpenvorland, Alpen).
Nordic classification: "2234 *Fraxinus excelsior*-typ" and "224 Alskog".
- 4) Most of these forests are in contact with humid meadows or ravine forests (*Tilio-Acerion*). A succession towards *Carpinion* (*Primulo-Carpinetum*) can be observed.
- 5) **Brunet, J. (1991)**. Vegetation i Skånes alm- och askskogar. *Sven. Bot. Tidskr.* 85:377-384.
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91F0 **Riparian mixed forests of *Quercus robur*, *Ulmus laevis* and *Ulmus minor*, *Fraxinus excelsior* or *Fraxinus angustifolia*, along the great rivers (*Ulmenion minoris*)**

PAL.CLASS.: 44.4

- 1) Forests of hardwood trees of the major part of the river bed, liable to flooding during regular rising of water level or, of low areas liable to flooding following the raising of the water table. These forests develop on recent alluvial deposits. The soil may be well drained between inundations or remain wet. Following the hydric regime, the woody dominated species belong to *Fraxinus*, *Ulmus* or *Quercus* genus. The undergrowth is well developed.
- 2) Plants: *Quercus robur*, *Ulmus laevis*, *U. minor*, *U. glabra*, *Fraxinus excelsior*, *Fraxinus angustifolia*, *Populus nigra*, *P. canescens*, *P. tremula*, *Alnus glutinosa*, *Prunus padus*, *Humulus lupulus*, *Vitis vinifera* ssp. *sylvestris*, *Tamus communis*, *Hedera helix*, *Phalaris arundinacea*, *Corydalis solida*, *Gagea lutea*, *Ribes rubrum*.
- 3) Corresponding categories
German classification: "43040501 Hartholzaunenwald mit weitgehend ungestörter Überflutungsdynamik", "43040502 Hartholzaunenwald ohne Überflutung".
Nordic classification: "2223 *Ulmus glabra*-typ", "2236 *Quercus robur*-*Ulmus glabra*-*Tilia cordata* typ".
- 4) These forests form mosaics with pioneer or stable forests of soft wood trees, in low areas of the river bed; they may develop also from alluvial forests of hard wood trees. This habitat type often occurs in conjunction with alder-ash woodlands (44.3).

91G0 * Pannonic woods with *Quercus petraea* and *Carpinus betulus*

PAL.CLASS.: 41.2B, 41.266, 41.267

- 1) Forests with *Quercus petraea* and *Carpinus betulus* of the plains and low hills of south eastern central Europe on varied soil types (both calcareous and siliceous substrates). The shrub- and herb layer are dominated by subcontinental and submediterranean plant species. They occur in shady, humid valleys and slopes, particularly on deep soils but also on hill tops with shallow, oligotrophic substrates. Syntaxa include, *Primulo veris-Carpinetum*, *Fraxino pannonici-Carpinetum*.
- 2) Plants: *Carex pilosa*, *Euphorbia amigdaloides*, *Symphytum tuberosum*, *Dentaria bulbifera*, *Glechoma hirsuta*, *Festuca heterophylla*, *Carpinus betulus*, *Quercus petrae*, *Q. robur*, *Tilia cordata*, *Euonymus verrucosa*, *Acer campestre*, *Sorbus torminalis*, *Galium sylvaticum*, *Viola mirabilis*, *Gagea spathacea*, *Acer tataricum*, *Galanthus nivalis*, *Galium schultesii*, *Helleborus dumetorum*, *H. purpurascens*, *Isopyrum thalictroides*, *Knautia drymeia*, *Quercus cerris*, *Scilla drunensis*, *Staphylea pinnata*, *Symphytum tuberosum*, *Vinca minor*
- 4) These habitats may form a transition towards xerophile oak woods (*Quercus petraeae-cerris* forests and *Quercus pubescens* woods).
- 5) **Borhidi, A. (1967)**. Die geobotanischen Verhältnisse der Eichen-Hainbuchenwälder Südosteuropas. *Feddes Repert.* 77: 296-316.
Borhidi, A. & Kevey, B. (1996). An annotated checklist of the Hungarian plant communities. II. The forest vegetation. In: Borhidi, A. (ed.): *Critical Revision of the Hungarian Plant Communities*. Janus Pannonius Univ. Pécs, 95-138.
Csapody, I. (1967). Eichen-Hainbuchenwälder Ungarns. *Feddes Repert.* 77: 245-269.
Mucina, L., Grabherr, G., Wallnöfer, S. (1993). Die Pflanzengesellschaften Österreichs. Teil III, S. 199.
Neuhäusl U. Neuhäuslova-Novotna (1968). Übersicht der Carpinion-Gesellschaften der Tschechoslowakei.

91H0 * Pannonian woods with *Quercus pubescens*

PAL.CLASS.: 41.7374

- 1) Xerophyle oak woods of the periphery and hills of the Pannonic plain dominated by *Quercus pubescens* on extremely dry, southern exposed locations on shallow, calcareous soils. Because of these extreme site conditions, the woods are often fragmentary and low-growing, sometimes only shrubby. The herb layer is rich in species and often contains xerothermic species from dry grasslands or forest fringes. Occasionally *Tilia platyphyllos* and *Fraxinus excelsior* can become dominant.
- 2) Plants: *Quercus pubescens*, *Q. cerris*, *Fraxinus ornus*, *Sorbus domestica*, *S. torminalis*, *Colutea arborescens*, *Cornus mas*, *Pyrus pyraster*, *Arabis pauciflora*, *A. turrita*, *Buglossoides purpurcaerulea*, *Campanula bononiensis*, *Carex michelii*, *Euphorbia polychroma*, *Lactuca quercina*, *Limodorum abortivum*, *Milittis melissophyllum*, *Orchis purpurea*, *Potentilla alba*, *P. micrantha*, *Pulmonaria mollis* ssp. *mollis*, *Tanacetum corymbosum*, *Viola suavis*, *Euphorbia angulata*.
- 4) White-oak woods often form mosaics with dry grasslands.

91I0

* Euro-Siberian steppic woods with *Quercus* spp.

PAL.CLASS.: 41.7A

- 1) Xero-thermophile oak woods of the plains of south-eastern Europe. The climate is very continental, with a large temperature range. The substrate consists of 'Loess' (Chernozem soils). *Quercus robur*, *Quercus cerris* and *Quercus pubescens* dominate in the treelayer of this habitat type, which is rich in continental stepic vegetation elements and geophytes of the *Aceri tatarici-Quercion* Zólyomi 1957.
 - 2) Plants: *Quercus cerris*, *Q. pubescens*, *Q. robur*, *Q. petraea*, *Acer campestre*, *Sorbus torminalis*, *Cornus sanguinea*, *Crataegus monogyna*, *Euonymus verrucosa*, *Ligustrum vulgare*, *Prunus spinosa*, *Pyrus pyraster*, *Rhamnus cathartica*, *Ulmus minor*, *Buglossoides purpureoerulea*, *Carex michelii*, *Dactylis polygama*, *Geum urbanum*, *Lathyrus niger*, *Polygonatum latifolium*, *Pulmonaria mollis* spp. *mollis*, *Tanacetum corymbosum*, *Vincetoxicum hirundinaria*.
 - 4) This habitat type, which formed the natural vegetation of south-eastern Europe, is today very fragmented. In Austria they are often degraded by invasion of *Robinia*.
-

91J0

* *Taxus baccata* woods of the British Isles

PAL.CLASS.: 42.A71

- 1) *Taxus baccata* woods with *Sorbus aria* or *Mercurialis perennis* of dry valleys and scarps of the chalk of south-east England, very locally of the Durham Magnesium limestone, Morecambe Bay and elsewhere. They also occur in the forest of Muckcross (Killarney, Ireland).
 - 2) Plants: *Buxus sempervirens*, *Ilex aquifolium*, *Mercurialis perennis*, *Sorbus aria*, *Taxus baccata*.
 - 3) Corresponding categories
United Kingdom classification: "W13 *Taxus baccata* woodland".
-

91K0 Illyrian *Fagus sylvatica* forests (*Aremonio-Fagion*)

PAL.CLASS.: 41.1C

- 1) *Fagus sylvatica* forests of the Dinarides and of associated ranges and hills, with outliers and irradiations in the southeastern Alps and in the mid-Pannonic hills. In these areas they are in contact with, or interspersed among, medio-European beech forests such as 9130, 9140 and 9150. Species diversity is greater than in the Central European beech woods and the *Aremonio-Fagion* constitutes an important centre of species diversity.
- 2) Plants:. *Fagus sylvatica*, *F. moesiaca*, *Acer obtusatum*, *Ostrya carpinifolia*, *Abies alba*, *Quercus cerris*, *Sorbus graeca*, *Tilia tomentosa*, *Anemone trifolia*, *Aremonia agrimonioides*, *Calamintha grandiflora*, *Cardamine trifolia*, *C. waldsteinii*, *Corylus colurna*, *Cotoneaster tomentosa*, *Cyclamen purpurascens*, *Dentaria eneaphyllos*, *Dentaria enneaphyllos*, *Dentaria trifolia*, *Doronicum austriacum*, *Epimedium alpinum*, *Euphorbia carniolica*, *Hacquetia epipactis*, *Helleborus niger* ssp. *niger*, *H. odoratus*, *Knautia drymeia*, *Lamiukm orvala*, *Lamium orvala*, *Lonicera nigra*, *Omphalodes verna*, *Pancicia serbica*, *Primula vulgaris*, *R. hypoglossum*, *Ruscus* spp. *Saxifraga lasiophylla*, *Scopolia carniolica*, *Scrophularia scopolii*, *Sesleria autumnalis*, *Vicia oroboides*

- 5) **Borhidi, A. (1963).** Die Zönologie des Verbandes Fagion illyricum. I. Allgemeiner Teil. - *Acta Bot. Acad. Sci. Hung.* **9**: 259-297.
Borhidi, A. (1965). Die Zönologie des Verbandes Fagion illyricum. II. Systematischer Teil. - *Acta Bot. Acad. Sci. Hung.* **13**: 53-102.
Horvat, I., Glavac, V. & Ellenberg, H. (1974). *Vegetation Süd-Osteuropas*. Stuttgart, pp. 768.
Maricek, L., Mucina, L., Zupanic, L., Poldini, I., Dakskobler, I. & Acceto, M. (1992). Nomenklatorische Revision der Illyrischen Buchenwälder (Verband Aremonio-Fagion). *Studia Geobotanica* **13b**: 121-135.
Török, K., Podani, J. & Borhidi, A. (1989:). Numerical revision of Fagion illyricum alliance. - *Vegetatio*, **81**: 169-180.
-

91L0 Illyrian oak –hornbeam forests (*Erythronio-Carpinion*)

PAL.CLASS.: 41.2A

- 1) Forests of *Quercus robur* or *Q. petraea*, sometimes *Q. cerris*, and *Carpinus betulus* on both calcareous and siliceous bedrocks, mostly on deep neutral to slightly acidic brown forest soils, with mild humus in the SE-Alpine-Dinaric region, West- and Central Balkans extending northwards to Lake Balaton mostly in hilly and submontane regions, river valleys and the plains of the Drava and Sava. The climate is more continental than in sub-Mediterranean regions and warmer than in middle Europe; these forests are intermediate between oak-hornbeam woods (e.g. 9170) of central Europe and those of the Balkans and merge northwards into the Pannonic oak woods (91G0). They have a much higher species richness than the Central European oak woods. Outliers of these forests also occur in Frioul and the northern Apennines.
- 2) Plants: *Quercus robur*, *Q. petraea*, *Q. cerris*, *Carpinus betulus*, *Acer tataricum*, *Tilia tomentosa*, *Castanea sativa*, *Fraxinus angustifolia* subsp. *pannonica*, *Euonymus verrucosa*, *Lonicera caprifolium*, *Adoxa moschatellina*, *Cyclamen purpurascens*, *Dentaria pentaphyllos*, *Epimedium alpinum*, *Erythronium dens-canis*, *Knautia drymeia*, *Helleborus macranthus*, *H. dumetorum* ssp. *atrorubens*, *H. cyclophyllus*, *Asperula taurina*, *Lathyrus venetus*, *Potentilla micrantha*, *Dianthus barbatus*, *Luzula forsteri*, *Primula vulgaris*, *Pseudostellaria europaea*, *Ruscus aculeatus*, *Tamus communis*.
- 5) **Borhidi, A. (1967).** Die geobotanischen Verhältnisse der Eichen-Hainbuchenwälder Südosteuropas. *Feddes Repert.* **77**: 296-316.
Borhidi, A. & Kevey, B. (1996). An annotated checklist of the Hungarian plant communities. II. The forest vegetation. In: Borhidi, A. (ed.): *Critical Revision of the Hungarian Plant Communities*. Janus Pannonius Univ. Pécs, 95-138.
Marineček, L. (1994). Zur Nomenklatur der Hainbuchenwälder des Erythronio-Carpinion. Simpozij-Pevalek (Zagreb): 57-62
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91M0 Pannonian-Balkan turkey oak- sessile oak forests

PAL.CLASS.: 41.769

- 1) Sub-continental thermo-xerophile *Quercus cerris*, *Q. petraea* or *Q. frainetto* forests of the Pannonic and northern Balcanic hilly regions and in lower mountains with the continental *Acer tataricum* and lacking typically sub-Mediterranean species such as *Carpinus orientalis* and *Ruscus aculeatus*. Distributed generally between 250 and 600 (800) m above sea level and developed on varied substrates: limestones, andesites, basalt, loess, clay, sand, etc., on slightly acidic, usually deep brown soils

- 2) Plants: *Quercus petraea* *Q. dalechampii*, *Q. polycarpa*, *Q. cerris*, *Q. frainetto*, *Acer tataricum*, *Ligustrum vulgare*, *Euonymus europaeus*, *Festuca heterophylla*, *Carex montana*, *Poa nemoralis*, *Potentilla alba*, *Potentilla micrantha*, *Tanacetum corymbosum*, *Campanula persicifolia*, *Digitalis grandiflora*, *Vicia cassubica*, *Viscaria vulgaris*, *Lychnis coronaria*, *Achillea distans*, *Achillea nobilis*, *Silene nutans*, *S. viridiflora*, *Hieracium racemosum*, *H. sabaudum*, *Galium schultesii*, *Lathyrus niger*, *Veratrum nigrum*, *Asphodelus albus*, *Peucedanum oreoselinum*, *Helleborus odorus*, *Luzula forsteri*, *Physospermum aquilegifolium*, *Molinia litoralis*
- 6) **Borhidi, A. (1996)**. A critical revision of the Hungarian plant communities. – Janus Pannonius University, Pécs, 138 pp.
Borhidi A. and Sánta A. (eds.) (1999). Vörös Könyv Magyarország növénytársulásairól. 1-2. kötet. (Red Book of Hungarian plant communities. Vol. 1-2.) - TermészetBÚVÁR Alapítvány Kiadó, Budapest. 768 pp. (in Hungarian).
Horánszky, A. (1964). Die Wälder des Szentendre-Visegráder Gebirges. - Akadémiai Kiadó, Budapest. Pócs, T., Domokos, É., Pócs-Gelencsér, I. & Vida, G. (1958): Vegetationsstudien in Örség (Ungarisches Ostalpenvorland). - Akadémiai Kiadó, Budapest.
Simon, T. (1979). Vegetationsuntersuchungen im Zempléner Gebirge. - Akadémiai Kiadó, Budapest.

91N0 *Pannonic inland sand dune thicket (*Junipero-Populetum albae*)

PAL.CLASS.: 41.87

- 1) Xerophilous mosaic of open scrub or open woodlands with *Juniperus communis* and *Populus* species and open or closed sand steppe grasslands of sands, particularly sand dunes, of the Danube-Tisza confluence of the Pannonic plain. Woodland herbaceous species are lacking and the habitat in general more closely resembles semi-desert scrub than steppe woodland.
- 2) Plants: *Populus alba*, *P. canescens*, *P. nigra*, *Juniperus communis*, *Ligustrum vulgare*, *Rhamnus catharticus*, *Crataegus monogyna*, *Prunus spinosa*, *Prunus mahaleb*, *Rubus caesius*, *Euonymus verrucosus*, *Berberis vulgaris*, *Festuca vaginata*, *Syntrichia* spp., *Fumana procumbens*, *Euphorbia seguieriana*, *Polygonatum odoratum*, *Poa angustifolia*, *Koeleria glauca*, *Stipa joannis*, *Bromus tectorum*, *Epipactis bugacensis*, *E. atrorubens*, *Cephalanthera rubra*
- 5) **Altbacker, V. (1998)**. Növényevő emlősök és a vegetáció kapcsolatának vizsgálata homoki társulásokban. (A study of the relationship between herbivores and the vegetation in sand communities.) - pp. 125-143 in: Fekete, G. (ed.): A közösségi ökológia frontvonalai. (Frontiers in communities ecology). Scientia Kiadó, Budapest (in Hungarian).
Borhidi, A. (1996). Critical revision of the Hungarian plant communities, Janus Pannonius University, Pécs, p. 138.
Borhidi A. & Sánta A. (eds.) (1999). Vörös Könyv Magyarország növénytársulásairól. 1-2. kötet. (Red Book of Hungarian plant communities. Vol. 1-2.) - TermészetBÚVÁR Alapítvány Kiadó, Budapest. 768 pp. (in Hungarian).
Fekete, G., Molnár, Zs. & Horváth, F. (eds.) (1997). Nemzeti Biodiverzitás-monitorozó Rendszer II. A magyarországi élőhelyek leírása és határozója és a Nemzeti Élőhely-osztályozási Rendszer. (National Biodiversity Monitoring System II. Description and identification key of Hungarian habitats, and the National Habitat Classification System.) - The Hungarian Natural History Museum, Budapest, pp. 374. (in Hungarian).

91P0 Holy Cross fir forests (*Abietetum polonicum*)

PAL.CLASS.: 42.134

- 1) Upland fir, or fir-dominated fir-spruce or fir-pine-oak forests developed on mesotrophic acid soils of Little-Poland, in particular of the Holy Cross mountains and of sub-Carpathic hills. They are rich in ferns, bryophytes and lowland forest species shared with deciduous forests of the *Tilio-Carpinetum*.
 - 2) Plants: *Abies alba*, *Fagus sylvatica*, *Quercus robur*, *Quercus sessilis*, *Pinus silvestris*, *Betula verrucosa*, *Populus tremula*, *Picea excelsa*, *Alnus glutinosa*, *Sambucus racemosa*, *Rubus idaea*, *Dryopteris austriaca*, *Athyrium filix-femina*, *Phegopteris dryopteris*, *Phegopteris polypodioides*, *Lycopodium annotinum*, *Hylocomium splendens*, *Polytrichum formosum*, *Majanthemum bifolium*, *Rubus* cfr. *hirsutus*, *Galeobdolon luteum*, *Oxalis acetosella*, *Luzula pilosa*.
-

91Q0 Western Carpathian calcicolous *Pinus sylvestris* forests

PAL.CLASS.: 42.542

- 1) Isolated, calcicolous *Pinus sylvestris* forests of the western Carpathians limited to a few small enclaves in the Strazov mountains, the Velka Fatra, the Pienini, the inner-Carpathian basins and the Erzgebirge. *Erica herbacea* and *Polygala chamaebuxus* are absent and the undergrowth includes a number of species of continental distribution and xerothermic affinities including western Carpathian endemics.
 - 2) Plants: *Pinus sylvestris*, *Linum flavum*, *Carex humilis*, *Carex alba*, *Calamagrostis varia*, *Pulsatilla slavica*, *Thymus carpathicus*, *Primula auricula* ssp. *hungarica*, *Globularia aphyllanthes*, *Campanula carpatica*, *Festuca tatrae*, *Dianthus nitidus*, *D. praecox*, *Festuca tatrae*, *Cyanus triumfettii* ssp. *dominii*, *Minuartia langii*, *Soldanella carpatica*, *Campanula carpatica*, *C. serrata*, *Gentianella fatrae*, *G. lutescens* subsp. *carpatica*, *Koeleria tristis*, *Thymus pulcherrimus* ssp. *sudeticus*, *Iris aphylla* ssp. *hungarica*
-

91R0 Dinaric dolomite Scots pine forests (*Genisto januensis-Pinetum*)

PAL.CLASS.: 42.5C52

- 1) *Pinus sylvestris* woods of dolomites and dolomite rendzinas of the Dinarides. They are developed within the Illyrian beech forest zone (91K0) and often occupy somewhat higher elevations than the similar dolomite *Pinus nigra* woods of unit 42.6214.
 - 2) Plants: *Pinus sylvestris*, *Erica herbacea*, *E. carnea*, *Galium lucidum*, *Genista januensis*, *Aquilegia vulgaris*, *Bupthalmum salicifolium*, *Teucrium chamaedrys*, *Carex humilis*, *Anthericum ramosum*, *Cyclamen purpurascens*, *Polygala chamaebuxus*, *Hepatica nobilis*, *Geranium sanguineum*, *Helleborus niger* ssp. *macranthus*, *Epipactis atrorubens*, *Carex alba*.
-

91T0 Central European lichen pine forests

PAL.CLASS.: 42.52112, 61.15p

- 1) Natural lichen-rich acidophilous *Pinus sylvestris* forests belonging to the alliance *Dicrano-Pinion* occurring on inland nutrient poor sands of the north-eastern plains and hills of Central Europe and of

the nemoral belt of the middle and southern Sarmatic region. The trees are low growing as the soils are nutrient deficient and subject to drought stress

- 2) Plants: *Pinus sylvestris*, *Juniperus communis*, *Cladonia furcata*, *Cladonia gracilis*, *Cladonia silvatica*, *Ptilidium ciliare*
 - 4) These forests are often a characteristic stage of natural succession on inland dunes (61.15), stands of plantation origin should not be included. Similar woodlands on coastal sand dunes should be regarded as '2180 Wooded dunes of the Atlantic, Continental and Boreal region'.
-

91U0 Sarmatic steppe pine forests (*Cytiso-Pinetalia*)

PAL.CLASS.: 42.5232

- 1) Xerophilous Scots pine woods of the Sarmatic region of western Eurasia and of areas with an extremely continental micro climate in northeastern Central and Eastern Europe. Towards its western limit this habitat is restricted to well drained habitats such as inland dunes and cliffs. There are many relict species of continental origin. Syntaxa included are the *Anemono-Picetum sylvestris*, *Peucedano-Pinetum*, *Koelerio glaucae-Pinetum sylvestris*, *Caragano-Pinetum*, *Pyrolo-Pinetum sylvestris* (p.) & *Corynephoru-Pinetum sylvestris*.
 - 2) Plants: *Pinus sylvestris*, *Vaccinium myrtillus*, *Pyrola minor*, *Orthilia minor*, *Chimaphilla umbellata*, *Ophrys insectifera*, *Coronilla vaginalis*, *Globularia punctata*, *Brachypodium pinnatum*.
 - 3) Corresponding categories
Czech classification: L8.2 Lesostepní bory
-

91V0 Dacian Beech forests (*Symphyto-Fagion*)

PAL.CLASS.: 41.1D

- 1) *Fagus sylvatica*, or, locally, *F. orientalis*, *F. moesiaca* or *F. taurica* forests of the Romanian, Ukrainian and eastern Serbian Carpathians, east of the Uz and the Stry, and of the west Ukrainian pre-Carpathic hills and plateaux.
- 2) Plants: *Symphytum cordatum*, *Cardamine glanduligera* (syn *Dentaria glandulosa*), *Hepatica transsilvanica*, *Pulmonaria rubra*, *Leucanthemum waldsteinii*, *Silene heuffelii*, *Ranunculus carpaticus*, *Euphorbia carniolica*, *Aconitum moldavicum*, *Saxifraga rotundifolia* ssp. *heuffelii*, *Primula elatior* ssp. *leucophylla*, *Hieracium rotundatum*, *Galium kitaibelianum*, *Moehringia pendula*, *Festuca drymeja*
5. Coldea GH. (1991). Prodrome des associations vegetales des Carpates du sud-est (Carpates Roumaines). *Documents Phytosociologiques*, Camerino

Mediterranean deciduous forests

9210 * Apennine beech forests with *Taxus* and *Ilex*

PAL.CLASS.: 41.181, 41.185 and 41.186

- 1) Thermophilous beech forests, highly fragmented and harbouring many endemics, with *Taxus baccata* and *Ilex aquifolium* (*Geranio nodosi-Fagion*, *Geranio striati-Fagion*). This habitat type includes: Monte Gargano Foresta Umbra, rich in *Taxus baccata* (41.181); silicolous beech forests of the Aspromonte range of Calabria with *Taxus baccata*, *Populus tremula*, *Sorbus aucuparia* and *Betula pendula* (41.185); Relict beech forests of the Madonie, Nebrodi and, very locally, the monti Peloritani, with *Ilex aquifolium*, *Daphne laureola*, *Crataegus monogyna* and *Prunus spinosa* (41.186).
 - 2) Plants: *Fagus sylvaticus*, *Ilex aquifolium*, *Taxus baccata*.
-

9220 * Apennine beech forests with *Abies alba* and beech forests with *Abies nebrodensis*

PAL.CLASS.: 41.186 and 41.187

- 1) Beech forests of the hill level, on sites colder than those of 41.181, highly fragmented and harbouring many endemics, with *Abies alba* and *Abies nebrodensis* (*Geranio nodosi-Fagion*, *Geranio striati-Fagion*). Relict beech forests of the Madonie, Nebrodi and, very locally, the monti Peloritani, with *Ilex aquifolium*, *Daphne laureola*, *Crataegus monogyna* and *Prunus spinosa* (41.186); isolated beech forests of Mount Etna, at the southern limit of the range of the species (41.187).
 - 2) Plants: *Abies alba*, **A. nebrodensis*, *Fagus sylvatica*.
-

9230 Galicio-Portuguese oak woods with *Quercus robur* and *Quercus pyrenaica*

PAL.CLASS.: 41.6

- 1) *Quercus pyrenaica* -dominated forests (*Quercion robori-pyrenaicae*).
Sub-types :
 - 41.61 - Central Iberian *Quercus pyrenaica* forests
Supra- and sometimes meso-Mediterranean *Quercus pyrenaica* forests of western Iberia, the Leonese interior, the Cordillera Central, the Iberian Range, the Montes de Toledo and the Sierra Morena.
 - 41.62 - Cantabrian *Quercus pyrenaica* forests
Melampyro pratense-Quercetum pyrenaicae, *Linario triornithophorae-Quercetum pyrenaicae*
Quercus pyrenaica formations of medio-European character, of the collinar and montane levels of the Cantabrian chain and its satellite ranges west to the Sierra de Picos de Ancares in Galicia, characteristic of areas with comparatively low precipitation, in the rain shadow of the coastward ranges or the interior oro-Cantabrian hills.
 - 41.63 - Maestrazgan *Quercus pyrenaica* forests

- Cephalanthero rubrae-Quercetum pyrenaicae*
Quercus pyrenaica forests of the sub-Mediterranean siliceous enclaves of the Maestrazgo and eastern Catalanian ranges, reduced to a very few relicts in the Penagolosa and Prades massifs.
- 41.64 - Baetic *Quercus pyrenaica* forests
Adenocarpus decorticans-Quercetum pyrenaicae
Quercus pyrenaica forests of siliceous supra-Mediterranean areas with sub-humid climate of the western Sierra Nevada, the Sierra de Alfacar, the northern flanks of the Sierra de Cazulas and the Sierra Tejeda; in more humid locations *Fraxinus angustifolius* and *Acer granatense* accompany *Q. pyrenaica*.
- 41.65 - French *Quercus pyrenaica* forests
Betulo-Quercetum pyrenaica i. a.
Quercus pyrenaica forests of south-western France north to the Sologne where they constitute relatively extensive formations on poor soils, with *Betula pendula*, *Lonicera periclymenum*, *Deschampsia flexuosa*, *Holcus mollis*, *Molinia caerulea*, *Teucrium scorodonia*.

- 2) Plants: *Quercus pyrenaica*, *Q. robur*.

9240

***Quercus faginea* and *Quercus canariensis* Iberian woods**

PAL.CLASS.: 41.77

- 1) Forests and woods dominated by *Quercus faginea*, *Quercus canariensis* or *Quercus afares*. The humid formations of south-western Iberia (41.772 and 41.773) are forest types of unique character in Europe and of extreme biological importance.
- Sub-types :
- 41.771- Spanish *Quercus faginea* forests
Spiraea obovatae-Quercetum fagineae, *Cephalanthero longifoliae-Quercetum fagineae*, *Viola wilkommii-Quercetum fagineae*, *Daphno latifoliae-Aceretum granatensis*, *Fraxino ornithogalae-Quercetum fagineae*
Xero-mesophile *Quercus faginea* formations of slopes and plateaux of middle elevations of the Spanish Meseta and associated ranges.
- 41.772 - Portuguese *Quercus faginea* forests
Arisaro-Quercetum fagineae
Humid, epiphyte-clad, dense, relict *Quercus faginea* forests of Portugal, restricted to a very few isolated localities.
- 41.773 -Andalusian *Quercus canariensis* forests
Rusco hypophylli-Quercetum canariensis
Humid and hyper-humid, luxuriant *Quercus canariensis* forests of the sierras of extreme southern Spain, limited to the Aljibe and a very few localities in the Serrania de Ronda.
- 41.774 - Catalanian *Quercus canariensis* stands
Carici depressae-Quercetum canariensis
Formations of Catalonia rich in *Quercus canariensis*.
- 41.775 - Balearic *Quercus faginea* woods
Aceri-Quercetum fagineae p.
Relict formations of Mallorca dominated by, or rich in, *Quercus faginea*.
- 2) Plants: *Quercus faginea*, *Q. canariensis*.

9250***Quercus trojana* woods**

PAL.CLASS.: 41.78

- 1) Supra-Mediterranean, and occasionally meso-Mediterranean woods dominated by the semi-deciduous *Quercus trojana* or its allies (*Quercetum trojanae*).

Sub-types :

41.781 - Helleno-Balkan Trojan oak woods

Usually low formations dominated by *Quercus trojana*, often with junipers or maples, of Macedonia, Thrace and Thessaly, north to Herzegovina, Montenegro, Albania and the Vardar valley of Paeonia.

41.782 - Apulian Trojan oak woods

Relict woods, sometimes of considerable height, of *Quercus trojana* and *Q. pubescens*, often with an admixture of *Q. ilex* and its associated vegetation (Murge: e.g. bosco delle Pianelle, foresta Gaglione).

- 2) Plants: *Quercus trojana*.
-

9260***Castanea sativa* woods**

PAL.CLASS.: 41.9

- 1) Supra-Mediterranean and sub-Mediterranean *Castanea sativa*-dominated forests and old established plantations with semi-natural undergrowth.

- 2) Plants: *Castanea sativa*.
-

9270**Hellenic beech forests with *Abies borisii-regis***

PAL.CLASS.: 41.1A

- 1) *Fagus sylvatica* forests with reduced medio-European character and high endemism, characterised by the presence of *Abies borisii-regis*, *Doronicum caucasicum*, *Galium laconicum*, *Lathyrus venetus*, *Helleborus cyclophyllus* (*Fagion hellenicum*).

- 2) Plants: *Fagus sylvatica*, *Abies borisii-regis*.
-

9280***Quercus frainetto* woods**

PAL.CLASS.: 41.1B

- 1) *Fagus sylvatica* or *Fagus moesiaca* forests, more thermophile than those of 41.19 and 41.1A, occurring in the transition zone between the supra-Mediterranean and montane levels, characterised by the presence of numerous species of the *Quercion frainetto*.

- 2) Plants: *Fagus sylvatica*, *Quercus frainetto*.

9290***Cupressus* forests (*Acero-Cupression*)**

PAL.CLASS.: 42.A1

- 1) Montane forests of the Mediterranean basin, dominated by *Cupressus sempervirens*, *Cupressus atlantica* or *Cupressus dupreziana* (*Acero-Cupression*).
 - 2) Plants: *Cupressus sempervirens*.
-

92A0***Salix alba* and *Populus alba* galleries**

PAL.CLASS.: 44.141 and 44.6

- 1) Riparian forests of the Mediterranean basin dominated by *Salix alba*, *Salix fragilis* or their relatives (44.141). Mediterranean and Central Eurasian multi-layered riverine forests with *Populus* spp., *Ulmus* spp., *Salix* spp., *Alnus* spp., *Acer* spp., *Tamarix* spp., *Juglans regia*, lianas. Tall poplars, *Populus alba*, *Populus caspica*, *Populus euphratica* (*Populus diversifolia*), are usually dominant in height; they may be absent or sparse in some associations which are then dominated by species of the genera listed above (44.6).
 - 2) Plants: *Salix alba*, *Populus alba*.
-

92B0**Riparian formations on intermittent Mediterranean water courses with *Rhododendron ponticum*, *Salix* and others**

PAL.CLASS.: 44.52 and 44.54

- 1) Distinctive, relict thermo- and meso-Mediterranean alder galleries of deep, steep-sided valleys, with *Rhododendron ponticum* ssp. *baeticum*, *Frangula alnus* ssp. *baetica*, *Arisarum proboscideum* and a rich fern community including *Pteris incompleta*, *Diplazium caudatum*, *Culcita macrocarpa* (44.52).
Relict *Betula parvibracteata* riparian galleries. The dominant species, an extremely local endemic, is accompanied by *Myrica gale*, *Frangula alnus*, *Salix atrocinerea*, *Galium broterianum*, *Scilla ramburei* (44.54).
- 2) Plants: *Rhododendron ponticum* ssp. *baeticum*, *Frangula alnus* ssp. *baetica*, *Arisarum proboscideum*, *Betula parvibracteata*.
- 4) The *Rhododendron*-alder galleries are often in contact with humid to hyper-humid *Quercus canariensis* forests (41.773) and with *Salix pedicellata* formations (44.1271).

***Platanus orientalis* and *Liquidambar orientalis* woods
(*Plantanion orientalis*)**

PAL.CLASS.: 44.71 and 44.72

- 1) Forests and woods, for the most part riparian, dominated by *Platanus orientalis* (oriental plane) or *Liquidambar orientalis* (sweet gum), belonging to the *Plantanion orientalis* alliance.

Sub-types :

44.71 - Oriental plane woods (*Plantanion orientalis*)

Forests of *Platanus orientalis*.

44.711 - Helleno-Balkan riparian plane forests

Platanus orientalis gallery forests of Greek and southern Balkanic watercourses, temporary rivers and gorges; they are distributed throughout the mainland and archipelagos, colonising poorly stabilised alluvial deposits of large rivers, gravel or boulder deposits of permanent or temporary torrents, spring basins, and particularly, the bottom of steep, shady gorges, where they constitute species-rich communities. The accompanying flora may include *Salix alba*, *S. elaeagnos*, *S. purpurea*, *Alnus glutinosa*, *Cercis siliquastrum*, *Celtis australis*, *Populus alba*, *P. nigra*, *Juglans regia*, *Fraxinus ornus*, *Alnus glutinosa*, *Crataegus monogyna*, *Cornus sanguinea*, *Ruscus aculeatus*, *Vitex agnus-castus*, *Nerium oleander*, *Rubus* spp., *Rosa sempervirens*, *Hedera helix*, *Clematis vitalba*, *Vitis vinifera* ssp. *sylvestris*, *Ranunculus ficaria*, *Anemone blanda*, *Aristolochia rotunda*, *Saponaria officinalis*, *Symphytum bulbosum*, *Hypericum hircinum*, *Calamintha grandiflora*, *Melissa officinalis*, *Helleborus cyclophyllus*, *Cyclamen hederifolium*, *C. repandum*, *C. creticum*, *Galanthus nivalis* ssp. *reginae-olgae*, *Dracunculus vulgaris*, *Arum italicum*, *Biarum tenuifolium*, *Brachypodium sylvaticum*, *Dactylis glomerata* and may be rich in mosses, lichens and ferns, among which *Pteridium aquilinum* is often abundant. Various associations have been described, reflecting regional and ecological variation in the composition of the undergrowth. The plane tree galleries are particularly well represented along the Ionian coast and in the Pindus; other important local complexes exist in Macedonia, in Thrace, around the Olympus massif, in the Pelion, in the Peloponnese, particularly in the Taygetos, where luxuriant gorge forests reach 1300m, in Euboea and in Crete; local, distinctive, representatives occur in other Aegean islands, such as Rhodes, Samos, Samothrace, Thasos. Restriction to gorges is increasingly pronounced towards the south.

44.712 - Hellenic slope plane woods

Platanus orientalis woods on colluvions, detritus cones, ravine sides or other poorly stabilised substrates, of Greece.

44.713 - Sicilian plane tree canyons

Relict *Platanus orientalis*-dominated or *P. orientalis* -rich galleries of the Cassabile, the Anapo, the Irminio and the Carbo rivers, in the Iblei range of south-eastern Sicily, of the gorge of the Sirmeto, in the vicinity of the Nebrodi. Some of these formations, in particular, in the gorges of the Cassabile and of the Anapo, are true plane tree woods. Others, such as on the Sirmeto, are *Populus alba*, *Fraxinus angustifolia*, *Salix* spp. formations with *Platanus orientalis*; as they grade into each other, and because of the very isolated occurrence, and great biogeographical and historical interest of *Platanus orientalis* in Sicily, they are all listed here. Plane tree woods have had a much greater extension in Sicily and probably in Calabria. A large forest has, in particular, existed on the Alcantara, where the species is now extinct.

44.72 - Sweet gum woods

Riverine forests dominated by the Tertiary relict *Liquidambar orientalis*, with very limited range in south Asia Minor and Rhodes.

44.721 - Rhodian sweet gum woods

Liquidambar orientalis gallery forest of the Petaloudhes Valley, on Rhodes, with poorly developed undergrowth and a ground layer dominated by *Adiantum capillus-veneris* in damp areas. This forest constitutes the only European formation of this species and harbours the unique, concentrated aggregation of Jersey Tiger Moths, *Panaxia quadripunctaria*.

- 2) Plants: *Platanus orientalis*, *Liquidambar orientalis*.
-

92D0 Southern riparian galleries and thickets (*Nerio-Tamaricetea* and *Securinegion tinctoriae*)

PAL.CLASS.: 44.81 to 44.84

- 1) Tamarisk, oleander, and chaste tree galleries and thickets and similar low ligneous formations of permanent or temporary streams and wetlands of the thermo-Mediterranean zone and south-western Iberia, and of the most hygromorphic locations within the Saharo-Mediterranean and Saharo-Sindian zones.
The formations with *Tamarix africana* should not be taken into account.
- 2) Plants: *Nerium oleander*, *Vitex agnus-castus*, *Tamarix* spp., *Securinega tinctoria*, *Prunus lusitanica*, *Viburnum tinus*.
-

Mediterranean sclerophyllous forests

9310 Aegean *Quercus brachyphylla* forests

PAL.CLASS.: 41.735

- 1) Stands of *Quercus brachyphylla*, often associated with *Quercus macrolepis* or *Q. ilex*.
- 2) Plants: *Quercus brachyphylla*.
-

9320 *Olea* and *Ceratonia* forests

PAL.CLASS.: 45.1

- 1) Thermo-Mediterranean or thermo-Canarian woodland dominated by arborescent *Olea europaea* ssp. *sylvestris*, *Ceratonia siliqua*, *Pistacia lentiscus*, *Myrtus communis* or, in the Canary Islands, by *Olea europaea* ssp. *cerasiformis* and *Pistacia atlantica*. Most formations will be listed as arborescent matorral (35.12), but a few stands may have a sufficiently tall, closed canopy to qualify for this unit.
Sub-types :
45.11 - Wild olive woodland
Olea europaea ssp. *sylvestris* - dominated formations. A climax olive forest, with *Ceratonia siliqua* and *Pistacia lentiscus* exists on the north flank of Djebel Ichkeul in northern Tunisia. Elsewhere, the communities most resembling olive forest are found in southern Andalusia (*Tamo communis-Oleetum sylvestris*: extinct?), in Menorca (*Prasio majoris-Oleetum sylvestris*), Sardinia, Sicily, Calabria, Crete.

45.12 - Carob woodland

Ceratonia siliqua - dominated formations, often with *Olea europaea* ssp. *sylvestris* and *Pistacia lentiscus*. The most developed examples, some truly forest-like, are to be found in Tunisia, on the slopes of the Djebel, where they constitute carob-dominated facies of the wild olive woodlands (45.11), in Mallorca (*Cneoro tricocci-Ceratonietum siliquae*), in eastern Sardinia, in south-eastern Sicily, in Puglia, in Crete.

45.13 - Canarian olive woodland

Olea europaea ssp. *cerasiformis* and *Pistacia atlantica* formations of the Canary Islands.

- 2) Plants: *Olea europaea* ssp. *sylvestris*, *Ceratonia siliqua*, *Pistacia lentiscus*, *Myrtus communis*, *Olea europaea* ssp. *cerasiformis*, *Pistacia atlantica*.
-

9330

***Quercus suber* forests**

PAL.CLASS.: 45.2

- 1) West-Mediterranean silicicolous forests dominated by *Quercus suber*, usually more thermophile and hygrophile than 45.3.

Sub-types :

45.21 - Tyrrhenian cork-oak forests

Quercion suberis

Mostly meso-Mediterranean *Quercus suber* forests of Italy, Sicily, Sardinia, Corsica, France and north-eastern Spain. They are most often degraded to arborescent matorral (32.11).

45.22 - South-western Iberian cork-oak forests

Quercion fagineo-suberis

Quercus suber forests, often with *Q. faginea* or *Q. canariensis*, of the south-western quadrant of the Iberian peninsula.

45.23 -North-western Iberian cork-oak forests

Very local, exiguous *Quercus suber* enclaves in the *Q. pyrenaica* forest area of the valleys of the Sil and of the Mino (Galicia).

45.24 - Aquitanian cork-oak woodland

Isolated *Q. suber*-dominated stands occurring either as a facies of dunal pine-cork oak forests or in a very limited area of the eastern Landes.

- 2) Plants: *Quercus suber*.
-

9340

***Quercus ilex* and *Quercus rotundifolia* forests**

PAL.CLASS.: 45.3

- 1) Forests dominated by *Quercus ilex* or *Q. rotundifolia*, often, but not necessarily, calcicolous.

Sub-types :

45.31 - Meso-Mediterranean holm-oak forests

Rich meso-Mediterranean formations, penetrating locally, mostly in ravines, into the thermo-Mediterranean zone. They are often degraded to arborescent matorral (32.11), and some of the types listed below no longer exist in the fully developed forest state relevant to category 45; they have nevertheless been included, both to provide appropriate codes for use in 32.11, and because restoration may be possible.

45.32 - Supra-Mediterranean holm-oak forests

Formations of the supra-Mediterranean levels, often mixed with deciduous oaks, *Acer* spp. or *Ostrya carpinifolia*.

45.33 - Aquitanian holm-oak woodland

Isolated *Quercus ilex*-dominated stands occurring as a facies of dunal pine-holm oak forests.

45.34 - *Quercus rotundifolia* woodland

Iberian forest communities formed by *Q. rotundifolia*. Generally, even in mature state, less tall, less luxuriant and drier than the fully developed forests that can be constituted by the closely related *Q. ilex*, they are, moreover, most often degraded into open woodland or even arborescent matorral. Species characteristic of the undergrowth are *Arbutus unedo*, *Phillyrea angustifolia*, *Rhamnus alaternus*, *Pistacia terebinthus*, *Rubia peregrina*, *Jasminum fruticans*, *Smilax aspera*, *Lonicera etrusca*, *L. implexa*.

- 2) Plants: *Quercus ilex*, *Q. rotundifolia*.
-

9350

Quercus macrolepis forests

PAL.CLASS.: 41.79

- 1) Woods dominated by the semi-deciduous *Quercus macrolepis*, often fairly open, mostly of the meso-Mediterranean zone.

Sub-types :

41.791 - Hellenic valonia oak woods

Quercus macrolepis formations of continental Greece and its archipelagos, as well as of adjacent Albania; well developed forests exist, in particular, in the Ionian islands and on Lesbos; more modified, grove-like, stands, exist on the maritime slopes of the low mountains bordering the gulf of Arta and in western Etolia, in the north-western Peloponnese, in Thessaly, in Attica, in Thrace.

41.792 - Apulian valonia oak woods

Relict *Quercus macrolepis* formations of Salento (Tricase).

- 2) Plants: *Quercus macrolepis*.
-

9360

* Macaronesian laurel forests (*Laurus*, *Ocotea*)

PAL.CLASS.: 45.61 to 45.63

- 1) Humid to hyper-humid, mist-bound, luxuriant, evergreen, lauriphyllous forests of the cloud belt of the Macaronesian islands, extremely rich in floral and faunal species, among which many are restricted to these communities (*Pruno-Lauretalia*). Genera such as *Picconia*, *Semele*, *Gesnouinia*, *Lactucosonchus*, *Ixanthus* are entirely endemic to these communities, while others, such as *Isoplexis*, *Visnea* and *Phyllis*, reach in them their maximum development; in addition, each of the formations of the various archipelagos harbours distinctive endemic species.

This habitat type includes:

- lauriphyllous forests of the Azores (45.61 *Ericetalia azorica* p.), where the humid forests of the coastal areas (*Myrico-Pittosporietum undulati* p.) have been totally or almost totally degraded, largely invaded by the introduced Australian *Pittosporum undulatum*; a better representation survives of the hyper-humid forests (*Culcito-Juniperion brevifoliae* p.) of higher elevations;

- lauriphyllous forests of Madeira (45.62 *Pruno-Lauretalia azorica*) still occupying a relatively large surface, of the order of 10,000 ha ;

- lauriphyllous forests of the Canary Islands (45.63 *Ixantho-Laurion azoricae*); the laurel forests of each island harbour a distinctive set of endemic plants and animals, as exemplified by the species of the composite genus *Pericallis*, the well-marked races of the chaffinch *Fringilla coelebs* or the carabid fauna.

- 2) Plants: *Apollonias barbujana*, *Ardisia bahamensis*, *Asparagus fallax*, *Canarina canariensis*, *Carex canariensis*, *C. eregrina*, *Clethra arborea*, *Convolvulus canariensis*, *Cryptotaenia elegans*, *Erica arborea*, *Euphorbia melifera*, #*E. stygiana*, #*Frangula azorica*, *Geranium canariensis*, *Heberdenia excelsa*, *Hedera canariensis*, *Ilex canariensis*, *I. perado* ssp. *azorica*, *I. perado* ssp. *perado*, *Isolexis canariensis*, *Ixanthus viscosus*, *Juniperus brevifolia*, *Laurus azorica*, *Myrica faya*, *Ocotea foetens*, *Persea indica*, #*Picconia azorica*, *P. excelsa*, **Pittosporum coriaceum*, *Pleiomeris canariensis* (= *Myrsine canariensis*), *Prunus lusitanica*, #*P. l.* ssp. *azorica*, *P. l.* ssp. *hixa*, *Rubia peregrina*, *Rubus bollei*, *Ruscus streptophyllus*, *Sambucus lanceolata*, **S. palmensis*, *Semele androgyna*, *Senecio auritus* (= *S. maderensis*), *Sideretis canariensis*, *S. macrostachys*, *Smilax aspera*, *S. canariensis*, *S. divaricata*, *Sonchus fruticosus*, *Tamus edulis*, *Teline maderensis* (= *Cytisus maderensis*), *Vaccinium cylindraceum*, *V. padifolium*, *Viburnum tinus* ssp. *subcordatum*, *Visnea mocanera*.
- Animals: *Columba bollei*, *C. junionae*, *C. trocaz*, *Fringilla coelebs* ssp. *ombriosa*, *F. teydea*, *F. t.* ssp. *polatzeki*.
-

9370

* Palm groves of *Phoenix*

PAL.CLASS.: 45.7

- 1) Woods, often riparian, formed by the two endemic palm trees, *Phoenix theophrasti* and *Phoenix canariensis*.
The palm groves of Crete are restricted to damp sandy coastal valleys; they include the extensive forest of Vai, where the luxuriant palm growth is accompanied by a thick shrubby undergrowth rich of *Nerium oleander*, and about four other smaller coastal groves, notably on the south coast of the prefectorate of Rethimnon.
The Canarian palm groves are mostly characteristic of the bottom of barrancos and of alluvial soils, below 600 metres; particularly representative examples are found at Fragata, Maspalomas and Barranco de Tirajana in the Gran Canary, Valle Gran Rey in La Gomera, Masca in Ténériffe and Brena Alta in La Palma.
- 2) Plants: *Phoenix canariensis*, #*Phoenix theophrasti*.
-

9380

Forests of *Ilex aquifolium*

PAL.CLASS.: 45.8

- 1) Communities dominated by arborescent *Ilex aquifolium*, relict of various forests with a field layer rich in *Ilex* and sometimes with *Taxus* (42.A7), of the supra-Mediterranean level on various substrates. These woods correspond to the senescence stage of a forest with a undergrowth with *Taxus* and *Ilex* (belonging among others to the *Ilici-Quercetum ilicis*), after the fading of the tree layer. They generally form patches inside or outside forests.
-

9390

*Scrub & low forest vegetation with *Quercus alniflora*

PAL.CLASS.: 45.48

- 1) Arborescent *Quercus alnifolia*-dominated formations on basic eruptive substrates of the Troodos range, together with matorrals derived from these forests (32.1146).

- 2) Plants *Quercus alnifolia*, *Acer sempervirens*, *Teucrium kotschyana*, *Salvia cypria*, *Crepis fraasii*, *Sedum cyprium*
-

93A0 Woodlands with *Quercus infectoria* (*Anagyro foetidae*- *Quercetum infectoriae*)

PAL.CLASS.: 45.46 (p)

- 1) *Quercus infectoria* woods constitute the potential natural vegetation growing on limestones and chiefly marly limestone substrata of the Troodos Mountains between 600 – 700 to 1000 –1100 m. Degraded stages of these communities are associated with *Quercetalia ilicis* maquis (*Quercus coccifera* subsp. *pseudococcifera*) or with *Cistus creticus* phrygana.
 - 2) Plants *Quercus infectoria*, *Q. brachyphylla*, *Q. coccifera* ssp. *calliprinos*, *Arbutus andrachne*, *Acer syriacum*, *Fontanesia philliraeoides*, *Aristolochia altissima*, *Cyclamen persicum*, *Eryngium falcatum*, *Anagyris foetida*, *Styrax officinalis*, *Agropyron panormitanum*, *Glaucosciadium cordifolium*, *Crepis micrantha*: *Crataegus azarolus*, *Pinus brutia*, *Pistacia terebinthus*, *P. lentiscus*, *Arbutus andrachne*, *Calicotome villosa*, *Cistus creticus*, *Ptilostemon chamaepeuce* var. *cypria*, *Allium neapolitanum*, *Ferula communis*, *Geranium tuberosum*, *Scaligeria cretica*, *Scutellaria cypria* var. *cypria*, *Serratula cerinthifolia*.
 - 4) The *Anagyro foetidae*- *Quercetum infectoriae* association may become degraded to maquis (9320), or phrygana (5420).
-

Temperate mountainous coniferous forests

9410 Acidophilous *Picea* forests of the montane to alpine levels (*Vaccinio-Piceetea*)

PAL.CLASS.: 42.21 to 42.23, 42.25

- 1) Sub-alpine and alpine conifer forests (dominated by *Picea abies* and *Picea orientalis*).
Sub-types:
 - 42.21 - Alpine and Carpathian sub-alpine spruce forests. *Piceetum subalpinum*.
Picea abies forests of the lower sub-alpine level, and of anomalous stations in the montane level, of the outer, intermediate and inner Alps; in the latter, they are often in continuity with the montane spruce forests of 42.22. The spruces are often stunted or columnar; they are accompanied by an undergrowth of decidedly sub-alpine affinities. *Picea abies* forests of the lower sub-alpine level of the Carpathians.
 - 42.22 - Inner range montane spruce forests. *Piceetum montanum*.
Picea abies forests of the montane level of the inner Alps, characteristic of regions climatically unfavourable to both beech and fir. Analogous *Picea abies* forests of the montane and collinar levels of the inner basin of the Slovakian Carpathians subjected to a climate of high continentality.
 - 42.23 - Hercynian sub-alpine spruce forests

Sub-alpine *Picea abies* forests of high Hercynian ranges ²¹.

42.25 - Peri-Alpine spruce forests

Spontaneous *Picea abies* formations occupying outlying altitudinal or edaphic enclaves within the range of more predominant vegetation types of the montane levels of the outer Alps, the Carpathians, the Dinarides, the Jura, the Hercynian ranges, the subalpine levels of the Jura, the western Hercynian ranges and the Dinarides

- 2) Plants: *Picea abies*, *Vaccinium* spp.
-

9420 Alpine *Larix decidua* and/or *Pinus cembra* forests

PAL.CLASS.: 42.31, 42.32 and 42.35

- 1) Forests of the sub-alpine and sometimes montane levels, dominated by *Larix decidua* or *Pinus cembra*; the two species may form either pure or mixed stands, and may be associated with *Picea abies* or *Pinus uncinata*.

Sub-types:

42.31 - Eastern Alpine siliceous larch and arolla forests. *Larici-Cembretum*.

Sub-alpine *Larix decidua*, *Pinus cembra*, or *Larix decidua-Pinus cembra* forests of the eastern and central Alps, mostly of the inner ranges, usually on siliceous substrates, with an often species-poor undergrowth comprising *Vaccinium myrtillus*, *Rhododendron ferrugineum*, *Calamagrostis villosa*, *Luzula albida*.

42.32 - Eastern Alpine calcicolous larch and arolla forests. *Laricetum*, *Larici-Cembretum*

Rhododendretosum hirsuti

Sub-alpine and montane *Larix decidua*, *Larix decidua - Picea abies*, *Pinus cembra* or *Larix decidua-Pinus cembra* forests of the eastern and central Alps, mostly of the outer ranges, on calcareous substrates, with a usually species-rich undergrowth including *Erica herbacea*, *Polygala chamaebuxus*, *Rhododendron hirsutum* or *Pinus mugo*.

42.35 - Carpathian larch and arolla forests

Uncommon *Larix decidua* or *Pinus cembra* formations of the Carpathians, each occurring as a single dominant, together as codominants, or mixed with *Picea abies*.

- 2) Plants: *Larix decidua*, *Pinus cembra*.
-

9430 Subalpine and montane *Pinus uncinata* forests (* if on gypsum or limestone)

PAL.CLASS.: 42.4

- 1) Mountain pine (*Pinus uncinata*) forests, usually open and with a very developed shrubby understory, of the subalpine and montane levels; on limestone, gypsum or siliceous substrate in a cool or thermophile situation depending on the region. Sometimes mixed with *Pinus sylvestris*, more rarely with *Larix-Pinus cembra*.

Two major types: 42.41 - mountain pine forests of the western outer Alps, the Jura and Pyrenean ubacs, developed on siliceous or decalcified soils of the subalpine level with a predominately ericaceous undergrowth comprising *Rhododendron ferrugineum* (*Rhododendro-Vaccinion* p.); 42.42 - xerocline mountain pine forests of the inner Alps, of the western outer Alps and the Jura, and of

²¹ Bayerischer Wald, Harz (above 750 m) and Erzgebirge.

Pyrenean adrets, accompanied by a shrubby undergrowth in which *Rhododendron ferrugineum* is absent or rare (*Junipero-Pinion* p., *Erico-Pinion* p.)

- 2) Plants: *Arctostaphylos alpina*, *A. uva-ursi*, *Astrantia minor*, *Calluna vulgaris*, *Coronilla vaginalis*, *Cotoneaster integerrimus*, *Crepis alpestris*, *Daphne striata*, *Deschampsia flexuosa*, *Dryas octopetala*, *Erica herbacea*, *Homogyna alpina*, *Huperzia selago*, *Juniperus hemisphaerica*, *J. nana*, *Lycopodium annotinum*, *Pinus uncinata*, *Polygala chamaebuxus*, *Rhamnus saxatilis*, *Rhododendron ferrugineum*, *Rhododendron hirsutum*, *Thesium rostratum*, *Vaccinium myrtillus*, *V. uliginosum*.
- 4) In association with bog woodland (44.A), *Pinus mugo* scrub (31.5) and sometimes pioneer phases of fir or spruce in disturbed zones.

Mediterranean and Macaronesian mountainous coniferous forests

9510 * Southern Apennine *Abies alba*

PAL.CLASS.: 42.15

- 1) Relict *Abies alba* woods associated with the beech forests of the *Geranio versicolori-Fagion*.
- 2) Plants: *Abies alba*.

9520 *Abies pinsapo* forests

PAL.CLASS.: 42.19

- 1) Forests and stands of the endemic *Abies pinsapo* of the supra-meso-Mediterranean level. Calcicolous forests; ultra basic serpentine outcroppings.
- 2) Plants: *Abies pinsapo*.

9530 * (Sub-)Mediterranean pine forests with endemic black pines

PAL.CLASS.: 42.61 to 42.66

- 1) Forests of the montane-Mediterranean level, on dolomitic substrate (high tolerance to magnesium), dominated by pines of the *Pinus nigra* group, often with a dense structure.
Sub-types :
 - 42.61 - Alpino-Apennine *Pinus nigra* forests - *Pinus nigra* s.s. forests of the eastern Italian, Austrian and Slovenian Alps and of the Apennines;
 - 42.62 - Western Balkanic *Pinus nigra* forests - *Pinus nigra* ssp. *nigra* of the Dinarides, the Pelagonides; *Pinus dalmatica* forests of the Dalmatian coastal areas;

- 42.63 - Salzmänn's pine forests - *Pinus salzmannii* forests of Spain (Pyrenees, northern Iberian Range, Sierra de Gredos, Sierra de Cuenca, Maestrazgo, Sierras de Cazorla, Segura and Alcaraz, calcareous periphery of the Sierra Nevada) and the Causses;
- 42.64 - Corsican lario pine forests - *Pinus laricio* forests of the mountains of Corsica (1000 to 1800 m) on granitic soils;
- 42.65 - Calabrian lario pine forests - *Pinus laricio* var. *calabrica* forests of the Sila (Sila Greca, Sila Grande, Sila Piccola), the Aspromonte and Etna;
- 42.66 - Pallas's pine forests - montane forests of *Pinus pallasiana* of Greece and the Balkan peninsula.

- 2) Plants: *Pinus laricio*, *Pinus nigra*, *Pinus pallasiana*, *Pinus salzmannii*.
Animals: *Sitta whiteheadi*.

9540 Mediterranean pine forests with endemic Mesogean pines

PAL.CLASS.: 42.8

- 1) Mediterranean and thermo-Atlantic woods of thermophilous pines, mostly appearing as substitution or paraclimatic stages of forests of the *Quercetalia ilicis* or *Ceratonio-Rhamnetalia*. Long-established plantations of these pines, within their natural area of occurrence, and with an undergrowth basically similar to that of paraclimatic formations, are included.

Sub-types :

42.81 - Maritime pine forests

Forests and plantations of *Pinus pinaster* ssp. *atlantica* of south-western France and the western Iberian peninsula.

42.82 - Mesogean pine forests

Forests of *Pinus pinaster* ssp. *pinaster* (= *Pinus mesogeensis*) of the western Mediterranean, mostly in siliceous meso-Mediterranean, upper meso-Mediterranean and supra-Mediterranean situations of Spain, Corsica, south-eastern France, north-western Italy, Sardinia and Pantelleria.

42.821 - Iberian mesogean pine forests

Pinus pinaster forests of the Iberian peninsula, appearing mostly as substitution communities of *Quercus rotundifolia*, *Q. pyrenaica* or, locally, *Q. suber*, *Q. faginea* woodlands.

42.822 - Corbières mesogean pine forests

Isolated *Pinus pinaster* - dominated woods of the Corbières.

42.823 - Franco-Italian mesogean pine forests

Pinus pinaster forests of siliceous lower meso-Mediterranean areas of Provence, of marls and limestones of the upper meso-Mediterranean level of the Maritime Alps and the Ligurian Alps, and of mostly siliceous or clayey soils of the hills of Liguria and Tuscany.

42.824 - Corsican mesogean pine forests

Pinetum pinastri, *Erico-Arbutetum* p., *Galio-Pinetum* p.

Pinus pinaster-dominated forests of the meso- and supra-Mediterranean levels of Corsica, mostly on granitic substrates; they are very developed, accompanied by a maquis-like understory, in the meso-Mediterranean zone, mostly in its upper levels; they occur locally within the supra-Mediterranean zone, on adrets and at lower altitudes, as facies of lario pine forests.

42.825 - Sardinian mesogean pine forests

Pinus pinaster formations on granitic substrates of northern Sardinia, with *Arbutus unedo*, *Quercus ilex*, *Rosmarinus officinalis*, *Erica arborea*, *Genista corsica*, *Lavandula stoechas*, *Rubia peregrina*, *Calicotome spinosa*, *Pistacia lentiscus*, *Teucrium marum*.

42.826 - Pantellerian mesogean pine forests

Pinus pinaster woods of Pantelleria.

42.83 - Stone pine forests

Mediterranean forests and old naturalised plantations of *Pinus pinea*. Old introductions in many areas often makes the distinction between self sown forests and long-established formations of artificial origin difficult. These are thus included here, while recent, obviously artificial groves are not.

42.831 - Iberian stone pine forests

Pinus pinea forests of the Iberian peninsula, where they reach their greatest development.

42.832 - Balearic stone pine woods

Pinus pinea formations of the Balearic Islands, native only on Ibiza and Formentera.

42.833 - Provence stone pine woods

Pinus pinea formations of Provence, possibly spontaneous on coastal sands and in the Maures area.

42.834 - Corsican stone pine woods

Pinus pinea formations of the littoral of Corsica, some of which may be of natural origin, in particular on old dunes of the east coast.

42.835 - Sardinian stone pine forests

Pinus pinea formations of Sardinia.

42.836 - Sicilian stone pine forests

Pinus pinea formations of the Monti Peloritani, north-western Sicily, of probable native origin.

42.837 - Peninsular Italian stone pine forests

Large, ancient, *Pinus pinea* plantations of the Tyrennian, and locally, Adriatic coasts of the Italian peninsula, in Liguria, Tuscany, Latium, Campania, Emilia-Romana (Ravenna) and Friuli-Venetia Giulia (Grado).

42.838 - Greek stone pine forests

Pinus pinea woods of the littoral and coastal hills of the Peloponnese, Chalcidice, Crete and Aegean islands, rather local but probably in part, at least, spontaneous; a splendid example exists, in particular, on Skiathos.

42.84 - Aleppo pine forests

Woods of *Pinus halepensis*, a frequent colonist of thermo- and calcicolous meso-Mediterranean scrubs. The distinction between spontaneous forests and long-established formations of artificial origin is often difficult. The latter are thus included here, while recent, obviously artificial groves are not.

42.841 - Iberian Aleppo pine forests

Pinus halepensis forests of Spain, considered native for at least two-thirds of their considerable expanse; they are mostly restricted to eastern regions on the Mediterranean slope of the Catalanian mountains, the Maestrazgo, the pre-Baetic ranges of the upper Guadalquivir basin, the southern Andalusian mountains; they penetrate farther inland in the Ebro basin and around the headwaters of the Tagus and Guadalquivir systems.

42.842 - Balearic Aleppo pine forests

Pinus halepensis formations of the Balearics, present and probably native on all the major islands.

42.843 - Provenço-Ligurian Aleppo pine forests

Mostly lower meso-Mediterranean *Pinus halepensis* forests of Provence and of the lower slopes and coastlines of the Maritime and Ligurian Alps, extensive and undoubtedly native.

42.844 - Corsican Aleppo pine woods

Rare and local *Pinus halepensis* woods of the Corsican coasts, some, at least, possibly natural.

42.845 - Sardinian Aleppo pine woods

Pinus halepensis formations of Sardinia, where certainly native woods occur on Isola di San Pietro and the Sulcis coast of Iglesiente.

42.846 - Sicilian Aleppo pine woods

Pinus halepensis formations of Sicily and peripheral islands (Egadi, Lampedusa, Pantelleria).

42.847 - Peninsular Italian Aleppo pine forests

Pinus halepensis formations of the Italian peninsula; extensive, probably at least partially native ones are individualised in the subdivisions below.

42.848 - Greek Aleppo pine forests

Pinus halepensis formations of Greece, where the species is relatively widespread, particularly in Attica, Thessaly, the coasts of the Peloponnese and of central continental Greece, the Ionian islands, Chalcidici, the northern Sporades, Euboea and Skiros.

42.85 - Aegean pine forests

Pinus brutia forests of Crete and eastern Aegean islands. Eastern vicariants of Aleppo pine forests (42.84), they comprise, however, taller, more luxuriant, and often extensive, formations. Disjunct formations of this pine or of related species, described from Crimea and the Caucasian region (*Pinus pityusa*, *Pinus stankewiczii*, *Pinus eldarica*) have been included..

42.851 - Aegean pine forests of Crete

Pinus brutia-dominated forests of Crete and its satellite islands Gavdos and Gaidaronisi, pure or mixed with *Cupressus sempervirens*; they are widespread in particular in the White Mountains, the Psiloriti range, the Dikti range and, locally, in the Sitia mountains and the Asterousia mountains.

42.852 - Aegean pine forests of Lesbos

Extensive *Pinus brutia* forests of Lesbos, occupying Mount Olympus and surrounding hills in the south-eastern quadrant of the island, as well as parts of the Kuratsonas range in the north-west; these forests harbour the only European population of the nuthatch *Sitta krueperi* and the most significant one of the orchid *Comperia comperiana*.

42.853 - Aegean pine forests of Samos

Pinus brutia forests covering large expanses of Samos, in particular in the Ambelos range, the Kerki mountains, the southern hills and the north-eastern peninsula.

42.854 - Aegean pine woods of Chios

Remnant forests of Chios with a composition and stratification similar to those of the forests of Samos.

42.855 - Aegean pine forests of Thasos

Broad *Pinus brutia* belt on the lower reaches of Thasos, up to about 400 to 500 metres, mixed with *Pinus pallasiana* in the higher areas.

42.856 - Aegean pine woods of Samothrace

Mostly sparse *Pinus brutia* formations of the lowlands of Samothrace.

42.857 - Aegean pine forests of Rhodes

Remnant *Pinus brutia* forests of Rhodes, still represented by some relatively natural formations with rich scrub undergrowth.

42.858 - Aegean pine forests of Karpathos

Fairly extensive *Pinus brutia* forests of Karpathos, distributed, in particular, in the northern coastal area, the southern interior and the middle elevation of Kali Limni.

42.859 - Aegean pine forests of the Dodecanese

Pinus brutia formations of the islands of Simi, Kos, Leros and Icaria.

- 2) Plants: *Pinus pinaster* ssp. *atlantica*, *Pinus pinaster* ssp. *pinaster* (= *Pinus mesogeensis*), *Pinus pinea*, *Pinus halepensis*, *Pinus brutia*, *Pinus mugo*, *Pinus leucodermis*.

9550

Canarian endemic pine forests

PAL.CLASS.: 42.9

- 1) Forests of endemic *Pinus canariensis*, of the dry montane level at around 800 to 2000 metres (locally down to 500 and up to 2500 metres) in Tenerife, La Palma, Gran Canaria and Hierro, with *Chamaecytisus proliferus*, *Adenocarpus foliolosus*, *Cistus symphytifolius*, *Lotus campylocladus*, *L. hillebrandii*, *L. spartioides*, *Daphne gnidium*, *Juniperus cedrus*, *Micromeria* spp.; these forests, of

which well-preserved examples have become rare, are the only habitat of *Fringilla teydea*, *Dendrocopos major canariensis* and *D. m. thanneri*.

Sub-types :

42.91 Canary pine-rockrose forests

Climax *Pinus canariensis* forests within the main zone of altitudinal occurrence, with an undergrowth characterised and often dominated by *Cistus symphytifolius* and comprising *Chamaecytisus proliferus*, *Lotus campylocladus*, *L. hillebrandii*, *L. spartioides*, *Juniperus cedrus*, *Bystropogon origanifolius*, *Argyranthemum adauctum*.

42.92 Canary pine-dry scrub forests

Formations of dry, south-facing slopes in the lower part of the *Pinus canariensis* belt, transitional towards juniper formations and their degradation scrubs, with an undergrowth often formed by *Cistus monspeliensis*, *Euphorbia obtusifolia* ssp. *regis-jubae*, *Salvia canariensis*, *Micromeria hyssopifolia*, *Echium aculeatum*.

42.93 Canary pine-heath forests

Formations of humid, fogbound north- and north-west-facing slopes in the lower reaches of the *Pinus canariensis* belt, with an abundance of *Erica arborea* and *Myrica faya*, and occasionally with *Ilex canariensis* and *Arbutus canariensis*; epiphytic lichens are abundant, as are dense carpets of mosses, in particular, *Hypnum cupressiforme*. These woods are the main habitat of *Regulus teneriffae*.

42.94 Canary pine-broom woods

Formations of the highest altitudes of the *Pinus canariensis* belt, invaded by species of the supra-Canarian level, in particular *Adenocarpus viscosus*.

42.95 Canary pine-juniper woods

Junipero cedri-Pinetum canariensis

Pinus canariensis and *Juniperus cedrus* formations of steep, rocky slopes of high altitudes of Tenerife and La Palma.

- 2) Plants: *Pinus canariensis*, *Chamaecytisus proliferus*, *Adenocarpus foliolosus*, *Cistus symphytifolius*, *Lotus campylocladus*, *L. hillebrandii*, *L. spartioides*, *Daphne gnidium*, *Juniperus cedrus*, *Micromeria* spp.

9560

*** Endemic forests with *Juniperus* spp.**

PAL.CLASS.: 42.A2 to 42.A5 and 42.A8

- 1) Medium altitude forest formations dominated by *Juniperus* spp. The arborescent matorrals (32.13 and 31.3) should not be included.

Sub-types :

42.A2 - Spanish juniper woods (*Juniperon thuriferae*) - forest formations dominated by *Juniperus thuriferae* of Spain (calcareous substrates in the supra-Mediterranean levels of the Iberian Range and neighbouring plateaux, often with *Pinus sylvestris*, *P. salzmannii*, *Juniperus hemisphaerica* and *Berberis hispanica*; enclaves on the periphery of and within the Sierra de Guadarrama, occurring both on rare local limestone deposits and in a few siliceous stations; dry, warm, rocky, calcareous southern slopes of the Cordillera Cantabrica, between the Rio Pisuerga and the Rio Luna, with *Juniperus nana*, *J. sabina*, *Berberis vulgaris* ssp. *cantabrica*, *Rhamnus alpinus*, *Viburnum lantana*; gypsiferous soils of the Ebro basin, with *Rhamnus lycioides*; clay soils of the Campo de Montiel; Sierra Taibilla), southern France (Montagne de Rie); warm calcareous supra-Mediterranean slopes of the south-western Alps, in Drôme, Hautes-Alpes and Alpes-de-Haute-Provence, between 700 and 1200 metres; warm calcareous supra-Mediterranean slopes of the Isère valley, in the western Alps, between 300 and 500 metres; valleys in the interior of Corsica -Pinnera, Ruddy, Prunaccia - sometimes mixed with *Pinus laricio*;

- 42.A3 - Grecian juniper woods (*Juniperetum excelsae*) - forest formations dominated by *Juniperus excelsa*, of the *Ostryo-Carpinion* zone of the mountains of northern Greece (up to 900-1000m, around lake Prespa);
- 42.A4 - Stinking juniper woods - forest formations dominated by *Juniperus foetidissima* on adrets of the upper supra-Mediterranean level in Greece;
- 42.A5 - Syrian juniper woods - *Juniperus drupacea* woods of the northern slopes of Mount Parnon, Greece;
- 42.A8 - Macaronesian juniper woods - *Juniperus cedrus* formations of the high altitudes in Tenerife, La Palma, Gomera, Gran Canaria, restricted to steep rocky slopes; *Juniperus phoenicea* formations of Tenerife, La Palma, Hierro, Gran Canaria, La Gomera (*Maytenio-Juniperion phoeniceae* p.); endemic *Juniperus brevifolia* formations of the Azores (*Juniperion brevifoliae* p.).

- 2) Plants: *Juniperus brevifolia*, *J. cedrus*, *J. drupacea*, *J. excelsa*, *J. foetidissima*, *J. oxycedrus*, *J. phoenicea*, *J. thurifera*.
- 4) The arborescent matorrals of *Juniperus thurifera* (32.136), *Juniperus excelsa* and *J. foetidissima* (32.133), *Juniperus drupacea* (32.135) and the ericoid-dominated facies of the Macaronesian *Juniperus* formations (31.3) are generally associated in the field, but they should not be included in this habitat type.

9570

* *Tetraclinis articulata* forests

PAL.CLASS.: 42.A6

- 1) Xero-thermophile forests of Arbor-vitae (*Tetraclinis articulata*); *Periplocion angustifoliae*: *Arisaro-Tetraclinidetum articulatae*, *Mayteno-Periplocetum angustifoliae*. Scrub formed by *T. articulata* should also be considered a part of this habitat.
- 2) Plants: *Asparagus albus*, *A. stipularis*, *Arisarum vulgare*, *Brachypodium retusum*, *Chamaerops humilis*, *Lavandula dentata*, *Lithodora fruticosa*, *Periploca laevigata*, *Rhamnus lycioides*, *Tetraclinis articulata*, *Teucrium carthaginense*, *Thymus glandulosus*.

9580

* Mediterranean *Taxus baccata* woods

PAL.CLASS.: 42.A72 and 42.A73

- 1) Woods dominated by *Taxus baccata*, often with *Ilex aquifolium*, of very local occurrence. This habitat type may have two origins: senescent phase of a beech wood or beech-fir wood, made up of clusters of *Taxus* after the fall of the tall species, surrounded by layered stands of beech-yew; residual *Taxus* stand with disappearance of the tall species, both above and in the proximity of *Taxus*.
Habitat sub-types included:
42.A72 - Corsican yew woods - Formations of *Taxus baccata*, *Ilex aquifolium*, *Buxus sempervirens* restricted to cool, montane areas in the Tenda range, the San Pedrone range and the Cap Corse mountains;
42.A73 - Sardinian yew woods - *Taxus baccata* and *Ilex aquifolium* woods of the Catena del Marghine and the Mount Limbara system.
In the north and centre of Portugal there are *Taxus baccata* relicts, sometimes in small isolated formations (Serras do Gerês and Estrela), that may be included in this habitat type.
- 2) Plants: *Buxus sempervirens*, *Ilex aquifolium*, *Mercurialis perennis*, *Sorbus aria*, *Taxus baccata*.

9590

****Cedrus brevifolia* forests (*Cedrosetum brevifoliae*)**

PAL.CLASS.: 42.B2

- 1) Forests of *Cedrus brevifolia*, endemic to the western summits of the Troodos range
- 2) Plants *Cedrus brevifolia*, *Quercus alnifolia*, *Arrhenatherum album*, *Cephalorrhynchus cypricus*, *Galium peplidifolium*, *Stellaria media*, *Lindbergella sintensii*