



**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)

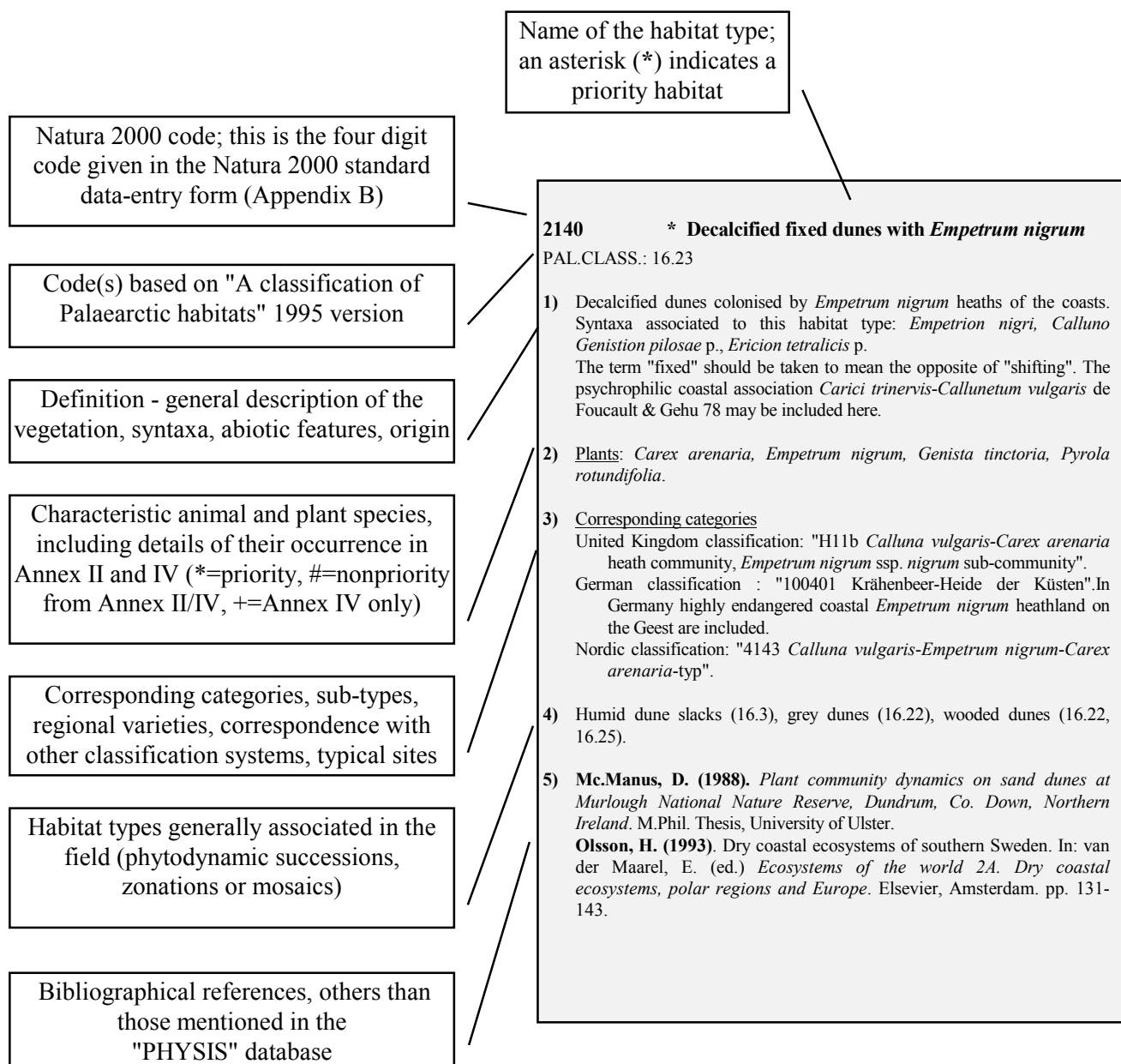
¹⁰ Devillers, P. & Devillers-Terschuren, J. (1993). A classification of Palaearctic habitats. Strasbourg: Council of Europe Institut Royal des Sciences Naturelles de Belgique

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-Limonieta*
- 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-Astidamieta* *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*, *Frankenia 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. *discoides* 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-Limonion 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 hysopifolia*, *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
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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.
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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.
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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 sabiniae* 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 - Alpidic 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 silesiacae*-*Betuletum carpaticae* [p.], *Piceo-Salicetum silesiacae* [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 salviastris-Echinopartum pulviniformis*, *Genista hystericis-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*: *Ziziphium 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 phryganas 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 phryganas, 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 phrygas (*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* phrygas

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.
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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 eriocaulis*, *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 caryophylla*, *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)",

