

Issues related to the classification of Mediterranean temporary wet habitats according with the European Union Habitats Directive

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Abstract

From a biological and biogeographic point of view, Mediterranean temporary wet habitats are recognised to be amongst the most interesting habitats in the Mediterranean bioclimatic region. They are considered to be habitats of Community Interest and are included in the "standing water group". Due to an overlap in the plant species and syntaxa indicated as characteristic, the assignment of the plant communities to the habitats 3120, 3130 and 3170* is far from straightforward. We propose that the *Isoetion* communities be assigned to habitat 3170*, the *Preslion cervinae*, *Cicendio-Solenopsis* and *Agrostion pourretii* communities to habitat 3120, and the *Cyperetalia fusci* and *Littorelletea uniflorae* communities to habitat 3130.

Key words: Habitats of Community Interest, *Isoetion*, Natura 2000, temporary ponds.

Riassunto

Problematiche connesse con la classificazione degli habitat umidi temporanei mediterranei in attuazione alla Direttiva Habitat. Gli habitat umidi temporanei sono considerati tra quelli di maggiore interesse biologico e biogeografico della regione mediterranea. La Direttiva Habitat li include tra quelli di interesse comunitario nel gruppo "acque dolci stagnanti". L'attribuzione delle comunità vegetali a tre di questi habitat, il 3120, il 3130 e il 3170* è resa difficile dalla sovrapposizione di alcune delle specie vegetali e dei syntaxa indicati come caratteristici. Si propone pertanto uno schema di riferimento che dovrebbe consentire un'interpretazione univoca della Direttiva Habitat. Viene pertanto proposto di riferire all'habitat 3170* le comunità dell'*Isoetion*, al 3120 quelle del *Preslion cervinae*, *Cicendio-Solenopsis* e *Agrostion pourretii* e al 3130 le comunità dei *Cyperetalia fusci* e della *Littorelletea uniflorae*.

Parole chiave: Habitat di interesse comunitario, *Isoetion*, Natura 2000, stagni temporanei.

Introduction

From a biological and biogeographic point of view, Mediterranean temporary wet habitats are recognised to be amongst the most interesting habitats in the Mediterranean bioclimatic region (Quezel, 1998; Médail *et al.*, 1998; Médail, 2004). They shelter extremely rare and isolated taxa: in New Zealand, for example, 18% of all protected species occur in these habitats (Johnson & Rogers, 2003) and a considerable part of the Red-List-species in France is dedicated to temporary wet habitats (Oliver *et al.*, 1995).

Temporary wet habitats are characterized by considerable spatial and temporal variability, which is influenced by a number of factors, such as flooding period, water depth variation and habitat size (Barbour *et al.*, 2003; Battaglia & Collins, 2006; Biondi & Bagella, 2005; Gopal, 1986; Fernández-Aláez *et al.*, 1999; Oertli *et al.*, 2002; Rhazi *et al.*, 2006; Rita & Babiloni, 1991).

From a syntaxonomic point of view the vegetation which characterizes these habitats is mainly referable to the class *Isoeto-Nanojuncetea* Br.-Bl. & Tüxen ex Westhoff, Dijk & Passchier 1946, including pioneer annual and dwarf perennial ephemeral isoetid communities on periodically flooded bare soils, but also

to the classes *Isoeto-Littorelletea* Br.-Bl. & Vlieger in Vlieger 1937, including dwarf helophyte amphibious oligotrophic communities on shore dystrophic lakes, nutrient-poor standing or slow flooding water and *Charetea fragilis* Fukarek ex Krausch 1964, including charophyte pioneer communities growing on sub-aquatic barren soils of pools, lakes and shallow water courses (Rivas Martínez *et al.*, 2002). Furthermore, communities belonging to other classes, such as *Potametea* Klika in Klika & Novák 1941, *Phragmito-Magnocaricetea* Klika in Klika & Novák 1941, *Molinio-Arrhenatheretea* Tüxen 1937 and *Helianthemetea guttati* (Br.-Bl. in Br.-Bl., Roussine & Nègre 1952) Rivas Goday & Rivas-Martínez 1963 em. Rivas-Martínez 1978, could be present in the temporal succession in the same sites.

Mediterranean temporary wet habitats are considered to be habitats of Community Interest (European Commission, 1992) and are included in the "standing water group". Reference habitats in Annex I of the Habitats Directive are the following: 3120 - Oligotrophic waters containing very few minerals, generally on sandy soils of the West Mediterranean, with *Isoetes* spp.; 3130 - Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoeto-Nanojuncetea*; 3140 -

Hard oligo-mesotrophic waters with benthic vegetation of *Chara* spp.; 3160 - natural dystrophic lakes and ponds; 3170* - Mediterranean temporary ponds. The other temporary wet habitats of the “standing water group” denominated 3110 - Oligotrophic waters containing very few minerals of sandy plains (*Littorelletalia uniflorae*) and 3180* - Turloughs, are not present in the Mediterranean region.

Aims

The aims of this paper are: 1) to outline the issues related to the classification of Mediterranean temporary wet habitats in relationship to the application of the Habitats Directive (European Commission, 1992) and the Nature 2000 network institution; 2) to propose criteria for adoption to facilitate univocal identification of the habitats of Community Interest referable to this typology.

Issues

Mediterranean temporary wet habitats are highly vulnerable due to their shallow water and their frequently small surface area. Despite an improvement in the public’s perception of wetlands over recent years, temporary pools are often poorly identified and their importance largely unappreciated, leaving them vulnerable to unintentional destruction (Grillas, 2004).

Issues related to the individuation and the classification of Mediterranean temporary wet habitats are due at least partly to their intrinsic characteristics and to the traits of the plants that they host. In fact they cover very limited surface areas, are ephemeral and

present high variability in the duration of the flooding period. Furthermore, the species which colonise them are often inconspicuous (e.g. dwarf annuals or dwarf geophytes), exhibit a very short life cycle and are often not well-known.

Although the Interpretation Manual (European Commission, 2003) gives more details than the list of habitat names in Annex I itself, there are still many problems concerning the identification of habitat types in the field, and in both selecting sites and assessing the national lists of proposed sites. Some of these problems arise from poorly defined, sometimes overlapping, habitat types (Evans, 2006).

The “standing water” group of habitat types is particularly complex, with both priority subtypes of wider habitats and similar vegetation in several habitat types in some cases separated by substrate and/or water quality (Evans, 2006). Furthermore, these habitat types rarely, if ever, occur as isolated stands: more frequently they are found in a dynamic mosaic of several types.

Habitat type 3130 includes two phytosociological classes: *Littorelletea uniflorae* and *Isoeto-Nanojuncetea*. However, some communities within the class *Littorelletea uniflorae* can also be assigned to habitat type 3110 which includes communities of the unique order of the class *Littorelletea uniflorae*: *Littorelletalia uniflorae*. The communities of the class *Isoeto-Nanojuncetea* are also included in habitats 3120 and 3170* (*Isoetion*, *Nanocyperion flavescens*, *Preslion cervinae*, *Agrostion salmanticae*, *Heleochoion* and *Lythron tribracteati*). The 3170* habitat, the only priority habitat of the group, is considered to be a subtype of habitat 3120. These overlaps concern syntaxonomic units, as well as some characteristic plant species (Fig. 1).

As a result, it is hard to assign the plant communities

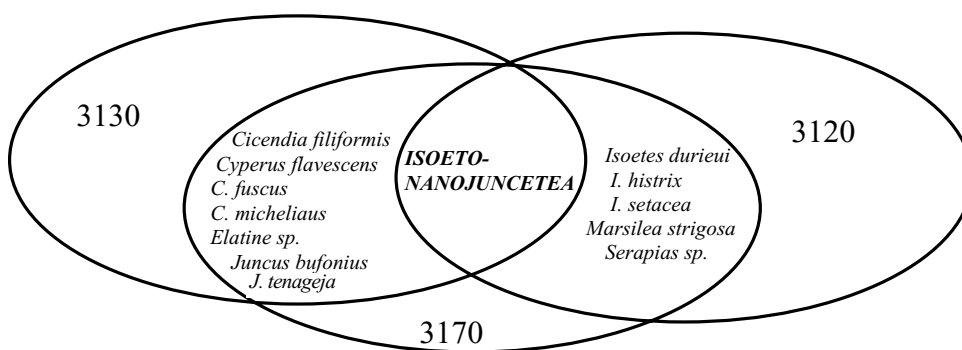


Fig. 1 - Overlapping of taxa and syntaxa amongst habitats 3120, 3130 and 3170*

to the different typology of habitats. Another explanatory problem derives from the fact that the priority habitat 3170* has an exact biogeographical reference in its name “Mediterranean temporary ponds” which would imply a restriction of the range of distribution to the Mediterranean biogeographical region.

The lack of knowledge concerning flora and vegetation and the issues relating to the understanding of the Interpretation Manual of the Habitats Directive (European Commission, 2003) have had several consequences on the process of filling in Nature 2000 forms in Italy (WWW.MINAMBIENTE.IT): i) difficulty in the assignment of plant communities to the relative habitats; ii) lack of indications concerning the presence of these habitats in several pSCIs; iii) shortage of proposals for pSCI establishment in sites where these habitats are so well represented that they may be considered to be “typical”. Furthermore, habitat 3170* has also been recognised outside the Mediterranean area. In this case the solution is not so clear, but interpretations have tended to be flexible rather than strict (Evans, 2006). As a consequence, an inflation of habitat 3170* has been brought about, leading to a decrease in its rarity index. In Italy the habitat is reported in 89 sites (Petrella *et al.*, 2005), of which 23, about 26%, fall within the continental biogeographic region.

Syntaxonomic aspects

The class *Isoeto-Nanojuncetea* is to be considered a very complex syntaxon in terms of its wide distribution area and its floristic diversity due to both phytogeographic and ecological factors. Several syntaxonomical classifications have been proposed for this class (e.g. Kock, 1926; Braun-Blanquet, 1935; Rivas Goday, 1955), as well as the following, that was recently proposed by Deil (2005) based to a large extent on the syntaxonomic scheme proposed by Brullo & Minissale (1998), with some modification according to Mucina (1997); Täuber & Petersen (2000) and Rivas- Martínez *et al.* (2001, 2002).

ISOETO-NANOJUNCETEA Br.-Bl. & R. Tüxen ex Westhoff *et al.* 1946
ISOETETALIA Br.-Bl. 1935 em. Rivas Goday 1970
Isoetion Br.-Bl. 1935

Cicendio-Solenopsis Brullo & Minissale 1998 (= *Cicendion* auct. mediterran.)

Agrostion pourretii Rivas Goday 1958 em. Rivas- Martínez *et al.* 1986

Preslion cervinae Br.-Bl. ex Moor 1936 (= *Menthion cervinae*)

CYPERETALIA FUSCI Pietsch 1963 (= *Nanocyperetalia*)

Nanocyperion flavescens Koch ex Lippert 1936

Radiolion linoidis (Rivas Goday 1961) Pietsch 1973

Elatino triandrae-Eleocharition ovatae (Pietsch & Müller-Stoll 1968) Pietsch 1973

Verbenion supinae Slavnic 1951

The *Isoetetalia* are of circum-Mediterranean distribution, with a higher density of the habitats and richer flora in the Western parts of the Mediterranean area. The *Cyperetalia fusci* are distributed in the temperate zone of Europe and include summer communities.

Among the *Isoetetalia* only two alliances present a closely Mediterranean distribution: *Isoetion* and *Preslion cervinae*. The *Isoetion* alliance has a circum-Mediterranean distribution and occurs in thermomediterranean and mesomediterranean bioclimates. Geophytic qwillorts are a major component of the biomass (Deil, 2005). Amongst them, the terrestrial *Isoetes durieui* and *I. histrix* are considered characteristic of the alliance (Rivas Martínez *et al.*, 2002). The *Preslion cervinae* alliance also presents a Mediterranean distribution, but occurs in long submerged depressions. Amongst the others some aquatic qwillorts, such as *I. velata* subsp. *velata*, are considered characteristic taxa (Rivas Martínez *et al.*, 2002).

Discussion and proposals

The issues encountered in the surveying and classification of Mediterranean temporary wet habitats underline the advantage of having more detailed data regarding characteristic flora and vegetation in order to facilitate their assignment to the different typologies of Annex I of the Habitats Directive. The more problematic matters are due to overlaps among habitats 3130, 3120 and 3170*.

Taking as a reference point the *Isoeto-Nanojuncetea* class, which builds up the connection among the 3 habitat types, the syntaxa belonging to this class were clustered in order to clearly define the reference habitats (Fig. 2).

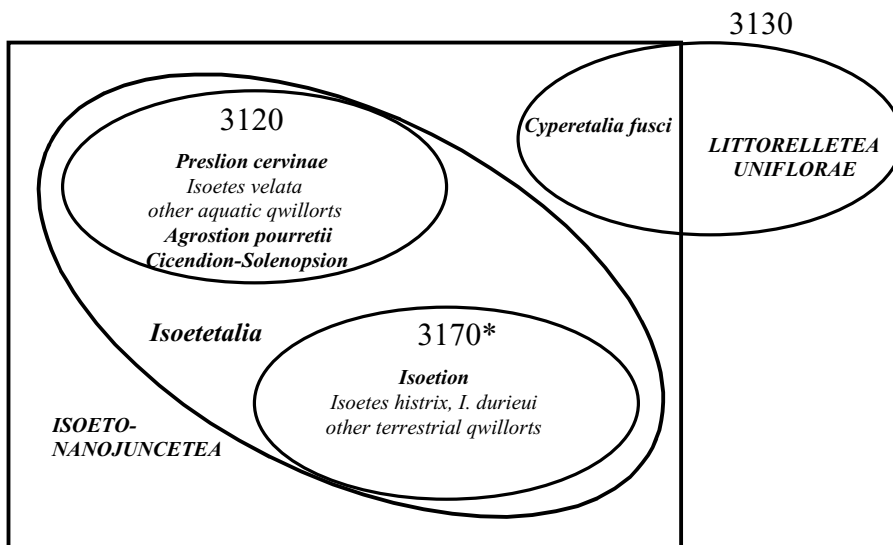


Fig. 2 – Schematic interpretation of habitats 3120, 3130 and 3170*

Our proposal is: i) to assign to the habitat 3170* only the communities which develop in “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” as suggested in the Interpretation Manual of the European Union Habitats (European Commission, 2003). Nevertheless, these communities do not all belong to the alliances indicated in the manual [e.g. *Isoetion*, *Nanocyperion flavescens*, *Preslion cervinae*, *Agrostion salmanticae* (= *Agrostion pourretii*), *Heleochoion* and *Lythron tribracteati*], but among them only to that of *Isoetion* which is the only one including communities occurring in shallow water in early spring; ii) to assign to habitat 3120 the communities belonging to the other 3 alliances of *Isoetetalia*: *Preslion cervinae* (Mediterranean communities dominated by aquatic quillorts such as *Isoetes velata* subsp. *velata* which include long flooded communities), *Cicendion-Solenopsis* (Mediterranean-Atlantic communities demanding water until the end of spring) and *Agrostion pourretii* (late communities generally in temporal succession with other *Isoeto-Nanojuncetea* communities); iii) to assign to habitat 3130 the *Cyperetalia fusci* communities which, in spite of those of *Isoetetalia*, are characterised by late summer and autumn bloom communities occurring on eutrophic or subeutrophic soils (Brullo & Minissale, 1998) and the *Littorelletea uniflorae* communities.

References

- Barbour M., Solomeshch A., Witham C., Holland R., Macdonald R., Cilliers S., Molina JA., Buck J. & Hillman J., 2003. Vernal pool vegetation of California: variation within pools. *Madroño* 50(3): 129-146.
- Battaglia L.L. & Collins B.S., 2006. Linking hydroperiod and vegetation response in Carolina bay wetlands. *Plant Ecology* 184: 173-185.
- Biondi E. & Bagella S., 2005. Vegetazione e paesaggio vegetale dell'arcipelago di La Maddalena (Sardegna nord-orientale). *Fitosociologia* 42(2) suppl. 1: 3-99.
- Braun-Blanquet J., 1935. Un joyau floristique et phytosociologique “L’*Isoetion*” méditerranéen. *Bull. Soc. Etude Sci. Nat. Nimes* 47: 1-23.
- Brullo S. & Minissale P., 1998. Considerazioni sintassonomiche sulla classe *Isoeto-Nanojuncetea*. *Itineraria Geobotanica* 11: 263-290.
- Deil U., 2005. A review on habitats, plant traits and vegetation of ephemeral wetlands - a global perspective. *Phytocoenologia* 35: 533-705.
- European Commission, 1992. Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. *European Community Gazette* 206: 1-50.
- European Commission, 2003. Interpretation manual of European Union habitats – EUR 25. DG Environment-Nature and Biodiversity. Brussels. Commission of the European Community.
- Evans D., 2006. The habitats of the European Union Habitats Directive. *Biology and Environment: Proceedings of the Royal Irish Academy* 106 B (3): 167-173.

- Fernández-Aláez C., Fernández-Aláez M. & Bécares E., 1999. Influence of water level fluctuation on the structure and composition of the macrophyte vegetation in two small temporary lakes in the northwest of Spain. *Hydrobiologia* 415: 155-162.
- Gopal B., 1986. Vegetation dynamics in temporary and shallow freshwater habitats. *Aquatic Botany* 23: 391-396.
- Grillas P., 2004. Introduction. In: Grillas P., Gauthier P., Yaverkovski N., Perennou C., editors. *Mediterranean Temporary Pools 1*. Station Biologique de la Tour du Valat, Arles. p. 34.
- Johnson P.N. & Rogers G.M., 2003. Ephemeral wetlands and their turfs in New Zealand. *Sci. Conserv.* 230: 109 pp., Wellington.
- Koch W., 1926. Die Vegetationseinheiten der Linthebene unter Berücksichtigung der Verhältnisse in der Nordostschweiz. Systematisch-kritische Studie. *Der Jahrb. St.-Gall. Nat. Ges.* 61: 1-144.
- Médail F., Michaud H., Molina J., Paradis G. & Loisel R., 1998. Conservation de la flore et de la végétation des mares temporaires dulçaquicoles et oligotrophes de France méditerranéenne. *Ecologia Mediterranea* 24: 119-134.
- Médail F., 2004. Biodiversity and conservation issues. Plant species. In: Grillas P., Gauthier P., Yaverkovski N. & Perennou C., editors. *Mediterranean Temporary Pools 1*. Station Biologique de la Tour du Valat, Arles. pp. 18-24.
- Mucina L., 1997. Conspectus of classes of European vegetation. *Folia Geobot. Phytotax.* 32: 117-172.
- Oertli B., Joye D.A., Castella E., Juge R., Cambin D. & Lachavanne J.-B., 2002. Does size matter? The relationship between pond area and biodiversity. *Biological Conservation* 104: 59-70.
- Oliver L., Galand J.P. & Mauvin H., 1995. *Livre Rouge de la flore mendacée de France I. Espèces prioritaires*. (eds.). 486 pp., Paris
- Petrella S., Bulgarini F., Cerfolli F., Polito M. & Teofili C., 2005. *Libro rosso degli habitat d'Italia della Rete Natura 2000*. WWF Italia.
- Quezel P., 1998. La végétation des mares transitoires à *Isoetes* en région méditerranéenne, intérêt patrimonial et conservation. *Ecologia Mediterranea* 24: 111-117.
- Rhazi L., Rhazi M., Grillas P., Tan Ham L., El Khyari D., 2006. Richness and structure of plant communities in temporary pools from western Morocco: influence of human activities. *Hydrobiologia*: 570: 197-203.
- Rita J., Bibiloni G., 1991. Zonación de la vegetación hidrófila de balsas periódicas en las zonas semiáridas de Baleares. *Orsis* 6: 61-74.
- Rivas Goday S., 1955. Aportaciones a la fitosociología hispánica, not. I. (Proyectos de comunidades hispanicas). *Anal. Inst. Bot. Cavanilles* 13: 335-422.
- Rivas-Martinez S., Fernández-González F., Loidi J., Lousa M. & Penas Á., 2001. Syntaxonomical checklist of vascular plant communities of Spain and Portugal to association level. *Itinera Geobotanica* 14: 5-341.
- Rivas-Martínez S., Diaz T.E., Fernández-González F., Izco J., Loidi J., Lousa M. & Penas Á., 2002. Vascular plant communities of Spain and Portugal. *Itinera Geobotanica* 15 (1-2): 1-922.
- Täuber T. & Petersen J., 2000. Isoeto-Nanojuncetea (D1) Zwergbinsen-Gesellschaften. *Synopsis Pflanzenges. Deutschlands* 7: 87 pp., Göttingen.