

Hydrophytic vegetation aspects in the Nebrodi Mountains (Sicily).

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Abstract

A study of the hydrophyte communities of some small ponds in the beech-wood belt of the higher Nebrodi Mts is presented. A new association of shallow stagnant water bodies, the *Utriculario-Potametum natantis*, is described. Its biological structure, biogeographical characteristics, syntaxonomic position, phytosociological relationships and dynamic links are discussed.

Key words: hydrophyte communities, Mediterranean islands, *Potametea*, *Utricularion*.

Riassunto

Viene presentato uno studio inerente alla vegetazione idrofitica insediata in alcuni piccoli stagni presenti nella parte alto montana dei Monti Nebrodi, all'interno del bosco di faggio. Limitatamente alla vegetazione legata alle acque superficiali stagnanti viene descritta una nuova associazione, l'*Utriculario-Potametum natantis*. Di essa viene presentata la struttura biologica, l'organizzazione biogeografica, l'inquadramento sintassonomico, le relazioni fitosociologiche e i collegamenti dinamici.

Parole chiave: comunità idrofitiche, isole mediterranee, *Potametea*, *Utricularion*.

Introduction

Wetland areas have a high naturalistic value despite the small area they cover. They can be considered as important "islands" of biodiversity, providing a suitable habitat for several species of animals and plants and functioning as stopover sites for migrating birds. However, the wetland areas of Sicily have been drastically reduced, by drainage and land reclamation in particular, and are but the scant remains of an environment that was definitely more extended in the past.

The Nebrodi Park abounds in scientifically and scenically remarkably interesting wetland habitats, both ponds and swamps, that host a peculiar flora characteristic of more northerly regions with a continental climate. These elements are believed to have immigrated during periods when the climate was colder than it is now. They have persisted under the peculiar conditions of the Nebrodi hills and mountains, rich in woodlands of a Central European type that in Sicily reach their southern distributional boundary. In spite of human pressure, stronger in the past than it is now, these habitats have maintained their ecologically and biogeographically interesting plants.

The wetland vegetation in the Nebrodi Natural Park has been surveyed by Brullo *et al.* (1994), who classified the various hygro- and hydrophyte communities as associations belonging to the *Phragmitetea* and *Potametea* class, respectively. In Sicily, small lacustrine habitats have disappeared almost totally. Only in the

Nebrodi Mountains have they survived to the present day, hosting widely distributed hydrophyte species some of which, in Sicily, occur very locally only: e.g. *Potamogeton polygonifolius* and *Utricularia australis*, the latter also found in the Madonie Mountains.

In this paper we present the first results of a study of some ponds or water holes almost but not totally drying out in summertime, found in some ponds on the northern slopes of Monte Soro in the Nebrodi Natural Regional Park. In these we found *Utricularia vulgaris*, a species that, in Sicily, was known only from the Sicani Mountains where it was not observed recently. In some water holes of the Nebrodi Mountains that species grows plentiful and, together with *U. australis* and *Potamogeton natans*, forms a still undescribed association of the order *Potametalia*, here newly named *Utriculario-Potametum natantis*. Our aim is to define the floristic, ecological and phytosociological features of this peculiar type of lacustrine vegetation.

Location of the study areas

The studied vegetation is situated in the Nebrodi Mountains, Sicily's largest mountain complex in terms of surface area, and third in elevation after Mt. Etna and the Madonie. Its exact location are the beech woods of Sollazzo Verde on the northern slope of Monte Soro (1847 m), the highest top of the Nebrodi (Fig. 1). The studied ponds are "Sollazzo Verde" (2492362 E - 4200372 N) (Fig. 2) and "Pappanu" Pond (2492405

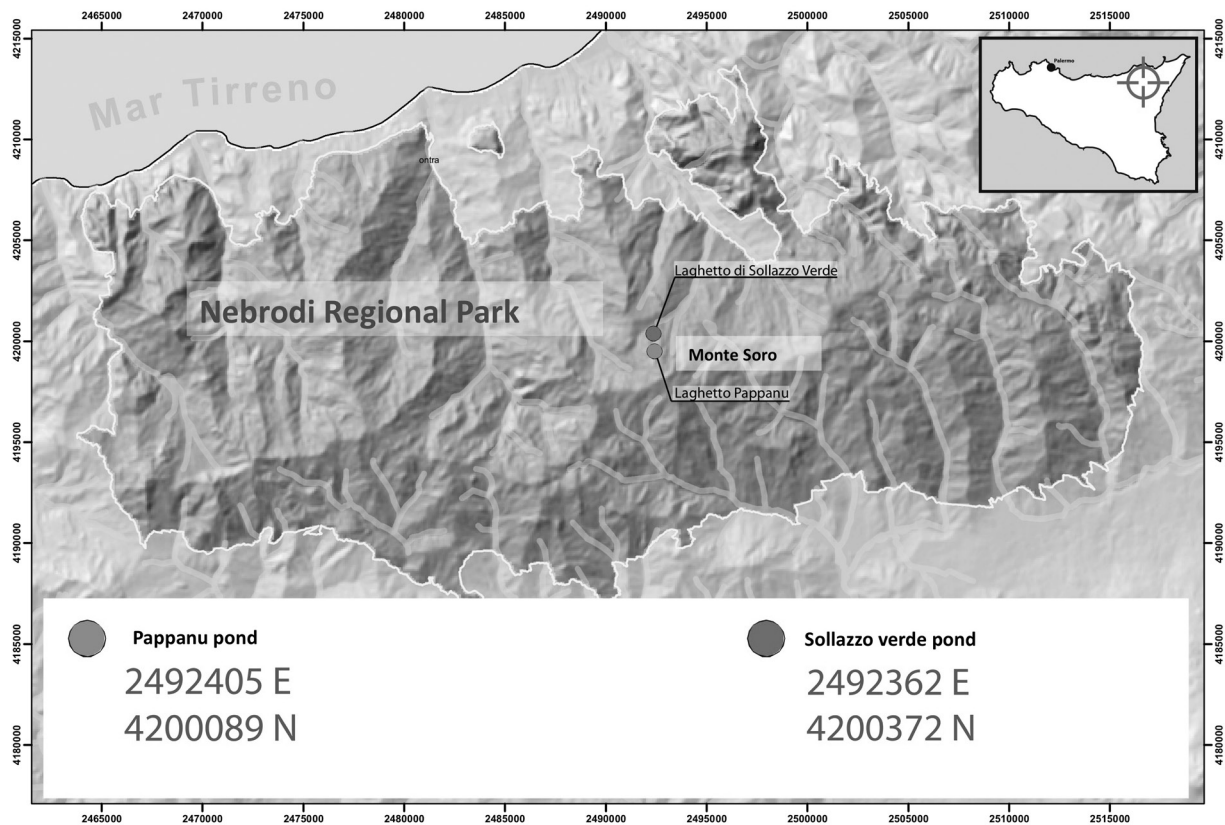


Fig. 1 – Location of the study area.

E - 4200089 N) (Fig. 3), both in Cesarò municipality, province of Messina.

According to Rivas Martínez *et al.* (2004), the bioclimate of this area is supra-Mediterranean lower middle-humid bioclimatic conditions (Bazan *et al.*, 2006). On slopes facing north, currents of humid air contribute to the water supply through hidden precipitation, mitigating temperature extremes and frost damage in the spring. At the highest elevations, as in the studied areas, the winter brings heavy snowfall, and the snow sometime remains until the first half of May.

The lithological substrate of the wood of Sollazzo Verde, and of the northern slope of the Nebrodi in general, uniformly consists of fissile, blackish or reddish quartzitic sandstone with siliceous cement, of lower Miocene (Aquitani) age.

Methodology

The phytosociological analysis is based on vegetation relevés according to Braun-Blanquet (1928) as modified by Pignatti (1952). The relevés

were made in summer and are limited to phanerogamic species. Those of Sollazzo Verde pond date from July 2008, those of Pappanu pond from July 2006. They are shown in table 1. The syntaxonomic classification follows Brullo *et al.* (2002)

Results

On the basis of our phytosociological relevés and of the floristic composition of the studied vegetation units, *Utricularia vulgaris* – a very rare taxon in Sicily, according to Giardina *et al.* (2007) – characterises the vegetation of the studied ponds (Fig. 4), which is here described as a new association named *Utriculario-Potametum natantis*.

UTRICULARIO-POTAMETUM NATANTIS ASS. NOVA (FIG. 5).

Floristic composition: as indicated in tab. 1, this association in its most typical aspect includes very few species. It is characterised above all by *Potamogeton natans* and *Utricularia vulgaris*, but also *Utricularia australis* and other taxa of *Potametea* as *Potamogeton pusillus*, *Myriophyllum verticillatum*, *Glyceria*



Fig. 2 – Panoramic view of the “Sollazzo Verde” pond, in The Nebrodi Mountains (Sicily).



Fig. 3 – Panoramic view of the “Pappanu” pond, in the Nebrodi Mountains (Sicily).



Fig. 4 – Flowering of *Utricularia vulgaris* in the “Sollazzo Verde” pond.



Fig. 5 – Detail of the *Utriculario-Potametum natantis* in the Nebrodi ponds.

spicata, *Callitriche stagnalis* and *Apium inundatum* are important.

Biological structure: mesopleustophytic medium-sized vegetation including floating and rooted hydrophytes characteristic of backwaters. Scapose, caespitose and creeping hemicryptophytes add to its structural diversity. However, the occurrence of therophytes and geophytes is insignificant.

Biogeographic Characters: in this association several floristic elements are represented, among which the Subcosmopolitan and European are most significant. Among the species rare or very rare in Sicily are: *Utricularia vulgaris*, *U. australis*, *Potamogeton pusillus*, *Myriophyllum verticillatum*, *Apium inundatum*, *Lythrum portula*, *Alopecurus aequalis* and *Lemna minor*.

Characteristic species: *Utricularia vulgaris*.

Holotypus: ril. 3, tab. 1.

Habitat: small ponds with oligomesotrophic or dystrophic surface water not more than one meter deep, subject to temporary drying out in summer. They are located between 1300 and 1500 m a.s.l., in the climax belt of beech wood, mainly on north-facing slopes. The studied vegetation belongs to Habitat Natura 2000 – 3150: Natural eutrophic lakes with vegetation of *Magnopotamion* or *Hydrocharition*.

Phytosociological arrangement: the occurrence of *Utricularia vulgaris* and *Utricularia australis* refer this vegetation to *Utricularion* alliance – a syntaxon that includes associations characterised by hydrophytes with above-water flowering and associated the oligo-mesotrophic surface backwater – belonging to *Utricularietalia* order and to *Potametea* class.

DYNAMICS AND CONTACTS: This association occurs in ponds of variable size in clearings in the *Anemono*

Tab. 1 - *Utriculario-Potametum natantis* ass. nova

N. rel.	1	2	3	4	5
Date	14/07/08	15/07/08	16/07/08	14/07/06	14/07/06
Locality	Sollazzo Verde	Sollazzo Verde	Sollazzo Verde	Pappanu	Pappanu
Altitude (m a.s.l.)	1396	1396	1396	1450	1450
Cover (%)	90	90	90	90	80
Area (m ²)	100	100	100	100	100
<hr/>					
Car. Association					
Utricularia vulgaris	2.3	2.3	3.3	1.2	2.3
Car. All. <i>Utricularion</i>					
Utricularia australis	1.3	1.2	1.3	1.2	1.2
Car. Cl. <i>Potametea</i>					
Potamogeton natans	1.3	3.4	2.3	3.3	2.3
Myriophyllum verticillatum	1.1	1.2	1.1	1.1	1.2
Glyceria spicata	1.1	1.1	1.2	1.1	1.1
Potamogeton pusillus	1.2	1.2	+	1.2	1.2
Callitriche stagnalis	1.1	+	+	1.1	1.1
Apium inundatum	+	+	1.1	+	+
Lythrum portula	+	1.1	+	+	+
Alopecurus aequalis	+	+	+	+	+
Other species					
Eleocharis palustris	+	+	+	+	+
Veronica beccalunga	+	+	+	+	+
Lemna minor	.	+	+	.	.

apenninae-Fagetum, a mesophilous and acidophilous beech wood. In its outer part enter in contact with the *Oenanthe fistulosae-Glycerietum spicatae* (Fig. 6), an association of the *Alopecuro-Glycerion spicatae* characterised by *Oenanthe fistulosa* in association with other hydrophytes such as *Apium inundatum*, *Callitriche stagnalis*, *Glyceria spicata*, *Lythrum portula*, *Myriophyllum verticillatum*, *Potamogeton natans*, and *P. pusillus*. In its turn, the *Oenanthe fistulosae-Glycerietum spicatae*, toward the edges of the pond, is bounded by the *Glycerio-Callitricetum obtusangulae* (Brullo *et al.*, 1994) characterised by *Callitriche obtusangola*, *C. hamulata*, and *C. stagnalis*. The later species, in particular, is more abundant under the shade of the beeches.

The outer belt of the ponds is colonised by a community with *Mentha pulegium*, *Juncus conglomeratus*, *Hypericum perforatum* and *H. tetrapterum*.

All these associations together form a permaseries, not subject to vegetation dynamism as long as the environmental conditions and water supply are not modified with consequent settlement of other vegetation types.

Other associations of this class occurring in Sicily:

Potametum perfoliati W. Koch 1926 *em.* Passerge 1964

Potametum pectinati Cartensen 1955

Groenlandietum densae (Oberd. 1962) Segal 1965

Myriophylletum spicati Soò 1927

Myriophylletum verticillati Gaudet 1924

Polygono-Potametum natantis Soò 1964

Ranunculo saniculifolii-Callitricetum brutiae Brullo, Grillo & Terrasi 1976

Ranunculetum penicillati Brullo & Spampinato 1990

Zannichellietum obtusifoliae Brullo & Spampinato 1990

Myriophylletum alterniflori Lemée 1937 *em.* Siss. 1943

Oenanthe fistulosae-Glycerietum spicatae Brullo & Grillo 1978

Glycerio-Oenanthea aquatica Brullo, Minissale & Spampinato 1994

Glycerio-Callitricetum obtusangulae Brullo, Minissale & Spampinato 1994

Utricularietum australis Müller & Görs 1960

Ceratophylletum demersi Hild 1956.

The *Utriculario-Potametum natantis* shows syntaxonomical affinities with the *Potamo-Utricularietum australis* Br.-Bl. in Br.-Bl. Roussine & Nègre 1952 corr. Rivas-Martínez & al. 2002 (*Potamo-Utricularietum vulgaris* Br.-Bl. in Br.-Bl. Roussine & Nègre 1952) which was described in France and than also reported in the Iberian Peninsula (Rivas-Martínez *et al.*, 2002). The new Sicilian association is distinguished by the occurrence of *Potamogeton natans* instead of *Potamogeton subflavus*, by the role played by *Utricularia vulgaris* in comparison with *U. australis*, and by the environmental conditions. As

regards this latter factor, the *Potamo-Utricularietum australis* occurs in littoral ponds bearing a high calcium carbonate rate, while the *Utriculario-Potametum natantis* is found in mountainous ponds, characterised by oligotrophic subacid water. The *Utriculario-Potametum natantis* should therefore be treated as a synvicariant of the *Potamo-Utricularietum australis*.

Conclusions

Utricularia vulgaris, a very rare species in Sicily, plays an important role in the colonization of some ponds in the mountain belt of the Nebrodi Mountains. It characterises the *Utriculario-Potametum natantis*, an ecologically and floristically well differentiated vegetation unit. It has been found in ponds in the clearings of mesophilous and acidophilous beech woods

belonging to the *Anemono apenninae-Fagetum*. The new association is part of a permaseries, substantially not subject to vegetation dynamism unless and until the environmental conditions are modified. Among the main threats of this kind of water system are sediment deposition on the seafloor, artificial changes in water supply, and damage by herds of swine that, in some cases, may irreparably alter the habitat and cause the settlement of other vegetation types.

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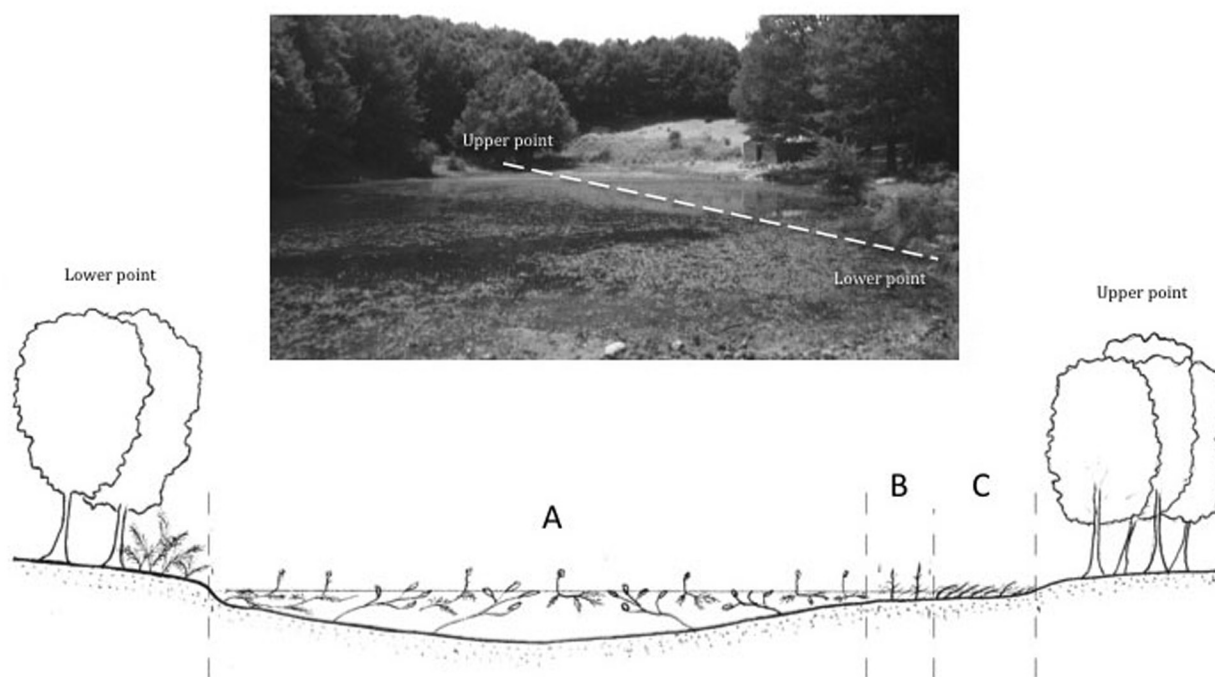


Fig. 6 – Vegetation transect in the “Sollazzo Verde” pond: A= *Utriculario-Potametum natantis*; B= *Oenanthe fistulosae-Glycerietum spicatae*; C= *Glycerio-Callitrichetum obtusangulae*.

Syntaxonomic scheme

POTAMETEA Klika in Klika & Novak 1941

UTRICULARIETALIA Den Hartog & Segal 1964

UTRICULARION Den Hartog & Segal 1964

Utricularietum australis Müller & Görs 1960

Utriculario-Potametum natantis ass. nova

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