

# Habitat diversity and environmental management of the Marchesale Natural Reserve (S Italy)

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**Abstract.** The elaboration of management plans for governance of protected areas is a synthesis of different types of information, approaches and methods. One of the fundamental data used to describe the environmental context, and to define priorities and action plans, is the spatial expression of the habitat diversity. The work discusses different approaches for analyzing and mapping of habitat diversity. The use of the “key species” concept, applied to the management plan elaboration for the Biosphere Reserve and Natura 2000 Marchesale site (IT 9340119), is examined too.

**Key words:** habitat diversity, management, Marchesale, Natura 2000, protected area, S Italy

## Introduction

The process of management plan elaboration for the governance of protected areas is the result of different types of information, approaches and methods applied to assure a sustainable territorial development, along with a rational use of the natural resources. The spatial expression of the habitat diversity is one of the fundamental tools used to describe the environmental context in order to outline the priorities, the main floristic accounts, and the consequent action plans. The present study is part of an environmental analysis within the elaboration of the management plan of the Biosphere Reserve and Natura 2000 Marchesale site (IT 9340119).

## Physiographic remarks

The Marchesale site is located in the Serre Calabre (C Calabria, Italy) and occupies an area of *ca.* 1250 ha, ranging from 750 m up to 1170 m a.s.l.

(16°12'57"–16°16'45" E and 16°14'30"–16°15'26" N). From geological point of view, the substrata constitute of acid rocks, mainly represented by quartz-monzonites and granites. According to Ciancio & al. (2004), the area at issue is included in the Crystalline Mountainous Granitic Reliefs Unit, with dominant soils of Dystric Leptosol type, predominantly sandy, with pH from 4.5 to 5.5.

The climate is typically mesic (Fig. 1) and, on the basis of data supplied by the thermo-pluviometric station of Mongiana (data from 1972 to 2003 by Corpo Forestale dello Stato), the annual mean temperature is 10.9°C and precipitation is 1682 mm. According to the bioclimatic classification of Rivas-Martinez & al. (1999, 2002), the area falls within the Supratemperate Submediterranean Hyperhumid Belt. In this area, the potential vegetation is represented by pine forests and beech forests mixed with firs belonging to the alliance *Doronico-Fagion* Ubaldi & al. ex Ubaldi 1995.

The high precipitation values, together with the siliceous substrata, favour the development of numerous streams and wetlands.

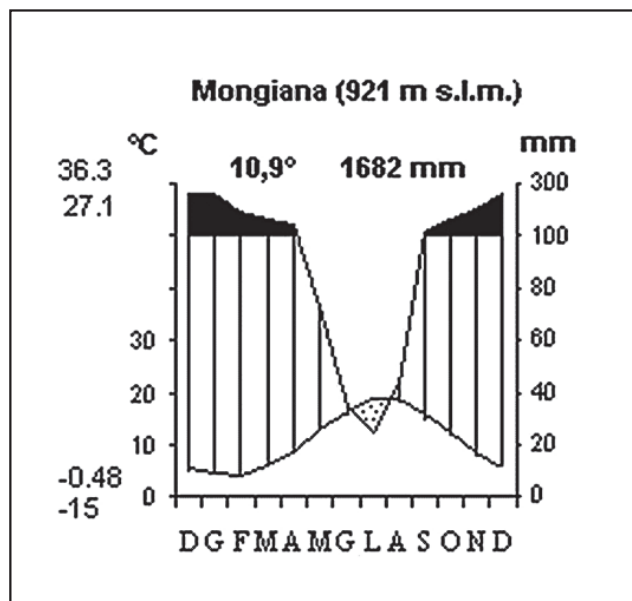


Fig. 1. Climatic diagram by Walter & Lieth of the station of Mongiana.

## Material and methods

The floristic investigation of the area was carried from 2003 to 2005. The *exsiccata* (ca. 1000) are preserved in the Herbarium of the Museum of Natural History of Calabria and Botanical Garden (CLU).

The phytosociological study, according to the Braun-Blanquet approach (Braun-Blanquet 1964), is based on about 100 relevés compared and ordered according to the available literary data (Barbagallo & al. 1982; Brullo & al. 2001, 2004). ESRI ArcMap 9 was used for the cartographic elaboration.

## Results and discussion

There are only few contributions regarding the flora and vegetation of Serre Calabre. In addition to the old data (Bisogni 1896; Chiaruggi 1955), recent papers provide some physiognomic and phytosociological information on particular areas and vegetation types (Pizzigallo 1941; Barbagallo & al. 1982; Ciancio & al. 1985; Bernardo & al. 1995).

Concerning the flora of this area, 322 species belonging to 62 families and 189 genera were found. The Mediterranean element dominated, followed by the elements with wider distribution, such as Circum-boreal, Euroasiatic and Paleotemperate (Fig. 2). The endemic element has shown quite low values, especially

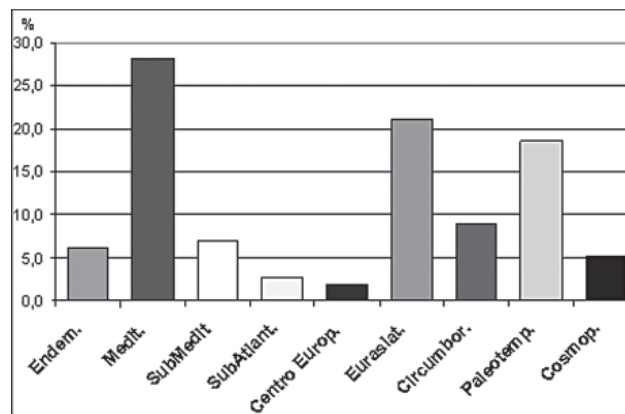


Fig. 2. Chorological spectrum.

when compared to the average value of the Calabrian territory as a whole.

Dominance of hemicryptophytes, as shown in the life-form spectrum (Fig. 3), could be related both to the temperate bioclimate characteristic of that territory and to the prevalence of woody plant-communities and wetlands.

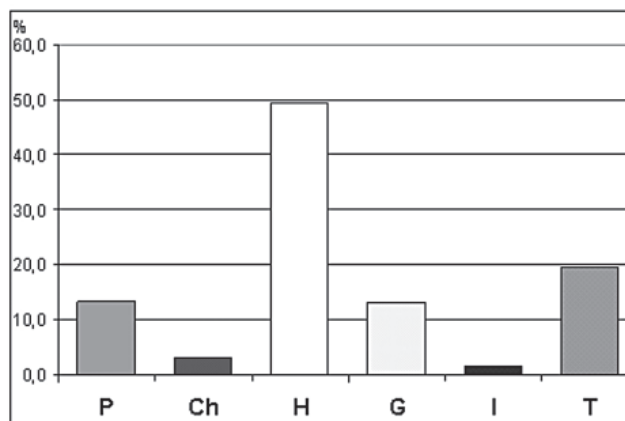


Fig. 3. Life-form spectrum.

Among the species occurring in the Marchesale Reserve, 23 are included in the Regional and National Red List (Conti & al. 1997), listed in Table 1. The ones marked with an asterisk are the “key species” mapped (applying UTM grid 1 km) in Fig. 4.

From a phytosociological viewpoint, the surveyed area is localized in the mountain belt and is characterized by the dominance of beech forests. In particular, forest communities with marked oceanic character, as testified by the occurrence of *Ilex aquifolium* L., can be ascribed to the *Anemone apenninae-Fagetum* (Gentile 1969) Brullo 1984, while those with more thermophilous requirements belong to the *Galio hirsuti-Fagetum* Brullo, Scelsi & Spampinato 2001, which is lacking in *I. aquifolium*. Thickets dominated by *Cytisus scoparius*

Table 1. List of the species included in the Italian Regional Plant Red List.

Taxa	Regional category	National category
<i>Adenocarpus brutius</i> Brullo, De Marco & Siracusa	LR	LR
<i>Aquilegia viscosa</i> Gouan*	VU	
<i>Arisarum proboscideum</i> (L.) Savi	LR	
<i>Blechnum spicant</i> (L.) Roth*	LR	
<i>Cardamine heptaphylla</i> (Vill.) O.E. Schultz*	VU	
<i>C. raphanifolia</i> Pourr.	LR	
<i>Chaerophyllum calabricum</i> Guss.	VU	
<i>Chrysosplenium dubium</i> Gay	LR	
<i>Cirsium palustre</i> (L.) Scop. var. <i>horridum</i> Posp.	LR	
<i>Epipactis helleborine</i> (L.) Crantz	LR	
<i>E. meridionalis</i> H. Baumann & R. Lorenz	VU	
<i>Euphorbia amygdaloides</i> L. subsp. <i>arbuscula</i> Meusel	LR	
<i>E. corallioides</i> L.	LR	
<i>Galanthus reginae-olgae</i> Orph. subsp. <i>vernalis</i> Kamari		VU
<i>Impatiens noli-tangere</i> L.*	LR	
<i>Lereschia thomasi</i> (Ten.) Boiss.*	LR	VU
<i>Lysimachia vulgaris</i> L.	VU	
<i>Neottia nidus-avis</i> (L.) L.C. Rich.	LR	
<i>Potamogeton polygonifolius</i> Pourr.*		VU
<i>Ranunculus fontanus</i> C. Presl*		VU
<i>Salix cinerea</i> L.	DD	
<i>Taxus baccata</i> L.*	VU	
<i>Veronica scutellata</i> L.	CR	

(L.) Link are related to the degradation processes of the beech woods.

Within the beech woods, *Abies alba* Mill. subsp. *apennina* Brullo, Scelsi & Spampinato is not rare, and sometimes constitutes monodominant fir communities ascribed to *Monotropo-Abietetum apenninae* Brullo, Scelsi & Spampinato 2001.

In the northern area of the Reserve (about 800 m. a.s.l.), there are chestnut forests related to artificial reforestation which replaced in the past the Mediterranean mesophilous deciduous oak communities.

Quite common are the wet habitats colonized by typical hygrophilous vegetation, particularly due to

the very humid microclimatic conditions. The syntaxonomic arrangement of this vegetation is fairly complex. Most of these communities belong to the *Holoschoenetalia* Br.-Bl. ex Tchou 1948, *Molinio-Arrhenetheretea* R. Tx. 1937 order or, less frequently, to *Isoeto-Littorelletea* Br.-Bl. & Vlieger in Vlieger 1937. Very frequent are the rush communities dominated by *Juncus effusus* L., or sedge communities with *Carex stellulata* Good., *C. distans* L. and *C. tumidicarpa* Andress. The less wet stands are often colonized by the endemic *Genista brutia* Brullo, Scelsi & Spampinato. Communities with *Potamogeton polygonifolius* and *Ranunculus fontanus* are circumscribed to the swamps.

The riparian woods with *Alnus glutinosa* can be ascribed to *Euphorbio-Alnetum glutinosae* Brullo & Furnari in Barbagallo & al. 1982. Along the streams, communities of *Galio-Urticetea* Passarge ex Kopecky 1969 and *Montio-Cardaminetea* Br.-Bl. & R. Tx. ex Br. Bl. 1948 are frequent. Among these, quite important is the occurrence of *Chrysosplenio-Lereschietum thomasi* Brullo & Furnari in Barbagallo & al. 1982, which is a peculiar hygrophilous

vegetation characterized by the endemic species *Lereschia thomasi*, usually associated with *Chrysosplenium dubium* Gay and *Cardamine flexuosa* With. var. *glaberrima* Fiori.

Habitats are mapped at 1:10 000 scale (Fig. 5) on the basis of photo-interpretation. The legend was elaborated in order to represent the basic physiognomic vegetation types in relation both to the habitat types and the syntaxonomic units (Table 2). On the basis of syndynamic interpretation of the different vegetation units (Fig. 5), the degree of naturalness/artificiality (Fig. 6) is evaluated according to the classification proposed by Ubaldi (1980).

Priority zones for species and habitat conserva-

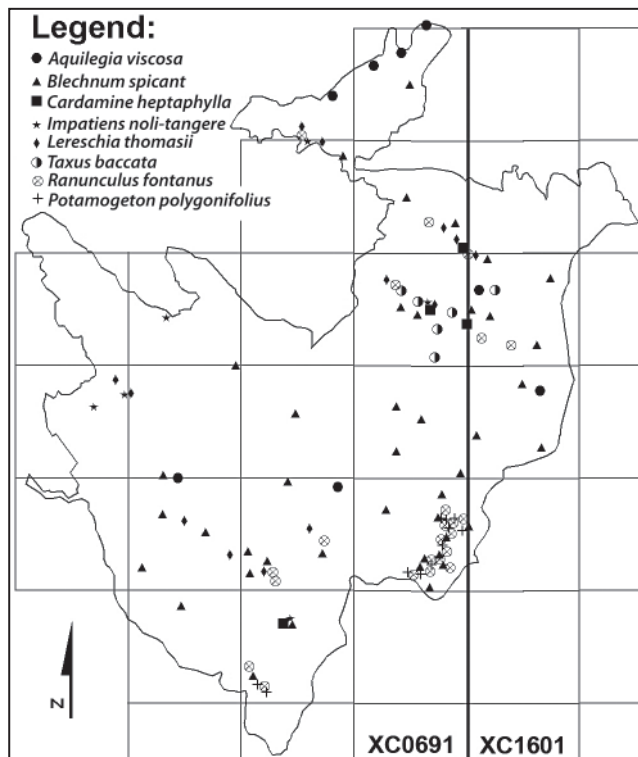


Fig. 4. Map of the rare species.

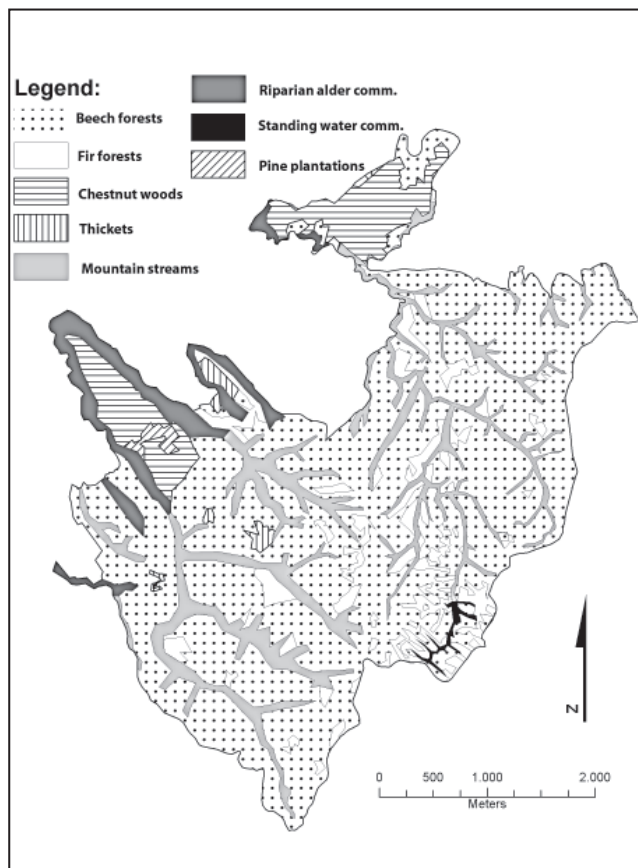


Fig. 5. Map of the vegetation.

Table 2. Correspondence of the main mapped units with habitat and vegetation types.

Map unit	DIR 92/43	EUNIS	CORINE	Description ( <i>Syntaxa</i> )	%
1 Beech forests	9210*	G1.68	41.18	Southern Italian beech forests Apeninne beech forests with <i>Taxus</i> and <i>Ilex</i> ( <i>Anemono apenninae-Fagetum</i> )	70
	9220*	G1.68	41.18	Apennine beech forests with <i>Abies alba</i> and beech forests with <i>Abies nebrodensis</i> ( <i>Galio hirsuti-Fagetum</i> )	
2 Fir forests	9510*	G3.15	42.15	Southern Apennine silver fir forests ( <i>Monotrope-Abietetum apenninae</i> )	8
3 Chestnut woods	9260	G1.7D6	41.96	<i>Castanea sativa</i> woods	7
4 Standing water communities	7140	D2.3	54.5	Transition mires and quaking bogs ( <i>Scheuchzerio-Caricetea fuscae</i> )	0.5
	3150	C1.2414	22.4314	Broad-leaved pondweed carpets ( <i>Isoeto-Littorelletea</i> )	
5 Riparian communities with <i>Alnus</i> and tall herb	91E0*	G1.1313	44.513	Western Mediterranean alder and ash-alder galleries ( <i>Euphorbio-Alnetum glutinosae</i> )	5
	6430	E5.43	37.72	Shady woodland edge fringes ( <i>Chrysosplenio-Lereschietum thomasii</i> )	
6 Mountain streams	3260	C2.1	24.41	Acid oligotrophic vegetation of spring brooks ( <i>Montio-Cardaminetea</i> )	8
	6430	E5.43	37.72	Water courses of plain to montane levels ( <i>Galio-Urticetea</i> )	
7 Thickets	–	F3.23	31.8A	Tyrrhenian sub-mediterranean deciduous thickets ( <i>Cytisetea striatoscoparii</i> )	1
8 Pine plantations	–	G3.F12	83.31	Native pine plantations	0.5

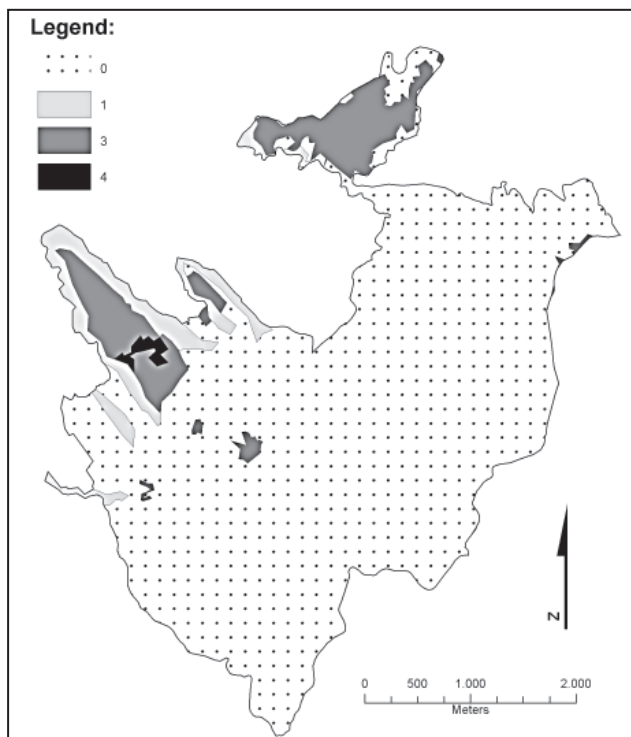


Fig. 6. Map of the naturalness/artificiality.

tion were individuated and indicated as Zones of Special Conservation Regime. A spatial overlay analysis was applied for their individuation: rare species, habitat types, ecosystems, and naturalness/artificiality layers (Fig. 7). The two zones are more representative of the conservation of the plant species and natural habitats and their definition is a useful management tool for supporting decision-making in the action plans and monitoring programme design.

## Conclusions

The major natural habitats (wetlands, beech and fir forests) occurring in the Marchesale Reserve represent one of the southernmost offshoots of the Central European vegetation type, with peculiar floristic compositions well adapted to the local climatic conditions (macro- and microclimate).

In conclusion, the overall conservation conditions of the site are good and the extension and diversification of the vegetation types depend mainly on the natural gradients, such as geology, hydrology and local climate. The main potential threat for these high sensibility natural habitats is represented by the increasing human activity.

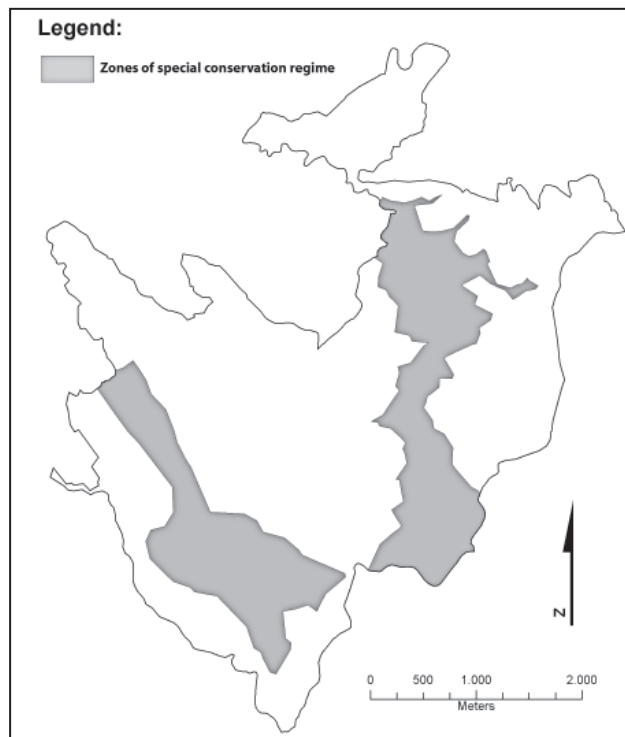


Fig. 7. Zones of special conservation regime.

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