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MONOGRAPH

Requalification of coastal plant landscape of South-Eastern Sicily, Italy: the case of Marina di Priolo

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ABSTRACT In this paper the Authors examine the psammophilous vegetation and the degrees of naturalness of the coastal plant landscape of a part of the South-Eastern littoral in Sicily. This area is characterized by considerable human pressure due to the presence of a large industrial center and beach tourism. The recent construction of the garden next to the beach, made mainly with ornamental plants has contributed to further amend the original physiognomy of the coastal landscape. Were analyzed, with phytosociological method, psammophilous plant communities and zonation of vegetation. The results of the analysis show a impoverishment of flora and a progressive decline in the psammophilous communities mainly due to the constant leveling the beach in summer. The authors propose a series of actions aimed at the requalification and conservation of coastal vegetation landscape of the investigated area.

KEY WORDS plant landscape; requalification; littoral; human pressure.

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INTRODUCTION

In the present work we analyzed the plant landscape of Marina di Priolo, a stretch of sandy coast between Marina di Melilli and Magnisi peninsula, about 6 km north of Syracuse (Sicily, Italy) (Fig. 1). In a not too distant past the area was used for the production of salt in the saltmarshes of Magnisi, placed in a large basin behind the dunes adjacent to the study area. Although reduced from its original extent, this important humid environment is protected through the establishment of the R.N.O. "Saline di Priolo" managed by the L.I.P.U. (D.A. n. 807/44 of 12/28/2000). Since the 50s of last century, the area has undergone significant environmental change mainly due to the progressive establishment of one of the largest petrochemical industrial centers of Europe. The massive industrialization of the area has also led to the growth of urban centers and neighboring persistent anthropogenic coastal environment that, in recent years, was also affected by the profound transformations related to the increase in tourism.

The recent creation of a green area called "Garden of the Sea", adjacent to the beach, consists mainly of ornamental species, some exotic, helped to further modify the original structure of the coastal landscape. The purpose of this research is the cognitive analysis of the dune environment, spatial seriation of psammophilous plant communities and their state of preservation. Based on the results obtained, we propose actions for the rehabilitation and protection of plant landscape of the site investigated.

The area of study. From the perspective of geological-structural the area of Marina di Melilli, Syracuse (Sicily, Italy) is part of the Hyblean Plateau and the local stratigraphic succession is represented by ceno-neozoic carbonate rocks (Carbone et al., 1986). Examining the thermo-pluviometric data from the nearby station of Syracuse, the climate of the study area is Mediterranean, with mild, rainy winters and hot, dry summers (Zampino et al., 1997). While, as evidenced by Scelsi & Spampinato (1998) bioclimate is in the range inferior thermomediterranean dry type.

MATERIAL AND METHODS

The methodological approach used for phytosociological study of the psammophilous vegetation is that of the Sigmatista School of Braun-Blanquet (Braun-Blanquet, 1964), while for syntaxonomical framing were followed proposals of Brullo et al. (2002).

The collected samples were determined according to the Flora of Italy (Pignatti, 1982), prepared and preserved in the herbarium of the Ecomuseo dei Monti Climiti Melilli (Laboratory of Nature and Environmental).

RESULTS

Despite the heavy distortions of anthropogenic nature, the investigations carried out made it possible to identify, in the least disturbed stretches of coastline, different communities of psammophilous plants that, despite impoverished of many typical elements, hint at some aspects of the original plant landscape and suggest effective conservation measures for the protection and rehabilitation of ecosystems. Through the observations made could be detected, proceeding from the aphytoic zone inland, a first strip of terophitic halonitrophilous vegetation, parallel to the coast-line, which is closely pioneer, ascribable to the *Salsolo-Cakiletum maritimae*, characterized by the dominance of *Cakile maritima* Scop. associated with *Salsola kali* L. and *Polygonum maritimum* L.

The next strip, attributable to the *Cypero-Agropyretum juncei*, is characterized by herbaceous perennial plants of low embryo dunes. The association physiognomically is characterized by the dominance of *Elytrigia juncea* (L.) Nevski which is associated with *Sporobolus virginicus* (L.) Kunth and *Achillea maritima* (L.) Ehrend. et Y.P. Guo. The vegetation parallel to the latter strip is dominated by *Centaurea sphaerocephala* L. and *Onosis natrix* subsp. *ramosissima* (Desf.) Batt.; are also present *Pancratium maritimum* L., *Euphorbia terracina* L. and *Lotus cytisoides*. It is a plant community ascribable to the *Centaureo-Ononidetum ramosissimae*, chamaephytic and hemicriptophytic vegetation normally confined on the dunes further inland with little movement, the expansion of which is favored by human disturbance (Minissale & Sciandrello, 2010).

Proceeding inland, the psammophilous series is interrupted by a road parallel to the coastline. The analysis also revealed a degradation of the psammophilous vegetation due to the leveling and trampling of the dunes in the vicinity of the holiday season. The persistent action of scraping in sandy shore led to the demise of mobile dunes with typical vegetation with *Ammophila arenaria* (L.) Link, therefore, observing the current vegetation confirms the absence of the typical zonation of dune environments like those along the Ionian coast of south-eastern and far less degraded (see Brullo et al., 1988; Minissale & Sciandrello, 2010). The plant communities found are ranked according to the following syntaxonomical scheme:

CAKILETEA MARITIMAE R.Tx & Preising in Br.-Bl. & R.Tx 1952
CAKILETALIA INTEGRIFOLIAE R.Tx ex Oberd. 1949 corr. Rivas-Martínez, Costa & Loidi 1992
CAKILION MARITIMAE Pignatti 1953
Salsolo-Cakiletum maritimae Costa & Mansanet 1981 corr. Rivas-Martínez et al. 1992

AMMOPHILETEA Br.-Bl. & R.Tx ex Westhoff et al. 1946
AMMOPHILETALIA Br.-Bl. 1933
AMMOPHILION AUSTRALIS Br.-Bl. 1921 em. Gèhu, Rivas-Martínez & R.Tx in Rivas-Martínez et al. 1980
Cypero capitati-Agropyretum juncei Kühnholtz-Lordat (1923) Br.-Bl. 1933
CRUCIANELLETALIA MARITIMAE Sissing 1974
ONONIDION RAMOSISSIMAE Pignatti 1952
Centaureo-Ononidetum ramosissimae Br.-Bl. & Frei in Frei 1937

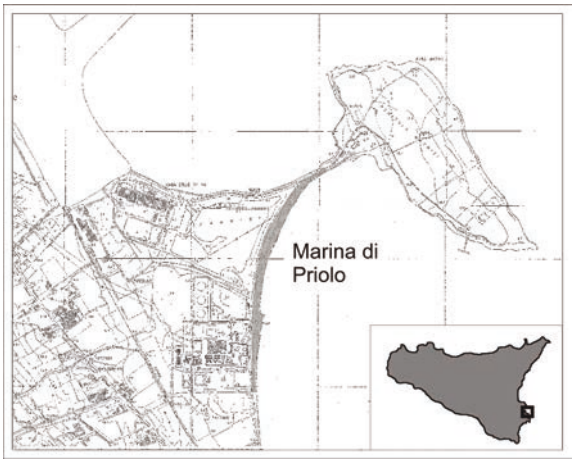

Figure 1. The area of study: Marina di Priolo, Syracuse (Sicily, Italy).

Figure 2. Marina di Priolo, Syracuse (Sicily, Italy): waste left along the beach.

Figure 3. Marina di Priolo, Syracuse (Sicily, Italy): psammophilous vegetation.

Figure 4. Marina di Priolo, Syracuse (Sicily, Italy): the green area caled “Garden of the Sea”.

CONCLUSIONS

The research suggests a number of measures aimed at the improvement and protection of plant landscape of the study area:

- allocation of a minimum unit of surface protection to the progressive development of natural vegetation. The "minimun dynamic area" is defined as the balance between the effects of disturbance and the area required for the development of the psammophilous community. In our case, the situation found suggests to preserve space as widely as possible to enable us to reconstruct the seriation of vegetation and restore the dune system.

This could be achieved by:

- elimination of non-native flora, both spontaneous and ornamental, present in the area concerned with habitat restoration through the use of native species from propagation material (seed), local germplasm collected in a special center or in a neighboring area less anthropized and comparable with the examined site. It is therefore proposed a renaturalization especially in the "Garden of the Sea", by converting the area into a natural garden characterized by the recovery of plant communities typical of dune environments having a dual role: eco-functional and didactic educational.

- development of a seaside tourism compatible with the environmental restoration of the site.

Salsolo-Cakiletum maritimae				
Relevé Number	1	2	3	
Surface (mq)	50	50	20	
Slope (%)	50	40	40	
Char. Ass.				
Salsola kali L.	1	+	+	3
Char. Euphorbion peplis & Cakiletea maritimae				
Cakile maritima Scop.	4	3	3	3
Polygonum maritimum L.	1	+	1	3
Xanthium strumarium italicum (Moretti) D. Löve	+	+	.	2
Chamaesyce peplis (L.) Prokh.	+	.	.	1
Companions				
Sporobolus virginicus (L.) Kunth	+	+	+	3
Achillea maritima (L.) Ehrend. & Y.-P. Guo	1	.	+	2

Table 1. The area of study, Marina di Priolo, Syracuse (Sicily, Italy): *Salsolo-Cakiletum maritimae* (Date 20.X.2012).

Cypero capitati-Agropyretum juncei				
Relevé Number	1	2	3	
Surface (mq)	30	30	30	
Slope (%)	70	60	60	
Char. Ass.				
Elytrigia juncea (L.) Nevski	4	3	3	3
Sporobolus virginicus (L.) Kunth	2	1	3	3
Achillea maritima (L.) Ehrend. & Y.-P. Guo	+	.	.	1
Char. Ammophilion & Ammophiletea				
Eryngium maritimum L.	1	+	+	3
Pancratium maritimum L.	+	+	+	3
Echinophora spinosa L.	+	+	.	2
Silene nicaeensis All.	+	+	.	2
Companions				
Cakile maritima Scop.	+	+	+	3
Polygonum maritimum L.	+	+	.	2

Table 2. The area of study, Marina di Priolo, Syracuse (Sicily, Italy): *Cypero capitati-Agropyretum juncei* (Date 20.X.2012).

Centaureo-Ononidetum ramosissimae				
Relevé Number	1	2	3	
Surface (mq)	15	20	20	
Slope (%)	100	100	100	
Char. Ass.				
Ononis hispanica ramosissima (Desf.) Förther et Podlech	4	4	3	3
Centaurea sphaerocephala L.	2	1	2	3
Char. Crucianelletalia & Ammophiletea				
Euphorbia terracina L.	2	2	1	3
Pancratium maritimum L.	1	+	+	3
Elytrigia juncea (L.) Nevski	1	1	+	3
Silene nicaeensis All.	1	+	+	3
Sporobolus virginicus (L.) Kunth	1	+	.	2
Ononis variegata L.	+	+	.	2
Cyperus capitatus Vandel.	1	.	.	1
Companions				
Anisantha rigida (Roth) Hyl.	2	2	1	3
Silene colorata Poir.	2	1	1	3
Lagurus ovatus L.	1	1	+	3
Vulpia fasciculata (Forssk.) Fritsch	1	1	+	3
Scolymus hispanicus L.	1	+	1	3
Glebionis coronaria (L.) Spach	1	+	+	3
Dittrichia viscosa (L.) Greuter	1	.	+	2
Cutandia maritima (L.) Barbey	+	+	.	2

Table 3. The area of study, Marina di Priolo, Syracuse (Sicily, Italy): *Centaureo-Ononidetum ramosissimae* (Date 15.IV.2013).

The recommended actions will help restoring psammophilous communities also improving the ecological continuity between the dune environment and the wetland of RNO "Saline di Priolo" permitting, at the same time, visitors to perceive a higher degree of naturalness of the environment compared to the current situation of degradation. The proposed objectives are part of a broader scope of environmental restoration of the examined area, connecting with an ongoing project concerning the work of restoring of the former tenement ESPESI, located on the peninsula Magnisi, to be allocated to the visitor center and guest house (PO FESR 2007-2013 axis 3 ob. specific 2.1; program agreement 31/08/2011 between Department of Environment and Regional Authorities of the “Enti gestori delle Riserve Siciliane”).

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