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STRUCTURE AND EVOLUTION OF THE MEDITERRANEAN MAQUIS IN ITALIAN AND NORTH AFRICAN FORESTS 2nd CONTRIBUTION: THE MAQUIS-*QUERCUS SUBER* FORESTS

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In this paper the structure of cork-forests (*Quercus suber)* in Italy (Latium, Calabria, Sardinia and Sicily) and North-Africa is analysed. This is our second contribution describing Mediterranean anthropic forests. Previously the dynamics of *Eucalyptus* plots in Sardinia and Tunisia has been studied. Varying arboreous cover, understory trends in cork-forests seem to differ from those in *Eucalyptus* plots, where higher brightness makes the growth of *Helianthemetea guttati, Thero-Brachypodietea* and *Stellarietea mediae* characteristic species easier. In cork-forests the characteristic species of both *Quercion ilicis* and *Quercetalia pubescentis* are made easy in their growth.

Introduction

This report was presented at the »Third International Colloquium of Phytosociology«, but cannot be stricly defined as phytosociological.

In fact we shall not discuss either syntaxonomy problems, or describe new vegetation forms of concern for the those who are interested in the following subject: »The Mediterranean vegetation regarding in particular the evergreen forestal vegetation of the *Quercetea ilicis* class«.

Our scope is to understand particular aspects of Mediterranean vegetation connected to the structural physiognomy of the vegetation form of the landscape, rather than to the phytosociological aspect by use of instruments suggested by classical phytosociology, in order to interpret coverage of vegetation.

Problems concerning the recovery of polluted environments have been the topic of our studies in the past years. In order to develop this research we must describe the vegetation, its structure, evaluate the probable anthropic influence and then suggest intervention so that the natural evolution of vegetation should assume more useful forms of vegetation by setting a possible time line of vegetation landscape evolution. The methods and means used in phytosociology are absolutely necessary (phytosociological relevés, phytosociological tables, fidelity card index, statistical elaborations and interpretation of data).

We have been studying the structure of several Mediterranean forests with dr. Pacioni, Mycologist of our Department of Environmental Sciences, and his collaborators. Of primary interest are forest of anthropic origin and/or those which have been subjected to heavy and constant human interference, as for example the semi-natural forests of *Quercus suber*, *Pinus halepensis*, and those derived from reafforestations, i. e. forests of *Pinus* sp. pl. and *Eucalyptus* sp. pl.

The structure and evolution of elements of the Mediterranean maquis in the *Eucalyptus* sp. pl. forests have been examined as suggested and the results have been published (Veri and Sebastiani 1984).

Our intentions are to compare the structure of these woods (*Eucalyptus* sp. pl. woods) of anthropic origin, with *Quercus suber* woods. The latter were originally spontaneous in the western part of the Mediterranean basin and in a few Atlantic countries (Marocco, Portugal). Now they may be considered highly anthropisized and often of anthropic origin, as for example some wood formations on the Ionic coasts of Calabria (Rel. N. 32) and Apulia (Scarascīa and Schirone 1983), regions of southern Italy.

Methodology

The 67 phytosociological relevés used in this study were carried out between 1980 and 1985 in the same territories where the *Eucalyptus* sp. pl. wood formations had been sampled (in Sardinia and northern Tunisia) and in northern Algeria, Sicily and Calabria. Because of the wide floreal variety in Morocco we have not included information concerning this area in the phytosociological table.

We shall compare the results obtained from this study concerning the *Quercus suber* formations with those regarding the *Eucalyptus* sp. pl. woods.

The *Quercus ilex* woods have been put to a different use by man if compared to *Quercus suber*. The former ones are very rich in flora because isolated elements are often allowed to grow (i. e. covering of the arboreous stratum often less than 50%) thus allowing a greater amount of sunshine to reach the soil. A census of 280 species (292 including different stages of development of the arboreal species) has been carried out.

The relevés in the phytosociological table (Table 1) are arranged according to the percentage of arboreal stratum coverage in the following three situations:

A: coverage of the arboreal stratum less than 50% (11 relevés);

B: coverage of the arboreal stratum between 50 and 80% (44 relevés);

C: coverage of the arboreal stratum greater than 80% (12 relevés).

The heading of the Phytosociological Table has been reduced because of limit in space. The number of the relevés is the only information given by the table. Other information (altitude, exposure, slant expressed in degrees, coverage in percentage of the arboreal, bush and herbaceous strata, surface of sampled ground in square metres, and information concerning the area where the survey has been conducted). is included in Table 2.

The *Eucalyptus* sp. pl. forests have been implanted where the original vegetation coverage was completely destroyed in order to facilitate the growth of a forest as wanted. The former vegetational coverage was made of bushy growth i. e. a vegetational aspect of the degraded *Oleo--Ceratonion, Cisto-Lavanduletea, Quercion ilicis,* and prairies that are very difficult to interpret phytosociologically, for example, grazing grounds, abandoned fields, or uncultivated land.

The elements of the Mediterranean maquis began recolonization by formation of undergrowth on conclusion of forestation. In the *Quercus suber* forests as well, we continuously observe the partial destruction of undergrowth, especially during periods of cork harvesting, and its successive reconstitution.

Both forestal formations are disturbed by man. The floreal composition is altered as well as the density of arboreal and bush species (by thinning out). Man exploits the herbaceous stratum for scanty sheep and cattle grazing. Frequently there are fires above all in cork forests.

By using the criteria used for *Eucalyptus* sp. pl. forests we have included the vegetational species reported in each phytosociological needs:

1. principle species (*Quercus suber* in its various stages of development);
2. characteristic species of *Quercetea ilicis* Br.-Bl. 1947;
3. characteristic species of *Quercetalia ilicis* Br.-Bl. (1931) 1936 and *Quercion ilicis* Br.-Bl. (1931) 1936;
4. characteristic species of *Oleo-Ceratonion* Br.-Bl. 1936;
5. characteristic species of *Cisto-Lavanduletea* Br.-Bl. 1940;
6. characteristic species of *Helianthemetea guttati* Br.-Bl. 1931;
7. characteristic species of *Thero-Brachypodietea* Br.-Bl. 1931 (pollution index of undergrowth due to eccessive anthropization and/or grazing);
8. companion species (sporadic species are listed in the Appendix and in Table 1B).

The Coefficient of Specific Coverage (C. S. C.) has been calculated for each one of the 67 relevés and for each situation of different coverage as formulated (A, B, C). The C. S. C. has been calculated considering the Abundance-Dominance coefficients with the following values:

$$+ = 0.1;\ 1 = 2.5;\ 2 = 15.0;\ 3 = 37.5;\ 4 = 62.5;\ 5 = 87.5.$$

We have thus calculated the Biological and Phytosociological Spectrum both Normal and Pondered.

In order to determine the reported species and the attribution of the Life Forms we followed the indications suggested by P i g n a t t i (1982) and by Q u e z e l & S a n t a (1962—63) (limited to the species of North Africa).

In order to accurately described the undergrowth and the way it is built, the Phanerophytes have been distinguished as follows:

Macrophanerophyta (P): individuals and habitus exclusively arboreal have been incluted in this category;

Nanophanerophyta (NP): this category comprises bush and shrub forms strictly speaking and also young trees, indicated in Tables 1A, 1B and the Appendix as »shrub« if as tall as 2.5 — 3.0; »pl« if young plants;

Phanerophyta liane (Pl): known as liane.

Analysis of Results

Tables 3, 4, 8 and 9 show the values in percentage referred to in both the Biological and Phytosociological Normal and Pondered Spectrum in the three different forestal aspects considering the change in arboreal covering. A control has also been carried out by listing the values in percentage also for all of the 67 relevés considered in this work. The formations of *Eucalyptus* sp. pl. are also listed in brackets. The values are expressed in percentages and have been taken from a previous publication (Veri and Sebastiani 1984).

By analysing Table 3 we may observe that numerical variations in percentage concerning the formations of *Quercus suber* with respect to those of *Eucalyptus* sp. pl. are not very big. This Table lacking information is relative to the Normal Biological Spectrum.

In fact, previously we recalled the fact that both these wood formations are rich in flora and continuously undergo an anthropical impact often due to grazing.

We must observe that there are more arboreal forms (P) of the *Quercus suber* formation than in *Eucalyptus* sp. pl. Besides the species introduced with the *Eucalyptus* sp. pl. and *Quercus suber, Q. cerris, Q. frainetto, Ceratonia siliqua, Fraxinus ornus* and some others have been reported. On the other hand amongst the *Quercus suber* formations we observe that there are many other arboreal species. Their growth is facilitated by an environmental stability due to the age of the forests and to the higher amount of shade and humidity in the environment. In fact the *Quercus suber* installations are often remains of natural woods and are much older than the others, which are very recent and of anthropic origin. *Quercus suber* often intermingles with *Quercus ilex, Q. pubescens, Q. cerris, Q. faginea, Pinus pinea, P. halepensis, Carpinus orientalis, Sorbus torminalis,* often with high coverage (Rel. N. 20, 22, 24, 29, 40, etc.).

Natural origin has helped and facilitated also the development of a layer of shrub, very rich in these forestal formations, although human impact is strong. The nanophanerophyta (NP) always maintain rather high values not only in number reaching as much as 21.97% of the reported flora when the coverage of the arboreal stratum is greater than 80%.

This is in spite of the fact that forests are thinned out and fires burnt from time to time in order to obtain better grazing conditions.

Phanerophyte lianose (Pl) and chamaephyte (Ch) do not provide useful information about the structure of these formations because of their low number and coverage.

The herbaceous species are the most interesting (H. G and T). All together they make up more than 70% of the reported flora. whereas their coverage is rather low. The greater richness of therophyte in *Eucalyptus* sp. pl. formations with respect to the *Quercus suber* which do not have as high a coverage as the former, show that there is a state of ecological tension in the stations of observation: the diaspores of many herba-

ceous species are able to germinate but do not become a stable part of the flora in the station. On the other hand perennial grasses (G and H) present greater coverage in *Quercus suber* woods than in *Eucalyptus* sp. pl., indicating a minor ecological environmental tension. It is important to remember that the layer of humus in *Eucalyptus* sp. pl. woods is composed of leaves, like in the *Quercus suber,* not very easily decomposable by natural agents, and of visible and abundant remains of bark that accumulate leaving very little free space.

Table 4 shows the Pondered Biological Spectrum. At first sight the difference in values of coverage of the arboreal stratum is evident when compared to those of shrubs amongst the *Quercus suber* and *Eucalyptus* sp. pl. formations. However, as the arboreal coverage varies in the *Eucalyptus* sp. pl. formations, the value of the phanerophyta coverage increases in percentage reaching levels as high as 70.45% in »C« (arboreal stratum coverage greater than 80%). In the *Quercus suber* formations in »C« the phanerophyta reach only 39.98% of coverage, very much like that of nanophanerophyta (35.52%). These numerical results confirm that the shrub stratum. made almost completely out of Mediterranean maquis, finds highly favourable conditions for its development in *Quercus suber* formations when compared to *Eucalyptus* sp. pl. woods. It is rather difficult to explain the structure of vegetation in woods where the undergrowth is rich in flora. In fact, the average coverage of each vegetable stratum is a function of the other two strata. It is useful to compare the table of actual coverage of each and every stratum obtained as the mean value of coverage of each vegetational stratum of the relevé considered, so that the differences in coverage between each vegetational stratum may be easily identified, should the area be rich in undergrowth, in studying the Pondered Biological Spectrum.

Consequently we believe that the right thing to do is to calculate the mean value of coverage of each vegetational stratum in each of the three situations of arboreal stratum coverage proposed and also for all of the 67 relevés carried out. The results are shown in Table 5.

By doing so we obtain a rather detailed view of the situation of these vegetation forms. In fact it shows that in *Quercus suber* woods the bushes have very high values of coverage (73.18%) when the arboreal coverage is relatively low (lees than 50% in »A«) and decreases as the woods get thicker to 62.39% (arboreal coverage between 50 and 80% in »B«), getting as low as 49.42% where the arboreal coverage is greater than 80% (»C«). In *Eucalyptus* sp. pl. woods the arboreal coverage is a lower level, from 60.38% in »A« to 21.27% in »C«. In this second type of forest the herbaceous stratum also present a minor coverage than the corresponding *Quercus suber* formations in each case and in the total of the relevés (67 relevés).

We have mentioned the fact that other arboreal species in different ways become part of *Quercus suber* and *Eucalyptus* sp. pl. forests. In fact the phanerophyta represent 3.37% of all the flora reported in *Quercus suber* forests and 2.42% in *Eucalyptus* sp. pl. forests (Table 3). Coefficients of Specific Coverage of phanerophyta for every forestal aspect are proposed proportional to the actual coverage of vegetational stratum as shown in Table 5, and are used to obtain the actual values of coverage of the principle species, *Quercus suber* and *Eucalyptus* sp. pl. at different stages of development, with respect to other arboreous and shrub formations. The results are given in Table 6 and it follows that in *Quercus suber* forests the coverage in percentage of other arboreal species in the formations sampled, increases with the increase of arboreal coverage,

going from 3.02% in »A« to 6.39% in »C«, whereas in *Eucalyptus* sp. pl. woods the exact opposite occurs, decreasing from 2.47% in »A« to 0.42% in »C«.

In fact the species typical of broad-leaved forestal formations are facilitated by a more favorable substratum. They are marked by an asterik (*) and find the right environment for their development in *Quercus suber* forests. They increase numerically (from 4.70% to as much as 13.62%) and in coverage (reaching 11.89% from the initial 2.63%). In *Eucalyptus* sp. pl. forests the exact opposite occurs and when the coverage of the arboreal stratum is greater than 80% (»C«), the coverage of these forestal species is negligible (0.02%). These values are shown in Table 7.

The composition of the Phytosociological Normal and Pondered Spectrum is very different (Tables 8 and 9).

The greater luminosity on the ground of *Eucalyptus* sp. pl. formations when compared to *Quercus suber* formations is due to the particular arrangement of the leaves. We studied the structure of *Eucalyptus* sp. pl. forests by using the projection of foliage on the ground in order to evaluate the coverage of the arboreous stratum, instead of the percentage of shadows as done for *Quercus suber* forests. This major brightness makes the development of grasslands easier (referring to *Helianthemetea guttati, Thero-Brachypodietea* and *Stellarietea mediae* classes) in *Eucalyptus* sp. pl. forests with respect to *Quercus suber* forests not only for the number of species but also for the coverage. This is shown in Table 10.

We considered as a references index of grazing in the forests the existence of nitrophilous species combined in the *Stellarietea mediae* s. l. class.

Looking at Table 8 and 9 it follows that *Eucalyptus* sp. pl. formations undergo much more grazing when compared to *Quercus suber*. In fact in *Quercus suber* forests the species of the *Stellarietea mediae* class at first seem to increase, from 2.50% in »A« to 4.26% in »B«, but afterwards as the woods get thicker (coverage above 80% in »C«) they greatly decrease in number (3.03%) with very low values of coverage (well below 0.50%); in *Eucalyptus* sp. pl. forests although the presence of these nitrophilous species is greater their coverage barely exceeds the values of *Quercus suber* forests (reaching the maximum value of coverage in »B« with 1.28%). They are often ubiquist and anthropochorous species with well-determined ecological needs. We have observed the grazing which is more intense and practised in *Eucalyptus* sp. pl. forests, often situated close to agricultural centres, especially in north Africa. This explains the greater presence of nitrophilous species (21 species) in *Eucalyptus* sp. pl. forests whereas only 11 species have been reported in the *Quercus suber* forests, but the very arid environmental conditions, in *Quercus suber* forests where there is more shade on the ground, do not allow development.

In both cases (*Quercus suber* and *Eucalyptus* sp. pl. forests) Companion species are numerous and represent more than 50% of reported flora. The very high numerical presence does not correspond to a very high value of coverage. It increases from 14.50% in »A« to 20.42% in »C« in *Quercus suber* forests, whereas in *Eucalyptus* forests the coverage is relatively much lower. On the other hand if we substract the values of coverage of characteristic species in broad-leaved forests from the value of coverage of Companion in *Quercus suber* forests, the coverage of Companion in the two different forests reach similar values. We may

thus conclude that the ecological tension in these wood formations allows the germination of diaspores of different species alien to the Mediterranean maquis but typical of other vegetational formations and that it operates in a selective way on their actual affirmation on the territory maintaining rather low values of coverage. We could refer to them as Accidental Species rather than Companion.

It is necessary to consider situation »B« (coverage of arboreal stratum between 50 and 80%) as apparently abnormal. Table 5 shows that in »A«, »B« and »C« the value of actual coverage of arboreal stratum increases and the shrub stratum decreases, the herbaceous stratum increases at first (from »A« to »B«) and then decreases (from »B« to »C«) whereas in theory it should decrease just as much as the value of coverage of shrub stratum. In addition to the many Companion there are also species of *Helianthemetea guttati, Thero-Brachypodietea* and *Stellarietea mediae* classes that are part of the herbacious stratum.

The increase in shade on the ground, whose values from less than 50% in »A« to less than 80% in »B«, should operate as a limiting factor towards the development of heliophilous species of the herbaceous stratum instead of helping the increase in number and coverage as it seems to be according to Tables 5 and 10. An explanation could be the following: at first when the arboreal coverage is low (lees than 50% in»A«), the high development of the shrub stratum (73.18% in *Quercus suber* forests and 60.38% in *Eucalyptus* sp. pl. forests) strongly reduces the amount of space where herbaceous species could develop. In fact the transit of man and grazing animals takes place in narrow spaces available between one shrub and another leaning towards the ground where the development of »grass« in negligible. The increase in coverage of the arboreal stratum (as much as 80% in »B«) and the corresponding decrease in mean value of shrub stratum coverage (in fact it decreases to 62.39% in *Quercus suber* forests and to 43.44% in *Eucalyptus* sp. pl. forests) brings about an increase in average plant height. This creates favourable conditions for the formation of microstations where the development of both heliophilous species occurs in space between one shrub and another, no longer subjected to excessive trampling, sciaphilous species that find more shade on the ground.

The decrease in evapo-transpiration brings enrichment of substratum with many other species, i. e. *Dactylis glomerata, Oryzopsis miliacea, Brachypodium pinnatum, Asphodelus microcarpus* and *Urginea maritima,* present in all the proposed forestal aspects and very common in the Mediterranean environment. They have a greater development increasing in »A« from 2.06% of coverage in percentage to 2.34% in »B«. The increase in arboreal coverage (greater than 80% in »C«) determines a reduction in luminosity which has a negative influence on these species. In fact, although the substratum conditions are more favourable, species which need more light are no longer able to develop properly. This is quite evident in the characteristic species of the *Helianthemetea guttati, Thero-Brachypodietea* and *Stellarietea mediae* classes (Table No 10) and for the other species mentioned above where coverage per cent decreases in »C« to 0.67%.

The presence of principle species in the different situations we have proposed (»A«, »B« and »C«) (Table 8) turned out to be greater than our expectations because we have considered the different stages of development of the principal species themselves (tree, shrub and tree seedlings).

The difference in coverage of principal species is rather big between *Quercus suber* and *Eucalyptus* sp. pl. forests (Table 9). The meaning of this quite evident difference has already been explained when we examined Tables 6 and 7.

When considering the characteristic species of the *Quercetea ilicis* and *Cisto-lavanduletea* classes it is best to examine only coverage per cent. In fact, although the characteristic species of these classes have a proper well-determined ecology, they find, within the complex structure of *Quercus suber* and *Eucalyptus* sp. pl. forestal formations, propitious microstations where their complete development is possible.

The characteristic species of the thermo-xerophilous formations of the *Cisto-Lavanduletea* and *Oleo-Ceratonion* undergo an abrupt decrease in number and coverage due to the change in ecological characteristics of stations when the arboreal coverage increases in both types of forest.

The characteristic species *Quercetea* and *Quercion ilicis* in *Quercus suber* and *Eucalyptus* sp. pl. forests behave in very different ways according to the proposed forestal aspect. They are constantly more numerous in *Quercus suber* forests, but decrease from 26.23% in »A« to 24.73% in »C« whereas in *Eucalyptus* sp. pl. forests there is a greater reduction: the coverage decreases from 23.42% in »A« to 10.91% in »C«.

Previously we spoke about the structure of *Eucalyptus* sp. pl. forets and said that, when the coverage of trees is within medium values (»B«), the majority of Mediterranean species can completely accomplish their biological cycle. In addition, if on one hand the production of wood is high, then on the other hand in the relevé stations the presence of all the microhabitats needed for a guaranteed survival of the Mediterranean species is assured. However, in *Quercus suber* forests the Mediterranean species are not endangered and occupy their own ecoloigcal niche in the economy of the forest. As is the case in all natural environments over-exploited by man, they must be safe-guarded in order to protect and conserve this unique *»Mediterraneis«* landscape.

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Table 1A

	Number of the relevé	14 54	21 16	17 78	24 39	12 59	04 56	77 40	63 93	12 68	98 98	25 23	08 43	80 67	25 34	93 36	41 57	00 12	54 87	Frequency classes A	B	C	Coefficient of specific coverage A	B	C	Freq. cl.	C. S. C. 67 releves
P	*Quercus suber* L.	3 2	3 1	3 2	2 2	2 2	5 1	4 2	5 2	4 1	5 2	5 2	4 2	5 2	5 2	4 2	4 2	4 2	5 2	V	V	V	2727.27	6534.09	8333.33	V	6231.34
NP	*Quercus suber* L. (shrub)	2 ·	1 ·	2 2	2 2	· 2	1 ·	· 2	· 2	1 ·	· ·	2 ·	· 1	2 ·	1 ·	1 1	1 ·	· 1	2 +	IV	III	III	863.63	460.45	313.33	III	500.30
NP	*Quercus suber* L. (pl)	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·			+			20.83	+	3.73
	QUERCETEA ILICIS character-species																										
Pl	*Rubia peregrina* L.	1 1	+ ·	1 ·	+ ·	1 ·	· +	1 1	1 ·	1 ·	1 2	1 +	1 2	+ ·	2 1	2 2	1 1	1 2	2 ·	III	IV	V	92.72	421.36	584.16	IV	400.30
Pl	*Smilax aspera* L.	2 2	+ ·	· ·	1 +	1 ·	· 1	· 1	2 2	2 ·	1 1	1 ·	1 2	1 +	2 2	1 1	1 ·	1 2	2 +	III	IV	IV	320.00	625.68	138.33	IV	474.78
G	*Asparagus acutifolius* L.	· 2	1 ·	2 ·	1 ·	+ ·	1 +	· 1	· 1	2 2	+ ·	2 1	· 2	· ·	+ ·	2 ·	· 1	+ 2	2 1	III	IV	V	341.81	342.72	167.50	IV	311.19
NP	*Pistacia lentiscus* L.	2 2	1 2	2 ·	1 +	· ·	· 1	· ·	3 2	· 1	3 ·	· ·	2 1	3 3	· ·	1 ·	1 2	· ·	· ·	IV	III	III	591.81	750.00	541.66	III	686.72
G	*Arisarum vulgare* Targ.-Tozz.	· ·	2 +	1 1	1 ·	· +	1 +	· 1	+ 1	+ 1	· ·	1 ·	· +	+ 1	1 ·	· ·	+ ·	· ·	1 ·	IV	III	III	229.09	138.40	4.16	III	125.52
H	*Asplenium adiantum-nigrum* L.	· ·	· ·	· ·	1 ·	· ·	+ +	· ·	1 ·	1 ·	+ 1	+ 1	· ·	+ +	1 +	1 +	1 1	· ·	1 ·	+	III	IV	22.72	59.54	190.00	III	76.37
NP	*Daphne gnidium* L.	+ ·	+ +	2 1	+ 1	· 1	· ·	1 1	· 1	1 2	+ ·	· ·	1 1	1 ·	1 ·	1 ·	· ·	1 ·	· ·	IV	III	I	208.18	130.90	1.66	III	120.45
NP	*Rosa sempervirens* L.	· ·	· ·	2 ·	· ·	· ·	+ 1	+ 1	1 1	1 ·	1 1	2 ·	· 2	· · ·	1 1	· 1	· 2	1 2	2 +	+	III	III	136.36	216.81	189.16	III	198.66
Ch	*Selaginella denticulata* (L.) Link	2 ·	· ·	· ·	1 +	1 1	· 1	+ 1	· ·	· ·	· ·	1 1	1 1	1 ·	· ·	1 +	· ·	2 +	· ·	III	III	III	205.45	114.31	44.16	III	116.72
NP	*Arbutus unedo* L.	2 1	+ ·	· ·	+ 1	· ·	· ·	· ·	2 2	1 ·	· ·	· ·	3 ·	1 ·	2 3	1 1	· ·	1 ·	· ·	III	II	II	183.63	698.86	583.33	II	593.58
H	*Eryngium tricuspidatum* L.	+ ·	· 1	· ·	· +	· 1	· +	+ ·	· 1	· ·	· ·	+ ·	1 ·	+ ·	1 1	· ·	· ·	· ·	· ·	II	II	II	47.27	35.90	42.50	II	38.96
NP	*Phillyrea angustifolia* L.	2 ·	1 1	· ·	1 1	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	+ ·	3 ·	· ·	· ·	· ·	· ·	III	II	I	227.27	466.13	250.00	II	276.27
Pl	*Lonicera implexa* L.	· 1	+ ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+ ·	1 2	· 1	· ·	· ·	· ·	1 ·	· ·	I	II	+	23.63	74.09	0.83	I	52.69
NP	*Arbutus unedo* L. (shrub)	· ·	· ·	· ·	· ·	2 1	· ·	+ ·	· ·	1 ·	· ·	· ·	· ·	· ·	2 1 1	· ·	· ·	· ·	· ·	I	I	II	159.09	51.36	458.33	I	141.94
NP	*Olea europaea* L.	1 ·	· 1	· ·	· ·	· ·	+ ·	· 1	· ·	· 1	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· 1	· ·	I	I	+	45.45	22.95	0.83	I	22.69
T	*Galium tunetanum* Lam.	+ ·	· +	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+ +	· ·	· ·	· ·	· ·	· +	· ·	· ·	+ +	I	+	I	1.81	0.90	1.66	I	1.19
G	*Ruscus hypoglossum* L.	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	+ ·	· ·	· ·		+			17.27		+	11.34
H	*Euphorbia characias* L.	· 2	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	2 ·	· ·	+		I	136.36		145.83	r	48.51
H	*Asplenium onopteris* L.	· ·	· ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· +	· ·	· ·	· +	· ·	· ·	· ·	· ·		+			0.68		r	0.45
NP	*Teucrium fruticans* L.	+ 1	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	II			46.76			r	7.61
NP	*Osyris alba* L.	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+	r		22.72	5.68		r	7.46
NP	*Juniperus oxycedrus* L.	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·		r			5.68		r	3.73
	QUERCETALIA — QUERCION ILICIS character-species																										
H	*Pulicaria odora* (L.) Rchb.	1 1	1 +	2 ·	1 2	1 2	1 +	1 ·	1 ·	2 1	· 1	1 2	· 2	1 +	1 +	+ 2	1 ·	2 1	1 +	V	IV	V	546.36	360.00	565.00	IV	427.16
NP	*Crataegus monogyna* Jacq.	2 ·	· ·	1 ·	· +	1 1	· 1	+ ·	+ 1	1 ·	1 +	1 ·	+ 1	· 1	· ·	1 ·	1 1	· 1	+ 1	III	IV	V	205.45	143.63	251.66	IV	173.13
H	*Carex distachya* Desf.	1 ·	· 1	+ ·	2 ·	+ 1	· 1	· 1	1 2	· ·	· 1	1 +	· ·	1 ·	1 ·	· ·	+ +	· ·	1 ·	III	III	III	206.36	154.09	105.00	III	153.88
NP	*Phillyrea latifolia* L.	· 1	· ·	· 2	· ·	2 1	2 ·	· ·	2 2	· ·	2 ·	· ·	2 ·	1 2	· 2	· ·	1 2	2 ·	· ·	III	II	II	454.54	420.68	270.83	II	399.40
G	*Ruscus aculeatus* L.	· 1	· ·	· ·	· ·	+ ·	· ·	· ·	· ·	· ·	+ ·	2 2	· ·	· ·	· ·	· ·	+ ·	· 2	+ 2	I	II	III	23.63	245.00	625.00	II	276.72
T	*Cynosurus elegans* Desf.	· ·	· ·	· ·	· ·	· ·	+ ·	+ 1	1 ·	· ·	· ·	· +	· 1	+ ·	· ·	+ ·	· ·	· ·	· ·	+	II	I	19.31	1.66		II	13.13
H	*Teucrium siculum* Rafin.	· ·	· ·	· ·	1 ·	· ·	· ·	· +	· 2	+ +	· 1	· ·	· ·	1 ·	· ·	· +	· 1	· ·	1 ·	+	II	II	22.72	58.18	146.66	II	68.21
G	*Cyclamen africanum* Boiss. et Reut.	· ·	· +	· ·	· ·	+ ·	1 ·	2 ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	· ·	+ +	· ·	· ·	I	II	I	1.81	57.95	21.66	II	42.09
G	*Tamus communis* L.	· 2	· ·	· ·	· ·	· ·	· ·	1 ·	· +	1 ·	· ·	· ·	· ·	+ 1	· ·	· +	· ·	· ·	· ·	+	I	III	136.36	17.72	44.16	I	41.94
T	*Galium scabrum* L.	· ·	· ·	· ·	· ·	+ ·	· ·	· ·	+ ·	· ·	+ ·	· ·	· ·	· +	· ·	· ·	+ +	· ·	· ·		II	II		2.04	22.50	I	5.37
H	*Luzula forsteri* (Sm.) DC.	· ·	· ·	· ·	1 ·	· ·	· ·	1 ·	1 +	· ·	1 ·	· ·	1 1	1 ·	1 ·	· ·	· ·	· ·	· ·	+	I	II	22.72	40.00	22.50	I	34.03
NP	*Cytisus villosus* Pourret	+ ·	· ·	· ·	· +	· ·	· ·	2 2	· ·	· ·	· ·	· ·	· 2	· ·	· ·	1 ·	· ·	· ·	· ·	I	I	+	1.81	176.13	125.00	I	138.36
NP	*Viburnum tinus* L.	· ·	· ·	· ·	1 ·	· ·	1 2	· ·	· ·	· ·	· 2	· ·	· ·	· ·	1 ·	· ·	4 ·	1 ·	· ·	+	I	+	22.72	227.27	20.83	I	156.72
NP	*Quercus ilex* L. (shrub)	· 2	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	2 2	1 ·	· ·	· ·	· ·	· ·	2 ·	· ·	+	I		136.36	113.63		+	97.01
P	*Quercus ilex* L.	· ·	· ·	· ·	2 ·	· ·	· ·	· ·	· ·	· ·	1 ·	1 2	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	+	+		136.36	45.45		+	52.24
Pl	*Clematis cirrhosa* L.	· ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	1 ·	· ·		+			11.59		r	7.61
T	*Cynosurus polybracteatus* Poiret	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+			22.72			r	3·73
Pl	*Lonicera etrusca* Santi	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·		r			5.68		r	3.73
NP	*Bupleurum fruticosum* L.	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·		r			5.68		r	3.73
	OLEO — CERATONION character-species																										
NP	*Myrtus communis* L.	2 ·	2 2	2 ·	2 2	· ·	· 1	· 3	· 2	2 2	· ·	· 3	1 3	4 2	3 1	1 2	· 2	· 1	· ·	III	IV	III	818.18	1210.22	833.33	III	1078.36
NP	*Calycotome villosa* (Poiret) Link	2 ·	· 1	· 2	· ·	1 2	+ ·	+ ·	· ·	· ·	2 2	2 1	· +	· ·	1 ·	1 ·	3 ·	2 ·	3 2	III	III	III	70.00	552.20	190.00	III	471.34
H	*Ampelodesmos mauritanicus* (Poiret) Dur. et Sch.	+ 1	· ·	· 2	· ·	+ 2	· 2	· ·	3 1	· +	· ·	· ·	2 ·	· 2	· 1	· ·	· ·	2 ·	· ·	III	II	II	297.27	272.95	354.16	II	287.61
G	*Ambrosinia bassii* L.	+ ·	· ·	· 1	· ·	1 ·	· ·	· ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	+ ·	· ·	· ·	II	I	+	46.36	17.72	0.83	I	19.40
NP	*Chamaerops humilis* L.	2 1	· ·	1 ·	· ·	· 1	· ·	2 ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· ·	· ·	· ·	II	+		204.54	68.40		I	78.51
P	*Quercus coccifera* L.	1 2	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	I	r		159.09	39.77		+	52.24
Pl	*Clematis flammula* L.	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	· 2	· ·	· ·	· ·	· 1	· ·	· ·	· ·		+			45.45		r	29.85
NP	*Prasium majus* L.	· ·	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· +	+		+	22.72		0.83	r	3.88
NP	*Ceratonia siliqua* L. (shrub)	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· ·	· ·	· ·		r			0.22		r	0.15
	CISTO — LAVANDULETEA character-species																										
NP	*Erica arborea* L.	3 ·	1 4	2 ·	1 3	3 1	· 4	2 3	2 2	1 ·	1 2	+ ·	2 2	2 3	2 1	4 3	2 2	1 2	2 ·	IV	V	IV	1795.45	1540.22	1729.16	IV	1638.36
NP	*Cistus salviifolius* L.	+ 2	· ·	1 ·	· +	2 1	2 ·	1 1	· 1	· ·	· 1	1 1	2 ·	· +	2 ·	1 1	3 ·	· ·	2 ·	IV	III	II	456.36	494.54	355.00	III	463.28
H	*Carex hallerana* Asso	1 +	· 1	· 1	+ ·	· ·	1 ·	1 ·	· ·	· ·	· ·	2 ·	1 ·	1 2	· ·	+ ·	· ·	1 ·	· ·	III	II	II	70.00	176.36	42.50	II	134.93
NP	*Cistus monspeliensis* L.	+ ·	3 ·	· 3	4 2	· 5	4 ·	· ·	· ·	· ·	· ·	· ·	· ·	1 ·	· 1	2 ·	· ·	· ·	2 ·	IV	I	+	2410.00	91.13	20.83	II	515.22
NP	*Cistus incanus* L.	· 2	2 1	· 3	1 ·	· ·	· 1	· ·	· ·	· ·	· ·	· 2	· 1	· ·	· ·	· ·	· ·	1 2	· ·	III	I	+	659.09	90.90	0.83	I	168.06
NP	*Lavandula stoechas* L.	1 ·	· ·	· +	· ·	· ·	+ ·	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	· ·	+ ·	I	+	+	23.63	17.27	0.83	I	15.37
H	*Asperula laevigata* L.	+ ·	· ·	· ·	· ·	· ·	+ +	+ ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· ·	· +	· ·	+	I	+	0.90	1.13	0.83	I	1.04
G	*Cytinus hypocistis* (L.) L.	· +	· ·	· ·	· ·	+ ·	· ·	· ·	· ·	· +	· ·	· ·	· ·	· +	· ·	· ·	2 ·	· ·	· ·	I	+	+	1.81	34.54	20.83	+	26.72
Np	*Genista ulicina* Spach	1 ·	· ·	· ·	· +	· ·	· ·	· ·	· +	· ·	· ·	· ·	· +	· ·	2 ·	· ·	· ·	· ·	· ·	I	+		23.63	74.09		+	52.54
Ch	*Chrysanthemum fontanesii* (B. et R.) Q. et S.	· ·	· ·	· ·	· ·	2 1	· ·	· ·	· ·	· +	· ·	· ·	· ·	· ·	· ·	+ ·	· ·	· +	· ·		+	+		40.22	0.83	+	26.57
Ch	*Fumana thymifolia* (L.) Spach	+ +	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	II			24.54			r	4.03
NP	*Erica scoparia* L.	2 ·	· ·	· ·	· ·	· ·	· ·	· ·	· 1	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+	r		136.36	5.68		r	26.12
NP	*Cistus crispus* L.	· ·	· ·	· ·	· ·	· 2	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+			136.36			r	22.39
NP	*Halimium halimifolium* (L.) Willk.	· ·	· ·	· ·	· ·	· ·	1 ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·		r			5.68		r	3.73
T	*Linum numidicum* Murb.	+ ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	· ·	+			0.90			r	0.15

HELIANTHEMETEA GUTTATI character-species

T	*Briza maxima* L.	II	I	II	69.09	80.45	22.50	II	68.21
T	*Ornithopus compressus* L.	II	I		24.54	23.40		I	19.40
T	*Trifolium campestre* Schreber	II	+		3.63	0.68		I	1.04
H	*Centaurium erythraea* Rafn	II	+	+	2.72	0.68	0.83	I	1.04
T	*Tuberaria guttata* (L.) Fourr.	II	+		46.36	17.04		+	18.81
T	*Aira tenorei* Guss.	I	r	+	1.81	5.90	0.83	+	4.33
T	*Oglifa gallica* (L.) Chrtek et Holub	II		+	3.63		0.83	+	0.75
T	*Silene gallica* L.		+	+		51.13	20.83	+	37.31
T	*Vulpia myuros* (L.) Gmelin	I	r		1.81	68.18		+	45.07
T	*Linaria pelisseriana* (L.) Miller	+	r	+	0.90	0.22	0.83	r	0.45
T	*Rumex bucephalophorus* L.		+			34.54		r	22.69
T	*Vulpia ciliata* (Danth.) Link		r			5.90		r	3.88
H	*Hypochoeris radiata* L.	+	r		27.72	0.22		r	3.88
T	*Tolpis umbellata* Bertol.	+			0.90			r	0.15
T	*Trifolium glomeratum* L.		r			34.09		r	22.39
T	*Trifolium subterraneum* L.		r			34.09		r	22.39
T	*Linum trigynum* L.		r			0.22		r	0.15

THERO — BRACHYPODIETEA character-species

G	*Aetheorrhiza bulbosa* (L.) Cass.	I	II	II	23.63	103.40	23.33	II	68.51
H	*Calamintha nepeta* (L.) Savi		II	III		92.04	4.16	II	61.19
H	*Hypericum perforatum* L.	II	I	II	2.72	1.81	2.50	II	2.09
T	*Sherardia arvensis* L.	III	I		48.18	6.59		I	12.24
T	*Euphorbia exigua* L.	I	I		12.50	1.66		I	8.51
H	*Reichardia picroides* (L.) Roth.	II	I		2.72	12.04		I	8.36
T	*Galium parisiense* L.		I	+		1.13	0.83	+	0.90
T	*Galium murale* (L.) All.	I	+		1.81	6.36		+	4.48
T	*Galactites tomentosa* Moench	+	+		0.90	40.22		+	26.57
T	*Catapodium rigidum* (L.) Hubbard		r	+		0.45	0.83	r	0.45
T	*Medicago hispida* Gaertner	+	r		22.72	5.90		r	7.61
T	*Evax pygmaea* (L.) Brot.		r	+		5.90	0.83	r	4.03
H	*Carlina corymbosa* L.	I	r		23.63	0.22		r	4.03
H	*Salvia verbenaca* L.		r	+		5.68	0.83	r	3.88
T	*Brachypodium distachyum* (L.) Beauv.		r	+		5.68	0.83	r	3.88
T	*Petrorhagia velutina* (Guss.) Ball et Heyw.		r			0.45		r	0.30
T	*Trifolium stellatum* L.		r			34.31		r	22.54
T	*Trifolium scabrum* L.	+	r		0.90	0.22		r	0.30
H	*Cymbopogon hirtus* (L.) Janchen	+			0.90			r	0.15
T	*Psoralea bituminosa* L.		r			0.22		r	0.15
T	*Hedypnois rhagadioloides* (L.) Willd.	+			0.90			r	0.15

STELLARIETEA MEDIAE character-species

H	*Daucus carota* L.	III	I	+	5.45	7.04	0.83	II	5.67
T	*Stellaria media* (L.) Vill.		I	II		23.18	43.33	I	22.99
T	*Geranium dissectum* L.	+	+	+	22.72	17.27	0.83	+	15.22
T	*Anagallis foemina* Miller	I	+		1.81	0.68		+	0.90
T	*Sonchus asper* (L.) Hill	+	r	+	0.90	5.90	0.83	+	4.18
H	*Silene alba* (Miller) Krause		+			11.59		r	7.61
T	*Sonchus oleraceus* L.		+			0.68		r	0.45
H	*Urospermum dalechampii* (L.) Baker		r			0.45		r	0.30
T	*Fumaria officinalis* L.		r			0.22		r	0.15
T	*Cerastium glomeratum* Thuill		r			0.22		r	0.15
H	*Silene dioica* (L.) Clairv.		r			5.68		r	3.73

Companions

NP	*Rubus ulmifolius* Schott	III	III	IV	319.09	307.95	459.16	III	336.72
H	*Oenanthe pimpinelloides* L.	II	II	III	24 54	165.45	237.33	II	161.64
H	*Dactylis glomerata* L.	III	II	II	70.00	131.36	23.33	II	101.94
T	*Geranium purpureum* Vill.	+	III	II	0.90	115.90	42.50	II	83.88
H	*Oryzopsis miliacea* (L.) Asch. et Schweinf.	II	II	I	90.90	200.00	21.66	II	153.88
H	*Brachypodium pinnatum* (L.) Beauv.	I	II	III	159.09	148.40	84.16	II	138.66
G	**Cyclamen repandum* S. et S.	I	II	III	45.45	86.13	168.33	II	94.03
T	*Ranunculus sardous* Crantz	V	I	III	73.63	57.27	4.16	II	50.45
NP	**Quercus pubescens* Willd. (shrub	I	II	III	159.09	193.40	334.16	II	209.25
H	*Bellis sylvestris* Cyr.	IV	I	II	71.81	7.04	22.50	II	20.45
G	*Asphodelus microcarpus* Viv.	II	II	+	47.27	170.90	20.83	II	123.73
NP	**Chamaecytisus hirsutus* (L.) Link	+	II	III	136.36	471.59	791.66	II	473.88
H	*Leontodon tuberosus* L.	III	I	I	114.54	12.50	21.66	II	30.90
H	*Gastridium ventricosum* (Gouan) Sch. et Th.	III	I	I	26.36	17.72	1.66	I	12.54
G	*Urginea maritima* (L.) Baker	I	II	I	23.63	23.86	1.66	I	19.70
H	*Carex flacca* L.	I	II	I	45.45	79.54	145.83	I	85.32
H	*Clinopodium vulgare* L.		II	I		23.86	1.66	I	16.12
H	*Hyoseris radiata* L.	II	I	I	160.00	28.86	21.66	I	49.10
T	*Anagallis arvensis* L.	I	II		1.81	7.50		I	5.22
H	**Viola odorata* L.		I	II		23.40	43.33	I	22.99
NP	**Prunus spinosa* L.		I	II		96.59	167.50	I	93.43
H	*Ranunculus flabellatus* Desf.	I	I	I	23.63	28.63	21.66	I	26.57
H	*Umbilicus horizontalis* (Guss.) DC.		I	II		22.95	3.33	I	15.67
T	*Hypochoeris achyrophorus* L.	II	I		24.54	74.54		I	52.99
H	*Prunella vulgaris* L.	I	I	+	23.63	6.81	0.83	I	8.51
H	*Ranunculus ficaria* L.		+	III		17.27	148.33	I	37.91
T	*Aira elegans* Willd.	I	I		23.63	23.18		I	19.10
H	*Polypodium vulgare* L.		I	+		1.59	0.83	I	1.19
H	*Trifolium pratense* L.		I	+		85.68	20.83	I	60.00
H	*Achillea ligustica* All.		I	+		23.18	20.83	I	18.96
T	*Fedia cornucopiae* (L.) Gaertner		I	I		108.18	21.66	I	74.93
NP	**Quercus cerris* L. (shrub)		I	+		119.31	20.83	I	82.09
H	*Anthoxanthum odoratum* L.	+	+	I	0.90	51.13	145.83	I	59.85
G	*Pteridium aquilinum* (L.) Kuhn	+	+	I	22.72	79.54	145.83	I	82.00
T	*Orobanche* sp.	I	I		1.81	6.59		I	4.63
H	**Brachypodium sylvaticum* (Hudson) Beauv.		+	II		51.13	42.50	I	41.19

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Table 1. Sporadic species and coefficients of specific coverage

		Frequency classes			Coefficient of Specific coverage			Freq. cl.	c. r. .s 67 releves
		A	B	C	A	B	C		
T	*Lathyrus sylvestris*	+	r	+	0.90	0.45	0.83	+	0.60
G	*Allium subhirsutum*	I	r	I	45.45	5.90	125.83	+	41.34
H	*Melica minuta*	+	+	I	0.90	6.13	21.66	+	8.06
Pl	**Lonicera caprifolium*	+	r	+	22.72	5.68	20.83	r	11.19
Pl	*Hedera helix*	+	r	+	136.36	34.31	20.83	+	48.66
H	*Linum bienne*	+	+	+	0.90	0.68	0.83	+	0.75
H	*Ranunculus bulbosus*	+	+	+	22.72	11.81	20.83	+	15.22
T	*Vicia disperma*	II	+		24.54	6.13		+	8.06
T	*Vicia disperma*	II	+		24.54	6.13		+	8.06
G	*Scilla autumnalis*	II	r		25.45	5.90		+	8.06
Ch	*Dorycnium hirsutum*	+	I		22.72	17.50		+	15.52
T	*Sedum cepaea*		+			0.90		+	0.60
G	*Allium triquetrum*		r	II		0.22	2.50	+	0.60
P	**Quercus faginea*		I	+		221.59	125.00	+	167.91
G	*Oxalis pes-caprae*	+	+		0.90	11.81		+	7.91
Ch	*Teucrium flavum*	+	+		22.72	11.81		+	11.49
H	**Melica uniflora*		+	+		6.13	20.83	+	7.76
H	*Asplenium trichomanes*		+			6.36		+	4.18
H	**Melittis melissophyllum*		+			17.27		+	11.34
T	*Vicia sativa*	+	+		136.36	6.13		+	26.42
H	*Festuca pratensis*		+	+		62.72	20.83	+	30.00
H	*Helleborus foetidus*		+			11.81		+	7.76
T	*Cerastium ligusticum*		I			17.50		+	11.49
H	*Carlina vulgaris*	+	+		22.72	73.86		+	52.24
T	*Anthemis arvensis*		+			11.81		+	7.76
T	*Cardamine hirsuta*		r	I		0.45	1.66	+	0.60
T	*Myosotis arvensis*	+	+		0.90	6.13		+	4.18
NP	**Sorbus torminalis* (shrub)		r	I		11.36	1.66	+	7.76
NP	**Fraxinus ornus* (shrub)		r	I		11.36	41.66	+	14.93
P	**Quercus pubescens*		r	II		39.77	395.83	+	97.01
H	*Ferula communis*		+	+		6.13	0.83	+	4.18
H	*Bellis perennis*		I	+		12.04	125.00	+	30.30
H	* *Ranunculus lanuginosus*		+	+		0.68	0.83	+	0.60
T	*Vicia bithynica*	+	+		0.90	0.90		+	0.75
T	*Cirsium arvense*		I			1.13		+	0.75
H	*Lotus corniculatus*	+	+		136.36	11.59		+	30.00
H	*Sanguisorba minor*	I	r		23.63	0.22		r	4.03
H	*Cynosurus cristatus*	I	r		23.63	0.22		r	4.03
H	*Plantago lanceolata*	+			0.90			r	0.15
H	*Atractylis gummifera*	I			1.81			r	0.30
T	*Trifolium angustifolium*	I	r		45.45	0.22		r	4.03
H	*Brachypodium ramosum*	I	r		23.63	0.22		r	4.03
H	*Scabiosa columbaria*	+	r		0.90	5.90		r	4.03
H	*Poa trivialis*	+			0.90			r	0.15
H	*Kickxia commutata*	+	r		0.90	5.68		r	3.88
T	*Lagurus ovatus*	+	r		0.90	0.22		r	0.30
H	*Juncus acutus*		r			0.22		r	0.15
H	*Carex caryophyllea*		r			5.68		r	3.73
H	*Agrimonia eupatoria*		+			0.68		r	0.45
T	*Lupinus micranthus*		r			5.68		r	3.73
T	*Stipa bromoides*		r	+		0.45	20.83	r	4.03
G	*Orchis provincialis*		r			0.22		r	0.15
H	*Plantago serraria*		r	+		34.31	20.83	r	26.27
H	*Notobasis syriaca*		r			0.22		r	0.15

Table 1 B — continued

NP	*Ligustrum vulgare*		r			5.68		r	3.73
T	*Blackstonia perfoliata*		+				0.83	r	0.15
NP	*Nerium oleander*		r			5.90		r	3.88
NP	*Juniperus macrocarpa*		r			0.22		r	0.15
P	*Pinus pinea*		r			5.68		r	3.73
H	*Mentha pulegium*	I			1.81			r	0.30
T	*Helianthemum aegyptiacum*	+			0.90			r	0.15
G	*Romulea bulbocodium*			+			0.83	r	0.15
T	*Vicia lutea*			+			0.83	r	0.15
NP	*Quercus faginea* (shrub)		r	+		68.18	20.83	r	48.51
Ch	*Thymus fontanesii*	+			22.72			r	3.73
T	*Daucus muricatus*	+	r		0.90	0.22		r	0.30
T	*Geranium molle*	+			0.90			r	0.15
NP	*Genista sp.*		r			5.68		r	3.73
H	*Galium aparine*	+	r		0.90	0.45		r	0.45
H	*Cruciata glabra*			+			0.83	r	0.15
G	*Orchis maculata*		r			0.22		r	0.15
G	*Asphodelus cerasifer*		r			5.90		r	3.88
G	*Aristolochia longa*		r	+		39.72	0.83	r	26.27
H	*Senecio jacobaea*		r			34.09		r	22.39
P	*Pinus halepensis*		r			34.09		r	22.39
NP	*Sorbus domestica* (shrub)		r			5.68		r	3.73
G	*Aristolochia pallida*	+	r		0.90	11.36		r	7.61
G	*Epipactis helleborine*		r			0.22		r	0.15
H	*Stachys officinalis*		r			0.45		r	0.30
Ch	*Dorycnium herbaceum*		+			6.13		r	4.03
H	*Lathyrus venetus*		r			34.31		r	22.54
T	*Calystegia sepium*		r			5.68		r	3.73
Ch	*Vinca major*		r			0.22		r	0.15
T	*Holcus lanatus*		+			45.45		r	29.85
T	*Lathyrus aphaca*		+			0.68		r	0.45
G	*Symphytum tuberosum*		r	+		0.22	0.83	r	3.88
H	*Buglossoides purpurocaerulea*		r			0.45		r	0.30
T	*Elaeoselinum asclepium*		r			5.68		r	3.73
G	*Loroglossum hircinum*	+	r		0.90	0.22		r	0.30
H	*Hieracium piloselloides*		r			0.22		r	0.15
H	*Lathyrus setifolius*		+			6.13		r	4.03
T	*Bellium bellidioides*		r			11.36		r	7.46
T	*Avena barbata*		r			5.90		r	3.88
T	*Sonchus arvensis*		r			0.22		r	0.15
G	*Limodorum abortivum*		r			0.22		r	0.15
T	*Crepis vesicaria*		r			0.22		r	0.15
T	*Medicago arabica*		r			11.36		r	7.46
Ch	*Helichrysum italicum*		r			5.68		r	3.73
T	*Senecio vulgaris*		r			0.45		r	0.30
T	*Bromus rigidus*		r			5.68		r	3.73
H	*Ceterach officinarum*		r			0.22		r	0.15
NP	*Carpinus orientalis* (shrub)	+	r		136.36	11.36		r	29.85
G	*Orchis longicornu*	+			0.90			r	0.15
Ch	*Micromeria graeca*		r			0.22		r	0.15
T	*Acinos vulgare*		r			0.22		r	0.15
H	*Anogramma leptophylla*		r			0.22		r	0.15
T	*Veronica arvensis*		r			0.22		r	0.15
H	*Poa bulbosa*	+			0.90			r	0.15
T	*Asterolinum linum-stellatum*	+			0.90			r	0.15
G	*Orchis morio*	+			0.90			r	0.15
H	*Inula viscosa*	+			0.90			r	0.15
H	*Thapsia garganica*	+			22.72			r	3.73
T	*Biscutella lyrata*	+	r		22.72	34.31		r	22.69

T	*Coronilla minima*	+			0.90			r	0.15
T	*Vicia villosa*	+			22.72			r	3.73
T	*Lithospermum arvense*	+			0.90			r	0.15
T	*Lathyrus sphaericus*	+			0.90			r	0.15
T	*Pisum elatius*	+			0.90			r	0.15
H	**Doronicum orientale*		r	I		5.68	313.33	r	59.85
H	*Thalictrum calabricum*		r	+		34.09	20.83	r	26.12
NP	*Spartium iunceum*		r			34.09		r	22.39
H	*Lamium flexuosum*		r			0.22		r	0.15
T	*Andrachne telephioides*		+			11.59		r	7.61
G	*Arum italicum*		+			0.22		r	0.15
NP	**Cytisus sessilifolius*		r			34.09		r	22.39
H	*Euphorbia terracina*	+	r		0.90	5.68		r	3.88
G	*Serapias lingua*	+	r		0.90	0.22		r	0.30
H	*Picris hieracioides*	+	r		22.72	11.36		r	11.19
T	*Odontites rubra*		r	+		5.90	20.83	r	7.61
P	**Carpinus orientalis*		r			85.22		r	55.97
G	**Cyclamen hederifolium*		r			5.68		r	3.73
T	*Tordylium apulum*		r			0.22		r	0.15
P	**Quercus cerris*		r			34.09		r	22.39
G	*Colchicum autumnale*	+			22.72			r	3.73
T	*Theligonum cynocrambe*		r	+		0.22	0.83	r	0.30
H	*Silene italica*		r	+		0.22	125.00	r	22.54
H	*Silene vulgaris*		r	+		0.22	0.83	r	0.30
H	*Origanum vulgare*		r			5.68		r	3.73
H	*Trifolium repens*		r			0.22		r	0.15
H	*Rumex acetosella*		r			5.90		r	3.88
T	*Crepis setosa*		r			0.22		r	0.15
P	**Sorbus torminalis*			I			145.83	r	26.12

Table 2. List of relevés, topographical data, and information concerning the vegetation

Rel. N.	Altitude	Exposure	Slope (°)	Coverage trees	Coverage shrubs	Coverage grasses	Surface	Locality	
1	30	—	—	25	90	20	300	Italy Sardinia	Cuglieri
2	30	—	—	40	70	25	300	Italy Sardinia	Cuglieri
3	600	E	15	60	70	10	250	Italy Sardinia	Settefratelli
4	110	—	—	60	70	20	400	Tunisia	Nefza
5	200	NE	20	65	95	5	400	Tunisia	Nefza
6	80	NO	2	70	70	20	350	Tunisia	Tabarka
7	120	NE	10	85	80	10	400	Tunisia	Tabarka
8	120	N	1	65	80	10	300	Tunisia	Nefza — Tabarka
9	130	NE	2	80	70	25	450	Tunisia	Nefza — Tabarka
10	140	SE	2	85	3	5	400	Tunisia	Nefza — Tabarka
11	150	SE	1	40	80	10	500	Tunisia	Nefza — Tabarka
12	60	N	15	65	5	15	350	Tuniia	Mateur — Nefza
13	50	NE	5	70	70	30	300	Tunisia	Cap Negro
14	90	—	—	90	70	20	400	Tunisia	Cap Negro
15	80	NE	10	45	80	15	350	Algeria	Frontier Tunisia

Table 2 — continued

16	80	—	—	55	85	10	350	Algeria	El Kala
17	290	NO	20	20	40	20	300	Algeria	Ain Kechera
18	210	E	20	60	90	10	250	Algeria	El Milia
19	20	NE	25	70	90	20	300	Algeria	Jivel
20	410	NO	15	60	70	20	250	Algeria	El Kseur — Alger
21	940	N	10	80	35	20	200	Algeria	Adekar
22	680	NO	30	80	70	20	400	Algeria	Yakouren — Azazga
23	600	SO	3	70	80	15	100	Tunisia	Hain Drahan
24	350	E	20	75	95	15	150	Tunisia	Hain Drahan
25	350	NE	2	80	70	10	100	Tunisia	Hain Drahan
26	300	E	5	60	90	5	200	Tunisia	Beni Mtir — Fernana
27	320	SE	5	60	70	15	150	Tunisia	Beni Mtir — Fernana
28	700	NE	10	15	80	20	150	Algeria	Frontier Tunisia
29	350	NO	2	80	60	70	150	Algeria	Oran
30	50	NE	10	80	40	60	100	Italy Calabria	Algitola
31	70	N	35	70	40	60	150	Italy Calabria	Algitola
32	500	NE	25	70	80	25	150	Italy Calabria	Cropani — Sersale
33	150	—	—	55	5	85	150	Italy Sardinia	Oristano
34	150	—	—	80	20	85	150	Italy Sardinia	Oristano
35	300	SE	20	80	95	15	100	Italy Latium	S. Biagio
36	100	SE	5	70	70	20	100	Italy Latium	S. Biagio
37	100	SE	5	20	80	15	200	Italy Latium	S. Biagio
38	350	SE	30	70	90	10	100	Italy Calabria	S. Pietro — Luzzo
39	310	NO	15	70	75	10	50	Italy Calabria	Cetraro
40	310	NO	5	85	60	15	100	Italy Calabria	Cetraro
41	180	SO	5	85	60	15	100	Italy Calabria	Cetraro
42	140	SO	5	85	70	40	100	Italy Calabria	Lamezia — Catanzaro
43	290	—	—	10	85	20	100	Italy Sicily	S. Pietro
44	280	—	—	45	60	30	150	Italy Sicily	Nisseni
45	640	N	10	85	15	60	150	Italy Sicily	S. Fratello
46	380	NE	8	80	60	40	150	Italy Sicily	Caronia
47	510	N	20	80	30	50	150	Italy Sicily	Caronia
48	450	N	20	70	40	20	100	Italy Sicily	Caronia
49	30	N	7	70	30	40	100	Italy Calabria	Algitola
50	40	N	10	75	60	40	150	Italy Calabria	Algitola
51	70	SE	25	40	60	40	150	Italy Calabria	Lamezia — Catanzaro
52	70	SE	25	60	40	30	150	Italy Calabria	Lamezia — Catanzaro
53	70	SE	15	65	40	35	150	Italy Calabria	Lamezia — Catanzaro
54	200	SO	5	85	50	30	150	Italy Calabria	Cetraro
55	70	—	—	60	85	20	150	Italy Latium	S. Biagio
56	290	—	—	40	80	15	150	Italy Sicily	S. Pietro
57	620	SO	35	85	70	30	200	Italy Sicily	Caronia — Capizzi
58	640	SO	40	70	60	10	150	Italy Sicily	Caronia — Capizzi
59	660	SO	40	60	70	20	150	Italy Sicily	Caronia — Capizzi
60	640	SO	25	65	80	40	100	Italy Sicily	Caronia — Capizzi
61	570	NO	25	90	25	20	150	Italy Sicily	S. Fratello
62	600	O	35	70	50	40	100	Italy Sicily	S. Fratello
63	580	NO	30	60	40	50	100	Italy Sicily	S. Fratello
64	410	SO	15	60	60	40	150	Italy Sicily	S. Fratello
65	250	SO	40	90	30	10	150	Italy Sicily	Patti
66	300	SO	40	85	60	30	150	Italy Sicily	Patti
67	280	SO	40	80	50	25	150	Italy Sicily	Patti

Table 3. Normal biological spectrum (values referring to *Eucalyptus* forests are enclosed in brackets)

		A	B	C	67 relevés
Macrophanerophyta	(P)	1.89 (4.07)	3.49 (1.74)	3.03 (2.55)	3.37 (2.42)
Nanophanerophyta	(NP)	19.50 (18.03)	17.05 (15.22)	21.97 (17.20)	16.16 (13.45)
Phanerophyta lianosa	(Pl)	3.14 (1.75)	3.10 (2.61)	3.79 (3.19)	2.69 (2.07)
Chamaephyta	(Ch)	3.14 (2.91)	3.10 (3.05)	1.52 (2.55)	3.37 (2.76)
Hemicryptophyta	(H)	30.82 (25.00)	32.17 (29.13)	37.12 (30.57)	31.31 (28.97)
Geophyta	(G)	18.21 (11.04)	11.24 (11.73)	12.88 (11.46)	11.11 (12.06)
Therophyta	(T)	28.30 (37.20)	29.85 (36.52)	19.69 (32.48)	31.99 (38.27)

Table 4. Pondered biological spectrum (values referring to *Eucalyptus* forests are enclosed in brackets)

		A	B	C	67 relevés
Macrophanerophyta	(P)	15.90 (27.18)	30.12 (39.18)	39.98 (70.45)	29.91 (39.82)
Nanophanerophyta	(NP)	56.89 (48.61)	40.34 (33.95)	35.52 (15.83)	41.86 (37.83)
Phanerophyta lianosa	(Pl)	3.13 (3.87)	3.10 (3.76)	3.40 (1.29)	4.57 (3.26)
Chamaephyta	(Ch)	1.57 (0.45)	0.84 (0.36)	0.20 (0.38)	0.84 (0.36)
Hemicryptophyta	(H)	13.44 (9.99)	12.28 (11.74)	13.73 (7.59)	12.75 (10.03)
Geophyta	(G)	5.49 (5.53)	6.16 (5.40)	6.11 (2.14)	6.01 (4.28)
Therophyta	(T)	3.58 (4.37)	5.02 (5.61)	1.06 (2.32)	4.06 (4.42)

Table 5. Actual coverage of each vegetational stratum (values referring to *Eucalyptus* forests are enclosed in brackets)

	A	B	C	67 relevés
Coverage of trees	30.91 (41.92)	68.98 (66.55)	86.25 (83.63)	65.82 (63.30)
Coverage of shrubs	73.18 (60.38)	62.39 (43.44)	49.42 (21.27)	61.84 (44.35)
Coverage of grasses	20.91 (17.69)	28.07 (23.62)	23.75 (16.81)	26.12 (19.90)

Table 6. Actual coverage of *Quercus suber* as opposed to that of other woody entities (values referring to *Eucalyptus* forests are enclosed in brackets)

	A	B	C	67 relevés
Coverage of *Quercus suber* trees	27.89 (39.45)	64.03 (65.82)	79.86 (83.21)	60.91 (62.36)
Coverage of other trees	3.02 (2.47)	4.95 (0.73)	6.39 (0.42)	4.91 (0.94)
Coverage of *Quercus suber* shrubs	5.85 (5.60)	3.04 (1.65)	2.06 (0.24)	3.31 (8.20)
Coverage of other shrubs	67.33 (54.78)	59.35 (41.79)	47.36 (21.03)	58.53 (36.15)

Table 7. Presence and coverage of forestal species (values referring to *Eucalyptus* forests are enclosed in brackets)

	A		B		C		67 relevés	
Presence in percentage	4.70	(4.66)	11.31	(2.61)	13.62	(1.43)	10.10	(4.14)
Coverage in percentage	2.63	(0.30)	6.81	(0.81)	11.89	(0.02)	7.28	(0.54)

Table 8. Normal phytosociological spectrum (values referring to *Eucalyptus* forests are enclosed in brackets)

	A	B	C	67 relevés
Principle species	1.88 (2.33)	0.78 (1.74)	2.27 (1.91)	1.01 (1.38)
Quercetea ilicis char. sp.	11.88 (9.30)	7.75 (6.96)	12.88 (8.92)	7.07 (5.52)
Quercion ilicis char. sp.	9.37 (6.98)	6.98 (7.39)	9.85 (7.01)	6.73 (5.86)
Oleo-Ceratonion char. sp.	4.38 (3.49)	3.10 (3.04)	3.79 (5.10)	3.03 (2.76)
Cisto-Lavanduletea char. sp.	8.13 (5.81)	4.65 (4.35)	6.82 (4.46)	5.39 (3.45)
Helianthemetea guttati char. sp.	6.87 (11.05)	5.81 (10.00)	4.55 (5.73)	5.39 (9.66)
Thero-Brachypodietea char. sp.	6.87 (8.14)	7.36 (5.22)	6.82 (7.01)	6.73 (5.86)
Stellarietea mediae char. sp.	2.50 (5.23)	4.26 (5.65)	3.03 (8.28)	5.05 (7.24)
Companions	48.12 (47.67)	59.30 (55.65)	49.99 (51.58)	59.60 (58.27)

Table 9. Pondered phytosociological spectrum (values referring to *Eucalyptus* forests are enclosed in brackets)

	A	B	C	67 relevés
Principle species	18.90 (30.49)	28.97 (40.06)	38.51 (70.25)	29.93 (43.45)
Quercetea ilicis char. sp.	16.01 (16.65)	18.22 (16.27)	14.86 (7.45)	16.42 (15.00)
Quercion ilicis char. sp.	10.22 (6.77)	9.11 (6.67)	9.87 (3.46)	9.42 (6.10)
Oleo-Ceratonion char. sp.	8.52 (9.69)	9.55 (7.51)	6.13 (5.04)	8.98 (7.48)
Cisto-Lavanduletea char. sp.	30.21 (21.98)	11.13 (9.54)	9.65 (3.41)	13.77 (11.28)
Helianthemetea guttati char. sp.	0.82 (3.34)	1.68 (2.97)	0.21 (0.11)	1.21 (2.40)
Thero-Brachypodietea char. sp.	0.66 (1.90)	1.44 (2.19)	0.15 (1.41)	1.03 (1.97)
Stellarietea mediae char. sp.	0.16 (0.23)	0.32 (1.28)	0.20 (1.06)	0.31 (0.98)
Companions	14.50 (8.95)	19.58 (13.51)	20.42 (7.81)	18.93 (11.34)

Table 10. Presence and coverage in percentage of grass elements referable to *Helianthemetea guttati*, *Thero-Brachypodietea* e *Stellarietea mediae* classes (values referring to *Eucalyptus* forests are enclosed in brackets)

	A	B	C	67 relevés
Presence in percentage	16.24 (24.42)	17.43 (20.87)	14.40 (21.02)	17.17 (22.76)
Coverage in percentage	1.64 (5.47)	3.44 (6.44)	0.56 (2.57)	2.55 (5.35)

APPENDIX (ad Tab. 1)

Sporadic species and date of releve (the value of the Abundance-Dominance index is indicated in brackets).

Relevé n. 1, 28. 11. 1980;

Sanguisorba minor (+); *Cynosurus cristatus* (1); *Plantago lanceolata* (+); *Atractylis gummifera* (+); *Trifolium angustifolium (1)*; *Brachypodium ramosum* (1); *Vicia disperma* (1); *Scilla autumnalis* (1).

Relevé n. 2, 28. 11. 1981;

Cynosurus cristatus (+); *Atractylis gummifera* (+); *Brachypodium ramosum* (+); *Scabiosa columbaria* (+); *Poa trivialis* (+); *Kickxia commutata* (+); *Lagurus ovatus* (+); *Vicia disperma* (+); *Scilla autumnalis* (+).

Relevé n. 3, 1. 12. 1981;

Juncus acutus (+); *Carex caryophyllea* (1); *Lupinus micranthus* (1); *Stipa bromoides* (+); *Orchis provincialis* (+); *Lagurus ovatus* (+); *Dorycnium hirsutum* (+).

Relevé n. 4, 8. 12. 1981;

Sanguisorba minor (+); *Cynosurus cristatus* (+); *Trifolium angustifolium* (+); *Plantago serraria* (2); *Notobasis syriaca* (+); *Vicia disperma* (+); *Scilla autumnalis* (+).

Relevé n. 5, 8. 12. 1981;

Ligustrum vulgare (1).

Relevé n. 6, 8. 12. 1981;

Melica minuta (+); *Linum bienne* (+).

Relevé n. 7, 8. 12. 1981;

Plantago serraria (1); *Blackstonia perfoliata* (+); *Melica minuta* (+); *Linum bienne* (+).

Relevé n. 8, 9. 12. 1981;

Trifolium angustifolium (+); *Kickxia commutata* (1); *Nerium oleander* (1); *Juniperus macrocarpa* (+); *Pinus pinea* (1); *Melica minuta* (1).

Relevé n. 9, 9. 12. 1981;

Nerium oleander (+).

Relevé n. 10, 9. 12. 1981;

Relevé n. 11, 9. 12. 1981;

Mentha pulegium (+); *Helianthemum aegyptiacum* (+); *Scilla autumnalis* (+); *Linum bienne* (+).

Relevé n. 12, 10. 12. 1981;

Melica minuta (+).

Relevé n. 13, 10. 12. 1981;

Sedum cepaea (+); *Allium triquetrum* (+).

Relevé n. 14, 10. 12. 1981;

Romulea bulbocodium (+); *Vicia lutea* (+); *Quercus faginea* (shrub) (1); *Melica minuta* (1); *Allium triquetrum* (1); *Quercus faginea* (2).

Relevé n. 15, 11. 12. 1981;

Thymus fontanesii (1); *Scilla autumnalis* (+); *Melica minuta* (+).

Relevé n. 16, 12. 12. 1981;
Oxalis pes-caprae (+).

Relevé n. 17, 13. 12. 1981;
Sanguisorba minor (1); *Mentha pulegium* (+); *Daucus muricatus* (+); *Geranium molle* (+).

Relevé n. 18, 13. 12. 1981;
Daucus muricatus (+).

Relevé n. 19, 13. 12. 1981;
Agrimonia eupatoria (+); *Quercus faginea* (2).

Relevé n. 20, 14. 12. 1981;
Scabiosa columbaria (+); *Genista* sp. (1); *Galium aparine* (+); *Linum bienne* (+); *Quercus faginea* (3); *Teucrium flavum* (1).

Relevé n. 21, 14. 12. 1981;
Orchis maculata (+); *Asphodelus cerasifer* (1); *Quercus faginea* (2); *Teucrium flavum* (+).

Relevé n. 22, 14. 12. 1981;
Quercus faginea (shrub) (2); *Asphodelus cerasifer* (+); *Scilla autumnalis* (1); *Linum bienne* (+); *Quercus faginea* (2); *Teucrium flavum* (+).

Relevé n. 23, 13. 12. 1982.

Relevé n. 24, 13. 12. 1982;
Sedum cepaea (+); *Quercus faginea* (2); *Teucrium flavum* (1).

Relevé n. 25, 14. 12. 1982.

Relevé n. 26, 15. 12. 1982;
Melica uniflora (+).

Relevé n. 27, 15. 12. 1982;
Melica uniflora (+); *Asplenium trichomanes* (+).

Relevé n. 28, 16. 12. 1982.

Relevé n. 29, 18. 12. 1982;
Aristolochia longa (2); *Senecio jacobaea* (2); *Pinus halepensis* (2); *Oxalis pes-caprae* (1).

Relevé n. 30, 20. 5. 1984;
Galium aparine (+); *Sorbus domestica* (shrub) (1); *Aristolochia pallida* (1); *Epipactis helleborine* (+); *Stachys officinalis* (+); *Dorycnium herbaceum* (+); *Melittis melissophyllum* (+); *Vicia sativa* (+); *Festuca pratensis* (2); *Helleborus foetidus* (1); *Lathyrus sylvestris* (+).

Relevé n. 31, 20. 5. 1984;
Scabiosa columbaria (1); *Stachys officinalis* (1); *Aristolochia pallida* (1); *Dorycnium herbaceum* (1); *Lathyrus venetus* (2); *Calystegia sepium* (1); *Vinca major* (1); *Holcus lanatus* (1); *Lathyrus aphaca* (+); *Symphytum tuberosum* (1); *Buglossoides purpurocaerulea* (+); *Vicia disperma* (+); *Melittis melissophyllum* (1); *Festuca pratensis* (1); *Helleborus foetidus* (+).

Relevé n. 32, 20. 5. 1984;
Dorycnium herbaceum (1); *Elaeoselinum asclepium* (1); *Loroglossum hircinum* (+); *Hieracium piloselloides* (+); *Lathyrus setifolius* (+); *Melittis melissophyllum* (+); *Allium subhirsutum* (+).

Relevé n. 33, 24. 4. 1985;

Plantago serraria (+); *Holcus lanatus* (+); *Bellium bellidioides* (1); *Avena barbata* (1); *Sonchus arvensis* (+); *Limodorum abortivum* (+); *Crepis vesicaria* (+); *Medicago arabica* (1); *Cerastium ligusticum* (1); *Carlina vulgaris* (2); *Anthemis arvensis* (1).

Relevé n. 34, 24. 4. 1985;

Holcus lanatus (2); *Bellium bellidioides* (1); *Avena barbata* (+); *Medicago arabica* (1); *Helichrysum italicum* (1); *Senecio vulgaris* (+); *Bromus rigidus* (1); *Vicia sativa* (1); *Cerastium ligusticum* (1); *Carlina vulgaris* (2); *Anthemis arvensis* (1).

Relevé n. 35, 6. 4. 1984;

Brachypodium ramosum (+); *Ceterach officinarum* (+); *Carpinus orientalis* (shrub) (1); *Asplenium trichomanes* (+).

Relevé n. 36, 6. 4. 1984;

Lathyrus venetus (+); *Carpinus orientalis* (shrub) (1); *Hedera helix* (+).

Relevé n. 37, 6. 4. 1984;

Carpinus orientalis (shrub) (2); *Orchis longicornu* (+); *Hedera helix* (2).

Relevé n. 38, 7. 4. 1984;

Micromeria graeca (+); *Acinos vulgare* (+); *Anogramma leptophylla* (+); *Veronica arvensis* (+); *Cardamine hirsuta* (+); *Myosotis arvensis* (+); *Melica uniflora* (1); *Asplenium trichomanes* (+).

Relevé n. 39, 8. 4. 1984;

Lonicera caprifolium (1); *Sorbus torminalis* (shrub) (1); *Fraxinus ornus* (shrub) (1); *Quercus pubescens* (2); *Festuca pratensis* (+).

Relevé n. 40, 8. 4. 1984;

Lonicera caprifolium (1); Sorbus torminalis (shrub) (+); *Fraxinus ornus* (shrub) (1); *Quercus pubescens* (2); *Festuca pratensis* (1).

Relevé n. 41, 8. 4. 1984;

Quercus pubescens (2); *Ranunculus bulbosus* (1); *Melica uniflora* (1).

Relevé n. 42, 9. 4. 1984;

Lathyrus sylvestris (+).

Relevé n. 43, 10. 4. 1984;

Loroglossum hircinum (+); *Poa bulbosa* (+); *Asterolinum linum-stellatum* (+); *Orchis morio* (+).

Relevé n. 44, 10. 4. 1984;

Galium aparine (+); *Aristolochia pallida* (+); *Lonicera caprifolium* (1); *Inula viscosa* (+); *Thapsia garganica* (1); *Biscutella lyrata* (+); *Coronilla minima* (+); *Vicia villosa* (1); *Lithospermum arvense* (+); *Lathyrus sphaericus* (+); *Pisum elatius* (+); *Vicia disperma* (+); *Oxalis pes-caprae* (+); *Teucrium flavum* (1); *Vicia sativa* (2); *Allium subhirsutum* (1).

Relevé n. 45, 11. 4. 1984;

Symphytum tuberosum (+); *Doronicum orientale* (3); *Thalictrum calabricum* (1); *Cardamine hirsuta* (+); *Ferula communis* (+); *Bellis perennis* (2); *Ranunculus lanuginosus* (+); *Allium triquetrum* (+); *Cruciata glabra* (+); *Aristolochia longa* (+).

Relevé n. 46, 11. 4. 1984;

Sorbus torminalis (shrub) (1); *Bellis perennis* (1); *Ranunculus lanuginosus* (+); *Vicia bithynica* (+); *Cirsium arvense* (+); *Oxalis pes-caprae* (+).

Relevé n. 47, 11. 4. 1984;
Lamium flexuosum (+); *Andrachne telephioides* (+); *Cardamine hirsuta* (+); *Ferula communis* (1); *Bellis perennis* (+); *Ranunculus lanuginosus* (+); *Vicia bithynica* (+); *Oxalis pes-caprae* (1).

Relevé n. 48 11. 4. 1984;
Doronicum orientale (1); *Andrachne telephioides* (1); *Ferula communis* (+); *Bellis perennis* (1); *Ranunculus lanuginosus* (+); *Cirsium arvense* (+).

Relevé n. 49, 12. 4. 1984;
Agrimonia eupatoria (+); *Aristolochia longa* (1); *Buglossoides purpurocearulea* (+); *Andrachne telephioides* (1); *Arum italicum* (+); *Ranunculus bulbosus* (1); *Dorycnium hirsutum* (+); *Helleborus foetidus* (1).

Relevé n. 50, 12. 4. 1984;
Cytisus sessilifolius (2); *Quercus pubescens* (1); *Ranunculus bulbosus* (1); *Dorycnium hirsutum* (1); *Melittis melissophyllum* (1); *Helleborus foetidus* (+); *Lathyrus sylvestris* (+).

Relevé n. 51, 12. 4. 1984;
Euphorbia terracina (+); *Serapias lingua* (+); *Picris hieracioides* (1); *Myosotis arvensis* (+); *Ranunculus bulbosus* (1); *Vicia bithynica* (+); *Lotus corniculatus (2); Dorycnium hirsutum (1); Lathyrus sylvestris (+); Carlina vulgaris* (1).

Relevé n. 52, 30. 10. 1984;
Stipa bromoides (+); *Picris hieracioides* (1); *Odontites rubra* (1); *Ranunculus bulbosus* (+); *Lotus corniculatus* (1); *Dorycnium hirsutum* (1); *Carlina vulgaris* (1).

Relevé n. 53, 30. 10. 1984;
Lathyrus aphaca (+); *Picris hieracioides* (1); *Odontites rubra* (+); *Ranunculus bulbosus* (+); *Lotus corniculatus* (1); *Dorycnium hirsutum* (1).

Relevé n. 54, 30. 10. 1984;
Stipa bromoides (1); *Odontites rubra* (1).

Relevé n. 55, 31. 10. 1984;
Agrimonia eupatoria (+); *Carpinus orientalis* (3); *Cyclamen hederifolium* (1); *Tordylium apulum* (+); *Quercus cerris* (2); *Asplenium trichomanes* (1); *Hedera helix* (2).

Relevé n. 56, 8. 11. 1984;
Colchicum autumnale (1).

Relevé n. 57, 30. 4. 1985;
Silene italica (2).

Relevé n. 58, 30. 4. 1985;
Silene italica (+); *Cirsium arvense* (+); *Anthemis arvensis* (+).

Relevé n. 59, 30. 4. 1985;
Fraxinus ornus (shrub) (1); *Cirsium arvense* (+); *Anthemis arvensis* (+).

Relevé n. 60, 30. 4. 1985;
Thalictrum calabricum (2); *Origanum vulgare* (1); *Trifolium repens* (+); *Sedum cepaea* (1).

Relevé n. 61, 1. 5. 1985;
Silene vulgaris (+); *Quercus pubescens* (2); *Allium triquetrum* (+).

Relevé n. 62, 1. 5. 1985;

Biscutella lyrata (+); *Rumex acetosella* (+); *Myosotis arvensis* (+); *Ferula communis* (+); *Bellis perennis* (+); *Vicia bithynica* (+); *Cirsium arvense* (+); *Sedum cepaea* (+); *Cerastium ligusticum* (+).

Relevé n. 63, 1. 5. 1985;

Lathyrus setifolius (+); *Biscutella lyrata* (2); *Rumex acetosella* (1); *Crepis setosa* (+); *Euphorbia terracina* (1); *Myosotis arvensis* (1); *Vicia disperma* (1); *Cerastium ligusticum* (1).

Relevé n. 64, 1. 5. 1985;

Lathyrus aphaca (+); *Lathyrus setifolius* (1); *Spartium juncem* (2); *Silene vulgaris* (+); *Serapias lingua* (+); *Bellis perennis* (+); *Lotus corniculatus* (+); *Vicia sativa* (1); *Cerastium ligusticum* (+).

Relevé n. 65, 2. 5. 1985;

Doronicum orientale (+); *Sorbus torminalis* (2); *Sorbus torminalis* (cesp) (+); *Fraxinus ornus* (cesp) (1); *Allium subhirsutum* (+); *Hedera helix* (1).

Relevé n. 66, 2. 5. 1985;

Theligonum cynocrambe (+); *Sorbus torminalis* (1); *Cardamine hirsuta* (+); *Allium subhirsutum* (2).

Relevé n. 67, 2. 5. 1985;

Senecio vulgaris (+); *Theligonum cynocrambe* (+); *Vicia bithynica* (+); *Allium subhirsutum* (+).

SAŽETAK

STRUKTURA I RAZVITAK ELEMENATA SREDOZEMNE MAKIJE U ŠUMSKIM NASADIMA U ITALIJI I SJEVERNOJ AFRICI

II. PRILOG: MAKIJA — PLUTNJAKOVE ŠUME (*QUERCUS SUBER* L.)

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Autori se, zajedno sa svojim suradnicima, u svojim istraživanjima bave u prvom redu unapređenjem čovjekova okoliša. Predmet njihova istraživanja je dinamički razvitak napuštenih polja; poboljšanje priroda travnjačkim zajednicama *Xerobrometum* s hrastovima, u sklopu kojih se razvijaju gljive gomoljače; pašnjaci i mogućnost poboljšanja travnjaka u pašnjačke svrhe; struktura i razvoj šumskih nasada, i to u mediteranskom i u središnjem apeninskom području.

Ovaj rad o strukturi i razvitku elemenata mediteranske makije u šumskim nasadima analizira strukturu šuma hrasta plutnjaka *(Quercus suber)* u nekim područjima Italije (Lazio, Kalabrija, Sardinija i Sicilija) i sjeverne Afrike (Tunis i sjeverni Alžir). To je drugi prilog prikazu sredozemnih šuma nastalih čovjekovom djelatnošću. On je zapravo nastavak jednog ranijeg rada (V e r i i S e b a s t i a n i 1984) u kojem je proučavan, u svojoj dinamici, sastav šuma više vrsta roda *Eucalyptus* na Sardiniji i u sjevernom Tunisu.

Služeći se načinom rada koji preporučuje klasična fitosociologija i njezinom metodologijom u procjeni biljnog pokrova i njegova sastava, ističu različite aspekte sredozemne vegetacije koji su veoma povezani s izgledom biljnog krajolika i njegovom poviješću.

Svih 67 fitosocioloških snimaka napravljenih na spomenutim područjima, skupljeno je u fitosociološku tabelu na temelju pokrovnosti sloja drveća u sklopu triju različitih stanja:

A — pokrovnost sloja drveća ispod 50% (11 snimaka)

B — pokrovnost sloja drveća između 50 i 80% (44 snimaka)

C — pokrovnost sloja drveća iznad 80% (12 snimaka).

Struktura šuma hrasta plutnjaka *(Quercus suber)* u ovom je radu uspoređena sa strukturom šuma eukaliptusa (*Eucalyptus* sp. pl. Zbog toga su pojedine vrste popisane u fitocenološkim snimkama skupljene, s obrom na njihova ekološka svojstva, u slijedeće skupine, po kriterijima upotrebljavanim za šume eukaliptusa:

1 — vrsta vodilja (*Quercus suber* na različitim stupnjevima razvoja);
2 — karakteristične vrste razreda *Quercetea ilicis*
3 — „ „ reda *Quercetalia* i sveze *Quercion ilicis*
4 — „ „ sveze *Oleo-Ceratonion*;
5 — „ „ razreda *Cisto-Lavanduletea*;
6 — „ „ razreda *Helianthemetea guttati*;
7 — „ „ razreda *Thero-Brachypodietea;*
8 — „ „ razreda *Stellarietea mediae*;
9 — vrste pratilice.

Zbog procjene strukture vegetacije šuma hrasta plutnjaka *(Quercus suber)* i usporedbe sa šumom eukaliptusa (*Eucalyptus* sp. pl.) uzete su u razmatranje i objašnjene ove tabele:

— biološki i fitocenološki spektri (tab. br. 3, 4, 8, 9);
— stvarni pokrov pojedinih slojeva vegetacije (tab. br. 5);
— stvarna pokrovnost hrasta plutnjaka *(Quercus suber)* nasuprot pokrovnosti drugih drvenastih vrsta (tab. br. 6);
— prisutnost i procentualni pokrov šumskih vrsta (tab. br. 7);
— prisutnost i procentualni pokrov zeljastih vrsta koji se odnosi na razrede *Helianthemetea guttati, Thero-Brachypodietea, Stellarietea mediae* (tab. 10).

Primijećeno je različito ponašanje sloja zeljastih i grmolikih biljaka u šumama hrasta plutnjaka *(Quercus suber)* u odnosu na šume eukaliptusa (*Eucalyptus* sp. pl.) pri promjenama pokrovnosti sloja drveća.

U šumama eukaliptusa (*Eucalyptus* sp. pl.) veća osvijetljenost tla olakšava razvitak zeljasta rašća karakterističnog za fitocenološke razrede *Helianthemetea guttati, Thero-Brachypodietea* i *Stellarietea mediae.*

U šumama hrasta plutnjaka *(Quercus suber)* međutim pri razvitku su u prednosti vrste karakteristične za razred *Quercetea ilicis* i za šumske tvorbe reda *Quercetalia pubescentis.*

U oba tipa šuma smanjena je prisutnost vrstâ karakterističnih za svezu *Oleo-Ceratonion* i razred *Cisto-Lavanduletea.*

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