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## SURVEY OF VEGETATION AND AEROBIOLOGICAL RESEARCH ON THE ISLAND OF MLJET

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The climatogenic community *Orno-Quercetum ilicis* spreads over comparatively large areas and as a real forest of *Quercus ilex* mainly in the western part of the island of Mljet. The woodland facies of *Pinus halepensis* represents the most valuable type of woodland vegetation. The vegetation of the garrigues of the easternmost part differs from the garrigues of the rest of the island. Among various degrading types the vegetation of the stony pastures and dry grassland, particularly in deserted olive groves, is characteristic.

Certain differences in the vegetation composition of the northern parts of the island in relation to the southern expositions are pointed out, and also some fragments of the Mediterranean-mountainous belt.

The results of aerobiological investigations are also presented. On the ground of daily collections of samples the total amount of pollen and spores throughout the year is graphically given by months, as well as their spectra and the frequency of their appearance. The appearance of some particles of organic origin in the air of Mljet is presented as well as various biopollutants.

In the pollen collected from the exposed test slides representatives of the flora, as well as some anthropogenic elements, have been observed. The results obtained from the research into recent atmospheric pollen have also been compared with the results of earlier investigations of fossil pollen in the sediments of »Malo Jezero« on the island of Mljet.

## Introduction

The vegetation of Mljet was not studied much in the past. The first more intensive phytocoenologic research was carried out by S. Horvatić (1958, 1963a, 1971, 1975). In 1972 the author of this work took part in phytocoenological vegetation mapping of Mljet (S. Horvatić et coll.) and in the following years continued to study of the vegetation, particularly in some units which earlier had not been observed there.

Parallely with the research into the vegetation of Mljet, in 1972 the author also started aerobiological investigation in this region. The aim of this research was primarily to obtain, with the knowledge of real vegetation of the island, an insight into the composition and the spread of atmospheric pollen and spores.

## Materials and Methods

The survey of the vegetation was done on the ground of the results of phytocoenological investigations according the methods of Braun-Blanquet (1964). Besides the published results the author has gathered phytocoenological and phoenological data and made collections of pollen on her frequent visits to the island in different seasons, for some ten years.

Aerobiological research presented in this paper was carried out from July 18, 1972 until September 20, 1974. The test slides were exposed daily at the village of Babino Polje in the central part of the island of Mljet. The gravimetric method was applied and pollen grains were counted on 324 sq. mm of slide surface.

## Results and Discussion

*Survey of vegetation**The woods and the maquis*

The climatogenic community of the whole island of Mljet is the association *Orno-Quercetum ilicis* H-ić (56) 58. It spreads over relatively large areas, most frequently as a maquis or as a wood of Aleppo pine (*Pinus halepensis*) on a maquis substratum, less frequently as a real holm oak (*Quercus ilex*) forest. On the island it is represented by two subassociations: *Orno-Quercetum ilicis typicum* H-ić 63 and *Orno-Quercetum ilicis myrtetosum* H-ić 63. As a real holm oak forest the community *Orno-Quercetum ilicis* has been preserved mainly in the western part of the island, in the region of the National park and with its complete composition the stands on the slopes of Planjak are prominent. Here, as in other similar places, with the corresponding characteristic species of *Orno-Quercetum ilicis*, among the differential species contrary to the westmediterranean association *Quercetum ilicis galloprovinciale* Br.-Bl. 36, *Coronilla emerus* L. subsp. *emeroides* (Boiss. et Spruner) Hayek, *Fraxinus ornus* L., *Tamus communis* L. and *Laurus nobilis* L. are present. This typical association *Orno-Quercetum ilicis*, as a maquis too, is also represented in the facies of *Arbutus unedo*, *Pistacia lentiscus*, *Erica arborea*, *Laurus nobilis*, *Ostrya carpinifolia* and others, everywhere also in the form of the facies of *Pinus halepensis*. The subassociation *myrtetosum* has developed over large areas, also in the form of a wood of Aleppo pine (facies *Pinus halepensis*). These beautiful woods are in the

western part of the island, but are also very common in the other parts. Most frequently they are very luxuriant and at the same time represent the most valuable type of woodland vegetation of the island.

### *The garrigues*

The vegetation of the garrigues on Mljet belongs to the alliance *Cisto-Ericion* H-ić 58. In the western part of the island partly represented is the association *Cisto-Ericetum arboreae* H-ić 58. Even with the characteristic species *Erica arborea* L. and *Cistus salvifolius* L. it does not represent a typical association. The stands are often uniform i.e. invariable in composition and not numerous in species, e.g. great areas of only *Juniperus phoenicea*. *Erica arborea* itself in the open garrigues has deteriorated in growth and in the closed complex of a wood or maquis grows well in this part of the island. The facies of the *Juniperus phoenicea* is frequent and a variant of *Cistus incanus* L. subsp. *creticus* (L.) Heywood (*Cisto-Ericetum arboreae* var. *Cistus creticus* H-ić /61/ 62) is also represented. The garrigues of Mljet are also formed by the community of *Erico-Cistetum cretici* H-ić 58. This association is localised mostly in the central and partly in the western part of the island. With characteristic and differential species *Cistus incanus* L. subsp. *creticus* (L.) Heywood, *Linaria microsepala* A. Kerner and *Helianthemum nummularium* (L.) Miller subsp. *obscurum* (Čelak.) Holub it has developed in its typical composition. The association *Erico-Calycotometum villosae* (= *infestae*) H-ić 58 is restricted to the most eastern part only. It grows over the area of some 8 sq. km, also in the facies of *Teucrium fruticans* L. On the substratum of this community partly in this part of the island grow Aleppo pine woods, but also wild *Pinus pinea* L. All the mentioned communities of the garrigues on Mljet are developed in the facies of Aleppo pine too.

### *The stony pastures and dry grassland*

They develop on comparatively small areas, on clearings within maquis and garrigues and in abandoned orchards or olive groves. Among the stony pastures and dry grassland vegetation of Mljet two alliances are represented: *Cymbopogono-Brachypodion ramosi* H-ić (56) 58 and *Vulpio-Lotion* H-ić 60. The *Cymbopogono-Brachypodion* on Mljet is characterised by the following species: *Cymbopogon hirtus* (L.) Janchen (= *C. pubescens* Fritsch), *Convolvulus elegantissimus* Mill., *Hippocrepis unisiliquosa* L., *Sideritis romana* L., *Ononis reclinata* L., *Tragopogon dubius* Scop., *Euphorbia peploides* Gou. and others. The association *Thero-Brachypodietum adriaticum* H-ić 70 (= *Brachypodio-Trifolietum stellati* H-ić 58 p.p.) generally inhabits warm and very dry surfaces (H o r v a t i ć 1975: 307). It covers small stony places exposed to the sun, e.g. in the area of Soline. Although in this southern transitory range it is not so important as in the middle area of the Eumediterranean zone of the east Adriatic belt — like the whole alliance *Cymbopogono-Brachypodion* to which it belongs — the association is still floristically rich and of considerable variability. The most frequent facies on the island are from the species *Helichrysum italicum*, *Hippocrepis comosa*, *Cirsium stellatum* and *Sedum sediforme*. The association *Ononido-Brachypodietum ramosi* H-ić 70 (= *Brachypodio-Trifolietum stellati* H-ić 58 p.p.) is present in higher places, on stony ground exposed to the wind, e.g. in the region of Vrhmlječe. This community is more sparse in the region. Particularly interesting is the facies of the *Salvia officinalis*, *Centaurea glaberrima*

(which is also a characteristic species of the association in this region), *Cymbopogon hirtus*, *Scorpiurus subvillosus* and *Hippocrepis comosa*. The communities of the alliance *Vulpio-Lotium* H-ić 60 are dry grassland or rarely stony pastures. They grow in deep poorly calcified, often more or less sandy soil (Horvatić 1975: 308). The alliance is characterized by *Vulpia ciliata* (Danth.) Lk., *Silene gallica* L., *Trifolium subterraneum* L. and others. The association *Ornithopo-Vulpietum* H-ić 60 grows over small areas in the eastern part of the island. It spreads on turfs or as a pioneer community on abandoned ploughland. It is mostly exploited by mowing. The association *Gastridio-Brachypodietum ramosi* H-ić 62 is on Mljet connected to deep, sandy, washed out soil, particularly in the western part of the island, over the areas which are less exposed to the influence of man (also olive groves, clearings within maquis and garrigues, light woods of the Aleppo pine). The association is regularly dominated by *Brachypodium ramosum* (L.) Roemer et Schultes and the grassland is also used as moderate pasture. Regularly the characteristic species is *Gastridium ventricosum* (Gou.) Schinz. et Thell. and prominent differential species on the island are *Brachypodium ramosum* (L.) R. et Sch., *Blackstonia perfoliata* (L.) Hudson and *Gladiolus illyricus* Koch. The association *Trifolio-Brachypodietum rupestris* Hodak 75, also known on the southern Dalmatian mainland and the island of Šipan (Hodak 1975), overgrows olive groves or orchards as grassland on Mljet. Among the characteristic species of the alliance *Trifolium stellatum* L., *T. lappaceum* L. and *Gastridium ventricosum* (Gou.) Schinz et Thell. are frequent, while the differential species of the association are *Lathyrus megalanthus* Steudel, *Andropogon ischaemum* L. and others. In some places this association appears on Mljet also in the facies of *Pteridium aquilinum*, e.g. in the region of the village of Babino Polje.

#### *The stony walls and rocks vegetation*

On the stony walls, dry-stone walls («gromača») and rocks several communities are prominent. In the vicinity of inhabited places in smaller ingredients the association of *Asplenio-Umbilicetum horizontalis* H-ić 63 has developed. It usually covers old dry-stone walls and is spread all over the island. In humid and shady places over the area of the whole island, on the stony and rocky ground, we find a distinct community formed by *Selaginella denticulata*. On the straight cliffs of the westernmost part of the island the association *Phagnalono-Centaureetum ragusinae* Ht. 42 em. H-ić 63 is developed. On the cliffs of the top region of Velji Grad (540 m above the sea) the association *Campanulo-Moltkietum petraeae* H-ić 63 is present, together with luxuriant and copious *Moltkia petraeae*.

#### *The marsh vegetation*

Connected to brackish or freshwater marshes or muds is the community *Scirpo-Phragmitetum mediterraneum* Tx. et Preising 42 (= *Scirpo-Phragmitetum* W. Koch 26 p.p.). We find it fragmentarily developed at edges of muds, mostly in the facies of *Phragmites communis*. In organogenic soils, most frequently in the form of «islets» in a marsh, at Blatina near the village of Blato and Slatina near Kozarica is the association of *Cladietum marisci* Zobrist 35. The association *Vitici-Tamaricetum africanae* H-ić 63 is also found fragmentarily developed over small areas along the edges of muds near Blato and Sobra.

*The weed and ruderal vegetation*

In gardens, vineyards, potato fields and generally on hoed up ground the association *Tribulo-Amaranthesetum* Hodak 62 from the alliance *Diploaxidion* Br.-Bl. (31) 36 is represented and also the association *Fumario-Cyperetum rotundi* H-ić (59) 60 from the same alliance. Both communities of hoed up ground weeds, however, as has been seen so far, are not particularly characterized. In ruderal vegetation, mainly in the inhabited areas, the alliance *Chenopodion muralis* Br.-Bl. (31) 36 is present, and also *Hordeion* Br.-Bl. (31) 47. The association *Urticetum caudatae-piluliferae* H-ić 62, in the places rich in organic waste near animal shelters particularly in the area of the villages Korita, Maranovići and Babino Polje, has developed in its entire and typical composition. On rubbish heaps and similar habitats less frequently observed are stands of the association *Erigero-Xanthietum* H-ić 62. The association *Hordeetum leporini* Br.-Bl. 36 also overgrows ruderal areas and the subassociation *chamomilletosum* H-ić 63 is represented.

*The seashore reefs and sandy beaches vegetation*

In the reefs of the rocky seashore we can find the association *Limonietum anfracti* Ilijanić et S. Hećimović 82. The sandy beaches in the eastern part of the island are overgrown by the association *Agropyretum mediterraneum* Br.-Bl. 33. It has developed as a pioneering vegetation on the sandy shores in the area of Saplunara and Blaca. On the soil of still sands, also in the eastern part of the island, a community has developed in which the grass *Corynephorus articulatus* is prominent. In some places it invades them with the woody representatives of the surrounding garrigues or maquis and among them also Aleppo pine and Cypress. Such habitats — although in miniature — correspond to »grey dunes« in northern Greece (Oberdorfer 1952) where, in another composition though, *Corynephorus articulatus* is found as well.

It has already been pointed out that the plant cover of Mljet is conditioned primarily by its plant-geographical position. General phytogeographic characteristics and division are taken here according to S. Horvatić (1963a, 1971).

On most of the island a successive transition from subhumid central region to particularly humid southern area is expressed climatically and vegetationally. This transition in the plant cover of Mljet is characterized first of all by luxuriant woods of Aleppo pine on the substratum of the maquis *Orno-Quercetum ilicis myrtetosum*. As already said, these woods spread over large areas and are of great importance. In the vegetation of garrigues this transitory region is characterized by the association *Cisto-Ericetum arboreae*, whose typical form, specially its intensified humidity, to a certain degree coincides with the analogous vegetation of northern transitory region while its southern variant with the *Cistus creticus* (*Cisto-Ericetum arboreae* var. *Cistus creticus*) is transitory in form contrary to the southern association *Erico-Cistetum cretici*. In the vegetation of stony pastures and dry grassland communities of the alliance *Cymbopogono-Brachypodion ramosi* are to a smaller extent represented on the island, but most of the stands are different facies of the association *Gastridio-Brachypodietum* from the southern alliance *Vulpio-Lotion*. However, the phytocoenological data from various parts of the island show, that nontypical stands, i.e. mixtures of both alliances are very frequent, which illustrates a transitory vegetation area, but calls for further phytocoenological research as well.

The southern area of the Eumediterranean zone, with great humidity and slightly expressed summer period of heat and draught »which stretches southeast from the island of Mljet...« (Horvatić 1971), in the climatogenic community of *Orno-Quercetum ilicis* corresponds to northern evergreen Eumediterranean zone particularly with abundantly present deciduous woody plants. The easternmost point of the island, point »Gruj«, is about 7 km from the south Dalmatian coast. A larger amount of deciduous oak, *Quercus lanuginosa*, present in the vicinity of the village of Korita, allegedly planted here about 40 years ago, with its vitality and abundant dissemination in some stands there shows climatically favourable conditions. Definite attachment to the southern Eumediterranean evergreen belt of this extreme southeastern part of the island, however, is shown by the woods of Aleppo pine developed on the substratum of these garrigues, then the association *Erico-Calicotometum villosae*, specific for the southern area and by the predominant presence of the alliance *Vulpio-Lotion* on this extreme southeastern tip of Mljet.

Thus the variety of vegetation of the island, conditioned just by the plant geographical attachment mentioned is also manifested by certain peculiarity. Among the fragmentarily developed elements of Mediterranean-mountainous belt the community *Campanulo-Moltkietum petraeae* has already been mentioned at »Velji Grad«, the highest point on the island. Particularly stressed, however, should be the stands with hop hornbeam (*Orno-Quercetum ilicis* fac. *ostryosum*) which is »significant for the area of upper highland of evergreen to deciduous vegetation, belt...« (Horvatić 1958: 11). Evidently rarer element on the island, *Ostrya carpinifolia* spreads more than it seemed at first, on many higher hilltops and even below 300 m, and besides the higher, middle chain of hilltops its stands I found at other prominent tops on the island, particularly in the northern marginal chain (Samóbor, Zmijjska glava and others). Near the bay of Grda, for example, on some northern slopes it descends together with other elements of thick maquis as low as about a hundred metres towards the sea. The finds of atmospheric pollen on Mljet have also indicated a larger presence of hop hornbeam in this area.

In colder and more humid parts of the northwestern marginal chain of hilltops, roughly between the hill of Orje brdo and Sobra, there are vast and impassable areas of thick and few metres high maquis with abundant presence of *Laurus nobilis*. Contrary to this on the southern slopes, sporadically also in the National Park, on habitats specially conditioned orographically and microclimatically we find the stands indicating to the alliance *Oleo-Ceratonion* Rothmaler 43. It is generally known that the southern parts of the island are steeper than those the northern parts, which affects the decrease in humidity and faster flow away of rainfall, and this side is also more exposed to the activity of south winds.

#### *Aerobiological investigations*

The investigations have shown that a larger amount the pollen is present in the air of Mljet in March, April, May and June, while in the other months the number is comparatively small as can be seen from the graph in Fig. 1. By comparing the two years it can also be seen in the graph that the total number of pollen in May in 1973 (10773 grains) was considerably greater than the total amount in the same month in 1974 (5695 grains). The number of spores compared to pollen was compa-

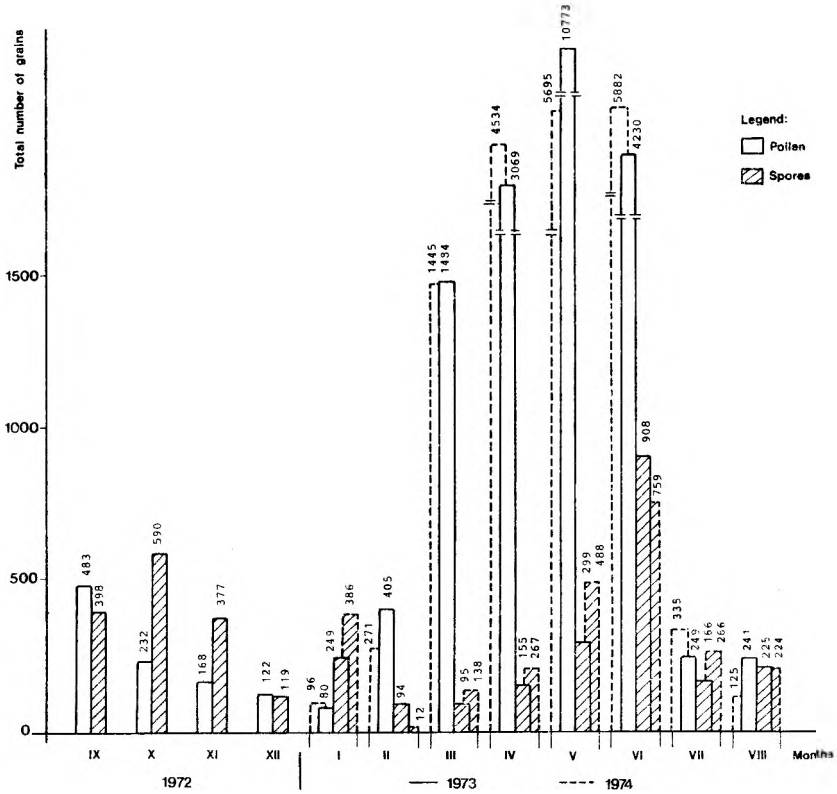


Fig. 1. Total number of atmospheric pollen and spores per months at Babino Polje (Island of Mljet) from August to December 1972 and January to July 1973 and 1974.

relatively small.\* From the graph of their total amount in Fig. 1 it can also be seen that they are a little more numerous at the beginning of the summer (e.g. in June 1973 there were 908 spores) and in the autumn months, i.e. in September, October and November (e.g. in October 1972 there were 590 spores). The total number of pollen and spores by months for 1972/73 is also shown graphically (Fig. 2) in comparison with the monthly mean values in temperature and percentage of relative humidity.

The daily rate of pollen and spores (Fig. 3) refers to spring and summer months, i.e. the period from March to August, 1974. From the graph given it can be seen that two peaks in the number of pollen grains are significant in mid April and beginning of June and a smaller peak in the number of spores at the beginning of May and the end of June. The data are also compared with the mean values of daily temperature and the percentage of relative humidity presented graphically in Fig. 3.

In the period from August 1, 1972 to July 31, 1973 54 groups of pollen (19103 grains) of defined families, genera or species were determined from the air in the region of Mljet and 14 groups with 122 grains of

\* Colonies of spores were counted as units singly.

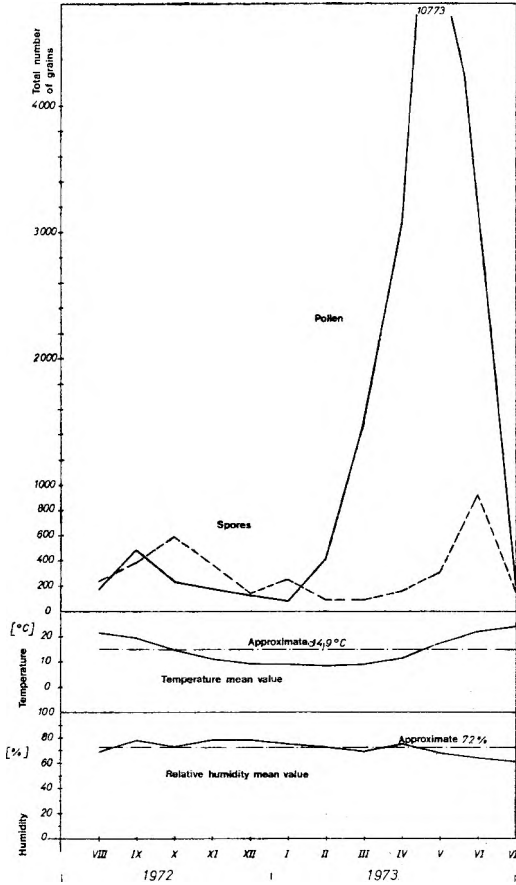


Fig. 2. Monthly values of the total number of atmospheric pollen and spores on Mljet in 1972/73 correlated with mean temperature values and percentage of relative humidity.

other pollen species undetermined as yet. In the same period 50 moss spores (*Bryophyta*) were found, 121 fern spores (*Pteridophyta*) and 2561 Fungus spores with 17 denominated groups (2408 spores). In Table 1 these representatives of pollen and spores are successively named and shown numerically. As can be seen in Table 1 the pollen determined belongs mainly to the anemophileous and some entomophileous plants of the surrounding vegetation. However, a number of representatives of the neighbouring and more distant parts, first of all from the neighbouring mainland, as e.g. the pollen of the *Fagus*, *Castanea* and others has been found too (compare also Volarić-Mršić 1974, 1976). With the *Pteridophyta* separately presented numerically are the *Selaginella* with 57 spores and *Equisetum* with only 4 spores in the 12 months investigated. Among the Fungus spores, as can be seen in Table 1, the most numerous are the spores of *Cladosporium* (846), then *Alternaria* (336), *Uredinales* (298) and *Tilletia* (182).



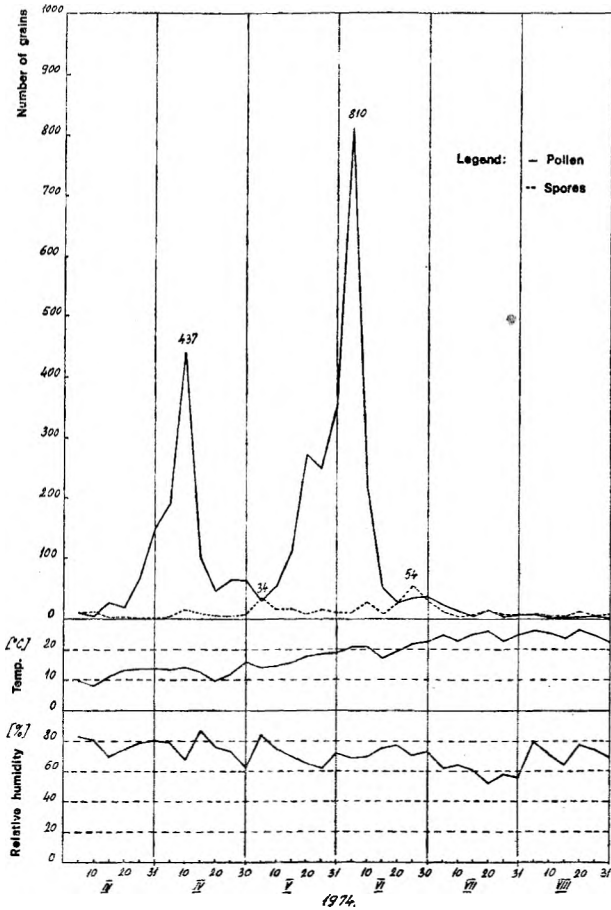


Fig. 3. Daily rate of pollen and spores in the air of Mljet, from March 1 to August 31, 1974, related to the mean values of temperature and percentage of relative humidity. The results are based on the mean value of the total amount of grains every five days.

In the presented spectre of atmospheric pollen (Fig. 4A) among the more frequent families found in the air in the period of twelve months in 1972/73 four are prominent as to amount: *Oleaceae*, *Fagaceae*, *Pinaceae* and *Urticaceae*, with the total number of 15664 grains, i.e. 81.7% of the total amount (19103 grains) of determined groups of atmospheric pollen. In Fig. 4B four most frequent families are given also in comparison with the total amount of pollen of all other groups, whose ratio is 18.3%. The reciprocal ratio of the most frequent families is shown in Fig. 4C. In the said period most of the pollen belongs to *Oleaceae* (34%), then *Fagaceae* (31.1%), *Pinaceae* (20.5%) and *Urticaceae* (14.1%). Within these families numerically the most significant is the pollen of *Quercus ilex*, then *Olea*, *Pinus* and *Parietaria*. They have all together 12468 grains, i.e. 65.3% of the total number of the pollen determined in the presented year (Fig. 4D).

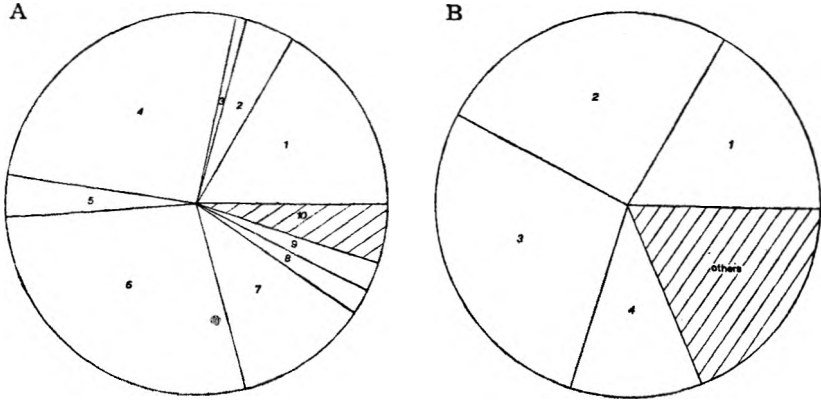
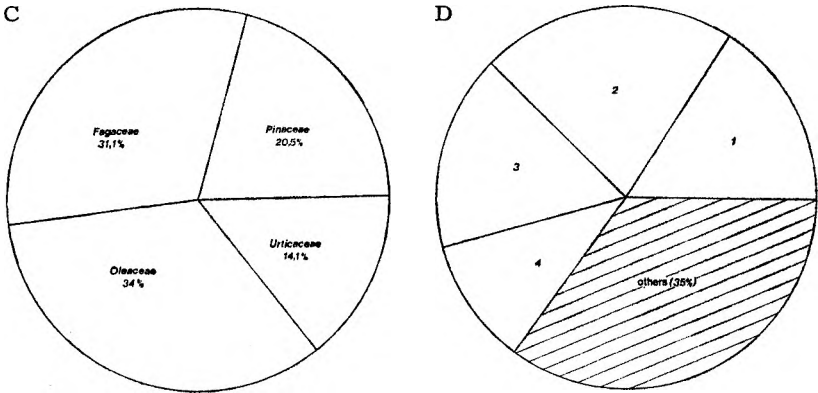


Fig. 4. Pollen spectra for Mljet (Babino Polje), August 1, 1972 — July 31, 1973.

A. Ratio of most frequent families:

1 <i>Pinaceae</i>	3209 grains	—	16.7%
2 <i>Cupressaceae</i>	783 "	—	4.1%
3 <i>Corylaceae</i>	167 "	—	0.9%
4 <i>Fagaceae</i>	4915 "	—	25.7%
5 <i>Ericaceae</i>	690 "	—	2.0%
6 <i>Oleaceae</i>	5335 "	—	100.5%
7 <i>Urticaceae</i>	2205 "	—	11.5%
8 <i>Polygonaceae</i> (60)			
<i>Chenopodiaceae</i> (146)	397 "	—	2.1%
<i>Amaranthaceae</i> (53)			
<i>Plantaginaceae</i> (62)			
<i>Compositae</i> (76)			
9 <i>Gramineae</i> ( <i>Poaceae</i> )	480 "	—	2.5%
10 others	922 "	—	4.8%

Botanical composition of the pollen and spores in the air of Mljet can be seen from the illustration (Fig. 5) being calendar of pollen and spores made on the ground of the results obtained in the investigated period from 1972 to 1974. The most frequent representatives in the atmosphere are given. In Fig. 5 it can be seen that throughout the year the pollen of *Urticaceae* is present. This pollen belongs mostly to *Parietaria*. Throughout most of the year the pollen of *Pinaceae*, *Cupressaceae*, *Quercus* and *Ericaceae* is present. The *Pinus* pollen belongs mostly to Aleppo pine. The pollen of *Pinus nigra*, *P. pinea* and others is also present and in autumn and winter individually the *Cedrus* pollen. *Cupressaceae* are represented mainly by *Juniperus*. The larger amount of pollen in February and presented in Fig. 5 belongs mainly to *J. oxycedrus* and that collected in September to *J. phoenicea*. At that time maximum pollination of these plants was observed on the island as well. The pollen of *Quercus* belongs mostly to *Q. ilex*. I used to find holm oak in bloom in sheltered places not only in the main season of pollination, which is



B. Four most frequent families in relation to the total amount of all other atmospheric pollen:

1 <i>Pinaceae</i>	3209 (20.5%)	— 16.8% of total 19103 pollen grains
2 <i>Fagaceae</i>	4915 (31.1%)	— 25.5% of total 19103 pollen grains
3 <i>Oleaceae</i>	5335 (34%)	— 27.9% of total 19103 pollen grains
4 <i>Urticaceae</i>	2205 (14.1%)	— 11.5% of total 19103 pollen grains

C. Relation of the total number of atmospheric pollen in four most frequent families:

<i>Pinaceae</i>	— 3209 grains	<i>Oleaceae</i>	— 5335 "
<i>Fagaceae</i>	— 4915 "	<i>Urticaceae</i>	— 2205 "

D. Four most frequent genera in relation to the total amount of all other atmospheric pollen:

1 <i>Pinus</i>	3100	— 16.2% of all pollen grains in 1972/73
2 <i>Quercus ilex</i>	4120	— 21.6% of all pollen grains in 1972/73
3 <i>Olea</i>	3188	— 16.7% of all pollen grains in 1972/73
4 <i>Parietaria</i>	2060	— 10.8% of all pollen grains in 1972/73

May and partly June, but also in other periods of the year e.g. in the middle of November and in all winter months. The *Ericaceae* pollen is present in the atmosphere individually most of the year. From the middle of February to the beginning of June pollen of *Oleaceae* represented in air belongs to *Olea*, *Fraxinus*, *Phillyrea* and *Ligustrum*. The *Pistacia* pollen belongs mostly to *P. lentiscus*. In winter or early spring months the pollen of *Salicaceae*, then *Corylus*, *Alnus*, *Ulmus* and *Viburnum* is present with a small amount and in short periods. In spring, mainly singly, the pollen of *Cycas* and *Palmae*, *Celtis* and *Fagus*, and *Moraceae* and *Cyperaceae* is present. The pollen of *Myrtus*, *Clematis*, some *Rosaceae*, *Castanea* and *Humulus* is present predominantly in summer. *Leguminosae* and *Rosmarinus* appear in a longer period, mainly in winter and spring. In autumn and winter (from August to January) the pollen of carob tree (*Ceratonia siliqua*) is found individually. *Gramineae* (*Poaceae*) are represented maximally at the end of may and pollen of cereals is sparse. Among other herbaceous plants and weeds there is the pollen of

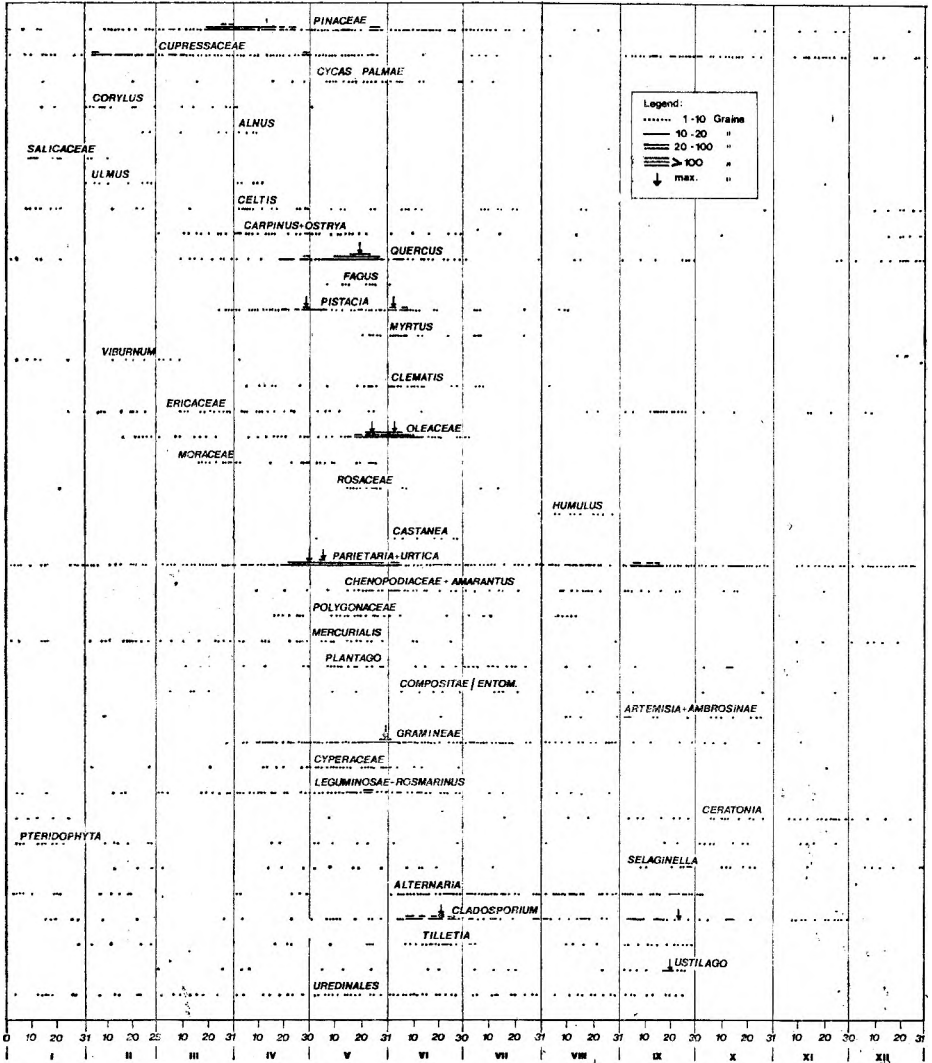


Fig. 5. Incidence of most prominent pollen and spores species in the atmosphere of Mljet, based on the data of daily counts (in 1972—1974) from July 18, 1972 to September 20, 1974.

*Chenopodiaceae* and *Amaranthus*, then *Polygonaceae*, *Mercurialis* and *Plantago*. Appearance of this pollen in the air of Mljet is presented in Fig. 5 as well. In late summer and autumn there is the pollen of *Artemisia* and *Ambrosinae*. Among Fungus spores *Cladosporium* is present the whole year, and *Alternaria*, *Tilletia* and *Uredinales* throughout most of the year.

I would like to point out that beside pollen and spores the mite from the group of *Eriophyidae* was found individually on the slides exposed at Babino Polje which may be of significance when investigating virus diseases on the fig tree. Among the various pollutants of biological origin are different fragments of the surface layers of plant cells, various trichoma, hypha fragments, insect feelers and the like. Such biopollutants were specially abundant on the test slides in the days of stronger wind when salt crystals and also singly organisms of sea plankton could be found.

As already said, and established by earlier investigations (V ol a r i ć -M r š i ć 1976), some plants whose pollen was found on the exposed slides are not represented on the island (e.g. *Fagus*, *Alnus* and others). But the finds on the samples were a guideline or indications for searching for such representatives in the neighbouring vegetation which had not been observed in the area. This refers particularly to some anthropogenic elements. For example the pollen of the group *Ambrosinae* found on the exposed slides at the end of summer, belongs mainly to *Xanthium* which mostly belong to the earlier mentioned association *Erigero-Xanthietum*, present also around the village of Babino Polje. Although the pollen grains of the species within *Ambrosinae* slightly differ morphologically, in some it seemed that they belong to *Ambrosia*. By persistent search I found two plants of *Ambrosia artemisiifolia* in the vegetable garden near a house at Babino Polje on November 26, 1973. On the test slide exposed on July 20, 1972 the pollen of *Ailanthus altissima* was found. I paid attention to this plant. A single tree was growing in a field near the place of slide exposure. The local inhabitants did not know this tree from earlier years. The plant spread amazingly fast and in 1979 vegetative shoots grew like weeds by the roadside and in neighbouring yards. In spite of constant weeding their expansion could not be stopped.

We tried to compare the results obtained from the research of recent atmospheric pollen with results of earlier investigations of fossil pollen in the sediments of »Malo Jezero« (B e u g 1961, 1967a, 1967b) on the island of Mljet. The comparison was carried out along the hypothesis that the factors influencing the sedimentation are not essentially different. Recent investigations were carried out by the gravimetric method and the sediment in the geological past was also created by direct sedimentation.

The results of this comparison are shown in Table 2. In the pollen diagram of »Malo Jezero« (B e u g 1967 in H o r v a t et al. 1974) the imaginary line is drawn at about the turn of the profile C3 and D which corresponds to about 200 or 100 B.C. In the view of historic development of vegetation this is a period of transition of evergreen holm oak woods into *Pinus-Quercus ilex* age (B e u g 1967a). At that time the influence of man already exists which is also a historic fact. The first Greek settlements on Mljet were known as early as 4th or 3rd century B.C. (C a s s o n 1926) and it is generally known that the first influence of Phoenicians and later Greeks existed in Dalmatia already around 9th century B.C.

The imaginary line with the value expressed in mm for chosen taxa is relative and thus the values obtained in mm of fossil pollen from »Malo Jezero« are relative as well. Therefore the reconstruction of the picture of fossil pollen is qualitative. On the other hand the data on recent pollen are absolute and correspond to the number of grains in one year (August 1, 1972 to July 31, 1973). Thus the recent atmospheric pollen, on the ground of absolute data, is compared with the relative

Table 1. Incidence of atmospheric pollen and spores at Babino Polje (Island of Mljet), from August 1, 1972 to July 31, 1973

	Total number in the year	
1 <i>Cycadaceae</i> ( <i>Cycas</i> )	19	
2 <i>Pinaceae</i>	3209	
3 <i>Cupressaceae</i>	783	
4 <i>Salicaceae</i> ( <i>Populus</i> )	8	
5 <i>Betulaceae</i> ( <i>Alnus</i> )	19	
<i>Corylaceae</i>		
6 <i>Carpinus</i> + <i>Ostrya</i>	138	
7 <i>Corylus</i>	29	167
<i>Fagaceae</i>		
8 <i>Fagus</i>	42	
9 <i>Castanea</i>	28	
10 <i>Quercus ilex</i>	4120	
11 <i>Q. sp. div.</i>	765	4955
<i>Ulmaceae</i>		
12 <i>Ulmus</i>	38	
13 <i>Celtis</i>	47	85
<i>Moraceae</i>		
14 <i>Moraceae</i>	54	
15 <i>Platanaceae</i> ( <i>Platanus</i> )	30	
16 <i>Simarubaceae</i> ( <i>Ailanthus</i> )	17	
17 <i>Anacardiaceae</i> ( <i>Pistacia</i> )	446	
18 <i>Aceraceae</i> ( <i>Acer</i> )	38	
19 <i>Vitaceae</i> ( <i>Vitis</i> )	22	
20 <i>Tiliaceae</i> ( <i>Tilia</i> )	8	
<i>Ranunculaceae</i>		
21 <i>Ranunculaceae</i>	9	
22 <i>Clematis</i>	83	92
23 <i>Myrtaceae</i> ( <i>Myrtus</i> )	42	
24 <i>Ericaceae</i>	690	
25 <i>Oleaceae</i> (undetermined)	2068	
26 <i>Fraxinus</i>	20	
27 <i>Ligustrum</i>	9	
28 <i>Olea</i>	3188	
29 <i>Phillyrea</i>	50	5335
30 <i>Rosaceae</i>	45	
31 <i>Leguminosae</i>	83	
32 <i>Ceratonia</i>	51	134
33 <i>Caprifoliaceae</i> ( <i>Viburnum</i> )	35	
34 <i>Cannabaceae</i> ( <i>Humulus</i> )	3	



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*Urticaceae*

35	<i>Urtica</i>	145	
36	<i>Parietaria</i>	2060	2205
37	<i>Polygonaceae</i>	60	
38	<i>Chenopodiaceae</i>	146	
39	<i>Amaranthaceae (Amaranthus)</i>	53	
40	<i>Caryophyllaceae</i>	7	
41	<i>Cruciferae</i>	26	
42	<i>Resedaceae</i>	22	
43	<i>Guttiferae (Hypericum)</i>	6	
44	<i>Europhorbiaceae (Mercurialis)</i>	90	
45	<i>Umbelliferae</i>	18	
46	<i>Plantaginaceae (Plantago)</i>	62	
47	<i>Compositae (entomophilous)</i>	22	
48	<i>Artemisia</i>	7	
49	<i>Ambrosinae</i>	47	
50	<i>Sparganiaceae (Sparganium)</i>	17	
51	<i>Typhaceae (Typha)</i>	5	
52	<i>Palmae</i>	42	
53	<i>Gramineae (Poaceae)</i>	480	
54	<i>Cyperaceae</i>	59	
<hr/>			
	Total (54 groups)	19103	
	Others (14 groups)	122	
	<i>Bryophyta</i>	50	
	<i>Pteridophyta (gen. diff.)</i>	60	
	<i>Selaginella</i>	57	
	<i>Equisetum</i>	4	121
	Fungus spores		
1	<i>Cladosporium</i>	864	
2	<i>Alternaria</i>	336	
3	<i>Penicillium</i>	41	
4	<i>Fusarium</i>	16	
5	<i>Helminthosporium</i>	26	
6	<i>Aspergillus</i>	7	
7	<i>Mucor</i>	85	
8	<i>Uredinales</i>	298	
9	<i>Puccinia</i>	38	
10	<i>Ustilago</i>	75	
11	<i>Tilletia</i>	182	
12	<i>Botrytis</i>	66	
13	<i>Basidiospores</i>	166	
14	<i>Ascospores</i>	156	
15	<i>Plasmopara</i>	18	
16	<i>Pleospora</i>	26	
17	<i>Chaetomium</i>	8	
<hr/>			
	Total (17 groups)	2408	
	Others	153	
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Table 2. Results of research into recent atmospheric pollen compared with the results of fossil pollen on Island of Mljet

	Fossil pollen Sediment in »Malo Jezero« (profile C <sub>3</sub> /D, Beug 1962)		Recent pollen Samples at Babino Polje August 1, 1972— —July 31, 1973	
	1 year expressed in mm	%	Number of grains in 1 year	%
<i>Quercus ilex</i>	4	11.1	4120	31.4
<i>Quercus others</i>	2	22.3	755	5.8
<i>Juniperus</i>	1.2	6.7	690	4.3
<i>Phillyrea</i>	0.5	2.8	50	0.4
<i>Pistacia</i>	3.5	19.5	446	3.4
<i>Erica</i>	0.8	4.5	690	5.3
<i>Pinus</i>	4.0	22.3	3100	23.5
<i>Carpinu orientalis</i> and <i>Ostrya</i>	0.8	4.5	138	1.0
<i>Fraxinus ornus</i>	0.15	0.8	20	0.2
<i>Olea</i>	0.2	1.1	3988	24.3
<i>Fagus</i>	0.2	1.1	22	0.2
<i>Corylus</i>	0.6	3.3	29	0.2
<b>TOTAL</b>	<b>17.95</b>	<b>100</b>	<b>13118</b>	<b>100</b>

value of fossil pollen based on the reconstruction of qualitative picture. In some representatives more significant differences are visible in expressed values of fossil and recent pollen (e.g. *Quercus*, *Pistacia*). This indicates climatic changes and also intensified anthropogenic influence in the interperiod from which there are no data yet (in the mentioned profile the last 2000 years are missing), and particularly distinguished are the changes caused by the arrival of civilisation (comp. e.g. *Olea* in Table 2).

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## S A Ž E T A K

## PREGLED VEGETACIJE I AEROBIOLOŠKA ISTRAŽIVANJA NA OTOKU MLJETU

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U radu je kratko prikazana vegetacija otoka Mljeta i rezultati aerobioloških istraživanja autora s ciljem da se uz poznavanje realne vegetacije dobije i slika sastava i rasprostranjenosti polena i spora u zraku tog područja. Na temelju dnevnih prikupljanja izloženih uzoraka tabelarno je prikazana ukupna količina polena i spora po mjesecima, njihov spektar i periodičnost pojavljivanja u zraku.

Rezultati ovih istraživanja recentnog polena uspoređeni su također s rezultatima ranijih istraživanja fosilnog polena u sedimentima Malog Jezera na Mljetu.

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