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VEGETATION OF PHOENICIAN JUNIPER  
 MACCHIA – *PISTACIO LENTISCI-JUNIPERETUM*  
*PHOENICEAE* TRINAJSTIĆ 1987  
 (OLEO-CERATONION BR.-BL.) ON THE ISLAND OF  
 MURTER AND THE SMALL SURROUNDING  
 ISLANDS

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**Pandža, M.: Vegetation of Phoenician juniper macchia – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 (*Oleo-Ceratonion*) on the island of Murter and the small surrounding islands. Nat. Croat., Vol. 13, No. 3., 201–212, 2004, Zagreb.**

Through plant geography research into the evergreen macchia vegetation on the island of Murter done in the last ten years, two clearly differentiated alliances inside the class *Quercetea ilicis* Br.-Bl. 1947 – *Quercion ilicis* Br.-Bl. (1931) 1936 and *Oleo-Ceratonion* Br.-Bl. 1936 have been determined. In the alliance *Quercion ilicis* are the following associations: *Myrto-Quercetum ilicis* Trinajstić (1976) 1985; *Fraxino orni-Quercetum ilicis* H-ić (1956) 1958; *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 and in the alliance *Oleo-Ceratonion* the associations of the xerothermal Phoenician juniper macchia – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 and *Quercus ilicis-Pinetum halepensis* Loisel 1971.

Xerothermal Phoenician juniper macchia constitutes a stage of the progression towards the development of evergreen forest vegetation after the termination of anthropogenic impact. It develops in the neglected olive-groves, vineyards, garrigues and rocky pasture lands on the island and the surrounding small islands. A total of 27 phytocenological relevés were made. Relevés were made and analyzed using the classical Braun-Blanquet method.

**Key words:** *Pistacio lentisci-Juniperetum phoeniceae*, flora, vegetation, the island of Murter and surrounding small islands, the Central Dalmatia, Croatia

**Pandža, M.: Vegetacija makije somine – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 (*Oleo-Ceratonion*) na otoku Murteru i okolnim otočićima. Nat. Croat., Vol. 13, No. 3., 201–212, 2004, Zagreb.**

Tijekom zadnjih desetak godina fitogeografskih istraživanja vazdazelene vegetacije makije otoka Murtera utvrđene su dvije jasno izdiferencirane sveze unutar razreda *Quercetea ilicis* Br.-Bl. 1947 – *Quercion ilicis* Br.-Bl. (1931) 1936 i *Oleo-Ceratonion* Br.-Bl. 1936. Unutar sveze *Quercion ilicis* su asocijacije: *Myrto-Quercetum ilicis* Trinajstić (1976) 1985; *Fraxino orni-Quercetum ilicis* H-ić (1956) 1958;

*Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 i unutar sveze *Oleo-Ceratonion* asocijacije kserotermne makije somine *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 i *Quercus ilicis-Pinetum halepensis* Loisel 1971 (PANDŽA 1998). Kserotermna makija somine predstavlja progresijski stadij po prestanku antropogenog djelovanja u razvoju vazdazelene šumske vegetacije. Razvija se po zapuštenim maslinicima, vinogradima, bušicama i na kamenjarskim pašnjacima otoka i okolnih otočića.

Ukupno je napravljeno 27 fitocenoloških snimaka. Snimke su rađene i analizirane po klasičnoj metodi Braun-Blanquet-a (1964).

**Ključne riječi:** *Pistacio lentisci-Juniperetum phoeniceae*, flora, vegetacija, otok Murter i okolni otočići, srednja Dalmacija, Hrvatska

## INTRODUCTION

During mapping of evergreen vegetation in Hrvatsko primorje, on many Adriatic islands a rather large macchia belt without any considerable amount of the evergreen holm oak (*Quercus ilex* L.) was noticed developing between the halophytic vegetation belt and a certain form of forest vegetation composed of either the evergreen holm oak or the Aleppo pine. These large areas with homogeneous floral composition make a special association designated by Trinajstić ass. *Pistacio lentisci-Juniperetum phoeniceae* (comp. TRINAJSTIĆ, 1987).

In terms of the syntaxonomy, the association belongs to the alliance *Oleo-Ceratonion*, and phytogeographically to the Mediterranean proper vegetation zone of the Mediterranean region (TRINAJSTIĆ, 1995; 1998).

The distribution and floral composition of vegetation *Pistacio lentisci-Juniperetum phoeniceae* were dealt with by many investigations (TRINAJSTIĆ, 1987, 1995a, 2000; PANDŽA, 1995; JASPRICA *et al.*, 2000; KOVAČIĆ *et al.*, 2001), and the analysis of a total of 42 relevés with 77 species was made.

The first to investigate this evergreen vegetation was TRINAJSTIĆ (1987) on the island of Unije near Lošinj and on Veliki Pržnjak near Korčula. On the island of Unije, he found 6 phytocenological relevés with a total of 23 species, and on Veliki Pržnjak three phytocenological relevés with 22 species, while on the island of Mljet TRINAJSTIĆ (1995a) made 6 vegetation relevés with a total of 26 species. For the island of Murter one relevé with 11 species has been registered (PANDŽA, 1995). In the Malostonski zaljev, TRINAJSTIĆ (2000) found 6 vegetation relevés (38 species). In the period from 1998 to 2000, this vegetation was studied by JASPRICA *et al.* (2000) and KOVAČIĆ *et al.* (2001) on the islands of Čiovo, Šolta, Brač, Hvar, Korčula and Lopud as well as on the Pelješac peninsula and in the Dubrovnik littoral. They analysed 20 vegetation relevés with a total of 56 species. The island of Murter (17.9 km<sup>2</sup>) is the largest inhabited island in the north-west Šibenik archipelago. It is built of limestones and dolomites, and so are the surrounding small islands. In its north-eastern part is the *polje* of red soil (MAMUŽIĆ *et al.*, 1975). Through the centuries, the forest on the island was cut and burnt by man to create pasture land, and smaller tracts of land were cultivated by making terraces, and dry stone walls. The terraces inside the dry walls are of red soil, like the *polje*. On the terraces, olive trees were planted of which now a small number are cultivated. There is no more burning (as there are no sheep or goats, just a few donkeys on the island), and

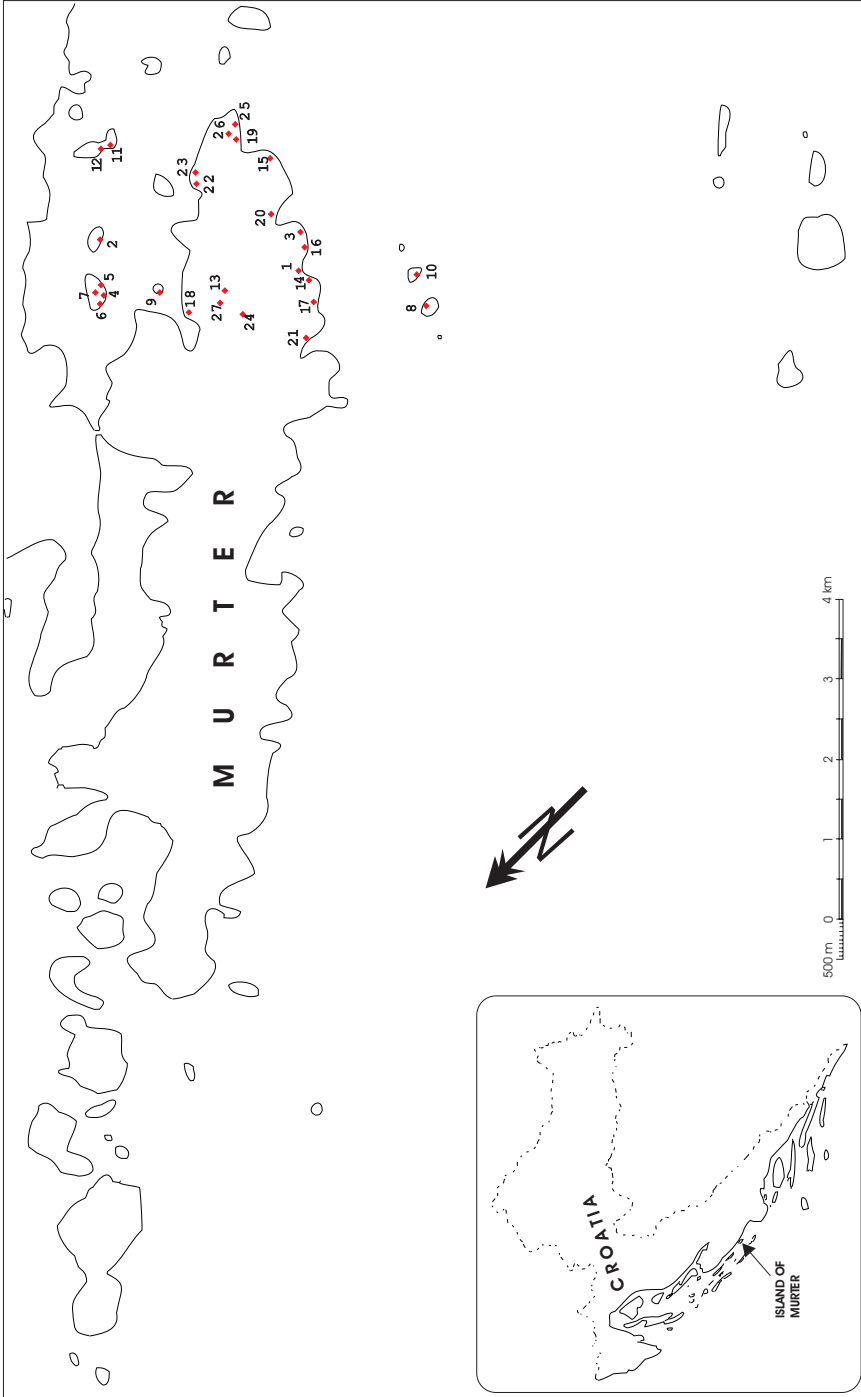


Fig. 1. Position of the localities investigated on the map of Murter and the surrounding small islands (Croatia) – localities are in the Appendix.

therefore the rocky pastureland and garigue have become overgrown with macchia. Large areas of the island are covered with evergreen holm oak macchia (the class *Quercetea ilicis*, associations: *Myrto-Quercetum ilicis* Trinajstić (1976) 1985; *Fraxino orni-Quercetum ilicis* H-ić (1956) 1958; *Quercus ilicis-Pinetum halepensis* Loisel 1971 and *Ostryo-Quercetum ilicis* Trinajstić (1965) 1974 (PANDŽA, 1998), and some with the Phoenician juniper macchia. The climate on the island of Murter is Mediterranean with mild winters and hot summers. The average temperature registered at the weather recording station on the island of Sestrice (the Kornati islands) in the 1981–1995 period was in January 8.7 °C and in July and August 24.9 °C, the average annual temperature being 16.2 °C. The average amount of precipitation is 591 mm, with most rain falling in autumn and winter (the data from the National Hydrometeorological Institute of the Republic of Croatia).

## MATERIAL AND METHODS

Several phytocenological investigations into the Phoenician juniper macchia (ass. *Pistacio lentisci-Juniperetum phoeniceae*) were made in the last ten years on the island of Murter and the surrounding small islands – Bisaga, Ljutac, Borovnik, Školjić, Vodenjak and Babuljak. A total of 27 relevés, presented in Table 1, were elaborated. The table shows the size of relevé and total cover, exposition, inclination and number of species surface in the relevés. The vegetation relevés were made and elaborated according to the standard procedures of the Braun-Blanquet method (BRAUN-BLANQUET 1964). The nomenclature of plant species follows PIGNATTI (1982) except *Rhamnus intermedium* Steud. et Hochst. (TUTIN *et al.*, 1964–1980).

Numerical analysis (Principal Coordinates Analysis using Similarity ratio as resemblance) of all relevés was performed using the programme package SYN-TAX 2000 (PODANI, 2001). The original Braun-Blanquet sampling scale has been transformed into the original scale according to VAN DER MAAREL (1979).

The localities are presented on the map (Fig. 1).

## RESULTS OF THE RESEARCHES AND DISCUSSION

### Syntaxonomic scheme:

Ass. – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987

All. – *Oleo-Ceratonion* Br.-Bl. 1936

Order – *Quercetalia ilicis* Br.-Bl. (1931) 1936

Class – *Quercetea ilicis* Br.-Bl. 1947

In the past, on the island of Murter and the surrounding small islands, felling of economically important tree species, the holm oak (*Quercus ilex*) in the first place, resulted in primary vegetation degradation. Grazing and burning contributed further

Tab. 1. Ass. *Pistacia lentiscus-Juniperetum phoeniceae* Trimajstić 1987 on the island of Murter and the surrounding small islands

|   |     |     |     |     |     |     |       |     |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
|---|-----|-----|-----|-----|-----|-----|-------|-----|-------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
| Number of veget. record.  | 1   | 2   | 3   | 4   | 5   | 6   | 7     | 8   | 9     | 10  | 11  | 12  | 13  | 14  | 15  | 16  | 17  | 18  | 19  | 20  | 21  | 22  | 23  | 24  | 25  | 26  | 27  |     |    |
| Size of releve (m <sup>2</sup> )  | 300 | 200 | 100 | 200 | 200 | 300 | 200   | 150 | 100   | 100 | 200 | 300 | 100 | 100 | 200 | 300 | 200 | 100 | 200 | 100 | 100 | 100 | 100 | 200 | 200 | 200 | 200 |     |    |
| Total cover (%)   | 90  | 100 | 90  | 100 | 90  | 100 | 80-90 | 100 | 80-90 | 100 | 90  | 100 | 100 | 90  | 100 | 100 | 100 | 90  | 100 | 90  | 80  | 100 | 90  | 100 | 100 | 100 |     |     |    |
| Exposition  | SW  | SW  | SE  | SW  | S   | SW  | S     | E   | SW    | S   | SW  | SW  | 0   | S   | S   | SW  | W   | NE  | S   | SW  | SW  | NE  | NE  | 0   | SW  | SW  |     |     |    |
| Inclination (°)   | 25  | 20  | 10  | 25  | 15  | 20  | 30    | 15  | 10    | 15  | 30  | 30  | 0   | 10  | 10  | 5   | 20  | 5   | 10  | 10  | 20  | 0   | 0   | 0   | 10  | 5   | 10  |     |    |
| Number of species   | 14  | 12  | 11  | 11  | 11  | 10  | 10    | 14  | 9     | 7   | 14  | 11  | 10  | 11  | 12  | 14  | 12  | 11  | 13  | 16  | 14  | 16  | 14  | 21  | 12  | 17  | 14  |     |    |
| <b>Char. Ass.</b>   | 4.4 | 4.5 | 4.4 | 4.4 | 4.4 | 4.5 | 4.4   | 4.4 | 3.4   | 4.4 | 4.5 | 4.5 | 3.4 | 3.3 | 3.3 | 4.4 | 3.3 | 3.4 | 3.4 | 3.3 | 3.4 | 3.3 | 3.4 | 2.2 | 2.3 | 2.2 | 2.2 | 100 |    |
| <i>Juniperus phoenicea</i> L.   |     |     |     |     |     |     |       |     |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| <b>Char. All. Oleo-Cerantonion:</b>   | 1.2 | 1.2 | 1.2 | 1.2 | 2.2 | 2.2 | 1.2   | 1.2 | 2.2   | 1.2 | 2.2 | 1.2 | 1.2 | 2.3 | 1.2 | 1.2 | 1.2 | 3.3 | 2.2 | 2.3 | 1.2 | 2.2 | 3.3 | 2.2 | 2.3 | 2.3 | 1.2 | 100 |    |
| <i>Pistacia lentiscus</i> L.  | +   | 1.2 | +2  | 1.2 | 1.2 | +2  | +2    |     |       |     |     |     | +2  | 3.3 | 2.2 | 1.2 | 1.2 | 1.2 | 1.2 | 2.2 | 1.2 | 1.2 | 1.2 | 1.2 | 2.2 | 2.2 | 1.2 | 81  |    |
| <i>Myrtus communis</i> L.   |     |     |     |     |     |     |       |     |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| <i>Pinus halepensis</i> Mill., juv.   |     | +2  |     | +2  | +2  |     |       |     | +2    |     |     |     |     |     |     |     |     | +2  | +2  |     |     | 1.2 | 1.2 | 1.2 | 1.2 |     |     | 37  |    |
| <i>Juniperus oxycedrus</i> L. subsp. <i>macrocarpa</i> (Sibth. et Sm.) Ball |     |     |     | 1.2 | +2  | 1.2 | +2    |     |       | 1.2 |     |     |     |     |     | +2  |     |     |     |     |     | 1.2 |     |     |     |     |     | 26  |    |
| <i>Rhamnus alaternus</i> L.   |     |     |     |     |     |     | 1.2   | 1.2 |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 7   |    |
| <i>Ephedra fragilis</i> Desf.   |     |     |     |     | +2  |     |       |     |       |     | +2  |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 7   |    |
| <b>Char. Order Quercetalia ilicis and char. Class Quercetia ilicis:</b>     |     |     |     |     |     |     |       |     |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |    |
| <i>Smilax aspera</i> L.   |     | 1.2 | +2  | +2  | +2  | 1.2 | 1.2   | +2  | 1.2   | 1.2 | +2  |     | 1.2 | +   |     | 1.2 | 1.2 | +2  | +   | 1.2 | 1.2 | 1.2 | +   | 1.2 | 1.2 | 1.2 | 1.2 | 89  |    |
| <i>Asparagus acutifolius</i> L.   |     |     |     | +2  |     |     |       | +2  | 1.2   | +2  | +2  | +2  | +   | +   | +   | +   | +   | +   | +   | 1.2 | +   | +   | +   | +   | +   | +   | 1.2 | 82  |    |
| <i>Juniperus oxycedrus</i> L. subsp. <i>oxycedrus</i>                       | 1.2 |     | +2  | +   |     |     |       | +2  |       |     | +   |     | 1.2 | 1.2 | +2  | +2  |     | 1.2 | +2  | +   | +2  |     | 1.2 | 1.2 | 1.2 | 2.2 | 1.2 | 67  |    |
| <i>Quercus ilex</i> L.  | +2  | 1.2 |     |     |     |     |       |     |       |     | +2  |     | +3  | +   | 1.2 | +   | +   | 1.2 | +   | +2  | +2  | +2  | +2  | +   | +   | +   | +2  | 67  |    |
| <i>Phillyrea latifolia</i> L.   | +2  | 1.2 | +2  | 1.2 | +2  | 1.2 | +2    |     |       | +2  | 1.2 |     |     |     | 1.2 | +2  |     |     | 1.2 |     | +2  |     |     |     | 1.2 | +   |     | 56  |    |
| <i>Rubia perezgrana</i> L.  |     | +   |     |     | +   |     |       |     |       |     |     | +   | +   |     |     |     | +   |     | +   | +   | 1.1 | +   | +   | +   | +   | +   | +   | 52  |    |
| <i>Clematis flammula</i> L.   | +   | +2  |     |     | +2  |     |       | +   |       |     | +   | +   | +   |     |     |     |     |     |     |     |     |     |     | +   | +   | +   | +   | 33  |    |
| <i>Lonicera implexa</i> Aiton   | +   |     | +   |     |     |     | +     |     |       |     |     |     |     |     |     |     |     |     |     |     |     |     |     | +   | +   | 1.2 | 1.2 |     | 22 |
| <i>Prasium majus</i> L.   |     |     |     |     |     | 1.2 | 1.2   | +   | 1.2   | +   |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     |     | 19 |
| <i>Spartium junceum</i> L.  |     |     |     |     |     |     |       |     | 1.2   |     |     | 1.2 |     |     |     |     |     |     |     |     | +   |     |     |     | +   | +   | +   |     | 19 |



to the degradation of habitats. The consequence was the formation of the degradation stages the garrigues characteristic of the investigated area (ass. *Erico-Cistetum cretici* H-ić 1958). Today, in the absence of such intensive grazing, burning and felling, the community of Phoenician juniper is developing by succession in the areas of garrigue, rocky pasturelands, vineyards and olive-groves (Tab. 1). This community presents a progression stage in the development of evergreen forest vegetation. The community grows in large areas (on slopes of southern and south-western exposition) to the south of Jezera village and in the south-western part of the island of Murter and the surrounding small islands (see Fig. 1).

Numerical analysis (Fig. 2) of phytocenological relevés showed the existence of the typical association *Pistacio lentisci-Juniperetum phoeniceae* (relevés 1–13). In addition to the typical association, there are also relevés in the succession toward the forest vegetation (relevés 14–27). Relevés corresponding to the typical association (comp. TRINAJSTIĆ, 1987) differ graphically from other relevés presenting certain succession stage toward the climazonal vegetation (ass. *Myrto-Quercetum ilicis*, relevés 14–27). This can be seen from a larger share of some species characteristic of the said association (*Quercus ilex*, *Myrtus communis*).

By the analysis of the phytocenological relevés (Tab. 1), the domination of the characteristic species is noticed. Another permanent species, in addition to the characteristic species, is *Pistacia lentiscus*, while the species *Myrtus communis* and *Brachypodium ramosum* are missing in several relevés.

Of the characteristic species of the alliance *Oleo-Ceratonion* the species *Pistacia lentiscus* and *Myrtus communis* are dominant, and *Pinus halepensis*, *Juniperus oxycedrus* subsp. *macrocarpa*, *Rhamnus alaternus* and *Ephedra fragilis* are also present. Of the characteristic species of the order and class, 16 species are present, among which *Smilax aspera* and *Asparagus acutifolius* and the shrubs of the *Juniperus oxycedrus* subsp. *oxycedrus*, *Quercus ilex* and *Phillyrea latifolia* are noted by the level of their presence.

23 syntaxonomically characteristic species have been registered, while in all 27 phytocenological relevés 19 companion species are present. The companion species cover small areas, except those making part of garrigues (*Cistus salvifolius* and *C. incanus*).

The association *Pistacio lentisci-Juniperetum phoeniceae* is an initial forest association characterized by a relatively small number of species (10–25; comp. RAUŠ, 1981; TRINAJSTIĆ, 1987, 1995a, 2000; PANDŽA, 1995), although in most recent research (comp. JASPRICA *et al.*, 2000; KOVAČIĆ *et al.*, 2001) a considerably larger number of species has been determined (56).

The number of species per single phytocenological relevé from the island of Murter ranges between 10 and 21. In 17 phytocenological relevés from the island of Murter, a total of 35 species have been registered. On the surrounding small islands, the number of species per phytocenological relevé is even smaller ranging between 7 and 14, and on 10 relevés there is a total of 26 species. By analysis of the floral composition it was noted that in the association the number of species per phytocenological relevé is small, on the average 13 species, and that the total num-

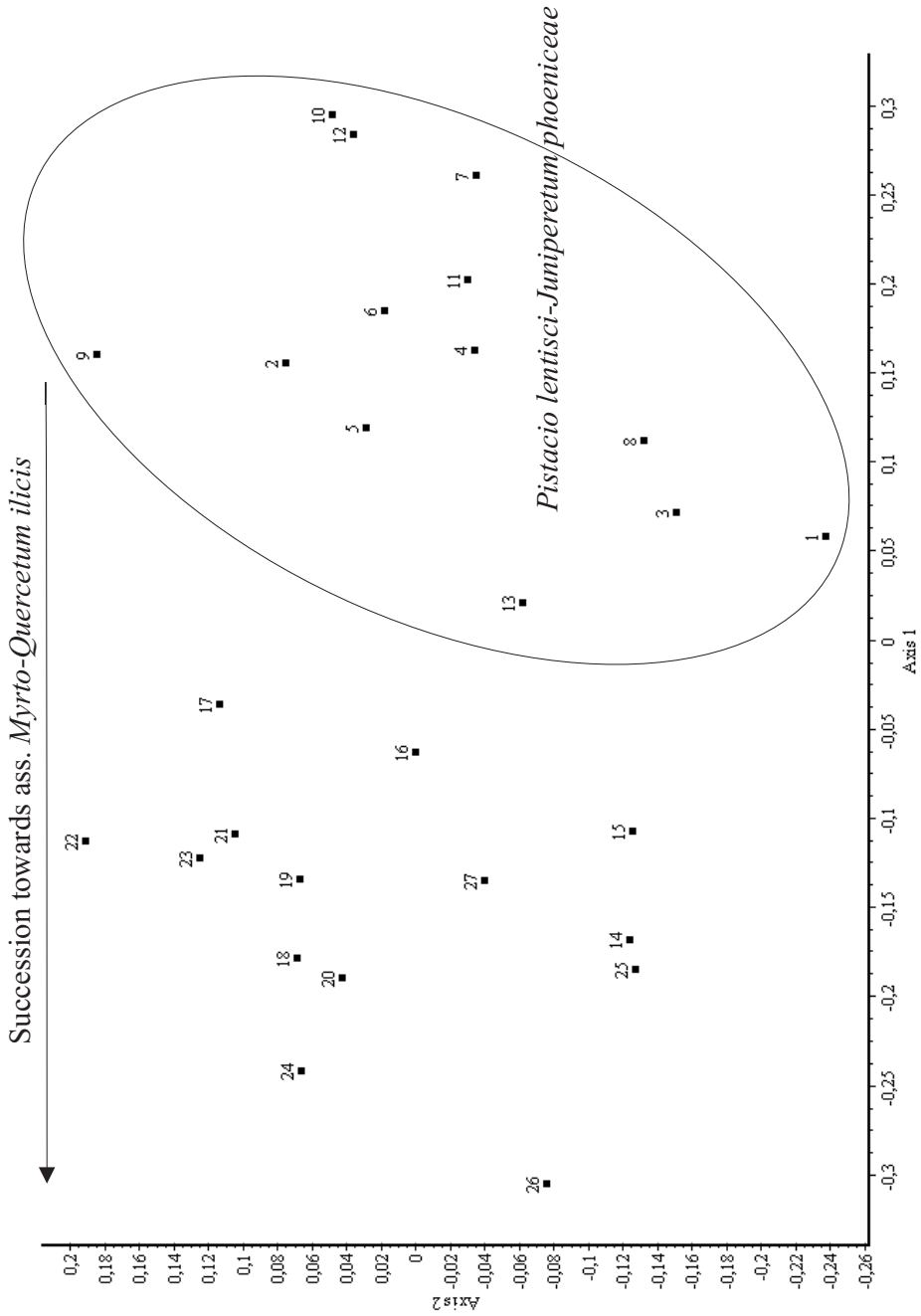


Fig. 2. Multidimensional scaling of relevés



ber of registered species within 27 phytocenological relevés is 42. Similar results have been obtained for the islands of Unije (6 relevés with 23 species) and Veliki Pržnjak (3 relevés with 22 species) TRINAJSTIĆ (1987), as well as for the island of Mljet (6 relevés with 26 species) TRINAJSTIĆ (1995a).

## CONCLUSION

The association *Pistacio lentisci-Juniperetum phoeniceae* is known from the islands of Unije, Veliki Pržnjak, Mljet, Murter (1 relevé), Čiovo, Šolta, Brač, Hvar, Korčula and Lopud, as well as from the Pelješac peninsula, the Dubrovnik littoral and Malostonski zaljev (a total of 42 relevés with 77 species). On the island of Murter and the surrounding small islands, 27 relevés were made with a total of 42 species (Tab. 1). The relevés were made and analyzed using the classical Braun-Blanquet method. In the researched area, the association is developed as a progressive succession stage upon termination of anthropogenic activities (pasture, burning, vineyards and olive-groves) on the garrigues, rocky pasturelands and abandoned olive-groves. The association is well characterized by the presence of 6 species of the alliance *Oleo-Ceratonion* and 16 species of the order *Quercetalia ilicis* and the class *Quercetea ilicis*.

## ACKNOWLEDGMENTS

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## APPENDIX

1. Relevé between the hills Visoka and Tripice, about 70 m from the sea. Vegetation grows between dry stone walls; 20. 05. 1993.
2. Island of Borovnik – relevé 20–30 m from the sea; 28. 03. 1996.
3. The hill Visoka – relevé 40 m from the sea. Dominant are Phoenician junipers 1.8 to 2 m high; 10. 08. 1996.
4. Island of Ljutac – relevé 50 m from the sea; 15. 05. 1995.
5. Island of Ljutac – relevé 30 m from the sea; 15. 05. 1995.
6. Island of Ljutac – relevé 30–40 m from the sea to the south of relevé no. 4; 15. 05. 1995.
7. Island of Ljutac – relevé at the foot of the hill. Inside the relevé there are sharp rocks; 15. 05. 1995.
8. Island of Vodenjak – Phoenician junipers 1.0 – 1.3 m high; 21. 10. 1995.
9. Island of Školjić – relevé 4–5 m from the sea; 17.10. 1996.

10. Island of Babuljak – relevé 10 m from the sea; 21. 10. 1995.
11. Island of Bisaga – relevé 4–5 m from the sea; 11. 03. 1995.
12. Island of Bisaga – relevé 10–15 m from the sea and about 100 m to the west of relevé no. 11; 11. 03. 1995.
13. The hill Mača – relevé made on the southern side of the hill under the road on insolated locality. The association is developed between dry stone walls; 08. 08. 1996.
14. The hill Tripica – relevé 20 m from the sea; 20. 05. 1993.
15. The hill Široka – relevé 40–50 m from the sea. The average vegetation height is 2 m; 10. 08. 1996.
16. The hill Visoka – relevé 20 m from the sea; 10. 08. 1996.
17. The hill Tripica – relevé 40–50 m from the sea; 10. 08. 1996.
18. Relevé between the coves Jezera and Mače. Vegetation develops between dry stone walls on the garrigue land. A protective dry wall separates this area from the sea; 20. 05. 1993.
19. The eastern side of Artiluka cove, relevé 20 m from the sea. The average vegetation height is from 1.5 to 1.8 m; 10. 08. 1996.
20. The middle of Nozdra cove, relevé 50 m from the sea; 20. 05. 1993.
21. Kamenar Hill – relevé 60–70 m from the sea; 10. 08. 1996.
22. Relevé to the right from the Aleppo pine forest in Gušćica cove – toward Rat. The relevé is 6–7 m from the sea. Vegetation is protected from the marine influence by a dry wall. The soil is rocky (bedrock). The average vegetation height from 1.5 to 2 m; 20. 05. 1993.
23. Relevé 200 m to the east of relevé no. 22 in Gušćica cove. Vegetation in the relevé is protected from the sea by a dry wall. There is dense impassable macchia on the plane surface. The average vegetation height is from 1.5 to 1.8 m; 20. 05. 1993.
24. Jamina – an isolated stand in an olive-grove; 27. 05. 1993.
25. Rat – relevé 20 m from the sea. The soil is rocky (bedrock). The average vegetation height about 1.5 m; 20. 05. 1993.
26. The eastern part of Artiluka cove, relevé 30 m from the sea and to the west of relevé no. 25. The average vegetation height is 2 m; 20. 05. 1993.
27. Edge of the hill Mače – relevé made along the path inside dry stone walls; 08. 08. 1996.

## REFERENCES

- BRAUN-BLANQUET, J., 1964: Pflanzensozioogie. Grundzuge der Vegetationskunde 3. Aufl. Springer-Verlag. Wien.
- JASPRICA, N., M. RUŠČIĆ & S. KOVAČIĆ, 2000: Floristički sastav makije somine (as. *Pistacio-Juniperetum phoeniceae* Trinajstić 1987) u srednjoj i južnoj Dalmaciji. Zbornik sažetaka priopćenja sedmog hrvatskog biološkog kongresa, Zagreb. 268–269.

- KOVAČIĆ, S., N. JASPRICA & M. RUŠIĆ, 2001: Floristic characteristic of Phoenician juniper macchia (ass. *Pistacio lentisci* – *Juniperetum phoeniceae* Trinajstić 1987) in Central and Southern Dalmatia (Croatia). Nat. Croat. **10**(2), 73–81.
- MAMUŽIĆ, P., I. BOROVIĆ & B. KOROLIJA, 1975: Tumač osnovne geološke karte 1 : 100 000, List Šibenik, K 33 – 8. Institut za geološka istraživanja, Zagreb.
- PANDŽA, M., 1995: Floristička, fitocenološka i fitogeografska obilježja otoka Murtera. Magistarski rad – PMF. Zagreb.
- PANDŽA, M., 1998: Flora of the island of Murter (Central Adriatic). Acta Bot. Croat. **57**, 99–122.
- PIGNATTI, S., 1982: Flora d'Italia. **I–III**. Edagricole, Bologna.
- PODANI, J., 2001: SYN-TAX 2000. User's manual. Scientia Publishing. Budapest.
- RAUŠ, Đ., 1981: Vegetacijske značajke uže okolice Malostonskog zaljeva. Savjetovanje o Malostonskom zaljevu – Prirodna podloga i društveno valoriziranje. Dubrovnik.
- TRINAJSTIĆ, I., 1987: Fitocenološko-tipološka analiza sastojine makije somine *Juniperus phoenicea* L. u Hrvatskom primorju. Acta Bot. Croat. **46**, 115–121.
- TRINAJSTIĆ, I., 1995: Plantgeographical Division of Forest Vegetation of Croatia. Ann. Forest. **20**(2), 37–66, Zagreb.
- TRINAJSTIĆ, I., 1995a: Vegetacijske značajke otoka Mljeta. Simpozij Prirodne značajke i društvena valorizacija otoka Mljeta. Ekološke monografije **6**, 247–269.
- TRINAJSTIĆ, I., 1998: Fitogeografsko raščlanjenje klimazonalne šumske vegetacije Hrvatske. Šum. list **122** (9–10), 407–421.
- TRINAJSTIĆ, I., 2000: Fitocenološke značajke makije somine *Pistacio-Juniperetum phoeniceae* Trinajstić 1987 (*Oleo-Ceratonion* Br.-Bl.) na obalama Malostonskog zaljeva. Rad Šum. Inst. Jastrebov. **35**(1), 5–12.
- TUTIN, T. G. *et al.* (eds.) 1968–1980: Flora Europaea **1–5**. University press, Cambridge.
- VAN DER MAAREL, E., 1979: Transformation of cover-abundance values in phytosociology and its effects on community. Vegetatio **39**(2), 97–114.

## SAŽETAK

### **Vegetacija makije somine – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 (*Oleo-Ceratonion*) na otoku Murteru i okolnim otočićima**

M. Pandža

Vegetacija makije somine – *Pistacio lentisci-Juniperetum phoeniceae* Trinajstić 1987 (*Oleo-Ceratonion*) se na otoku Murteru širi na površinama južnije od naselja Jezera i na jugoistoku otoka (sl.1). Zajednica raste nekoliko metara od mora po padinama brda južne i jugozapadne ekspozicije kao i u unutrašnjosti otoka na zaštićenim i osunčanim položajima. Istraživana vegetacija predstavlja progresijski stadij u razvoju vazdazelene šumske vegetacije na površinama zapuštenih maslinika, vinograda, po garizima i na kamenjarskim pašnjacima otoka.

U 27 fitocenoloških snimaka zabilježene su 42 vrste (tab. 1). Na otoku Murteru broj vrsta po fitocenološkoj snimci kreće se između 10 i 21 vrste (u 17 snimaka zabilježeno je ukupno 35 vrsta). Na okolnim otočićima – Bisaga, Ljutac, Borovnik, Školjić, Vodenjak i Babuljak broj vrsta po fitocenološkoj snimci je još manji (od 7 do 14 vrsta, u 10 snimaka ukupno je zabilježeno 26 vrsta). U 27 fitocenoloških snimaka su 23 sintaksonomski karakteristične vrste, a 19 je pratilica. U istraživanim snimcima dominira somina. Od karakterističnih vrsta sveze *Oleo-Ceratonion* zabilježeno je 6 vrsta od kojih se stalnošću ističu *Pistacia lentiscus* i *Myrtus communis*. Karakterističnih vrsta reda *Quercetalia ilicis* i razreda *Quercetea ilicis* zabilježeno je 16 vrsta.

Analizirajući murterske snimke i snimke s okolnih otočića zamijećena je razlika u sastavu fitocenoloških snimaka. Na otoku Murteru se redovito pojavljuje u snimcima *Quercus ilex* (95 % snimaka) dok je na okolnim otočićima nazočna u dvije od deset snimaka. Na murterskim otočićima je razvijena as. *Pistacio lentisci-Juniperetum phoeniceae* dok je na otoku Murteru ta asocijacija u sukcesiji prema klimazonalnoj šumskoj vegetaciji (sl. 2).