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Epiphytic flora and vegetation on *Posidonia oceanica* (L.) DELILE leaves in the Hvar Island area (middle Adriatic, Croatia)

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This paper presents the results of seasonal and depth distribution of epiphytic flora and vegetation on Mediterranean seagrass Posidonia oceanica (*L.*) *DELILE leaves. The investigations were carried out seasonally, in 1984 at 5, 15 and 25m depth in one* Posidonia *bed on the west coast of Hvar Island (middle Adriatic). A total of 103 epiphytic algal taxa were determined (Rhodophyta 72 taxa, Phaeophyta 16 taxa and Chlorophyta 15 taxa). The highest number of taxa was observed during winter (75 taxa) and at 5m depth (78 taxa), and the lowest during autumn (63 taxa) and at 15m depth (73 taxa). The SØRENSEN's coefficient of similarity,* R/P *quotient and Cluster Analysis were calulated for similarity epiphytic floras of different Mediterranean and Adriatic areas. In epiphytic vegetation the mean total covering of sample* (Rt%) *decreased along the depth gradient (21.56% at 5m and 11.03% at 25m). Within qualitative dominance* (DN%) *predominated the* filamentous *algal taxa of* Phsl *and* Ssl *ecological supergroups, and* D *ecological group. Regarding quantitative dominance* (DR%), *in this vegetation dominated the* calcareous, filamentous *and* foliose *algal taxa of* Phsl *and* Ssl *ecological supergroups, and* HP *and* D *ecological groups. The Cluster Analysis shows that a high significance (about 87%) of epiphytic vegetations exist between the investigated vegetation (present paper) and group of areas which are formed of Sicily, Dubrovnik, Ischia and the French coast. Within the structure of epiphytic vegetation it is possible to separate the algal taxa for which the high values of* RMi% $\geq 0.50\%$ *along with high values of* P *(3, 4 or 5) were recorded, that the most significantly participated in structure of this vegetation. The following species were present at all depths:* Chondria tenuissima, Dictyota linearis, Pneophyllum fragile *and* Fosliella farinosa *var.* farinosa, *and at different depths there were also found:* Spyridia filamentosa, Herposiphonia secunda *f.* tenella, Laurencia obtusa, Ceramium nodosum *and* Myrionema orbiculare *at 5m depth;* Polysiphonia fruticulosum, Spyridia filamentosa, Herposiphonia secunda *f.* tenella, Laurencia obtusa *and* Polysiphonia *sp.*3 *at 15m depth;* Antithamnion cruciatum *var.* profundum *and* Polysiphonia *sp.*3 *at 25m depth.*

Key words: *Posidonia oceanica* leaves, epiphytic flora and vegetation, Hvar Island, Adriatic Sea

INTRODUCTION

The endemic Mediterranean seagrass *Posidonia oceanica* (L.) DELILE is one of the most significant hosts of epiphytic flora along the eastern Adriatic coast. The significance of epiphytism on Posidonia is due to the fact that its beds are developed on mobile infralittoral bottoms (sandy and sandy-muddy), where benthic macro-algae are quantitatively and qualitatively poorly represented. The papers previously pub-

lished by different authors who studied benthic flora of the eastern Adriatic coast (ZANARDINI, 1871-1876; HAUCK, 1885; LORENZ, 1863; ERCEGOVIĆ, 1957, 1960, 1964; ŠPAN, 1980) only mention *Posidonia oceanica* as a host plant of individual algal taxa, but no one gave a detailed account of the epiphytic flora and vegetation. The intensified investigation of this phytocoenosis, which started in 1979, resulted in the most complete papers on the epiphytic flora of *Posidonia* leaves (ANTOLIĆ, 1985, 1986a) and rhizomes (ANTOLIĆ, 1986 b) of the eastern Adriatic coast.

Results presented in this paper represent only a small part of the researches of epiphytic flora and vegetation on *Posidonia oceanica* leaves and rhizomes. These results were obtained in the middle Adriatic from 1984 to 1987 (ANTOLIĆ, 1994).

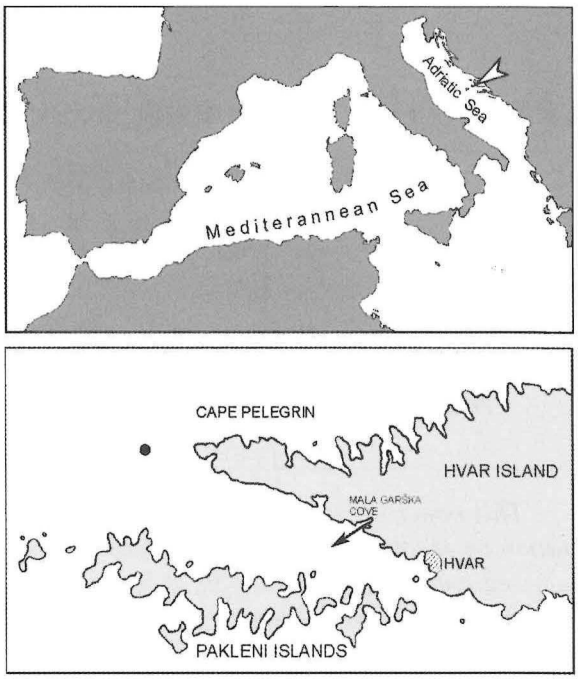

Fig. 1. Investigation area on the west coast of the Hvar Island.
→ *depth transect in the praire of* Posidonia oceanica
• *hydrographic station Pelegrin*

MATERIAL AND METHODS

On the west coast of the Hvar Island (Mala Garška Cove, 43 11'N, 16 26'E) *Posidonia oceanica* grows in continuation from 3 to 30-32 m depth (Fig. 1). The sandy bottom slope is about 15°-20° from surface to the 20-25 m depth and than the angle of slope decreases to 10°. The mean width of the praire is 100 - 110 m.

The samples were collected by SCUBA diving seasonally (March, June, September and November, 1984) along depth transect (5, 15 and 25 m depth).

For meadow structure (shoots per m^2) a total of 12 samples on permanent square 50 x 50 cm were collected.

Twenty shoots of *Posidonia* were collected and examined seasonality on each depth station for leaf fenology: mean number and surface of total leaves and different age classes of leaves (adult and intermediate; according to GIRAUD's classification, 1977) per shoot, and Leaf Area Index (*L.A.I.*; $m^2 m^{-2}$).

For floristic and vegetation investigations 10 shoots of *Posidonia* were separated and observed seasonality on each depth station, and used to determine the analytical parameters (coefficients abundance-dominance and sociability) for epiphytic algal taxa (BOUDOURESQUE, 1971).

The floristic composition of epiphytic algae is represented by the relationship of abundance (*N*) and qualitative dominance (*DN%*) of the systematic divisions Rhodophyta, Phaeophyta and Chlorophyta as well as by their depth and seasonal distribution.

The SØRENSEN's similarity coefficient (1948), *R/P* quotient (FELDMANN, 1938) and Cluster Analysis were used for similarity epiphytic floras and vegetations of different Mediterranean and Adriatic areas.

The structures of epiphytic community were analyzed by depth and seasonal distribution in the following synthetic parameters (BOUDOURESQUE, 1971):

- mean epiphyte covering of sample (*RM %*) expressed as percentage of leaf surface;
- mean total covering of sample (*Rt %*) expressed as sum of means total covering of the individual algal taxa (*RMi%*;)
- mean total covering of the individual epi phytic algal taxa (*RMi %*);
- qualitative dominance (*DN %*) of ecologi cal supergroups (*Phsl* - including the pho-

tophylic algae in a larger sense, *Ssl* - including the sciaphilic algae in a larger sense, *RMsl* - the benthic algae from mediolittoral rocks in a larger sense, *ETNsl* - including the eutrophyc and tionitrophilic algae in a larger sense), ecological groups (*ISR* - the benthic algae from infralittorals hard bottom, *HP* - the epiphytic algae on the *Posidonia oceanica* leaves, *D* - the benthic algae with a large ecological distribution) and morpho-functional groups (*calcareous* encrusting algae, "*soft*" encrusting algae, *foliose* algae, *filamentous* algae);

- quantitative dominance (*DR %*) of ecolog ical supergroups and groups, and morpho-functional groups;
- level presence (*P*) of the individual epi phytic algal taxa.

The groupment of benthic algal taxa were performed in ecological supergroups and groups by BOUDOURESQUE (1970, 1984) and PANAYOTIDIS (1980), and in morpho-functional groups by MAZZELLA *et al.* (1989).

The hydrographic characteristics (temperature, salinity, phosphate, nitrate, and sea water transparency) of the investigated area are based on mean values of data which were measured in the period 1971-1982 on permanent hydrographic station Pelegrin (ZORE-ARMANDA *et al.*, 1991) (Fig. 1).

RESULTS AND DISCUSSION

Hydrographic characteristics

Temperature

The lowest values of mean seawater temperature were recorded in March, and the highest in September at all depths. Temperature varied between 13.00 ± 0.56°C and 22.00 ± 1.23°C at surface, between 12.68 ± 0.33°C and 22.49 ± 0.59°C at 5 m, between 13.0 ± 0.53°C and 20.04 ± 1.23°C at 10 m, between 12.95 ± 0.55°C and 18.96 ± 2.00°C at 20 m, and between 13.00 ± 0.57°C and 17.44 ± 2.19°C at 30 m depth. In March and November an isothermy was present, with values around 13°C (March) i. e. around 17°C (November). Rapid changes in temperature (termocline) is evident between 10 and 20 m depth in June (from 20.09 ± 1.26 to 16.73 ± 1.65°C) (Table 1).

Table 1. Seasonal and depth mean values (± S.D.) of sea water temperature, salinity, nitrate and phosphate (1971-1982) at station Pelegrin (according to ZORE-ARMANDA et al., 1991)

Season	Depth (m)	Temperature (°C)	Salinity (psu)	Nitrate (NO_3 -N) (mmol m^{-3})	Phosphate (PO_4-P) (mmol m^{-3})
March	0	13.00 ± 0.56	37.92 ± 0.58	0.77 ± 0.19	0.067 ± 0.029
	5	12.68 ± 0.33	38.28 ± 0.34	0.92 ± 0.23	0.073 ± 0.027
	10	13.00 ± 0.53	38.08 ± 0.52	0.93 ± 0.53	0.067 ± 0.018
	20	12.95 ± 0.55	38.17 ± 0.42	1.01 ± 0.30	0.057 ± 0.023
	30	13.00 ± 0.57	38.24 ± 0.37	0.94 ± 0.46	0.177 ± 0.291
June	0	20.88 ± 1.44	37.49 ± 0.56	0.68 ± 0.40	0.065 ± 0.042
	5	21.64 ± 1.93	37.63 ± 0.51	0.65 ± 0.19	0.083 ± 0.029
	10	20.09 ± 1.26	37.80 ± 0.47	0.73 ± 0.49	0.072 ± 0.044
	20	16.73 ± 1.65	38.13 ± 0.29	0.79 ± 0.46	0.066 ± 0.034
	30	16.48 ± 1.23	38.34 ± 0.24	1.32 ± 1.50	0.079 ± 0.048
September	0	22.00 ± 1.23	38.28 ± 0.19	0.89 ± 0.47	0.059 ± 0.016
	5	22.49 ± 0.59	38.40 ± 0.16	0.70 ± 0.18	0.061 ± 0.022
	10	20.04 ± 1.23	38.37 ± 0.17	0.75 ± 0.22	0.060 ± 0.021
	20	18.96 ± 2.00	38.45 ± 0.21	0.80 ± 0.27	0.061 ± 0.014
	30	17.44 ± 2.19	38.50 ± 0.21	0.74 ± 0.32	0.069 ± 0.023
November	0	17.17 ± 0.68	38.19 ± 0.31	0.84 ± 0.34	0.069 ± 0.020
	5	17.14 ± 0.73	38.27 ± 0.24	0.42 ± 0.35	0.065 ± 0.015
	10	17.19 ± 0.69	38.22 ± 0.29	0.74 ± 0.35	0.067 ± 0.029
	20	17.20 ± 0.69	38.25 ± 0.30	0.85 ± 0.36	0.068 ± 0.019
	30	17.22 ± 0.65	38.31 ± 0.30	0.87 ± 0.35	0.082 ± 0.028

Salinity

Mean salinity increased with depth in all seasons. Values varied between 37.49 ± 0.56 psu (surface in June) and 38.50 ± 0.21psu (30 m depth in September). Halocline is formed in June between 10 and 20 m depth (from 37.80 ± 0.47 to 38.13 ± 0.29 psu) (Table 1).

Phosphate (PO_4-P)

The mean values of this salt don't vary much in the study area. If we separated the highest value in March at 30 m depth (0.177 ± 0.291 mmol m^{-3}) the remaining values varied between 0.057 ± 0.023 mmol m^{-3} and 0.083 ± 0.029 mmol m^{-3} (Table 1).

Nitrate (NO_3-N)

Mean values of this parameter slightly increased with depth in March and June. The minimum values were determined in November at 5 m (0.42 ± 0.35 mmol m^{-3}), and the maximum in June at 30 m depth (1.32 ± 1.50 mmol m^{-3}) (Table 1).

Sea water transparency (SECCHI disc, Ø 30 cm)

The highest mean values of seawater transparence were determined in September (23.36 ± 2.77 m), while the lowest were in June (21.00 ± 3.57 m)(Table 2).

Table 2. Seasonal mean transparency values (± S.D.) by SECCHI disc (1971-1982) at station Pelegrin (according to ZORE-ARMANDA et al., 1991)

SEASON	SECCHI (m)
March	23.36 ± 2.77
June	21.00 ± 3.57
September	27.55 ± 3.96
November	21.67 ± 4.06

Meadow structure and leaf phenology

Meadow structure

The density of the meadow changed along the transect seasonality. In general, the number of shoots decreased with depth in all seasons. Values varied between 564 (March) and 916 shoots per m^2 (June) at 5 m, between 272 (November) and 372 shoots per m^2 (September) at 15 m, and between 96 (March) and 200 shoots per m^2 (June and September) at 25 m depth (Fig. 2).

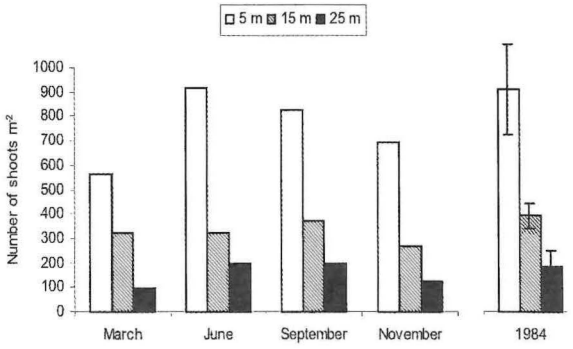

Fig. 2. The density medow of Posidonia oceanica *expresed as number of shoots per m^2 in different seasons and at different depths in the Hvar Island area*

Leaf phenology

The mean total number of leaves per shoot varied between 6.7 ± 1.0 (S.D) (June) and 7.9 ± 0.6 (November) at 5 m, between 7.5 ± 0.8 (June) and 7.8 ± 0.8 (November) at 15 m, and between 7.1 ± 1.0 (March) and 7.9 ± 1.2 (September) at 25 m depth. In June and September the values increased, while in November decreased with depth (Fig. 3a).

Regarding of adulte and inermediate leaves the mean number of adult leaves per shoot was higher in June and September and lower in March and November than intermediate leaves at all depths. The highest mean number of adult leaves was in June at 5 and 15 m depths, and in September at 25 m depth, whereas the mean number of intermediate leaves was the highest in November at 5 m, and in March at 15 and 25 m depths (Fig. 3a). The values varied for adult leaves from 2.3 ± 0.51 (November, 15 m) to 3.4 ± 0.88 (September, 25 m), and for intermediate leaves from 1.5 ± 0.61 (June, 5 m) and 3.5 ± 0.51 (March, 15 m) (Fig. 3a).

Only in November the total leaf surface per shoot showed decreasing trends towards the

deeper stations. In another seasons the highest values were determined at 15m depth. The values ranged between 116.9 ± 21,9 (S.D)(September) and 144.4 ± 26.7 cm^2shoot^{-1} (March) at 5 m, between 103.1 ± 24.9 (November) and 156.1 ± 42.3 cm^2shoot^{-1} (June) at 15 m, and between 78.9 ± 25.6 (November) and 148.5 ± 27.5 cm^2shoot^{-1} (June) at 25 m depth (Fig. 3b). Generally, the mean surface of adult leaves per shoot was higher than intermediate leaves in all seasons and at all depths. For adulte leaves the highest values determined in September at all depths ranged from 71.3 ± 21.5 (June) to 97.1 ± 22.7 cm^2shoot^{-1} at 5 m, from 66.4 ± 18.7 (November) to 117.6 ± 31.5 cm^2shoot^{-1} at 15 m, and from 47.9 ± 19.7 (March) to 105.5 ± 27.9 cm^2shoot^{-1} at 25 m depth. For intermediate leaves the mean surface

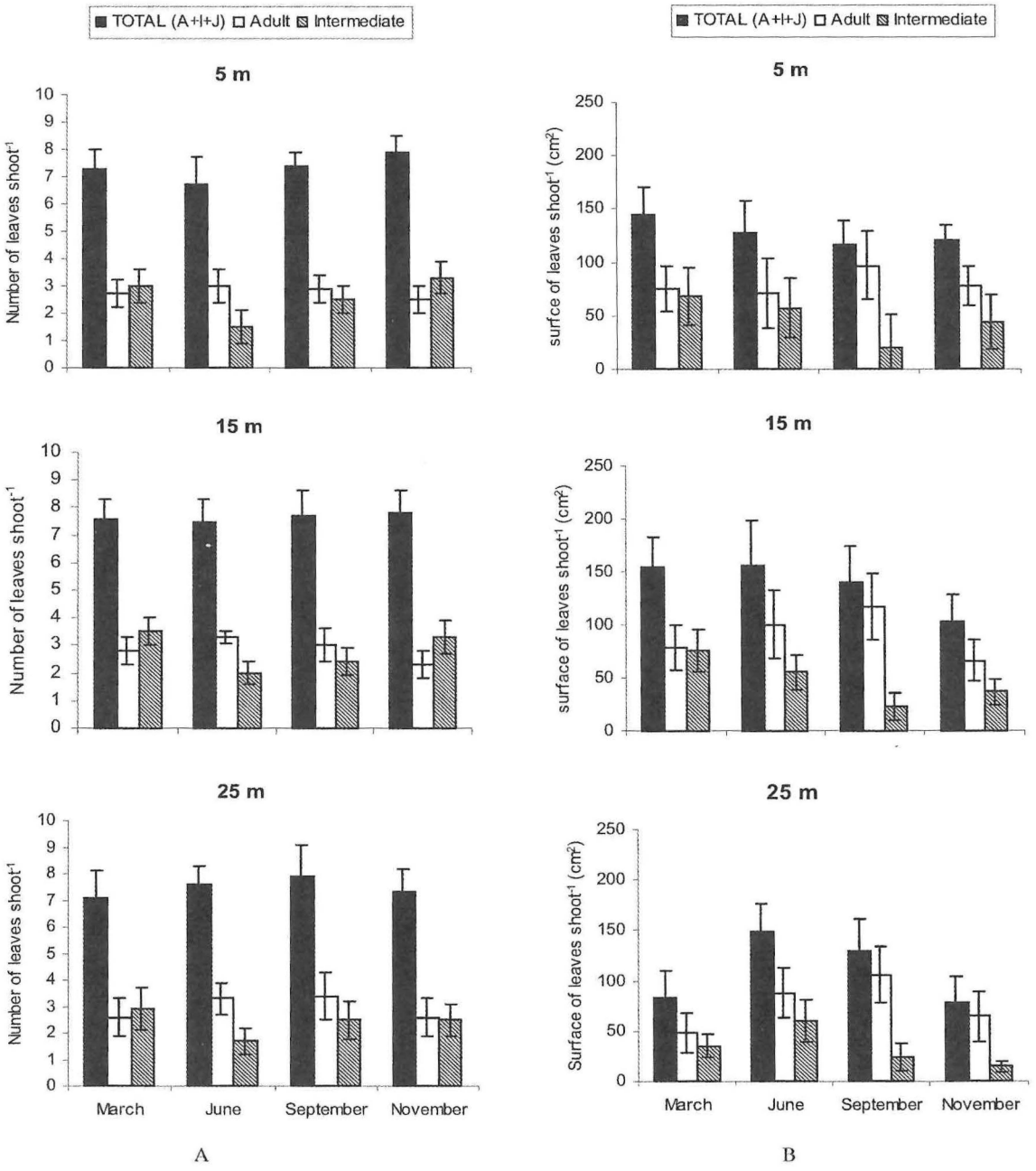

Fig. 3. Mean number (A) *and mean surface* (B) *of total, adult and intermediate leaves per shoot of* Posidonia oceanica *in different seasons and at different depths in the Hvar Island area*

per shoot varied between 19.6 ± 8.4 (September) and 68.2 ± 20.5 cm^2shoot^{-1} (March) at 5 m, between 22.9 ± 13.3 (September) and 75.3 ± 20.1 cm^2shoot^{-1} (March) at 15m, and between 14.4 ± 5.0 (November) and 60.4 ± 21.3 cm^2shoot^{-1} (June) at 25 m depth (Fig. 3b).

Leaf Area Index (*L.A.I.*)

The Leaf Area Index decreased with depth in all seasons, except in September while the highest value was determined at 15 m depth. The values varied between 8.1 (March) and 11.8 $m^2 m^{-2}$ (September) at 5 m, between 2.8 (November) and 10.7 $m^2 m^{-2}$ (September) at 15 m, and between 0.8 (March) and 3.0 $m^2 m^{-2}$ (June) at 25 m depth (Fig. 4). The mean value was at 5 m depth 9.5 ± 1.7 $m^2 m^{-2}$, at 15 m was 5.9 ± 3.4 $m^2 m^{-2}$, and at 25 m was 1.9 ± 1.1 $m^2 m^{-2}$ (Fig. 4).

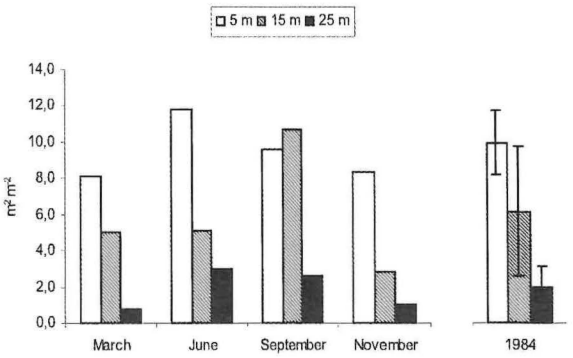

Fig. 4. Leaf Area Index (L.A.I.) *of* Posidonia oceanica *in different seasons and at different depths in the Hvar Island area*

Flora

A total of 103 epiphytic algal taxa were found regardless season and depth (Rhodophyta 72 taxa or 69.9 %, Phaeophyta 16 taxa or 15.5 % and Chlorophyta 15 taxa or 14.6 %) (Table 3).

Results have been compared with the data from BEN (1971), PANAYOTIDIS (1980), BATTIATO *et al.* (1982), BUIA *et al.* (1985, Sicily), ANTOLIĆ (1986) and BUIA *et al.* (1989). The analysis showed that the number of epiphytic algae in the Hvar Island area is 16% lower than in the South Adriatic, higher 9% and 17% than on the French coast, higher 2 % and 24% than on the Sicily, and higher for 21% then at the Ischia Island. The qualitative dominance of Rhodophyta is in correlation with results of investigations in the Adriatic and Mediterranean Sea. However, the *DN%* value of Phaeophyta is the least and Chlorophyta is the highest as compared to the same values in the epiphytic floras in the Adriatic and Mediterranean Sea (Table 3).

The analysis of results on seasonal distribution showed that the abundance of algal taxa didn't change among seasons and depth: maximum values have been recorded in March at 5 m

Table 3. Comparison of abundance (N), *percentage values (%), and* R/P *quotient of epiphytic flora on* Posidonia oceanica *leaves at the Adriatic and Mediterranean coast*

INVESTIGATION	RHODOPHYTA		PHAEOPHYTA		CHLOROPHYTA		TOTAL	R/P
AREAS	N	%	N	%	N	%	N	
French Mediterranean coast BEN, 1971	60	63.8	26	27.7	8	8.5	94	2.3
French Mediterranena coast PANYOTIDIS, 1980	59	68.6	19	22.1	8	9.3	86	3.1
Ischia Island, Tyrhenian Sea BATTIATO *et al.*, 1982	62	76.5	15	18.5	4	4.9	81	4.1
Sicily Island BUIA *et al.*, 1985	54	69.2	19	24.4	5	6.4	78	2.8
Dubrovnik, South Adriatic ANTOLIĆ, 1986a	87	70.7	22	17.9	14	11.4	123	4.0
Sicily Island BUIA *et al.*, 1989	74	73.3	20	19.8	7	6.9	101	3.7
Hvar Island, middle Adriatic present paper	72	69.9	16	15.5	15	14.6	103	4.5

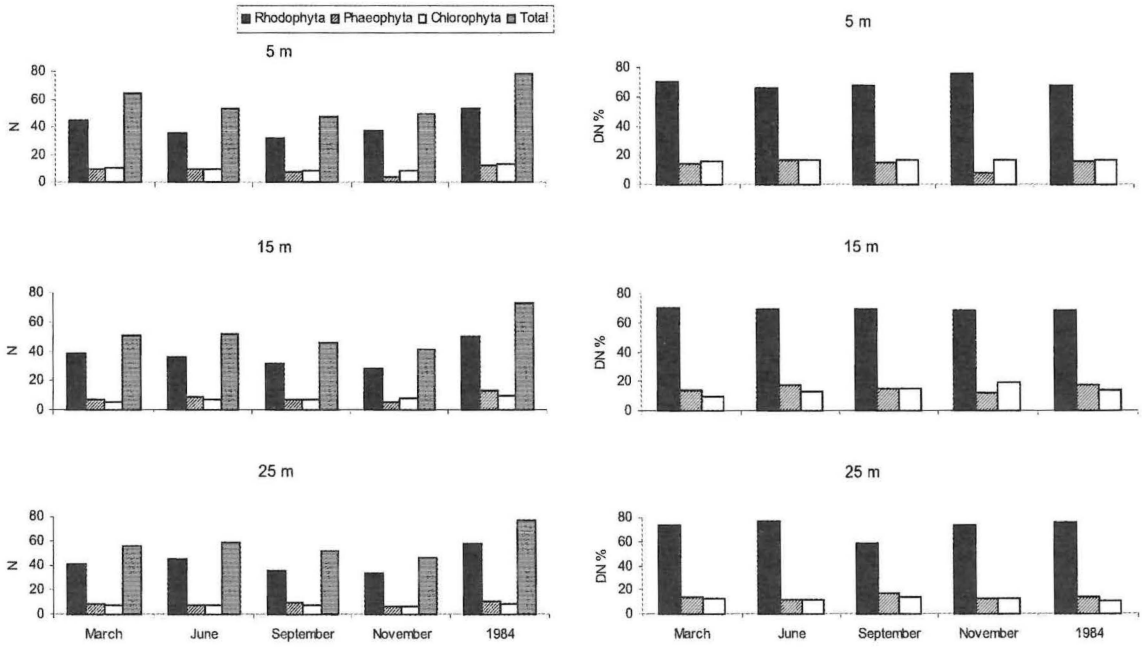

Fig. 5. Abundance (N) and qualitative dominance (DN%) of Rhodophyta, Phaeophyta and Chlorophyta in epiphytic flora on Posidonia oceanica *leaves in different seasons and at different depths in the Hvar Island area*

(64 taxa) while minimum values were recorded in November (41 taxa) at 15 m depth (Fig. 5).

The value of *R/P* quotient (FELDMANN, 1938) for investigated epiphytic flora is 4.8 and it is higher than the values in other compared areas of the Adriatic and Mediterranean Sea. The smallest difference exists in relation to Ischia Island values (BATTIATO *et al.*, 1982), whilst the highest one is in relation to French Mediterranean coast (BEN, 1971)(Table 3).

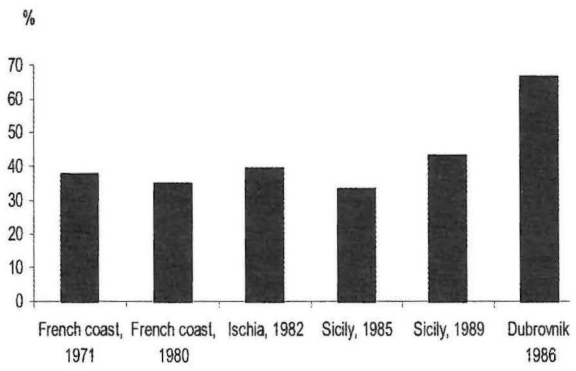

Fig. 6. Values of SØRENSEN's similarity coefficient between epiphytic floras of Hvar Island and differents areas in the Adriatic and Mediterranean Sea

The highest value of SØRENSEN's similarity coefficient (1948) was found between epiphytic flora of Hvar Island (present paper) and Dubrovnik area (68.1 %), (ANTOLIĆ, 1986b). Lower values of this coefficient were recorded between floras of Hvar Island and different areas in the Mediterranean Sea and they varied between 33.2 % (Sicily Island, BUIA *et al.*, 1985) and 4.41 % (Sicily Island, BUIA *et al.*, 1989)(Fig. 6).

The Cluster Analysis of epiphytic floras based on data of abundance (*N*) and qualitative (*DN%*) dominance of Rhodophyta, Phaeophyta and Chlorophyta from different areas of Adriatic and Mediterranean Sea show that there have been formed three groups of areas. The first group is formed only in Dubrovnik area (ANTOLIĆ, 1986a). Between the remaining two groups of areas exists the highest concurring (about 80%). In the second group are included Hvar Island (present paper) and Sicily Island (BUIA *et al.*, 1989), and in the third group the Ischia Island (BATTIATO *et al.*, 1982), Sicily Island (BUIA *et al.*, 1985), French coast (PANAYOTIDIS, 1980; BEN, 1971). Within those groups the significance doesn't exceed 40% (Fig. 7).

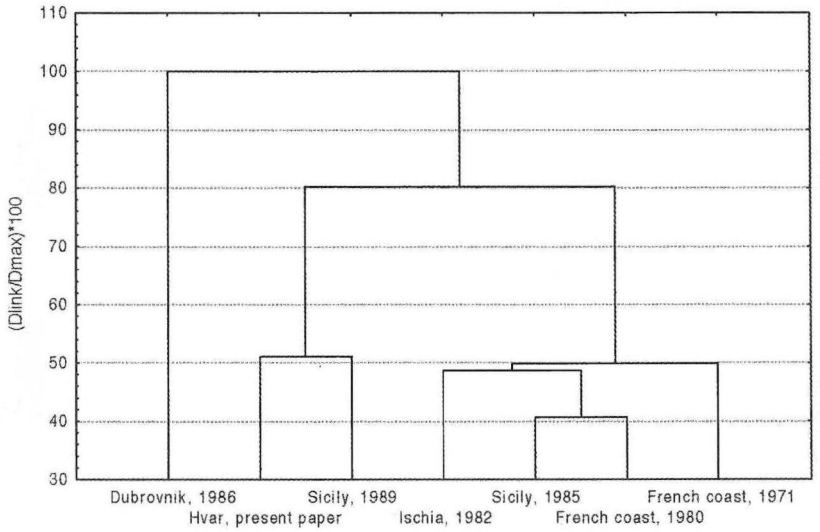

Fig. 7. Cluster Analisys of epiphytic floras on Posidonia oceanica leaves from different areas in the Adriatic and Mediterranean Sea based on data of abundance (N) *and qualitative dominance* (DN%) *of Rhodophyta, Phaeophyta nad Chlorophyta*

Vegetation

Mean epiphyte covering of sample (*RM%*)

The mean epiphytic covering doesn't exceed 13.3% of leaf surface (June, at 15 m depth). Only in March the value decrased with depth, than in other seasons the highest values were recorded at station of 15 m (June and November) and 25 m (September) depth (Fig. 8).

MAZZELLA *et al.* (1988) calculated that the cover as percentage of leaf surface decreased in May and November towards the deepest stations (from 1 to 30 m depth). At all depths the values were higher in November than in May.

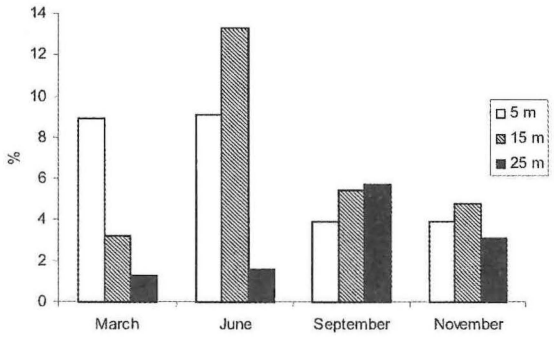

Fig. 8. Mean epiphytic covering of sample (RM%) *in different seasons and at different depths in the Hvar Island area*

CINELLI *et al.* (1984) showed that the epiphytic covering decreased with depth in both samplings of April and May.

Mean total epiphyte covering of sample (*Rt%*)

The mean total covering of sample (*Rt* %) decreased from the shallowest to the deepest station (21.56% at 5 m, 19.43% at 15 m, 11.03% at 25m). The maximum values were observed in June (27.97% and 35.39%) at 5 m and 15 m, and in September (16.26%) at 25m depth, and the minimum in December (18.82%) at 5 m, and in February (5.59% and 4.02%) at 15 m and 25 m depths (Fig. 9).

The value of *Rt* % regardless of seasons and depths for Hvar Island epiphytic vegetation is 17.36%. This value is higher then the *Rt* % values which were calculated in the same way for epiphytic vegetation on Sicily Island 8.28% (BUIA *et al.*, 1985), and much lower than on the French Mediterranean coast (52.66%; PANAYOTIDIS, 1980)(Table 4).

Qualitative dominance (*DN%*)

By values of qualitative dominance the taxa of ecological supergroups *Phsl* and *Ssl*, and group *D* were separated in all seasons and at all

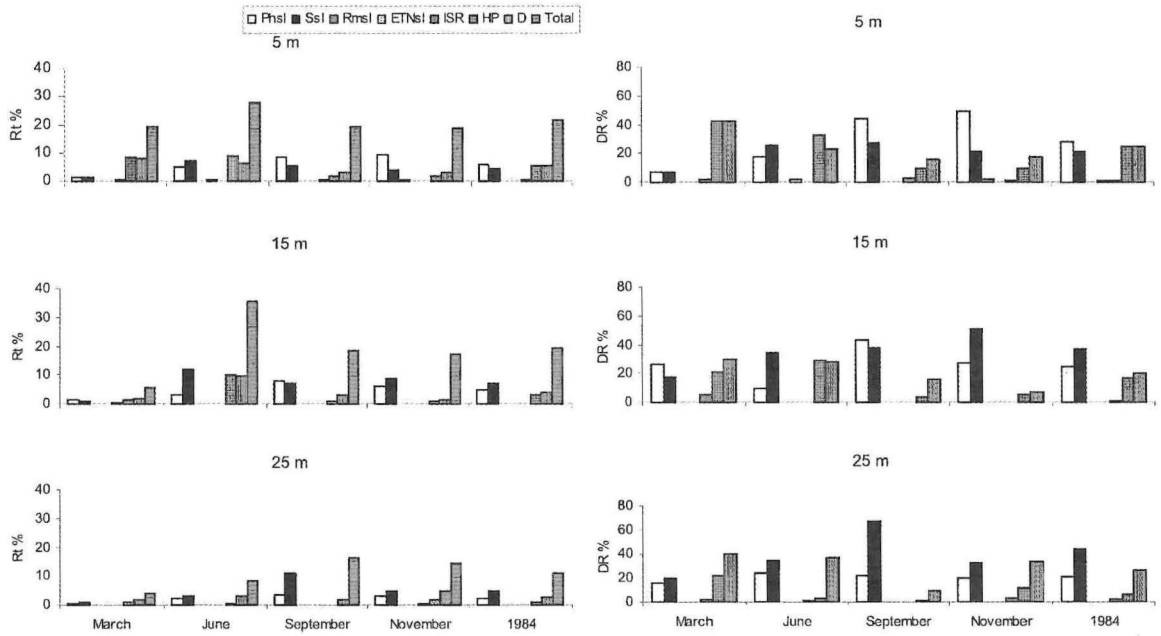

*Fig. 9. Mean total covering (*Rt%*) and quantitative dominance (*DR%*) of ecological supergroups (*Phsl, Ssl, RMsl, ETNs*l) and groups (*ISR, HP, D*) in epiphytic vegetation on* Posidonia oceanica *leaves in different seasons and at different depths in the Hvar Island area*

*Table 4. Comparison of numerical values (*N*), qualitative dominance (*DN%*), mean total covering (*Rt%*) and quantitative dominace (*DR%*) in ecological supergroups (*Phsl, Ssl, RMsl, ETNsl*) and groups (*ISR, HP, D*) of epiphytic vegetation on* Posidonia oceanica *leaves at the Adriatic and Mediterranean coast regardless of seasons and depths*

INVESTIGATION AREAS		*Phsl*	*Ssl*	*RMsl*	*ETNsl*	*ISR*	*HP*	*D*	Total
	N	20	24	1	4	6	9	14	94
French Mediterranean coast	*DN%*	21.3	42.5	1.1	4.3	6.4	9.6	14.9	100.0
BEN, 1971	*Rt%*	-	-	-	-	-	-	-	-
	DR%	-	-	-	-	-	-	-	-
	N	15	13	3	5	6	6	38	86
French Mediterranean coast	*DN%*	17.4	15.1	3.5	5.8	7.0	7.0	44.2	100.0
PANYOTIDIS, 1980	*Rt%*	1.17	0.42	0.02	0.94	0.20	46.76	3.15	52.66
	DR%	2.2	0.8	0.1	1.8	0.4	88.8	6.0	100.0
	N	13	32	5	3	9	8	11	81
Ischia Island, Tyrhenian Sea	*DN%*	16.1	39.5	6.2	3.7	11.1	9.9	13.6	100.0
BATTIATO *et al.*, 1982	*Rt%*	-	-	-	-	-	-	-	-
	DR%	-	-	-	-	-	-		-
	N	14	25	2	3	6	5	23	78
Sicily Island	*DN%*	17.9	32.1	2.6	3.8	7.7	6.4	29.5	100.0
BUIA *et al.*, 1985	*Rt%*	0.32	0.17	0.03	0.02	0.16	5.22	2.36	8.28
	DR%	3.9	2.1	0.4	0.2	1.9	63.0	28.5	100.0
	N	24	44	8	2	6	6	33	123
Dubrovnik, south Adriatic	*DN%*	19.5	35.8	6.5	1.6	4.9	4.9	26.8	100.0
ANTOLIĆ, 1986a	*Rt%*	-	-	-	-	-	-	-	-
	DR%	-	-	-	-	-	-	-	-
	N	21	30	2	3	8	3	34	101
Sicily Island	*DN%*	20.8	29.7	2.0	3.0	7.9	3.0	33.7	100.0
BUIA *et al.*, 1989	*Rt%*	-	-	-	-	-	-	-	-
	DR%	-	-	-	-	-	-	-	-
	N	20	38	2	1	5	5	32	103
Hvar Island, middle Adriatic	*DN%*	19.4	36.9	1.9	1.0	4.9	4.9	31.1	100.0
present paper	*Rt%*	4.41	5.55	0.03	0.05	0.20	3.08	4.04	17.36
	DR%	25.4	32.0	0.2	0.3	1.1	17.8	23.3	100.0

depths. The taxa of *D* ecological group dominated at 5 m and 15 m, and the taxa of *Ssl* ecological supergroup at 25 m depth. The values varied between 22.0 % (*Phsl*; June; 25 m depth) and 38.5% (*D*; June; 15 m depth). Generally, the values of *DN%* in *Phsl* ecological supergroup decreased, and in *Ssl* ecological supergroup increased by depth, whille in *D* ecological group doesn't exist the corelation with seasons and depth (Fig. 10).

The comparison of these results with the data regarding Adriatic Sea and Mediterranean showed that some results affirmated, while other didn't correspond with our results. The predomination of *Ssl* ecological supergroup were recorded on French Mediterranean coast 42.5% (BEN, 1971), on Ishia Island 39.5% (BATTIATO *et al.*, 1982), on Sicily Island 32.1% (BUIA *et al.*, 1985) and in Dubrovnik area 35.8% (ANTOLIĆ, 1986a). The domination of epiphytic algal taxa from *D* ecological group were expressed on French Mediterranean coast 44.2% (PANAYOTIDIS, 1980) and on Sicily Island 33.7% (BUIA *et al.*, 1989). In epiphytic vegetations in which dominated the algal taxa of *Ssl* ecological supergroup, were followed by the *Phsl* ecological supergroup and *D* ecological group, and in vegetations with predominition of the taxa of *D* ecological group, were followed by taxa of *Phsl* and *Ssl* ecological supergroups (Table 4).

Based on morphological features the *filamentous* algae totally dominated in all seasons and at all depths. High values of *DN%* varied from 68.1% (September) to 79.7% (March) at 5 m, from 63.4% (November) to 76.5% (March) at 15 m, and from 73.2% (March) to 78.8% (September) at 25 m depth (Fig. 11).

By *DN%* values, which were calculated for complete vegetation regardless the seasons and depths in the Hvar Island area, dominated the *filamentous* algae (80.6%). This result is comparable with the data in Adriatic and Mediterranean Sea. In the Adriatic Sea (Dubrovnik area; ANTOLIĆ, 1986a) this value of *filamentous* algae was 80.5%, and in the Mediterranean Sea it varied from 77.7% (French Mediterranean coast; BEN, 1971) to 85.2% (Ischia Island; BATTIATO *et al.*, 1982) (Table 5).

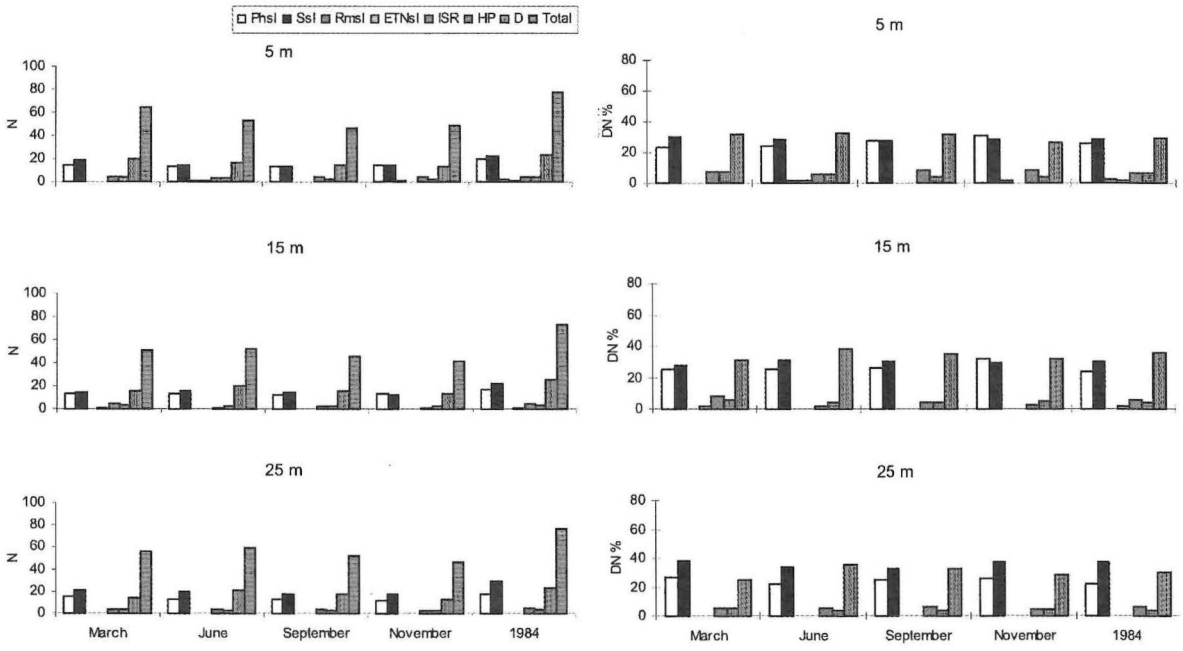

*Fig. 10. Abundance (*N*) and qualitative dominance (*DN%*) of ecological supergroups (*Phsl, Ssl, RMsl, ETNsl*) and groups (*ISR, HP, D*) in epiphytic vegetation on* Posidonia oceanica *leaves in different seasons and at different depths in the Hvar Island area*

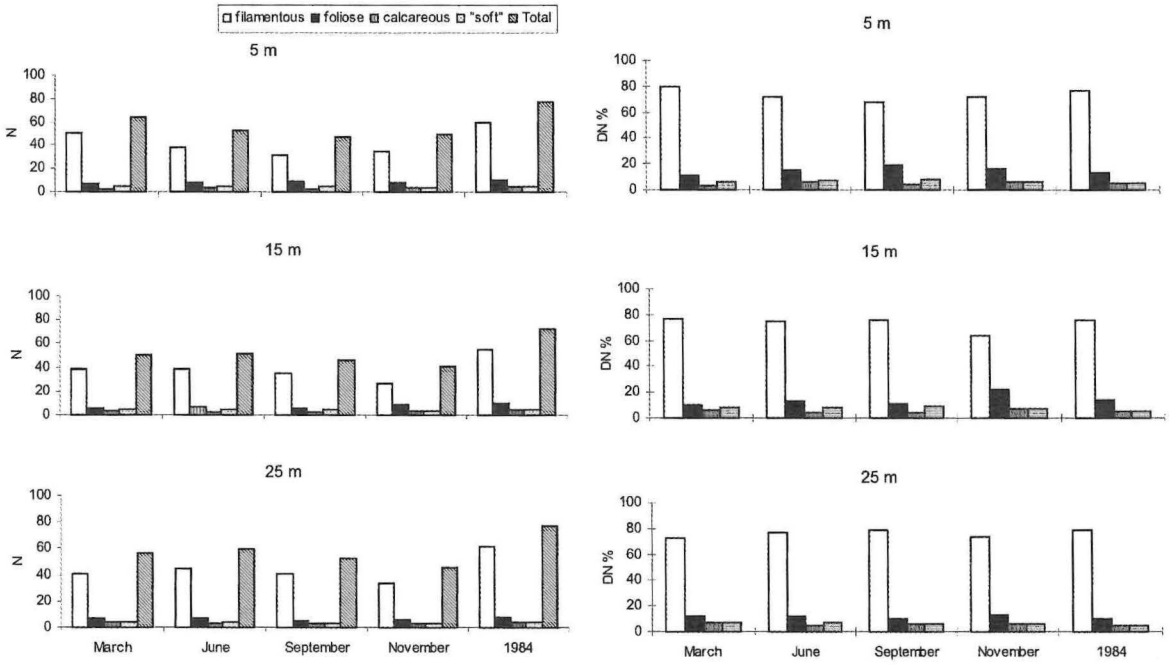

*Fig. 11. Abundance (*N*) and qualitative dominance (*DN%*) of morpho-functional groups (*filamentous, foliose, calcareous *encrusting and "*soft*" *encrusting alge) in epiphytic vegetation on* Posidonia oceanica *leaves in different seasons and at different depths in the Hvar Island area*

*Table 5. Comparison of numerical values (*N*), qualitative dominance (*DN%*), mean total covering (*Rt%*) and quantitative dominance (*DR%*) in morpho-functional groups ("*soft*" encrusting,* calcareous *encrusting,* foliose *and* filamentous *algae) of epiphytic vegetation on* Posidonia oceanica *leaves at the Adriatic and Mediterranean coast regardless of seasons and depths*

INVESTIGATION AREAS		*"soft"*	*calcareous*	*foliose*	*filamentous*	Total
	N	5	5	11	73	94
French Mediterranean coast	*DN%*	5.3	5.3	11.7	77.7	100.0
BEN, 1971	*Rt%*	-	-	-	-	-
	DR%	-	-	-	-	-
	N	2	3	10	71	86
French Mediterranean coast	*DN%*	2.3	3.5	11.6	82.6	100.0
PANYOTIDIS, 1980	*Rt%*	15.64	30.97	0.98	5.07	52.66
	DR%	29.7	58.8	1.9	9.6	100.0
	N	3	8	1	69	81
Ischia Island, Tyrhenian Sea	*DN%*	3.7	9.9	1.2	85.2	100.0
BATTIATO *et al.*, 1982	*Rt%*	-	-	-	-	-
	DR%	-	-	-	-	-
	N	2	6	5	65	78
Sicily Island	*DN%*	2.6	7.7	6.4	83.3	100.0
BUIA *et al.*, 1985	*Rt%*	150	5.93	0.09	0.76	8.28
	DR%	18.1	71.6	1.1	9.2	100.0
	N	7	5	12	99	123
Dubrovnik, south Adriatic	*DN%*	5.7	4.1	9.8	80.5	100.0
ANTOLIĆ, 1986a	*Rt%*	-	-	-	-	-
	DR%	-	-	-	-	-
	N	5	7	6	83	101
Sicily Island	*DN%*	5.0	6.9	5.9	82.2	100.0
BUIA *et al.*, 1989	*Rt%*	-	-	-	-	-
	DR%	-	-	-	-	-
	N	11	4	5	83	103
Hvar Island, middle Adriatic	*DN%*	10.7	3.9	4.9	80.6	100.0
present paper	*Rt%*	0.67	5.17	4.42	7.08	17.34
	DR%	3.9	29.8	25.5	40.8	100.0

Quantitative dominance (*DR%*)

With highest values of quantitative dominance (*DR%*) separated the taxa of *Phsl* and *Ssl* ecological supergroups, and *HP* and *D* ecological groups in all seasons and at all depths. The taxa of *Phsl* dominated at 5 m, and the taxa of *Ssl* at 15 m and 25 m depths. In general, the values of *DN%* in *Phsl* decreased while in *Ssl* increased with depth (Fig. 9).

The analysis data on seasonal distribution at different depths show that the values of *DN%* in *Phsl* decreased by depth in September and November; in *Ssl* increased by depth in March, June and September; in *HP* decreased by depth in June and September; in *D* increased, and in September decrerased with depth. In other seasons those values didn't show the corellation with depths. The values varied between 7.0 % (March, 5 m) and 49.0 % (November, 5 m) in *Phsl,* between 7.3 % (March, 5 m) and 67.2 % (September, 25 m) in *Ssl,* between 1.1 % (September, 25 m) and 41.9 % (March, 5 m) in *HP*, and between 7.2 % (November, 15 m) and 42.1 % (March, 5 m) in *D* (Fig. 9).

In complete epiphytic vegetation without regard to the seasons and depths in the Hvar Island area by *DR%* value dominated the taxa of *Ssl* ecological supergroup (32.0%), and *Phsl* ecological supergroup (25.4%), and D (23.3%), and *HP* (17.8%) ecological groups followed it. The comparison of these results with the data on Mediterranean coasts showed, that on French Mediterranean coast (PANAYOTIDIS, 1980) was noted a total predomination of the taxa of *HP* ecological group (88.8%) and in Sicily Island (BUIA *et al.*, 1985) the domination the taxa of *HP* ecological group (63.0%) with relatively high value of *DR%* in *D* ecological group (28.5%) (Table 4).

Based on morphological features of the algal vegetation, the *filamentous* algal taxa dominated at all depths (40.1% at 5 m, 34.6% at 15 m and 53.3% at 25 m). It was followed by *calcareous* and *foliose* algae at 5 m, and by *foliose* and *calcareous* algae at 15 m and 25 m depths. The maximum values were recorded for *folise* algae at 15 m depth (34.1%) and for *calcarous* algae at 5 m depth (38.0%)(Fig. 12).

Calcareous algae dominated in March and June at 5 m, and in June at 15 m. *Filamentous* algae dominated in March at 15 and 25 m, in June at 25 m, in September at 5 and 15 m, and in Novemeber at all depths. *Folisoe* algae dominated only in September at 25 m. The dominant values varied between 47.7% and 79.3% (Fig. 12).

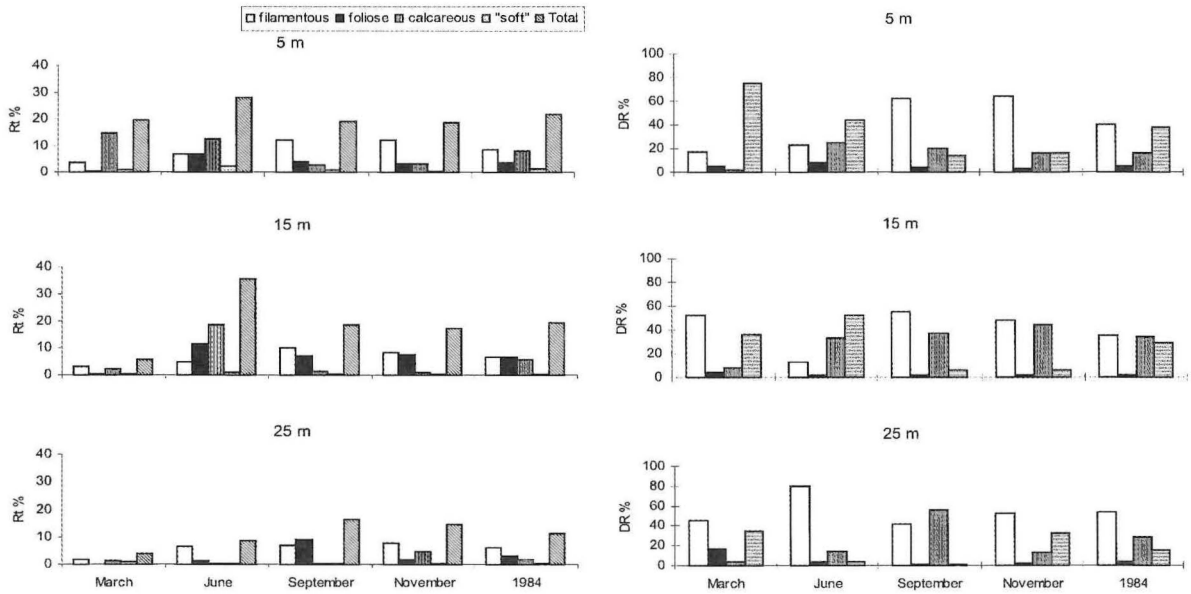

Fig. 12. Mean total covering (Rt%) *and quantitative dominance* (DR%) *of morpho-functional groups* (filamentous, foliose, calcareous *encrusting and* "soft" *encrusting alge) in epiphytic vegetation on* Posidonia oceanica *leaves in different seasons and at different depths in the Hvar Island area*

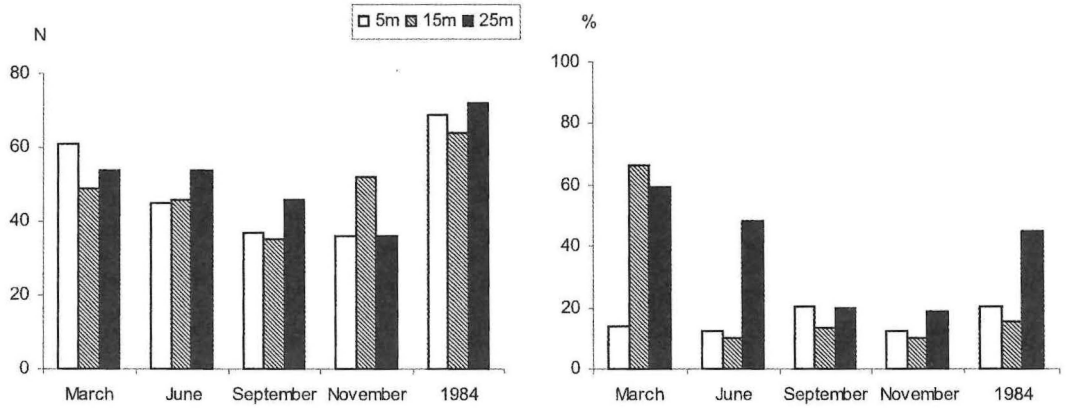

Fig. 13. Abundance (N) of epiphytic algal taxa with values of RMi < *0.50% and percentage (%) of* Rt% *which were applied to these algal taxa in different seasons and at different depths in the Hvar Island area*

In the complete epiphytic vegetation, without regard to the seasons and depths, in the Hvar Island area by *DR%* values predominated the *filamentous* algae (40.8%), followed by *calcareous* (29.8%) and *foliose* (25.5%) algal taxa. The comparison with data of epiphytic vegetation in Mediterranean Sea showed that in French Mediterranean coast (PANAYOTIDIS, 1980) and in Sicily Island area (BUIA *et al.*, 1985) by *DR%* values dominated the calcareous algal taxa (58.8% and 71.6%). "*Soft*" encrusting (29.7% and 18.1%) and *filamentous* (9.6% and 9.2%) taxa of epiphytic algae followed them (Table 5).

Mean total covering of the individual epiphytic algal taxa (*RMi %*)

In the structure of epiphytic algal vegetation exists much higher number of algal taxa with values of *RMi %* < 0.50% than number of algal taxa with values of *RMi %* ≥ 0.50%. However, the percentage of mean total epiphyte covering of sample (*Rt %*) which was applied to epiphytic algae with values of *RMi %* < 0.50% is smaller than the percentage of *Rt %* applied to epiphytic algal taxa with values of *RMi %* ≥ 0.50%. During seasons at different depths the number of algal taxa with values of *RMi %* < 0.50% varied from 35 to 61, and the percentage of *Rt %*, which was applied to these epiphytic algal taxa varied from 10.3% to 66.5% (Fig. 13). The number of algal taxa with values of *RMi %* ≥ 0.50% varied from 2 to 13, and the percentage of *Rt %*, which applied to this algae, varied from 33.5% to 89.7 % (Fig. 14).

On *Posidonia oceanica* leaves in the Hvar Island area it is possible to separate the algal

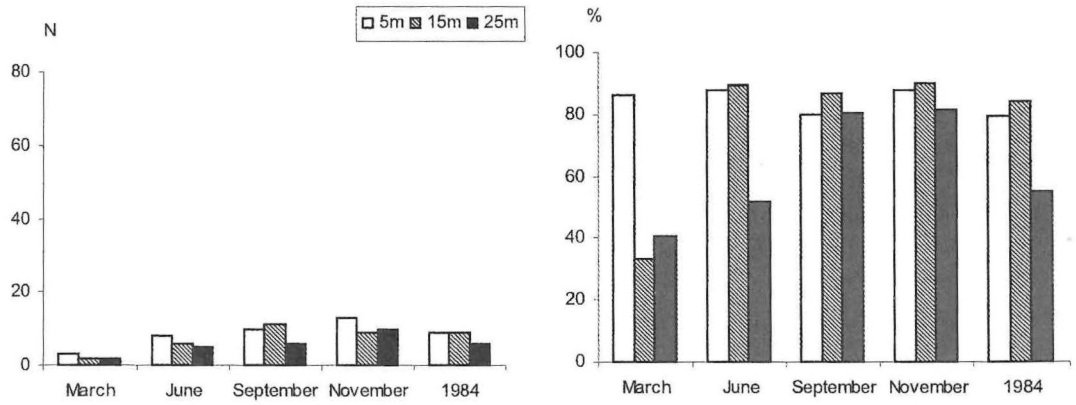

Fig. 14. Abundance (N) of epiphytic algal taxa with values of RMi% ≥ *0.50% and percentage (%) of* Rt% *which were applied to these algal taxa in different seasons and at different depths in the Hvar Island area*

taxa which with values of *RMi* % ≥ 0.50% are highly represented in qualitative structure and formation of epiphytic vegetation. They are:

- at 5 m depth *Spyridia filamentosa* (1.78%), *Herposiphonia secunda f. tenella* (1.34%), *Chondria tenuissima* (0.76%), *Laurencia obtusa* (0.64%) and *Ceramium nodosum* (0.64%) from *Phsl* ecological supergroup, *Dictyota linearis* (3.03) from *Ssl* ecological supergroup, *Pneophyllum fragile* (4.40 %) and *Myrionema orbiculare* (0.84%) from *HP* ecological group and *Fosliella farinosa* var. *farinosa* (3.71%) from *D* ecological group;

- at 15 m depth *Polysiphonia fruticulosum* (1.30%), *Spyridia filamentosa* (0.88%), *Chondria tenuissima* (0.64%), *Herposiphonia secunda f. tenella* (0.60%) and *Laurencia obtusa* (0.58%) from *Phsl* ecological supergroup, *Dictyota linearis* (6.33) from *Ssl* ecological supergroup, *Pneophyllum fragile* (3.06%) from *HP* ecological group, and *Fosliella farinosa* var. *farinosa* (2.44%) and *Polysiphonia* sp.3 (0.52%) from *D* ecological group;

- at 25 m depth *Dictyota linearis* (2.73%) and *Antithamnion cruciatum* var. *profundum* (0,75%) from *Ssl* ecological supergroup, *Pneophyllum fragile* (0.50%) from *HP* ecological group, *Fosliella farinosa* var. *farinosa* (1.07%) and *Polysiphonia* sp.3 (0.52) from *D* ecological group, and *Chondria tenuissima* (0.51) from *Phsl* ecological supergroup (Tables 6, 7, 8).

Comparison of these results with the data from the French Mediterranean coast (PANAYOTIDIS, 1980) showed that the values of *RMi* % in *Pneophyllum fragile* (28.36%) and *Myrionema orbiculare* (15.53%) from *HP* ecological group are much higher then in the same species in epiphytic vegetation in Hvar Island area. However, on the French Mediterranean coast exist other algal taxa in which were recorded the values of *RMi* % ≥ 0.50%. Those species are *Castagnea cylindrica* (1,39%) and *Gyraudia sphacelarioides* (1.17%) from *HP* ecological group, *Dermatolithon litorale* (1.57%) and *Fosliella farinosa* (1.04%) from *D* ecological group, and *Dictyota dichotoma* var. *intricata* (0.72%) from *Ssl* ecological supergroup.

In epiphytic vegetation in Ischia Island area (BUIA *et al.*, 1985) only in two algal taxa were recorded the values of *RMi* % ≥ 0.50%. Those are *Pneophyllum fragile* (3.62%) and *Myrionema orbiculare* (1.49%) from *HP* ecological group.

Degree of presence (*P*)

By abundance and percentage values dominated the algal taxa with the lowest degree of presence (0.5) at all depths (28 taxa or 35.9% at 5 m, 27 taxa or 37.0% at 15 m, and 31 taxa or 40.2% at 25 m). They are followed by algal taxa with the highest degree of presence (5)(14 taxa or 18.0% at 5 m, 15 taxa or 20.6% at 15 m, 12 taxa or 15.6% at 25 m depth). The seasonal distribution on different depths showed that in all seasons at 5 m and at 15 m (except September) dominated the algal taxa with 5 degree of presence. They are followed by algal taxa in which were determined 0.5 degree of presence. In February and June at 25 m depth dominated the algal taxa with 0.5, and in September and November the algal taxa with 5 degree of presence (Fig. 15).

In the structure of epiphytic vegetation it is possible to separate the algal taxa which with relatively high degree of presence (3, 4 or 5) the most frequently participated in their formation in all seasons and at all depths. They are: *Spyridia filamentosa*, *Chondria tenuissima*, *Ceramium nodosum*, *Laurencia obtusa*, *Sphacelaria cirrosa*, *Herposiphonia secunda f. tenella*, *Chylocladia verticillata*, *Polysiphonia fruticulosum* and *Sphacelaria fusca* from *Phsl* ecological supergroup, *Dictyota linearis*, *Ceramium codii*, *Spermothamnion johanis*, *Antithamnion cruciatum* var. *profundum* and *Dasya ocellata* from *Ssl* ecological supergroup, *Pneophyllum fragile* and *Myrionema orbiculare* from *HP* ecological group, and *Fosliella farinosa* var. *farinosa*, *Arachnophyllum confervaceum*, *Polysiphonia sp.3*, *Rizoclonium tortuosum*, *Ulvella lens* and *Fosliella farinosa* var. *callithamnioides* from *D* ecological group (Tables 6, 7, 8).

Table 6. Synthetic list of determined epiphytic algae on Posidonia oceanica *leaves at 5 m depth in the Hvar Island area. Algae are included in different ecological supergroups (*Phsl, Ssl, ETNsl*) and groups (*ISR, HP, D*), and morpho-functional (*MF*) groups (*fol-foliose *algae*, fil-filamentous *algae*, calc-calcareous *encrusting algae*, soft-"soft" *encrusting algae). Mean total covering (*RMi%*) and degree of presence (*P*) determine epiphytic algal*

	Study area	HVAR ISLAND									
	Depth of sampling	5 m									
	Date of sampling	18/03/1984		23/06/1984		9/09/1984		25/11/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*
	Ecol.supergroup *Phsl*										
fil	*Spyridia filamentosa* (WULF.) HARV.	0.10	5	2.26	5	2.50	5	2.26	5	1.78	5
fil	*Chondrya tenuissima* (WITH.) C.AG.	0.10	5	0.09	5	2.02	5	0.82	5	0.76	5
fil	*Ceramium nodosum* (KÜTZ.) HARV.	0.10	5	1.06	5	0.34	5	1.05	5	0.64	5
fil	*Laurencia obtusa* (HUDS.) LAMOUR.	0.10	5	0.34	5	0.82	5	1.30	5	0.64	5
fil	*Sphacelaria cirrosa* (ROTH) C.AG	0.10	5	0.09	5	0.06	3	0.09	5	0.09	5
fil	*Herposiphonia secunda* (C.AG) AMBR. f. *tenella* (C.AG.) WYNNE	-	-	0.32	4	2.50	5	2.54	5	1.34	4
fil	*Chylocladia verticillata* (LIGHT.) BLID.	0.10	5	0.05	3	0.06	3	0.06	3	0.07	4
fil	*Polysiphonia fruticulosum* (WULF.) SPRENG.	0.10	5	0.55	4	0.04	2	0.75	2	0.36	3
fil	*Sphacelaria fusca* (HUDS.) C.F.GRAY	0.06	3	0.08	4	0.06	3	0.01	05	0.05	3
fil	*Herposiphonia secunda* (C.AG.) AMBR. f. *secunda*	0.34	5	-	-	-	-	0.28	2	0.16	2
fil	*Griffithsia barbata* (SMITH) C.AG.	0.09	5	0.03	2	0.03	2	0.01	05	0.04	2
fil	*Wrangelia penicillata* (C.AG.) C.AG.	0.10	5	-	-	0.03	2	0.03	2	0.04	2
fil	*Crouania attenuata* (C.AG.) J.AG. f. *attenuata*	0.04	2	0.01	05	0.01	05	-	-	0.02	1
fil	*Spermothamnion repens* (DILW.) ROSENV. var. *repens*	-	-	-	-	-	-	0.01	05	0.01	05
fil	*Chondrya dasyphylla* (WOODW.) C.AG	0.02	1	-	-	-	-	-	-	0.01	05
fil	*Dipterosiphonia rigens* (SCHOS.) FALK.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Laurencia pinnatifida* (HUDS.) LAMOUR.	0.01	05	-	-	-	-	0.01	05	0.01	05
fil	*Feldmannia irregularis* (KÜTZ.) HAMEL var. *lebeliides* (ERCEG.) ŠPAN *et* ANTOL.	-	-	0.01	05	-	-	-	-	0.01	05
soft	*Myrionema strangulans* GREV.	-	-	0.01	05	0.01	05	-	-	0.01	05
fol	*Dictyota dichotoma* (HUDS.) LAMOUR.	-	-	-	-	-	-	0.01	05	0.01	05
	Ecol.supergroup *Ssl*										
fol	*Dictyota linearis* (C.AG.) GREV.	0.34	5	6.01	5	3.27	5	2.50	5	3.03	5
fil	*Ceramium codii* (RICH.) G.MAZ.	0.10	5	0.34	5	0.09	5	0.08	4	0.15	5
fil	*Spermothamnion johanis* FELDM.-MAZ.	0.10	5	0.10	5	0.09	5	0.08	4	0.15	5
fil	*Antithamnion cruciatum* (C.AG.) NäG. var. *profundum* FELDM.-MAZ.	0.10	5	0.33	5	0.32	4	0.52	2	0.32	4
fil	*Dasya ocellata* (GRAT.) HARV .	0.09	5	0.06	3	0.30	3	0.06	3	0.13	4
fil	*Polysiphonia scopulorum* HARV.	0.03	2	0.01	05	0.58	5	0.55	4	0.29	3
fil	*Halodictyon mirabile* ZAN.	0.31	4	0.02	1	0.52	2	0.05	3	0.20	3
soft	*Blastophysa polymorpha* KJELL.	0.02	1	0.04	2	0.08	4	0.06	3	0.05	3
fil	*Aglaothamnion byssoides* (ARN.) BOUD. *et* PERR.-BOUD.	0.06	3	0.03	2	0.02	1	0.03	2	0.04	2
fil	*Lejolisia mediterranea* BORNET	0.04	2	0.01	05	0.03	2	0.01	05	0.02	2
fil	*Griffithsia schousboei* MONT.	0.06	3	0.02	1	-	-	-	-	0.02	1
soft	*Blastophysa rhizopus* REINKE	-	-	0.01	05	0.04	2	0.02	1	0.02	1
fil	*Callithamnion corymbosum* (SMITH) LYNG.	0.04	2	0.01	05	-	-	-	-	0.01	1
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *lophophorum* FELDM.-MAZ.	0.04	2	-	-	0.01	05	-	-	0.01	1
fil	*Aglaothamnion caudatum* (J.AG.) FELDM.-MAZ.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Aglaothamnion tenuissimum* (HAUCK) SCHIFF.	0.02	1	0.01	05	-	-	-	-	0.01	05
fil	*Ceramium bertholdii* FUNK	0.02	1	-	-	-	-	-	-	0.01	05

Table 6. cont' d

	Study area	H V A R I S L A N D									
	Depth of sampling	5 m									
	Date of sampling	22/02/1984		10/06/1984		15/09/1984		05/12/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*
fil	*Champia parvula* (C.AG.) HARV.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Griffithsia phyllamphora* J.AG.	-	-	-	-	0.01	05	0.01	05	0.01	05
fil	*Lomentaria verticillata* FUNK	-	-	-	-	-	-	0.01	05	0.01	05
fil	*Monosporus pedicellatus* (SMITH) SOL. var. *pedicellatus*	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Spermothamnion flabellatum* BORNET	0.02	1	0.01	05	-	-	0.01	05	0.01	05
	Ecol. supergroup *RMsl*										
fil	*Ceramium tenerrimum* (MART.) OKAM.	-	-	-	-	-	-	0.27	2	0.07	05
fil	*Polysiphonia opaca* (C.AG.) MOR. et DE NOT.	-	-	0.01	05	-	-	-	-	0.01	05
	Ecol.supergroup *ETNsl*										
fol	*Nithophyllum punctatum* (STACK.) GREV.	-	-	0.53	3	-	-	-	-	0.13	1
	Ecol.group *ISR*										
fil	*Ceramium flaccidum* (HARV.) ARDISS.	0.09	5	0.02	1	0.54	3	0.04	2	0.17	3
fil	*Stylonema alsidii* (ZAN.) DREW	0.10	5	0.09	5	0.02	1	0.01	05	0.06	3
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *strictum* (KÜTZ.) FELDM.-MAZ.	0.10	5	-	-	0.01	05	0.05	3	0.04	2
fil	*Audouinella daviesii* (DILLW.) WOELK.	0.02	1	0.01	05	0.01	05	0.01	05	0.01	05
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *diaphanum*	0.01	05	-	-	-	-	-	-	0.01	05
	Ecol.group *HP*										
calc	*Pneophyllum fragile* KÜTZ.	7.26	5	7.26	5	1.54	5	1.54	5	4.40	5
soft	*Myrionema orbiculare* J.AG.	0.83	5	1.83	5	0.34	5	0.34	5	0.84	5
fil	*Cladosiphon mediterraneus* KÜTZ.	0.03	2	0.01	05	-	-	-	-	0.01	05
fil	*Myriactula stellulata* (HARV.) LEVR.	0.02	1	-	-	-	-	-	-	0.01	05
fil	*Giraudia sphacellarioides* DÉRB. *et* SOL.	0.01	05	-	-	-	-	-	-	0.01	05
	Ecol.group *D*										
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *farinosa*	7.26	5	5.00	5	1.06	5	1.53	5	3.71	5
fol	*Arachnophyllum confervaceum* (MEN.)ZAN.	0.10	5	0.34	5	0.57	5	0.58	5	0.40	5
fil	*Polysiphonia* sp. *3*	0,10	5	0.10	5	0.58	5	0.57	5	0.34	5
fil	*Rizoclonium tortuosum* (DILLW.) KÜTZ.	0.10	5	0.10	5	0.06	3	0.08	4	0.09	5
soft	*Phaeophylla dendroides* (CRO.*et* CRO.) BATT.	0.03	2	0.10	5	0.10	5	0.08	4	0.08	4
soft	*Ulvella lens* CRO. *et* CRO.	0.08	4	0.07	4	0.10	5	0.07	4	0.08	4
fil	*Cladophora* sp.	0.10	5	0.10	5	0.06	3	0.04	2	0.08	4
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *callithamnioides* (FOSLIE) CHEMB.	0.02	1	0.09	5	0.04	2	0.03	2	0.05	3
fil	*Feldmannia irregularis* (KÜTZ.) HAMEL										
fil	*Lomentaria chylocladiella* FUNK	0.01	05	0.06	3	0.30	3	0.27	2	0.16	2
soft	*Pringsheimiella scutata* (REIN.) MARCH.	0.02	1	0.07	4	0.05	3	0.02	1	0.04	2
calc	*Fosliella cruciata* BRESSAN	0.07	4	0.01	05	0.05	3	-	-	0.03	2
fil	*Cystoseira* sp.	0.01	05	0.10	5	0.01	05	-	-	0.03	2
soft	*Bolbocoleon piliferum* PRINGSH.	-	-	0.05	3	0.04	2	-	-	0.02	2
fil	*Seirospora interrupta* (SMITH) SCHM.	0.05	3	0.01	05	-	-	-	-	0.02	1
soft	*Erythrocladia subintegra* ROS.	0.02	1	-	-	0.02	1	0.02	1	0.02	1
fil	*Ulothrix subflaccida* WILE	0.07	4	-	-	-	-	-	-	0.02	1
fil	*Chroodactylon ornatum* (C.AG.) BASSON	0.02	1	-	-	-	-	-	-	0.01	05
fil	*Ceramium ordinatum* KÜTZ.	-	-	0.01	05	-	-	-	-	0.01	05
soft	*Entocladia viridis* REIN.	0.01	05	-	-	-	-	0.02	1	0.01	05
fil	*Cladophora glomerata* (L.) KÜTZ.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Bryopsis corymbosa* J.AG.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Derbesia* sp.	-	-	0.02	1	-	-	0.01	05	0.01	05

Table 7. Synthetic list of determined epiphytic algae on Posidonia oceanica *leaves at 15m depth in the Hvar Island area. Algae are included in different ecological supergroups (*Phsl, Ssl, ETNsl*) and groups (*ISR, HP, D*), and morpho-functional (*MF*) groups (*fol-foliose *algae*, fil-filamentous *algae*, calc-calcareous *encrusting algae*, soft-"soft" *encrusting algae). Mean total covering (*RMi%*) and degree of presence (*P*) determine epiphytic algal*

	Study area	HVAR ISLAND									
	Depth of sampling	15 m									
	Date of sampling	22/02/1984		10/06/1984		15/09/1984		05/12/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*Rmi* %	P	*RMi* %	*P*
	Ecol.supergroup *Phsl*										
fil	*Polysiphonia fruticulosum* (WULF.) PRENG.	0.10	5	1.06	5	1.77	05	2.25	5	1.30	5
fil	*Spyridia filamentosa* (WULF.) HARV.	0.34	5	0.82	5	1.30	5	1.06	5	0.88	5
fil	*Chondrya tenuissima* (WITH.) C.AG.	0.09	5	0.10	5	2.02	5	0.33	5	0.64	5
fil	*Laurencia obtusa* (HUDS.) LAMOUR.	0.34	5	0.10	5	1.06	5	0.82	5	0.58	5
fil	*Ceramium nodosum* (KüTZ.) HARV.	0.10	5	0.10	5	0.58	5	0.80	4	0.40	5
fil	*Chylocladia verticillata* (LIGHT.) BLID.	0.09	5	0.07	4	0.09	5	0.09	5	0.09	5
fil	*Sphacelaria fusca* (HUDS.) C.F.GRAY	0.06	3	0.34	5	0.05	3	0.06	3	0.13	4
fil	*Sphacelaria cirrosa* (ROTH) C.AG	0.10	5	0.08	4	0.06	3	0.08	4	0.08	4
fil	*Herposiphonia secunda* (C.AG) AMBR. f. *tenella* (C.AG.) WYNNE	-	-	0.56	4	1.03	4	0.79	4	0.60	3
fil	*Griffithsia barbata* (SMITH) C.AG.	0.04	2	0.02	1	0.04	2	0.03	2	0.03	2
fil	*Crouania attenuata* (C.AG.) J.AG. f. *attenuata*	0.06	3	-	-	0.01	05	0.01	05	0.02	1
fil	*Herposiphonia secunda* (C.AG.) AMBR. f. *secunda*	0.08	4	-	-	-	-	-	-	0.02	1
fil	*Wrangelia penicillata* (C.AG.) C.AG.	0.05	3	0.01	05	0.01	05	0.01	05	0.02	1
fil	*Laurencia pinnatifida* (HUDS.) LAMOUR.	0.02	1	-	-	-	-	-	-	0.01	05
fil	*Feldmannia irregularis* (KÜTZ.) HAMEL var. *lebeliides* (ERCEG.) ŠPAN *et* ANTOL.	-	-	0.01	05	-	-	-	-	0.01	05
soft	*Myrionema strangulans* GREV.	-	-	0.01	05	-	-	-	-	0.01	05
fol	*Dictyota dichotoma* (HUDS.) LAMOUR.	-	-	-	-	-	-	0.01	05	0.01	05
	Ecol.supergroup *Ssl*										
fol	*Dictyota linearis* (C.AG.) GREV.	0.33	5	11.25	5	6.25	5	7.50	5	6.33	5
fil	*Dasya ocellata* (GRAT.) HARV.	0.10	5	0.09	5	0.10	5	0.04	2	0.08	5
fil	*Ceramium codii* (RICH.) G.MAZ.	0.10	5	0.10	5	0.10	5	0.09	5	0.10	5
fil	*Antithamnion cruciatum* (C.AG.) NäG. var. *profundum* FELDM.-MAZ.	0.07	4	0.33	5	0.30	3	0.79	4	0.37	4
fil	*Spermothamnion johanis* FELDM.-MAZ.	0.09	5	0.08	4	0.07	4	0.08	4	0.08	4
fil	*Polysiphonia scopulorum* HARV.	0.03	2	0.03	2	0.06	3	0.07	4	0.05	3
fil	*Halodictyon mirabile* ZAN.	0.06	3	0.01	05	0.04	2	0.02	1	0.03	2
fil	*Lejolisia mediterranea* BORNET	0.06	3	0.04	2	0.01	05	-	-	0.03	2
soft	*Blastophysa polymorpha* KJELL.	-	-	0.03	2	0.04	2	0.04	2	0.03	2
fil	*Aglaothamnion byssoides* (ARN.) BOUD. *et* PERR.-BOUD.	0.04	2	0.01	05	-	-	0.02	1	0.02	1
fil	*Callithamnion corymbosum* (SMITH) LYNG.	0.04	2	0.01	05	0.01	05	-	-	0.02	1
fil	*Aglaothamnion tenuissimum* (HAUCK) SCHIFF.	0.02	1	0.02	1	0.01	05	-	-	0.01	1
fil	*Antithamnion heterocladum* FUNK	-	-	-	-	-	-	0.01	05	0.01	05
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *lophophorum* FELDM.-MAZ.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Griffithsia phyllamphora* J.AG.	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Griffithsia schousboei* MONT.	0.03	2	-	-	0.01	05	-	-	0.01	05
fil	*Lophosiphonia cristata* FALKEN.	-	-	0.01	05	-	-	-	-	0.01	05
soft	*Hymenoclonium serpens* (CRO. et CRO.) BATT.- stadium	-	-	-	-	-	-	0.01	05	0.01	05
fil	*Monosporus pedicellatus* (SMITH) SOL. var. *pedicellatus*	-	-	0.01	05	-	-	-	-	0.01	05

Table 7. cont'd

	Study area	H V A R I S L A N D									
	Depth of sampling	15 m									
	Date of sampling	22/02/1984		10/06/1984		15/09/1984		05/12/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*	*RMi* %	*P*
fil	*Spermothamnion flabellatum* BORNET	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Cladophora echinus* (BIASS.) KÜTZ.	-	-	0.01	05	0.02	1	-	-	0.01	05
soft	*Blastophysa rhrhizopus* REINKE	-	-	-	-	0.01	05	0.01	05	0.01	05
	Ecol.supergroup *ETNsl*										
fol	*Nithophyllum punctatum* (STACK.) GREV.	0.01	05	-	-	-	-	-	-	0.01	05
	Ecol.group ISR										
fil	*Stylonema alsidii* (ZAN.) DREW	0.09	5	0.09	5	0.02	1	-	-	0.05	3
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *strictum* (KÜTZ.) FELDM.-MAZ.	0.10	5	-	-	-	-	-	-	0.03	2
fil	*Ceramium flaccidum* (HARV.) ARDISS.	0.08	4	-	-	0.01	05	0.01	05	0.03	2
fil	*Audouinella daviesii* (DILLW.) WOELK.	0.03	2	-	-	-	-	-	-	0.01	05
	Ecol.group *HP*										
calc	*Pneophyllum fragile* KÜTZ.	1.06	5	9.76	5	0.58	5	0.82	5	3.06	5
soft	*Myrionema orbiculare* J.AG.	0.10	5	0.38	5	0.10	5	0.09	5	0.17	5
fil	*Giraudia sphacellarioides* DÉRB. *et* SOL.	0.01	05	-	-	-	-	-	-	0.01	05
	Ecol.group *D*										
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *farinosa*	0.81	5	8.27	5	0.58	5	0.10	5	2.44	5
fil	*Polysiphonia* sp. *3*	0.10	5	0.10	5	1.30	5	0.57	5	0.52	5
fil	*Rizoclonium tortuosum* (DILLW.) KÜTZ.	0.10	5	0.10	5	0.10	5	0.10	5	0.10	5
fol	*Arachnophyllum confervaceum*(MEN.)ZAN.	0.10	5	0.34	5	0.58	5	0.10	5	0.28	5
soft	*Ulvella lens* CRO. *et* CRO.	0.07	4	0.09	5	0.08	4	0.06	3	0.08	4
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *callithamnioides* (FOSLIE) CHEMB.	0.04	2	0.33	5	0.04	2	0.07	4	0.12	3
soft	*Phaeophylla dendroides* (CRO.*et*CRO.)BATT.	0.02	1	0.08	4	0.07	4	0.05	3	0.06	3
fil	*Cladophora* sp.	0.08	4	0.08	4	0.04	2	0.02	1	0.06	3
fil	*Feldmannia irregularis* (KÜTZ.) HAMEL var. *irregularis*	0.10	5	0.09	5	0.01	05	-	-	0.05	3
calc	*Fosliella cruciata* BRESSAN	0.09	5	0.04	2	0.04	2	-	-	0.04	3
soft	*Erythrocladia subintegra* ROS.	0.02	1	0.03	2	-	-	0.08	4	0.03	2
fil	*Seirospora interrupta* (SMITH) SCHM.	0.06	3	0.03	2	0.02	1	-	-	0.03	2
fil	*Lomentaria chylocladiella* FUNK	-	-	0.06	3	0.01	05	0.02	1	0.02	2
fil	*Cystoseira* sp.	-	-	0.06	3	0.01	05	-	-	0.02	1
soft	*Bolbocoleon piliferum* PRINGSH.	-	-	0.06	3	-	-	0.01	05	0.02	1
soft	*Pringsheimiella scutata* (REIN.) MARCH.	0.01	05	-	-	-	-	0.04	2	0.01	1
fil	*Audouinella virgatula* (HARV.) DIXON	-	-	0.02	1	-	-	-	-	0.01	05
fil	*Ceramium circinatum* (KÜTZ.) J.AG.	-	-	-	-	0.01	05	-	-	0.01	05
fil	*Ceramium ordinatum* KÜTZ.	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Monosporus pedicellatus* (SMITH) SOL. var. *tenuis* (FELDM.-MAZ.) HUIS. *et* KRAFT	0.01	05	-	-	-	-	0.01	05	0.01	05
fil	*Polysiphonia* sp. *1*	-	-	0.03	2	-	-	-	-	0.01	05
fil	*Lophosiphonia obscura* (C.AG.) FALK.	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Ectocarpus siliculosus* (DILLW.) LYNGB. var. *adriaticus* (ERCEG.) CORM. *et* FURN.	0.01	05	-	-	0.01	05	-	-	0.01	05
fil	*Hincksia dalmatica* (ERCEG.) CORM. *et* FURN.	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Elachista* sp.	-	-	-	-	0.01	05	-	-	0.01	05
fil	*Ulothrix subflaccida* WILE	0.03	2	-	-	-	-	-	-	0.01	05

Table 8. Synthetic list of determined epiphytic algae on Posidonia oceanica *leaves at 25m depth in the Hvar Island area. Algae are included in different ecological supergroups (*Phsl, Ssl, ETNsl*) and groups (*ISR, HP, D*), and morpho-functional (*MF*) groups (*fol-foliose *algae,* fil-filamentous *algae,* calc-calcareous *encrusting algae,* soft-"soft" *encrusting algae). Mean total covering (*RMi%*) and degree of presence (*P*) determine each algal*

	Study area	HVAR ISLAND									
	Depth of sampling	25 m									
	Date of sampling	22/02/1984		10/06/1984		15/09/1984		05/12/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		RMi %	P	RMi %	P	RM i%	P	RMi %	P	RMi%	P
	Ecol.supergroup Phsl										
fil	*Chondrya tenuissima* (WITH.) C.AG.	0.06	3	0.82	5	0.58	5	0.58	5	0.51	5
fil	*Laurencia obtusa* (HUDS.) LAMOUR.	0.09	5	0.10	5	0.34	5	1.06	5	0.40	5
fil	*Spyridia filamentosa* (WULF.) HARV.	0.04	2	0.34	5	0.82	5	0.10	5	0.33	5
fil	*Sphacelaria cirrosa* (ROTH) C.AG	0.10	5	0.09	5	0.08	4	0.08	4	0.09	5
fil	*Sphacelaria fusca* (HUDS.) C.F.GRAY	0.06	3	0.10	5	0.09	5	0.07	4	0.08	4
fil	*Polysiphonia fruticulosum* (WULF.) SPRENG.	0.02	1	0.33	5	1.04	4	-	-	0.35	3
fil	*Herposiphonia secunda* (C.AG) AMBR. f. *tenella* (C.AG.) WYNNE	-	-	0.05	3	0.07	4	0.54	3	0.17	3
fil	*Ceramium nodosum* (KÜTZ.) HARV.	0.01	05	0.08	4	0.10	5	0.04	2	0.06	3
fil	*Crouania attenuata* (C.AG.) J.AG. f. *attenuata*	0.08	4	0.01	05	0.02	1	0.08	4	0.05	3
fil	*Chylocladia verticillata* (LIGHT.) BLID.	0.03	2	0.01	05	0.06	3	0.08	4	0.05	3
fil	*Wrangelia penicillata* (C.AG.) C.AG.	0.08	4	0.03	2	0.04	2	0.03	2	0.05	3
fil	*Griffithsia barbata* (SMITH) C.AG.	-	-	0.04	2	0.30	3	-	-	0.09	2
fol	*Dictyota dichotoma* (HUDS.) LAMOUR.	0.01	05	-	-	0.01	05	0.26	1	0.07	05
fil	*Chondrya dasyphylla* (WOODW.) C.AG	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Herposiphonia secunda* (C.AG.) AMBR. f. *secunda*	0.02	1	-	-	-	-	-	-	0.01	05
fil	*Laurencia pinnatifida* (HUDS.) LAMOUR.	0.01	05	-	-	-	-	0.01	05	0.01	05
soft	*Myrionema strangulans* GREV.	0.01	05	0.01	05	-	-	-	-	0.01	05
	Ecol.supergroup Ssl										
fil	*Antithamnion cruciatum* (C.AG.) NäG. var. *profundum* FELDM.-MAZ.	0.08	4	1.06	5	1.28	4	0.57	5	0.75	5
fil	*Spermothamnion johanis* FELDM.-MAZ.	0.07	4	0.58	5	0.10	5	0.58	5	0.33	5
fil	*Ceramium codii* (RICH.) G.MAZ.	0.09	5	0.10	5	0.10	5	0.10	5	0.10	5
fol	*Dictyota linearis* (C.AG.) GREV.	0.04	2	0.58	5	8.75	5	1.53	5	2.73	4
fil	*Dasya ocellata* (GRAT.) HARV.	0.04	2	0.07	4	0.33	5	0.32	4	0.19	4
fil	*Halodictyon mirabile* ZAN.	0.03	2	0.05	3	0.07	4	0.03	2	0.05	3
fil	*Lejolisia mediterranea* BORNET	0.07	4	0.04	2	0.04	2	0.03	2	0.05	3
fil	*Aglaothamnion byssoides* (ARN.) BOUD. *et* PERR.-BOUD.	0.09	5	0.01	05	0.03	2	0.04	2	0.04	3
fil	*Polysiphonia scopulorum* HARV.	-	-	0.03	2	0.05	3	1.04	4	0.28	2
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *lophophorum* FELDM.-MAZ.	0.01	05	0.04	2	-	-	0.04	2	0.02	2
fil	*Griffithsia schousboei* MONT.	0.02	1	0.01	05	0.05	3	0.02	1	0.03	2
fil	*Aglaothamnion tenuissimum* (HAUCK) SCHIFF.	0.07	4	0.03	2	0.03	2	-	-	0.03	2
soft	*Blastophysa polymorpha* KJELL.	0.02	1	0.01	05	0.02	1	0.07	4	0.03	2
fil	*Dasya baillouviana* (S.G.GMEL.) MONT.	0.04	2	0.01	05	-	-	-	-	0.01	1
fil	*Antithamnion tenuissimum* (HAUCK) SCHIFF.	0.03	2	-	-	-	-	0.01	05	0.01	05
fil	*Antithamnionella elegans* (BERTH.) BOUD. *et* PERR.	0.01	05	-	-	-	-	-	-	0.01	05
fol	*Apoglossum ruscifolium* (TURN.) J.AG.	0.01	05	0.01	05	-	-	-	-	0.01	05
fil	*Botryocladia microphysa* (HAMEL) KYL.	-	-	-	-	-	-	0.01	05	0.01	05
fil	*Callithamnion corymbosum* (SMITH) LYNG.	0.02	1	0.01	05	0.02	1	0.01	05	0.02	05
fil	*Ceramium bertholdii* FUNK	0.03	2	-	-	-	-	0.01	05	0.01	05
fil	*Crouania attenuata* (C.AG.) J.AG. f. *maior* ERCEG.	0.02	1	-	-	-	-	-	-	0.01	05

Table 8. cont'd

	Study area	H V A R I S L A N D									
	Depth of sampling	25 m									
	Date of sampling	22/02/1984		10/06/1984		15/09/1984		05/12/1984		1984	
	Number of bundles	10		10		10		10		40	
MF		RMi %	P	RMi %	P	RM i%	P	RMi %	P	RMi%	P
fil	*Dasya hutchinsiae* HARV.	-	-	0.01	05	0.02	1	-	-	0.01	05
fil	*Eupogodon spinellus* (C.AG.) KÜTZ.	-	-	-	-	0.01	05	-	-	0.01	05
fil	*Gulsonia nodulosa* (ERCEG.) J.FELDM *et* G.FELDM.	0.01	05	0.01	05	-	-	-	-	0.01	05
fil	*Lophosiphonia cristata* FALKEN.	-	-	0.28	2	-	-	-	-	0.07	05
fil	*Seirospora apiculata* (MEN.) FELDM.-MAZ.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Seirospora sphaerospora* J.FELDM.	-	-	-	-	0.01	05	-	-	0.01	05
fil	*Spermothamnion flabellatum* BORNET	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Elachista intermedia* CRO. *et* CRO.	-	-	-	-	0.01	05	0.25	05	0.07	05
	Ecol.group ISR										
fil	*Ceramium flaccidum* (HARV.) ARDISS.	0.05	3	0.01	05	0.02	1	0.33	5	0.10	3
fil	*Stylonema alsidii* (ZAN.) DREW	0.04	2	0.08	4	0.02	1	-	-	0.04	2
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *strictum* (KÜTZ.) FELDM.-MAZ.	-	-	-	-	0.01	05	0.06	3	0.02	1
fil	*Audouinella daviesii* (DILLW.) WOELK.	0.01	05	-	-	-	-	-	-	0.01	05
fil	*Ceramium diaphanum* (LIGHT.) ROTH var. *diaphanum*	-	-	0.01	05	-	-	-	-	0.01	05
	Ecol.group HP										
calc	*Pneophyllum fragile* KÜTZ.	0.29	3	0.10	5	0.09	5	1.53	5	0.50	5
soft	*Myrionema orbiculare* J.AG.	0.57	5	0.13	5	0.09	5	0.10	5	0.23	4
fil	*Myriactula stellulata* (HARV.) LEVR.	0.01	05	-	-	-	-	-	-	0.01	05
	Ecol.group D										
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *farinosa*	1.06	5	0.10	5	0.10	5	3.03	5	1.07	5
fil	*Polysiphonia sp. 3*	0.10	5	0.10	5	0.58	5	1.30	5	0.52	5
fil	*Rizoclonium tortuosum* (DILLW.) KÜTZ.	0.10	5	1.54	5	0.10	5	0.08	4	0.46	5
fol	*Arachnophyllum confervaceum*(MEN.)ZAN.	0.09	5	0.58	5	0.33	5	0.10	5	0.28	5
soft	*Ulvella lens* CRO. *et* CRO.	0.04	2	0.07	4	0.09	5	0.10	5	0.08	4
calc	*Fosliella farinosa* (LAMOUR.) HOWE var. *callithamnioides* (FOSLIE) CHEMB.	0.01	05	0.07	4	0.5	3	0.09	5	0.06	3
fil	*Seirospora interrupta* (SMITH) SCHM.	0.06	3	0.04	2	0.05	3	0.05	3	0.05	3
fil	*Cladophora sp.*	0.01	05	0.33	5	0.04	2	0.02	1	0.10	2
fil	*Feldmannia irregularis* (KÜTZ.) HAMEL var. *irregularis*	0.03	2	0.08	4	0.02	1	-	-	0.03	2
calc	*Fosliella cruciata* BRESSAN	0.05	3	0.02	1	-	-	-	-	0.02	1
fil	*Lomentaria chylocladiella* FUNK	-	-	0.01	05	0.05	3	0.03	2	0.02	1
fil	*Cystoseira sp.*	-	-	0.05	3	0.03	2	-	-	0.02	1
soft	*Phaeophylla dendroides* (CRO.*et* CRO.)BATT.	0.01	05	0.02	1	0.04	2	0.01	05	0.02	1
fil	*Bryopsis hypnoides* LAMUR.	0.02	1	0.01	05	0.03	2	-	-	0.02	1
soft	*Pringsheimiella scutata* (REIN.) MARCH.	0.02	1	0.03	2	-	-	0.01	05	0.02	1
fil	*Audouinella virgatula* (HARV.) DIXON	-	-	0.01	05	0.02	1	-	-	0.01	05
fil	*Ceramium ordinatum* KÜTZ.	-	-	0.01	05	0.01	05	-	-	0.01	05
fil	*Chroodactylon ornatum* (C.AG.) BASSON	-	-	0.01	05	-	-	-	-	0.01	05
soft	*Erythrocladia subintegra* ROS.	0.01	05	0.01	05	-	-	0.01	05	0.01	05
fil	*Monosporus pedicellatus* (SMITH) SOL. var. *tenuis* (FELDM.-MAZ.) HUIS. *et* KRAFT	-	-	0.01	05	-	-	-	-	0.01	05
fil	*Lophosiphonia obscura* (C.AG.) FALK.	-	-	0.01	05	-	-	0.02	1	0.01	05
fil	*Ectocarpus siliculosus* (DILLW.) LYNGB. var. *adriaticus* (ERCEG.) CORM. *et* FURN.	-	-	-	-	0.01	05	-	-	0.01	05
soft	*Entocladia viridis* REIN.	-	-	-	-	0.01	05	-	-	0.01	05

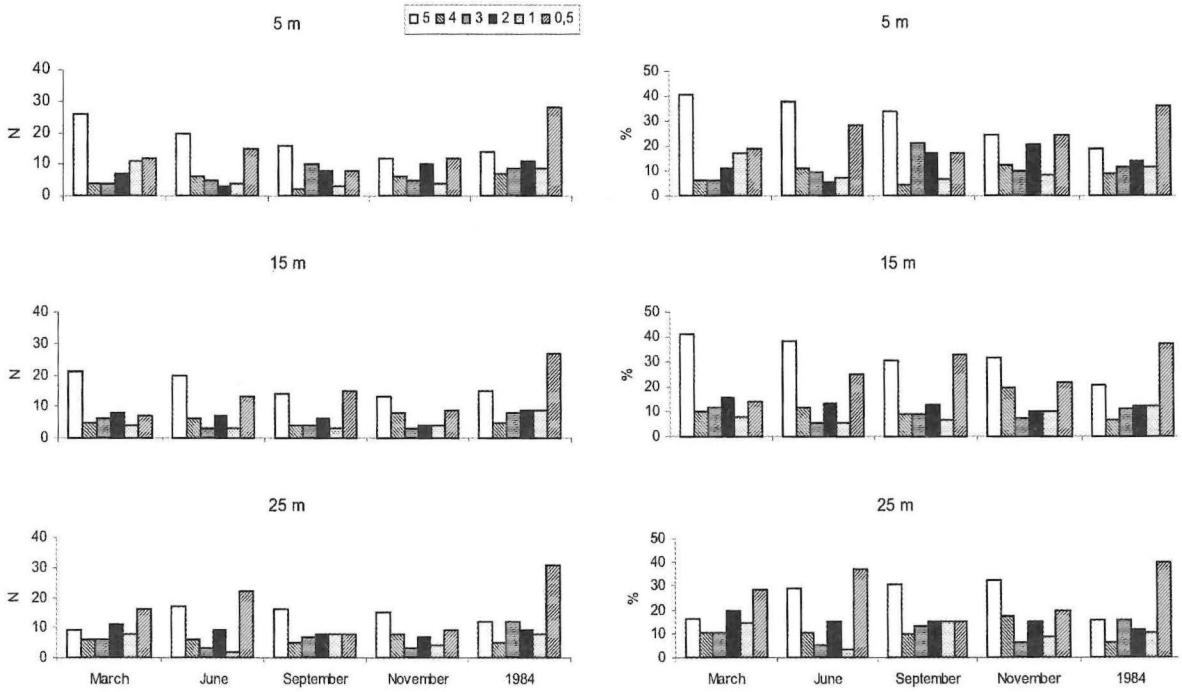

Fig. 15. Numerical (N) and percentage (%) values the degrees of presence P *(5, 4, 3, 2, 1, 05) in epiphytic vegetation in different seasons and at different depths in the Hvar Island area*

The Cluster Analysis of epiphytic vegetations based on data abundance (*N*), qualitative (*DN%*) and quantitative dominance (*DR%*), and mean total covering (*Rt%*) of ecological supergroups (*Phsl*, *Ssl*, *RMsl*, *ETNsl*) and groups (*ISR*, *HP*, *D*) and morfo-functional groups (*filamentous*, *foliose*, *calcareous*, "*soft*") of epiphytic algal taxa in different areas of the Adriatic and Mediterranean Sea show that the highest significance exists between Sicily (BUIA *et al.*,1985) and the French coast (PANAYOTIDIS, 1980) with about 90% significancy. Somewhath lower significancy (about 87%) exists between data in the present paper and the group of Sicily (BUIA *et al.*, 1989), Dubrovnik area (ANTOLIĆ, 1986), Ischia (BATTIATO *et al.*, 1982) and French coast (BEN, 1971) in which the significancy doesn't exceed 40% (Fig. 16).

CONCLUSIONS

A total of 103 epiphytic algal taxa were recorded in epiphytic flora on *Posidonia oceanica* leaves in the Hvar Island area. The percentage of Rhodophyta is in correlation with results of investigations in the Adriatic and Mediterranean Sea. Howewer, the value of Phaeophyta percentage is the least, and Chlorophyta is the highest in relation to epiphytic floras in the Adriatic and Mediterranean Sea.

The *R/P* quotient for investigated epiphytic flora is 4.8 and it is the highest among the values in another compared areas of the Adriatic and Mediterranean Sea. The highest value of SØRENSEN's similarity coefficient was found between epiphytic flora of Hvar Island (present paper) and Dubrovnik area. The Cluster Analysis shows that the most similar to the investigated flora (present paper) is epiphytic flora in Sicily (more than 50%).

In the epiphytic vegetation the mean total covering of sample (*Rt%*) decreased by depth. By qualitative dominance (*DN%*) dominated the *filamentous* algal taxa of *Phsl* and *Ssl* ecological supergroups and *D* ecological group. By quantitative dominance (*DR%*) the most represented were the *calcareous*, *filamnetous* and *foliose* algal taxa of *Phsl* and *Ssl* ecological supergroups, and *HP* and *D* ecological groups.

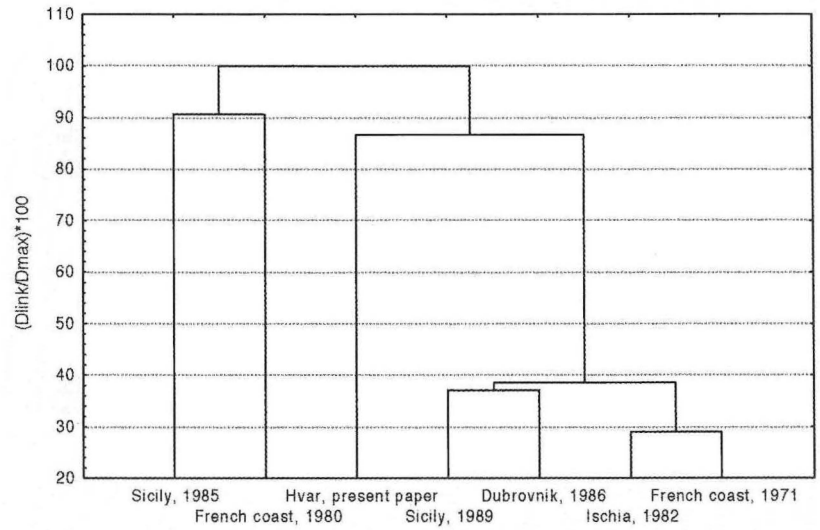

Fig. 16. Cluster Analisys of epiphytic vegetations on Posidonia oceanica *leaves from different areas in the Adriatic and Mediterranean Sea based on data of abundance (*N*), qualitative dominance (*DN%*), mean epiphytic covering (*Rt%*) and quantitative dominance (*DR%*) of ecological supergroups (*Phsl, Ssl, RMsl, ETNs*) and groups (*ISR, HP, D*), and morpho-funcional groups (*filamentous, foliose, calcareous, "soft"*)*

The Cluster Analysis shows that a high significance (about 87%) of epiphytic vegetations exist between the investigated vegetation (present paper) and group of areas which formed Sicily, Dubrovnik area, Ischia and the French coast.

It is possible to separate the algal taxa which quantitavely (high values of *RMi %* -exceeding 0.50%) and qualitatively (high values of *P* - 3, 4 or 5) has the most significantly participated in structure of epiphytic vegetation. They are *Chondria tenuissima* from *Phsl* ecological supergroup, *Dictyota linearis* from *Ssl* ecological supergroup, *Pneophyllum fragile* from *HP* ecological group and *Fosliella farinosa* var. *farinosa* from *D* ecological group, at all depths. However, at different depths with high values of *RMi %* and *P*, the next algal taxa were included:

- at 5 m depth *Spyridia filamentosa*, *Herposiphonia secunda f. tenella*, *Laurencia obtusa* and *Ceramium nodosum* from *Phsl* ecological supergroup, and *Myrionema orbiculare* from *HP* ecological group;

- at 15 m depth *Polysiphonia fruticulosum*, *Spyridia filamentosa*, *Herposiphonia secunda f. tenella* and *Laurencia obtusa* from *Phsl* ecological supergroup, and *Polysiphonia* sp.3 from *D* ecological group;

- at 25 m depth *Antithamnion cruciatum* var. *profundum* from *Ssl* ecological supergroup, and *Polysiphonia* sp.3 from *D* ecological group.

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Epifitska flora i vegetacija na lišću morske cvjetnice *Posidonia oceanica* (L.) DELILE na području otoka Hvara (srednji Jadran, Hrvatska)

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SAŽETAK

U ovom se radu iznose rezultati istraživanja sezonske i dubinske rasprostranjenosti epifitske flore i vegetacije na lišću morske cvjetnice *Posidonia oceanica* (L.) DELILE. Istraživanja su obavljena tijekom svih sezona 1984. godine u jednoj livadi posidonije, uz zapadnu obalu otoka Hvara, na dubinama od 5, 15 i 25 m. Tijekom floristićkih istraživnja ukupno su određene 103 svojte epifitskih algi (Rhodophyta 72 svojti, Phaeophyta 16 svojti i Chlorophyta 15 svojti). Najveći je broj svojti određen tijekom zime (75) i na dubni od 5 m (78), a najmanji tijekom jeseni (63) i na dubini 15 m (73). Za sličnost između epifitske flore otoka Hvara i epifitskih flora nekih područja u Jadranu i Sredozemlju upotrijebljen je SØRENSEN-ov koeficijent sličnosti, *R/P* koeficijenta i klaster analiza. U epifitskoj vegetaciji srednja ukupna pokrovnost uzoraka (*Rt %*) opada povećanjem dubine. Kvalitiativnom dominancijom (*DN%*) ističu se nitaste svojte algi iz ekoloških skupina *Phsl* i *Ssl*, te ekološke skupine *D*, dok se kvantitativnom dominancijom (*DR%*) ističu inkrustirane, nitaste i listolike svojte algi iz ekoloških nadskupina *Phsl* i *Ssl*, te ekoloških skupina *HP* i *D*. Klaster analiza je pokazala da postoji visok postotak sličnosti (oko 87%) između epifitske vegetacije otoka Hvara i vegetacija skupine nekoliko područja u Jadranu i Sredozemlju (Sicilija, Dubrovnik, Ischia i obala Francuske). U građi vegetacije ističu se alge koje svojim razmjerno visokim vrijednostima *RMi %* (*RMi %* ≥ 0.50%) i stupnjevima nazočnosti P (3, 4 ili 5) najznačajnije sudjeluju u njenom oblikovanju na svim dubinama. To su svojte *Chondria tenuissima*, *Dictyota linearis*, *Pneophyllum fragile* i *Fosliella farinosa* var. *farinosa*. Osim gore spomenutih svojti, na pojedinm dubinama u oblikovanju epifitske vegetacije sudjeluju i sljedeće svojte algi: *Spyridia filamentosa*, *Herposiphonia secunda f. tenella*, *Laurencia obtusa*, *Ceramium nodosum* i *Myrionema orbiculare* na dubini od 5 m; *Polysiphonia fruticulosum*, *Spyridia filamentosa*, *Herposiphonia secunda f. tenella*, *Laurencia obtusa* i *Polysiphonia* sp.3 na dubini od 15 m; *Antithamnion cruciatum* var. *profundum* i *Polysiphonia* sp.3 na dubini od 25 m.

Ključne riječi: *Posidonia oceanica*, lišće, epifitska flora i vegetacija, otok Hvar, Jadransko more