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Comparative studies of littoral biocoenoses of the Kornati Islands

Ivana GRUBELIĆ

Institute of Oceanography and Fisheries, Split, Croatia

Results of long-term studies of the structure and distribution of plant and animal organisms of littoral biocoenoses of the Kornati Islands, developed on ecologically different localiteties, are presented.

The studies included macrobenthic faunal forms and accompanying flora on the bionomic steps of supralittoral, mediolittoral, infralittoral and a part of circalittoral down to 100 m depth.

The distribution of benthic organisms in the waters of Kornati Islands is primarily dependent on the type and slope of habitats, their exposure to waves, currents and light. So the more exposed coasts of outer islands are inhabited by a greater variety of biocoenoses than more protected or sheltered ones. Steep, rocky shores, well sea washed, are inhabited by a larger number of plant and animal species than vertical and exposed localities or sloping and sheltered ones.

INTRODUCTION

The Kornati Islands Environment

The Kornati Islands is a unique area of a group of islands in the Adriatic Sea, both by its ecological and morphological properties and its aesthetics. This is the most dense group of islands in the Adriatic Sea, the area of 230 sq km of which includes 147 islands, islets and above-sea reefs. The archipelago stretches over a 53 km length, and the greatest width is 14 km (BASIOLI, 1978).

Limestone structure of these islands is exposed to intensive abrasive action of waves and atmosphere which created a picturesque karst relief, such as submarine and above-sea cliffs, caves, hollows, fissures, reefs and sandbanks.

Southwestern, high sea side of most of the islands is characterized by steep shores and cliffs, whereas inner, southwestern side of the islands slopes considerably less steeply.

Owing to their natural properties, both on land and under the sea, the Kornati Islands are a National Park, to subject them to as good protection as possible. Bing proclaimed a National Park this area has changed its purposes, so that from a fishery ground it has become an area intended for touristic-recreational pursuits and scientific research.

History of benthic investigations

The earliest beginning of benthic investigations in the area of Kornati can be traced back to the time of Hungarian expedition in the Adriatic by the vessel NAJADE in 1913 and 1914. Out of the material collected by dredge BABIĆ described sponges(BABIĆ 1923) and KOLOSVARY echinoderms (1936-1937).

Subsequent studies of flora and fauna of this Adriatic part were undertaken in 1925 as a part of a complex research of the biota, geomorphology and geology of the island Dugi otok and Kornati Islands. Scientific results refer to algae of the island Dugi otok (VOUK,1930). However, Kornati Islands were only sporadically studied so that the need for further investigations were already suggested.

The first biocoenological research of Kornati Islands were begun by GAMULIN-BRIDA and her coworkers (1975, 1983), who at the same time pointed to the need of their protection.

Vertical distribution of benthic Foraminifera from the cliffs of Kornati Islands as affected by temperature, substrate and transparency, was studied by DROBNE and CIMERMAN (1977) and DROBNE *et al.,* (1983).

BELAMARIĆ (1982) revealed the beauties of the archipelago by submarine photography.

N. ZAVODNIK and D. ZAVODNIK (1984) reported the results of the introductory research of benthic biocoenoces of the National Park "Kornati" giving the basic biocoenological properties of the area.

ANTOLIĆ (1985) studied the qualitative-quantitative distribution of epiphytic flora on the leaves of the species *Posidonia oceanica,* sampled in the Stiniva cove on the Kornat Island. A report on depth and horizontal distribution of benthic vegetation of Kornati Islands were decribed by ŠPAN and ANTOLIĆ (1989). In their latest paper the same authors presented the check-list of benthic algae and marine phanerogams of the National park "Kornati" (ŠPAN and ANTOLIĆ, in press).

The goal of the present study

For the purpose of getting as much information as possible on the natural resources of this area ecological observations began some ten years ago. A part of obtained results was worked out and shown in this paper aiming at comparing littoral biocoenoses developed on ecologically different localities.

Samplings were carried out in 1979, 1980 and 1981. Of 15 studied localities eight are described in this paper (Fig.1).

Surveys were carried out on the island Purara, one of the southeasternmost islands of Kornati Islands. This island is not protected and is directly exposed to waves, currents and winds.

Samplings were performed on the south, unsheltered side of the island (P_1, Fig.2), and

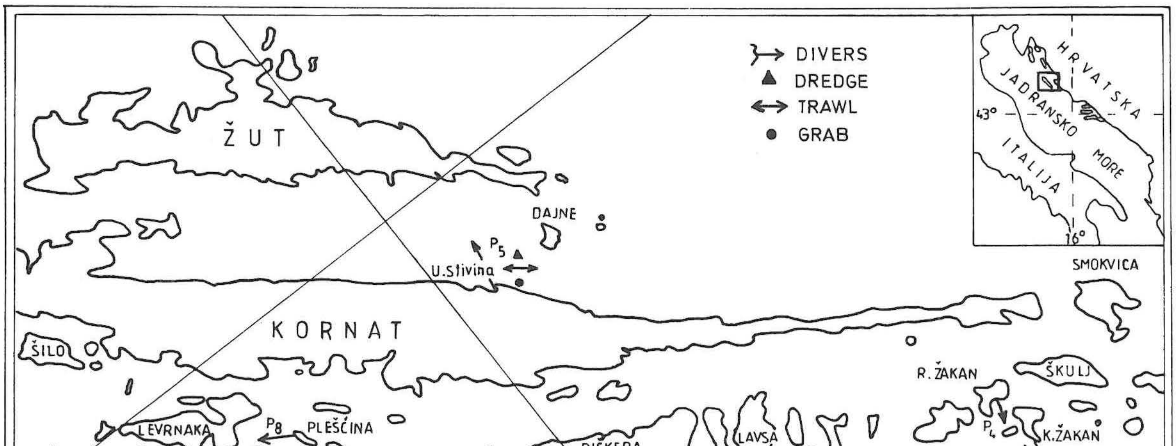

Fig.1. Study area

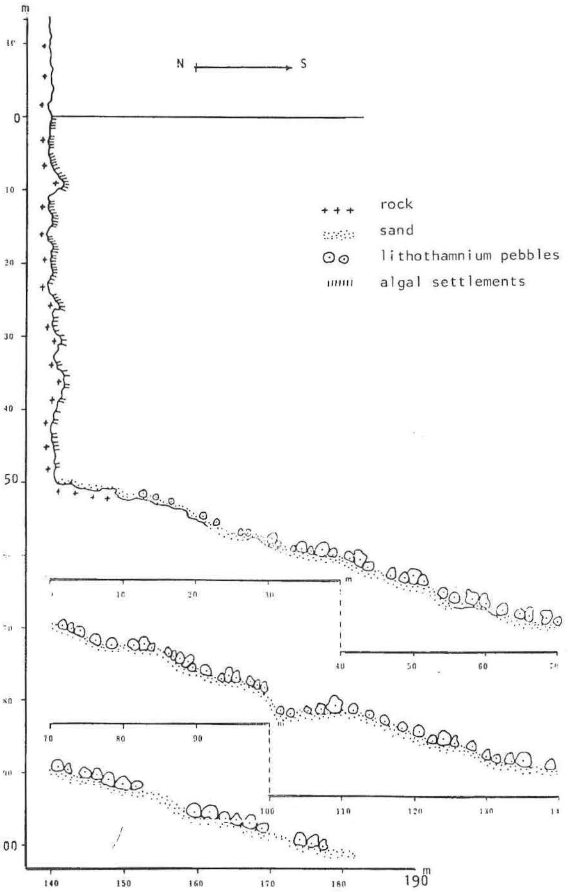

Fig.2. Purara Island, southern side (P_1)

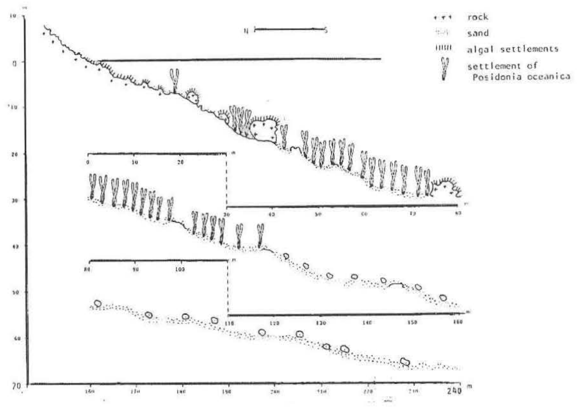

Fig.4. Kameni Žakan Island, southern side (P_3)

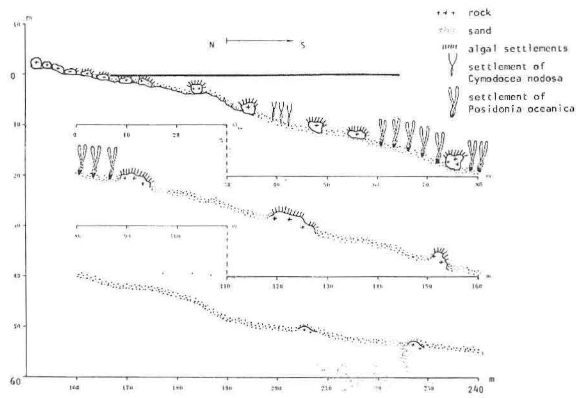

Fig.5. Ravni Žakan Island, southern side (P_4)

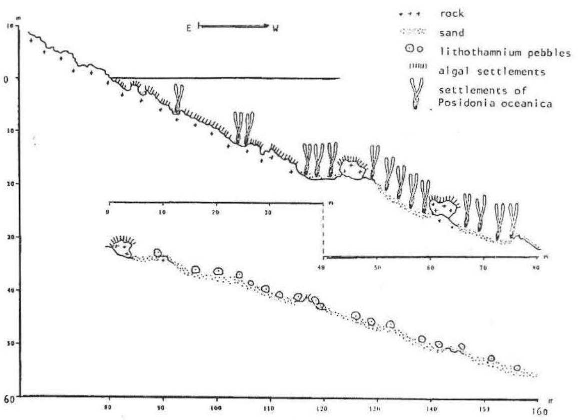

Fig.3. Purara Island, western side (P_2)

on the partly sheltered western side (P_2, Fig.3). Proceeding from the open sea onshore, the islands Kameni Žakan (P_3, Fig.4) and Ravni Žakan (P_4, Fig.5) come in succession. Their southern sides were sampled as well as the north-eastern part of the Kornat Island (P_5, Fig.6). For better comparison there were also taken the data from the Mana Island where submarine cliffs on the southern side of the island (P_6, Fig.7) and a small cove in the close vicinty (P_7, Fig.8) were investigated as well as the western, sheltered side of the island Pleščina (P_8, Fig.9).

METHODS

The research was carried out by the R/V BIOS of the Institute of Oceanography and Fisheries, Split.

The study included macrobenthic forms of fauna and flora on the bionomic steps supralittoral, mediolittoral, infralittoral and a part of circalittoral down to 100 m depth.

Two basic methods were used.

The method of direct observations and collections by SCUBA divers was used for sampling littoral (supralittoral, mediolittoral, infralittoral and a part of circalittoral) down to 50 m. A square of 1/16 m^2 was sampled consecu-

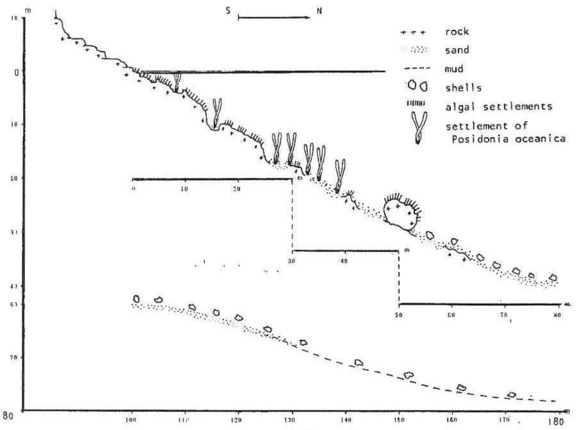

Fig.6. Kornat Island, northeastern side (P5)

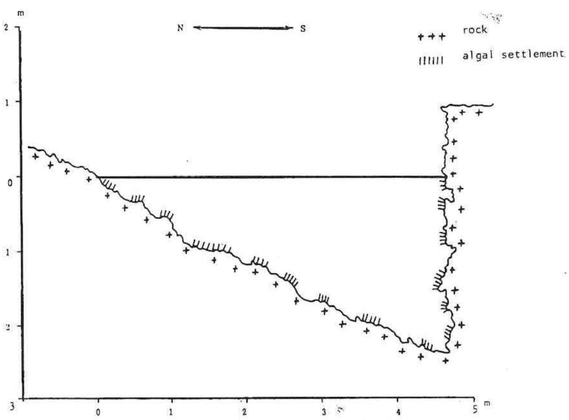

Fig.8. Mana Island, southern side (P7)

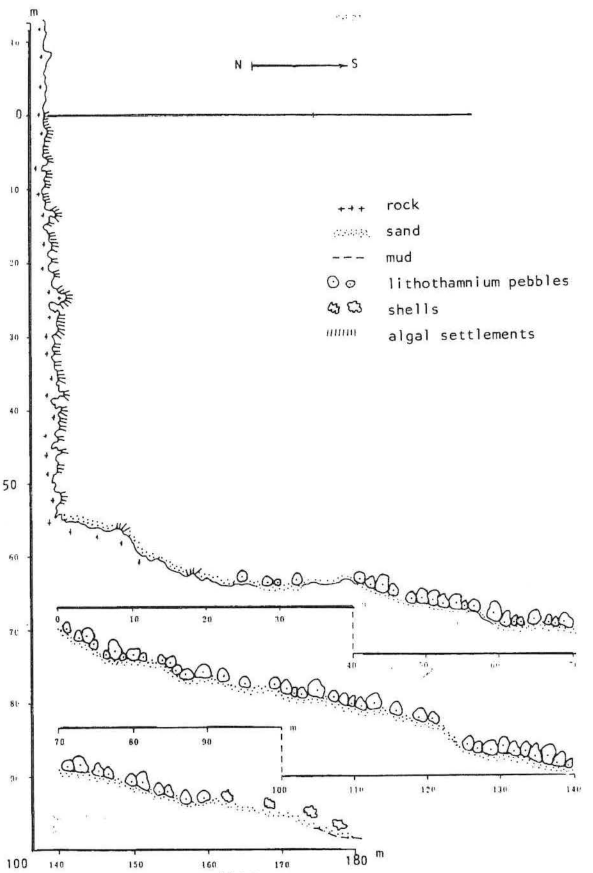

Fig.7. Mana Island, southern side (P6)

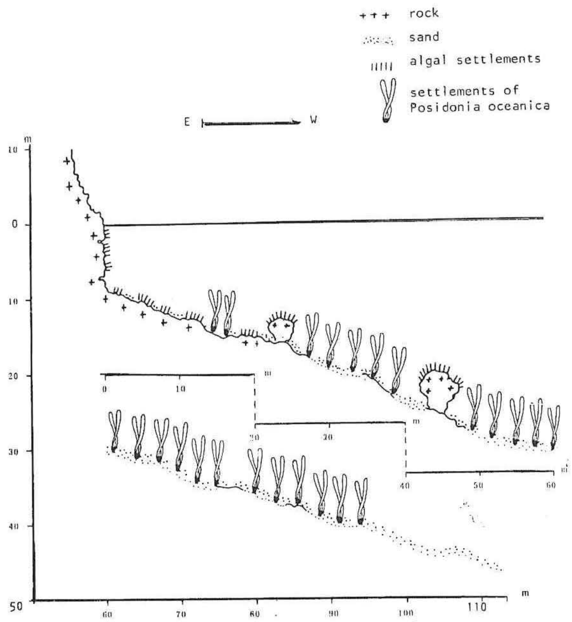

Fig.9. Plešćina Island, western side (P8)

tively down to 5 m. At greater depths, between 5 and 50 m, where settlements are more homogeneous, material sampling intervals were 5 m.

Depths below 50 m were studied by the indirect method of grab, dredge or bottom trawl samplings. Petersen grab of 0.2 m^2 was used for collecting material from soft mobile bottoms. Obtained sample of about 30 l sediment was sieved through a number of different mesh size sieves; the smallest mesh size was 2 mm. Coarser mobile bottoms were sampled by dredge and trawl twice at each station per cruise. Dredge hauls along the bottom lasted for 5 minutes at 2 Nm per h vessel speed. Trawl was towed for an hour at 2.5 Nm per h vessel speed. Trawl samples contributed to the data on the distribution of benthic organisms in the marine evironment of the Kornati Archipelago.

Material was determined after the following authors: PORIFERA - SCHMIDT, 1862, 1864; LENDENFELD, 1894; BABIĆ, 1923; VOSMAER, 1933, 1935a, b; SARA, 1971-1972; CNI-

DARIA - PAX and MÜLER, 1962; ROSSI, 1971; ARTHROPODA - PESTA, 1918; ANNELIDA - FAUVEL, 1923, 1927; MOLLUSCA - NORDSIECK, 1968, 1969; PARENZAN, 1970, 1974, 1976; TENTACULATA - OCCHIPINTI AMBROGI, 1981; ECHINODERMATA - TORTONESE, 1965; TUNICATA - TURSI, 1980. The papers of RIEDL, 1963, 1966, 1983; POŽAR - DOMAC, 1978 and ŠTEVČIĆ, 1990 were used when solving some systematic and taxonomic problems.

PERES and PICARD (1964) were used for vertical distribution of benthos and PERES and GAMULIN-BRIDA (1973) for determination of benthic biocoenoses.

An approximate abundance (number of individuals) of benthic species per unit area was marked in the following way:

- • species not found
- r single specimens of a species recorded
- x up to 10 specimens
- c from 11 to 100 specimens
- cc more than 100 specimens

Rasults of research were tabulated and given graphically. Tables show qualitative and quantitative structure of determined plant (Table A 1) and animal (Table A 2) species and numbers and percentages of plant and animal groups, recorded from the study area, are shown graphically in Figs. 10, 11, 12, 13 and 14.

Similarity of species at different study localities was expressed by the similarity quotient (QS) modified by SORENSEN method (GAMULIN-BRIDA, 1960).

Similarity quotient was calculated for only the animal component which showed no significant seasonal oscillations

RESULTS AND DISCUSSION

Flora and fauna characteristic of the study area

Plant and animal material of Kornati Islands benthic biocoenoses were collected from both hard (rocky shores) and mobile bottoms of eight different localities.

A total of 345 macrobenthic forms were determined, 127 (36.8%) of which were plant taxa and 218 (63.2%) animal taxa.

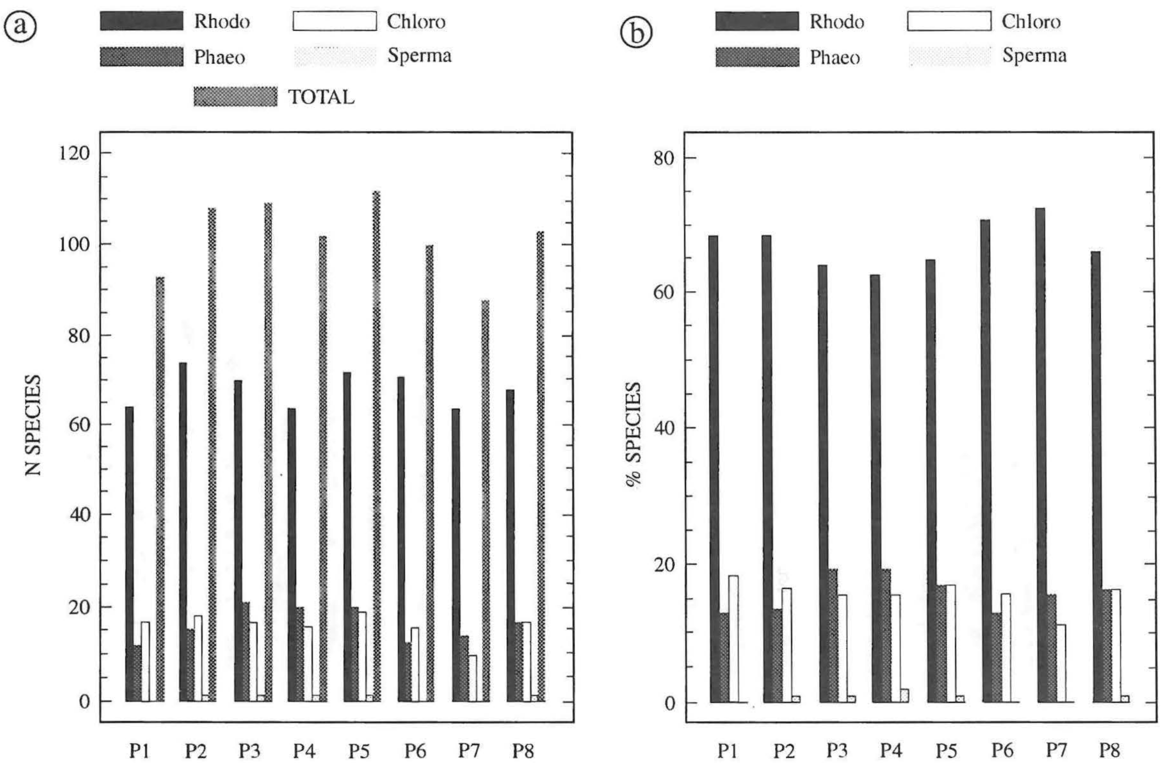

Fig.10. Number of species (a) and percentage presence (b) of systematic categories of benthic flora at sampling stations (P1-P8).

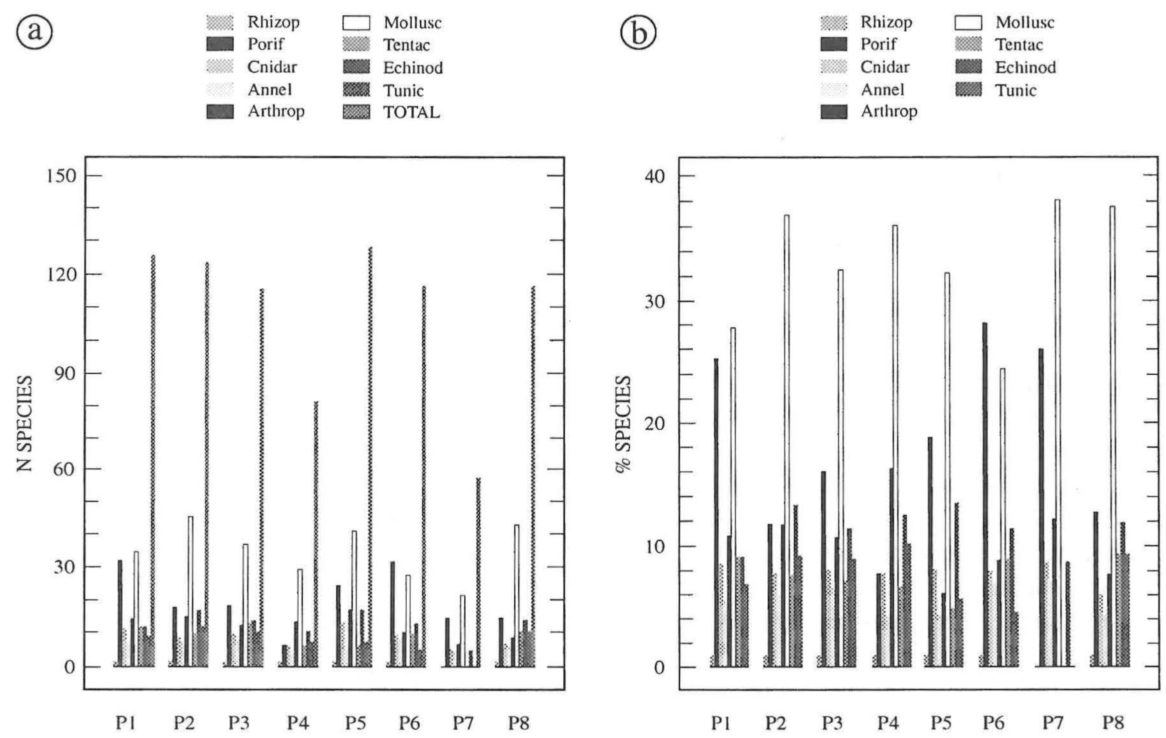

Fig.11. Number of species (a) and percentae presence (b) of systematic categories of benthic fauna at sampling stations (P_1-P_8).

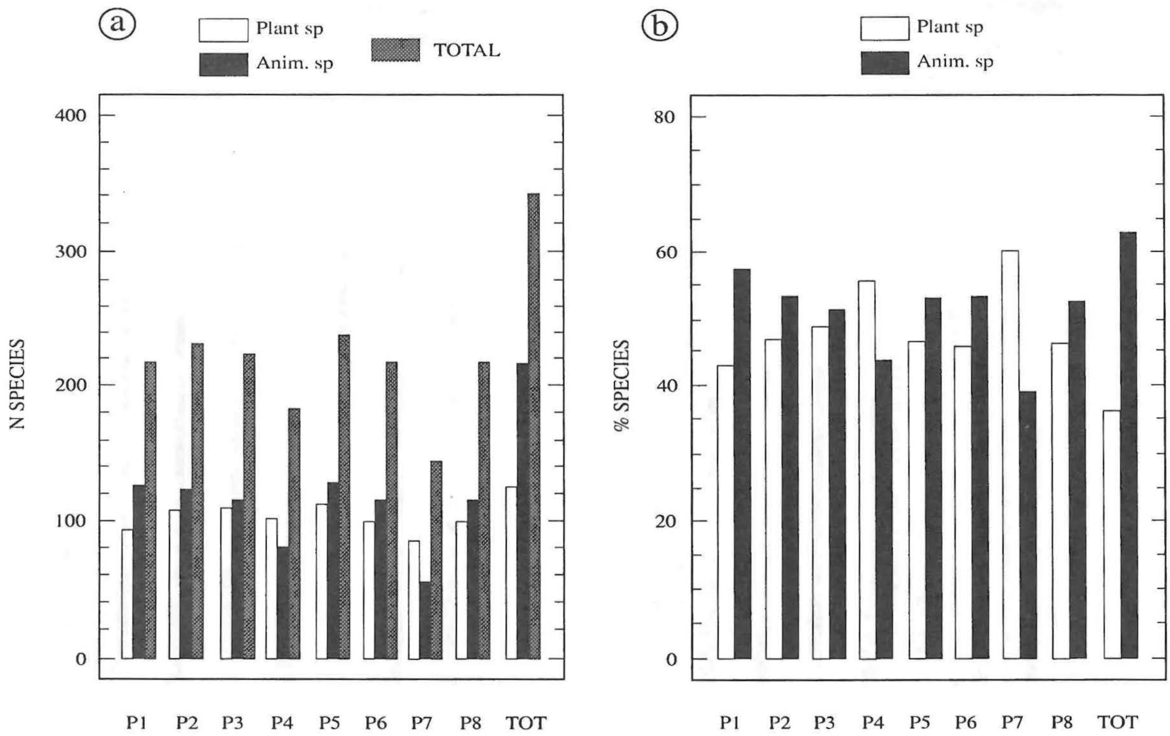

Fig. 12 Number (a) and percentage presence (b) of macrobenthic organisms at sampling stations (P_1-P_8) and throughout (TOT) the study area

The tables A1 and A2 present the list of taxa with the values of relative abundance of individual systematic groups of flora and fauna.

RHODOPHYTA dominated the study area with 82 species (65.1%), whereas PHAEOPHYTA were represented by 24 specise (18. 2%) and CHLOROPHYTA with 19 species (15.1%) Two species (1.6%) of SPERMATOPHYTA were also found (Fig. 10).

Of animal taxa MOLLUSCA were most abundant with 58 species (26.6%), followed by PORIFERA with 46 species (21.1%), ARTHROPODA - CRUSTACEA with 26 (12.0%), CNIDARIA and ECHINODERMATA with 23 (10.5%), TUNICATA with 16 (7.3%), TENTACULATA - BRYOZOA with 13 (6.0%), ANNELIDA - POLYCHAETA with 12 (5.5%) and RHIZOPODA with 1 species (0.5%) (Fig. 11).

The largest number of both plant and animal species (240) was determined from the northeastern coast of the Kornat Island (P_5), followed by the western coast of the Purara Island (P_2, 231 species), southern coast of the island K.Žakan (P_3, 224 species), western coast of the island Pleščina (P_8, 220 species), southern coasts of the island Purara (P_1, 218 species), Mana (P_6,216 species), R.Žakan (P_4, 183 species) and Mana (P_7, 146 species) (Fig. 12). At a larger number of localities the species constituted from 62.6% (P_6) to 68.6% (P_5) of the total of determined species. The only exceptions were the stations P_7 and P_4 wherefrom 42.3% and 53.0% species were determined respectively, due presumably to very small depths (P_7) and invariable biotope (P_4).

Animal component dominated both in numbers and percentages at almost all the stations, ranging from 51.3% (P_3) to 57.3% (P_1), except at stations P_7 and P_4, where plant component was dominant forming 60.3% and 55.7% respectively.

Bottom type, habitat slope, exposure to waves and currents and the light at a given locality are the basic factors affecting the distribution of benthic organisms.

Southern, exposed coast of the outer row of islands (Purara P_1 and Mana P_6) consists of cliffs vertically descending down to 50 m under the sea, with a plain with soft bottom formed below it. Mobile bottoms occur as small sandy surfaces at already 1 m depth on sloping and rocky coasts of other mentioned islands (P_2 and P_7) and on the coasts of more sheltered islands (P_3,P_4,P_5,P_8). Southern coasts of outer islands are also exposed to stronger light and wave effects. All these factors caused the differences in the structure and composition of benthic flora and fauna between studied localities.

The analysis of algae showed that the differences in their structure between different study areas are quite insignificant (Fig.10). The smallest number of species, 88, was recorded from the small cove at the southern side of the Mana Island (P_7), due to its markedly small depth (2 m). A larger number of species was found at the vertical cliffs of the southern coast of the Purara Island (P_1-93 species) and Mana (P_6-100 species) whereas the largest number (from 102 to 112 species) occurred on the sloping and rocky shores of other studied localities.

The differrences in the structure of phytobenthic species are better marked between the numbers and percentage presence if individual systematic algal group from the studied localities are compared. Numbers of red algae on rocky, sloping and rather sheltered shores exceed those on the vertical, wave exposed shores. However, their percentage proportions are higher on southern, wave exposed shores. Brown and green algae occur in smaller numbers and percentages on vertical south exposed shores than on other sheltered localities.

Therefore it may be stated that, irrespectivly of differences in abiotic factors between studied localities ,the floristic structure is quite uniform. This points to the fact that this study area is quite peculiar marine environment, which is well aerated even in its most sheltered parts, such as are the stations on the coast of the islands Ravni Žakan (P_4) and Pleščina (P_8), due to strong waves and currents around them. This is further supported by the fact that algae, characteristic of calm, sheltered localities were completely absent from the study area.

The bulk of animal species was collected from the northeastern coast of the Kornat Island (P_5-128 species). The number of collected species was slightly lower on the coast of the Purara (P_1-125 and P_2-123 species) and along the coast of better sheltered islands (P_8-117 and P_3-115 species) of Kornati Islands. The smallest number of animal species was recorded from the southern slightly sloping coast of the sheltered island R. Žakan (P_4-81 species) and from the southern unsheltered, slightly sloping and very shallow coast of Mana Island (P_7-58 species) (Fig.11).

Mollusca dominated both by numbers and percentages at all studied localities. Their percentages were higher on steeply sloping and shelterd shores (P_2-36.6%, P_3-32.2%, P_4-35.8%, P_5-32.0%, P_7-37.9%, P_8-37.6%) then on vertical, exposed shores (P_1-27.2%, P_6-24.1%).

Porifera are also very numerous inhabitants of studied localities. They were found to prefer more vertical (P_1-24.8%, P_6-27.8%) and steeply sloping shores (P_7-25.9%) directly exposed to waves and currents than slightly sloping and sheltered shores (P_5-18.7%, P_3-15.6%, P_8-12.8%., P_2-11.4% and P_4-7.4%).

Crustacea, Echinodermata and Tunicata prefer the areas with steeply sloping, hard and mobile bottoms and rather sheltered shores. However, Bryozoa and Cnidaria more frequently inhabit hard, vertical and exposed shores.

The qualitative smilarity of biota at different localities was expressed by the similarity quotient (QS) (GRUBELIĆ, 1992).

The highest equitability in animal structure (QS=82) was found for the habitats on the western coast of Purara (P_2) and western coast of Plešćina (P_8) and for the settlements (QS=81) on the southern coast of Purara (P_1) and Mana (P_6), as a consequence of their considerable biotopic similarity and orientation in space.

The lowest similarity in animal structure was observed for the settlements on the southern, vertical shores of outer islands Purara (P_1) and Mana (P_6) and for the settlements on steeply sloping and shallow shores of Mana (P_7) and Ravin Žakan (P_4), which are most diverse ecologically.

The shores of Ravni Žakan (P_4) and Mana (P_7) showed only 56% species in common (QS =56). No greater similarity was recorded, since nevertheless they are biotopes of slight slopes and low depths, they are differently situated. The former island is situated in a sheltered and the latter in an unsheltered part of the Kornati Islands. The equitability between other study localities was expressed by the similarity quotient (QS) which raning from 50 to 70 indicates that these localities are a kind of transitional localities between vertical, exposed and deep ones and slightly sloping, sheltered and shallow ones.

In general, the biota of animals and plants of this marine environment is far richer than presented here. However, these qualitative and quantitative data were sufficient to determine benthic biocoenoses and their characteristic species, as well as their vertical and horizontal distribution.

Properties of benthic biocoenoses and their distribution.

The distribution and structure of life communities (biocoenoses) on the sea bottom are mostly affected by the type and degree of slope of the sea bottom and depth. Factors important for the life change with depth. Here count light, temperature, salinity and quantity of dissolved gases. The effects of sea water movements (waves and currents) considerably change with depth.

The numbers of plant and animal species by different bionomic steps of each individual station and all stations together are shown in Figs. 13. and 14.

Life communities of supralittoral step

Supralittoral step is a transitory part between land and sea, extending inland up to the level of tidal wave. Lack of wet and considerable changes of, particularly, temperature and salinity, are basic properties of this step, to which small numbers of animal and plant species got abituated constituting a unique Biocoenosis of supralittoral rocks.

Biocoenosis of supralittoral rocks

This biocoenosis is developed on all study localities of Kornati Archipelago.

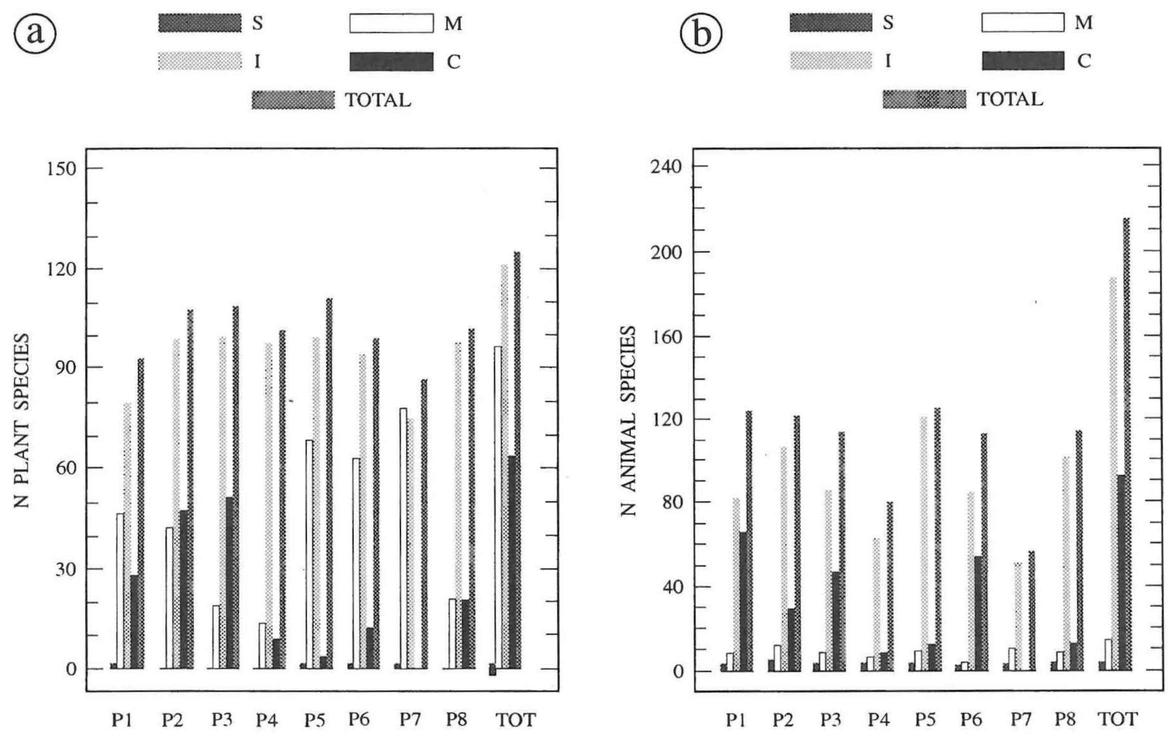

Fig 13. Numbers of plant (a) and animal (b) species in the supralittoral (S), mediolittoral (M), infralittoral (I) and a part of cirkalittoral (C) at sampling stations (P_1-P_8) and troughout (TOT) the study area

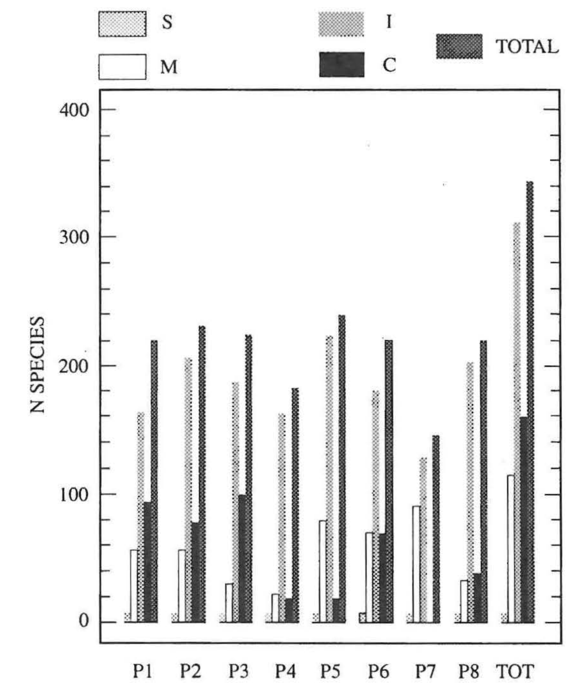

Fig 14. Total numbers of plant and animal species in the supralitoral (S), mediolittoral(M), infralittoral (I) and a part of cirkalittoral (C) at sampling stations (P_1-P_8) and throughout (TOT) the study area

Lithophytic bluegreen algae (Cyanophyta) form the floristic basis of this biocoenosis. Dependently on biotope characteristics they occupy different surfaces. Substrate (they prefer limestone), level of humidity, light and wave exposure (ERCEGOVIĆ, 1932, 1933) are factors directly affecting their distribution.

Biocoenosis of supralittoral rocks extends over the range of from 0.5 to approximately 5 metres as affected by wave exposure and angle of shore slope.

The highest level they were recorded from is 5 m on the southern and vertical shores of the Purara (P_1) and Mana (P_6) Islands, the parts of the outer crown of Kornati Arcipelago exposed to the activity of the open sea waves.

At stations in slightly better sheltered part of the archipelago, on steep (30 to 40°) and rocky shores of the island Purara (P_2), Kameni Žakan (P_3) and Kornat (P_5) and dependently on the site exposures, the biocoenoses of supralittoral rocks reach the height of 2.5 (P_2 and P_3) to 3.5 m (P_5). The station P_2 belongs to outer series of islands but it is west oriented, P_3 belongs to less exposed series of islands south oriented and P_5 belongs to the most shelterd series of islands of Kornati, northeastern oriented and exposed to the strong waves driven by the northeastern wind (bora).

This biocoenosis reaches considerably smaller height (about 2 m) on steep and west oriented coast of Pleščina island (P_8), situated in the inner series of Kornati, and on south oriented and well sheltered coast of the island Ravni Žakan (P_4), where waves break over almost plain (10^o) stone piles (height is about 0.4 m) which considerably reduces the wave force.

The effects of the slope of the substrate and wave effects on the development of supralittoral biocoenosis is clearly evident on the rocky shores of the recess on the Mana Island (P_7). It is directly exposed to waves driven by the southern winds from the open sea. South oriented side of the recess with a 30^o slope provide very favourable conditions for the development of this biocoenosis which reaches the height of 1.5 m. The situation is changed both left and right of the study area. Towards the opening of the recess this height is considerably greater and is reduced to 0.5 m. On the north oriented side of the recess the coast is vertical and low (about 0.7 m), overgrown by epilithic cyanophyceae, that is the biocoenosis of supralittoral rocks is well developed.

Similar distribution of this biocoenoses on differently exposed localities of outer islands of the eastern Adriatic was reported by ŠIMUNOVIĆ (1970) for the rocky shores of the middle Adriatic, DRAGANOVIĆ (1980) for the Mljet Island, ŠPAN *et al.*, (1989) and BELAMARIĆ and ŠERMAN (1989) for Lokrum Island.

After ERCEGOVIĆ (1932) epilithic bluegreen algae belong to the genre *Pleurocapsa*, *Brachynema* and *Calothrix* and they, along with somewhat rarer green algae and lichen *Verrucaria adriatica* are feeding medium for animals adapted to unfavourable living conditions at this bionomic step. The species characteristic of this biocoenoses are the gastropod *Littorina neritoides*, isopod *Ligia italica* and cirripedian crustacean *Chthamalus depressus*.

These species were recorded from all studied localities even though their number was affected by the slope and exposure of given substrate to waves. They occur in smaller numbers on the steep shores of Purara (P_1) and Mana (P_6) islands. They mainly choose shady and wet rock folds. On the steep rocks of the Purara (P_2), Ravni Žakan (P_4) and Kornat (P_5) coasts they occur in greater numbers and may be found in greatest numbers on the shores of the islands Kameni Žakan (P_3) and Mana (P_7) where slightly sloping substrate and sea water dynamics provide favourable living conditions.

Lower supralittoral step of all studied localities contained individuals of the species *Patella lusitanica*, and a larger number of specimens of the species *Chthamalus stellatus*.

Single specimens of the species *Monodonta turbinata* and *Pachygrapsus marmoratus*, not characteristic for this step, were recoreded from individual stations (P_2 and P_8).

The settlement of red alga *Catenella repens* is well developed in shady and wet rock folds of exposed localities (P_1, P_5, P_6 and P_7).

Obtained data point to the fact that the Biocoenosis of supralittoral rocks is poorer on sheltered rocky shores of study localities than on outer, wave exposed shores. This in the first place applies to lower depth distribution of the belt of epilithic cyanophiceae, whereas the coverage of rocky shores with characteristic animal species is growing proceeding from the shores with vertical wave exposed localitities (P_1 and P_6), and some sheltered shores (P_4) towards steeply sloping and wave exposed localities (P_2, P_3 and P_7).

A single plant and six animal species (Fig. 13) were recorded from this step throughout the study period.

Life communities of the mediolittoral step

The bionomic mediolittoral step extends within tidal zone on all rocky shores of study localities. It is covered by the settlements of lythophytic cyanophiceae of endolithic type.

Dependently on mechanical wave effects and substrate slope, mediolittoral height in the study area reaches 0.3 to 0.8 m.

The lowest height of 0.3 m is encountered in the sheltered localities of the Ravni Žakan

(P_4) island. This height rises with the greater exposure of localities to the open sea, so that it is 0.4 m on the western shore of the island Plešćina (P_8), 0.5 m on the western coast of Purara (P_2), 0.6 m on the southern shores of the islands Mana (P_7) and Kameni Žakan (P_3), 0.6 m on the southern shores of Purara (P_1) and Mana (P_6) and 0.8 m on the northern coast of the Kornat Island (P_5).

The height of the mediolittoral step on the southern exposed Purara (P_1) and Mana (P_6) shores is smaller than the mediolittoral height on the northeastern side of Kornat Island (P_5). This difference is not due only to wind forced sea water motion (southern and northeastern winds), but also to different shore slopes. The Purara (P_1) and Mana (P_6) shores are vertical whe reas the northeastern side of Kornat Island (P_5) slopes at an angle of 40° which allows free wave overflow.

The Biocoenosis of upper mediolittoral rocks and Biocoenosis of lower mediolittoral rocks are developed in the mediolittoral throughout the study area. A total of 115 species were recorded therefrom, of which 98 plant and 17 animal species (Figs. 13 and 14).

Biocoenosis of upper mediolittoral rocks

Apart from already mentioned endolithic bluegreen algae, the floristic substrate of this biocoenosis is comprised of some multicellular epilithic forms, such as red algae *Catenella repens,* forming more (Kornat-P_5) or less (Mana-P_6) dense coverages in shaded fissures and roofed rocks and *Nemalion helminthoides* at places ascending as high as to the suprlittoral of the western coast of Purara (P_2).

The barnacle *Chthamalus stellatus* and limpet *Patella lusitanica* are characteristic animal species of this biocoenosis.

The species *C. stellatus* is very rare on Purara (P_1) and Mana (P_6) cliffs where it mainly inhabits sheltered rock folds. Dependently on the slope and wave exposure it forms smaller (Ravni Žakan -P_4) or larger accumulations (Purara-P_2, Kameni Žakan-P_3, Kornati-P_5, Plešćina-P_8). The largest colonies at places reaching 100% coverage were recorded from the slight, wave exposed slope of Mana (P_7) coast.

The species *Patella lusitanica* is very numerous on all localities, the largest numbers of 15 individuals per 1/16 m² been recorded on the steep slopes of Kameni Žakan (P_4) and Mana (P_7) coasts. The relative species *Patella aspera* is also present throughout the study area with larger numbers on the wave exposed coasts of Purara (P_1), Kameni Žakan (P_3) and Mana (P_6 and P_7).

The amphibian crab *Pachygrapsus marmoratus* is very frequent throughout the mediolittoral step of all study localities, except on the wave exposed cliffs of Purara (P_1) and Mana (P_6).

Biocoenosis of lower mediolittoral rocks

Since the biotope where the biocoenosis of lower mediolittoral rocks is developed is characterized by a higher degree of wetness and is rather frequently submersed it is inhabited by a larger number of species.

Owing to favourable living conditions this biocoenosis is mainly well developed at all study localities. The island Ravni Žakan (P_4) is the only exception where this biocoenosis is poorly developed due to slightly sloping sheltered coast.

Floristic substrate of this biocenosis is comprised of already mentioned endolithic cyanophyceae which give easily indentifiable yellowish colour to the entire belt.

This biocoenosis is characterized by calcified algae *Lithophyllum tortuosum, Lithophyllum incrustans* and *Phymatholithon lenormandii,* which inhabiting smaller or larger recesses of exposed places of Purara (P_1) and Mana (P_6 and P_7), form organogenetic pavements. Sheltered coasts of the remainder of study localities contain these three species present even though in smaller and frequently discontinued crusty accumulations.

As reporter by ŠPAN (1969) large formations of organogenetic pavement in the Adriatic occur mainly on the coasts of outer islands exposed to strong and intensive waves where they could reach a width of 1.8 m.

During our study these large organogenetic formations were recorded from steep slopes of southern coasts of the islands Lavsa and Mana, at places not directly wave exposed but affected by wave activity (these localities are not a part of our study).

Along with calcified algae, this bionomic step is also inhabited by the algae of the genres *Laurencia* and *Cystoseira* which cover steep slopes of Purara and Mana.

The species *Cystoseira stricta* var. *amentacea* marks the boundary line between mediolittoral and infralittoral or it means the beginning of the infralittoral Biocoenosis of photophylic algae (ERCEGOVIĆ, 1966). On this bionomic step we recorded it from the steep, rocky and well wave exposed coasts of the island Kameni Žakan (P_3) and Mana (P_7). The occurrence of this alga points to the presence of the so called infralittoral edge.

The settlements of red alga *Corallina officinalis,* of greater or smaller coverage, were found on all wave exposed localities. They were not found on sheltered shores of Ravni Žakan (P_4).

As distinct from the inhabitants of clean and well aerated sea, brown alga *Fucus virsoides* is a representative of more calm and less saline sites. With respect to the peculiarities of Kornati Archipelago area, cleanliness and good aeration, the species *Fucus virsoides* is rare, found only at places, on well sheltered localities of northeastern side of Kornat Island (P_5).

The species *Patella aspera* and *Monodonta turbinata* and *Middendorffia caprearum* are characteristic animals of this biocoenosis.

The species *Patela aspera* si well represented at all study localities with the largest number of individuals on the south-oriented, wave exposed shores of Purara (P_1), K. Žakan (P_3) and Mana (P_6 and P_7).

The species *Middendorffia caprearum* evades steep and wave exposed shores (P_1 and P_6) like the gastropod *Monodonta turbinata* which is numerous on not steep and slightly sheltered localities.

The species *Actinia equina,* shellfish *Rocellaria dubia* and *Mytilus galloprovincialis* are permanent inhabitants of this biocoenosis whereas the larger or smaller numbers of sponges *Hymeniacidon sanguinea* and *Ircinia fasciculata* are also common here inhabiting shaded and roofed areas as well as the crab *Eriphia verrucosa,* gastropods *Cantharus d'Orbigny, Columbella rustica* and *Conus mediterraneus,* shellfish *Brachyodontes minimums,* rhizopodian *Miniacina miniacea,* fish *Blenius galerita* and different Polychaeta and Bryozoa.

It is evident that both biocoenoses are better developed on rocky and wave exposed shores of the islands Kornat (P_5), Purara (P_1 and P_2) and Mana (P_6 and P_7) than on more or less sheltered shores of other localities. This refers to the vertical distribution of biocoenoses and numbers and coverage by different species. The number of species and coverage values decrease proceeding from exposed shores (P_7-91 species, P_5-80, P_6-70, P1 and P_2-56) towards less exposed (P_8-33 species, P_3-29) and to completely sheltered (P_4-22 species) of Kornati Archipelago (Fig. 13).

Life communities of infralittoral step

The bionomic step of infralittoral extends from the level of normal low to the lower level of distribution of photophillic algae or meadows of marine phanerogams, dependently on the sea water transparency. Depth distribution increases from coastal towards the open island area.

This bionomic step follows the slope of the preceding steps on all study localities. With greater depth rocky bottoms, gradually transform in mobile bottoms dependently on the slope and wave exposure. The rate of illumination and sea water dynamics change with depth increase directly affecting both horizontal and vertical distribution of plant and animal species.

The Biocoenosis of photophilic algae is developed on hard and the Biocoenosis of marine phanerogams on mobile bottoms.

A total of 313 macrobenthic species were identified from the infralittoral of the study area. This constitutes 90.7% of the total number of the species we determined during present study. Of this number 123 species are plant and

190 animal species, making up 96.8% and 87. 1% of the plant and animal species respectively, of their total number determined (Figs. 13 and 14). Obtained data point to the fact that these depths are inhabited by the most diverse plant and animal species.

Biocoenosis of photophilic algae

The Biocoenosis of photophilic algae is developed on rocky, well illuminated shores of Kornati Archipelago. Depth reached by this biocoenosis and abundance of its biota mainly increase with the steepness of the substrate slope and the exposure of a locality to the open sea from slightly steep and sheltered coast of Ravni Žakan (P_4) to steep and wave exposed shores of Kornat (P_5), Kameni Žakan (P_3) and Purara (P_2).

This biocoenosis is dominated by the species of genus *Cystoseira* and *Sargassum*, with regular horizontal and vertical distribution. The representatives of these genres form mainly continued settlements in the upper part of the biocoenosis which are discontinued by sandy recesses at greater depths (P_2, P_3, P_4, P_5).

Even though almost all the species of mentioned genres were recorded from the study area earlier (ŠPAN and ANTOLIĆ, in press), the dominance of individual species at a locality is affected by the shore slope, wave exposure, illumination and sedimentation level.

Continuous coverage of *Cystoseira stricta* var. *amentacea* occurs in the boundary area between mediolittoral and infralittoral on more exposed rocky and steep shores of Kornati Archipelago (Purara-P_2, Kameni Žakan-P_3 and Mana-P_7). It is rather poor on the exposed and vertical shores of Purara (P_1) and Mana (P_6) whereas it was not found on the slightly sloping and sheltered shores of Ravni Žakan (P_4).

The smaller individuals of *Mytilus galloprovincialis*, single specimens of which are present on directly wave exposed localities (P_1, P_6, P_7) were very numerous and frequent in the belt of mentioned alga on steeply sloping and wave exposed shores of Kornati.

Steep shores of study localities (P_2, P_3, P_4, P_5) are overgrown by some other shalow-water algae such as *Cystoseira compressa, C. ercegovicii, C. compressa* var, *rosetta* and *Sargassum vulgare*, which evade vertical and directly wave exposed localities (P_1, and P_6). The species *Cystoseira corniculata* and *Cystoseira adriatica* were encountered at greater depths just like the species *Cystoseira corniculata* ssp. *laxior* and *Sargassum salicifolium* occurring on stone piles at depths exceeding 30 m (P_2, P_3, P_5).

Dense settlements of the species *Cystoseira barbata* may be found down to 2 m depth at the shores of the inner chain islands of the Archipelago, such as Kameni Žakan (P_3), Ravni Žakan (P_4) and Kornat (P_5). At greater depths these settlements are thinned out and this species replaced by some other species of genres *Amphiroa, Corallina, Fosliella, Ceramium, Dasya, Chondria, Cladophora, Laurencia* and others.

Owing to the specific and branched talus structure, very numerous epiphytic and epilithic benthic flora is developed in the multilayered settlements of the species of genre Cystoseira. During floristic analysis of the species of *Cystoseira adriatica*, collected from the 5 to 15 m depths in Kornati waters, ŠPAN and ANTOLIĆ (in press) identified 79 epiphytic taxa of the groups Rhodophyta, Phaeophyta and Chlorophyta.

The settlements of photophilic algae contain a diversity of animal species (phytal) which are differently distributed as affected by light penetration. Sciaphilic species of sponges *Chondrosia reniformis, Ircinia fasciculata, Spongia officinalis, Hyppospongia communis* and some others, bryozoa *Schizoporella sanguinea, Scrupocellaria reptans, Flustra securifrons* and many others are attached to the lower thalus part. Rhizopoda *Miniacina miniacea* is also very common, as well as tunicates such as *Didemnum* sp., *Halocynthia papillosa*, vagile forms of Ophiuroidea *Ophiothrix fragilis* and *Ophioderma longicauda* and Polycaheta and Cnidaria. All these sciaphilic species along with well developed sciaphilic algae (*Halimeda tuna, Peysonnelia squamaria, P. ruba* and others) form the enclaves of the settlements of sciaphilic type Precoralline aspect of coralline biocoenosis.

The upper part of branched thalus revealed a large number of gastropods: *Pisania maculosa, Pusia tricolor, Bittium reticulatum,* the species of genus *Rissoa, Gibbula, Caliostoma* and others. Small sponges are also frequent, *Sycon raphanus* and *Leuconia aspera*, as well as a large number of representatives of Polychaeta and other groups which mainly evade vertical, rocky, directly wave exposed biotopes (P_1 and P_6).

Gastropods *Patella coerulea* and *Haliotis lamellosa,* shellfish *Chama gryphoides* and *Spondylus gaederopus,* cnidarian *Caryophyllia* sp. and *Balanophyllia italica,* sea urchins *Arbacia lixula, Paracentrotus lividus, Sphaerechinus granularis,* sponges *Verongia aerophoba* are rather frequent on the rocky substrates in the Biocoenosis of photophilic algae; shellfish *Rocellaria dubia* and *Lithophage lithophaga* and sponges *Cliona viridis* and *Cliona celata* may be found in the stones. The mobile species, which search for food and habitat in this biocenosis, such as fishes of the groups Labridae, Blenniidae and Gobiidae, not dealt with in this paper, are also numerous.

On vertical and directly wave exposed shores of outer islands Purara (P_1) and Mana (P_6) the settlements of *Cystoseira* are mainly replaced by the settlements of short algae *Corallina officinalis, Tenarea undulosa, Wrangelia penicillata, Dilophus fasciola, Amphiroa rigida, Padina pavonica, Laurencia obtusa* and others.

From sea surface down to about 50 m depths vertical rocks are full of protrusions and recesses where shaded habitats are formed. Just at a very little depth beneath the sea surface the light intensity is significantly reduced at vertical rocks, so that the settlements of sciaphilic algae are developed at considerably smaller depths than on sloping shores.

Almost from the surface itself down to the bottom, vertical cliffs are inhabited by rather uniform well developed algae such as *Udotea petiolata, Peyssonnelia polymorpha, P. rubra, P. squamaria, Halimeda tuna, Pseudolithophyllum expansum* and others.

Since almost the entire area is well exposed to sea water motion and well airated, sponges dominate so that from surface to 20 m depth a large number of the following species may be encountered: *Petrosia ficiformis, Spongia officinalis, Hyppospongia communis, Chondrosia renformis, Chondrilla nucula, Calyx nicaensis, Ircinia fasciculata, I. oros, Cliona celata* and *C. schmidti.* The species *Haliclona cratera, Myxilla rosacea,* the species of genre Axinella, *Acanthella acuta* and others are frequent at greater depths, from 20 to 45 m. Different bryozoans, *Flustra securifrons, Porella cervicornis, Retepora* sp., *Myriapora truncata, Schizoporella sanguinea,* cnidarians *Leptopsammia pruvoti, Balanophyllia italica, Caryiophyllia sp., Paramuricea chamaeleon, Parerythropodium coralloides* and *Eunicella cavolinii,* developed from 7 m down to the bottom of the cliff, with maximum abundance at 15 m, are also numerous.

Between the surface and about 20 m depth the starfish (Asteroidea) species *Marthasterias glacialis, Echinaster sepositus, Coscinasterias tenuispina,* were also recored and in places also the sea cucumber *Holothuria tubulosa.* Single specimens of the sea urchin *Arbacia lixula* are scattered between 0.5 and 2 m depth whereas the sea urchin *Paracentrotus lividus* prefers rather calm areas between 7 and 15 m.

The polychaete *Palola sicilensis* is also characteristic of this biotope. It choses clean and well aerated sea water. Tunicates *Microcosmus sulcatus* and *Halocynthia papillosa* are fairly frequent along with many other animal and plant species.

The rocky shore of the western side of the island Pleščina (P_8) discends vertically down to 8 m depth. As distinct from southern vertical cliffs of Purara (P_1) and Mana (P_6) it is not directly exposed to the open sea but it belongs to the inner, sheltered chain of the Archipelago. All along it is inhabited by sciaphilic species, of which the algae *Halimeda tuna, Udotea petiolata and Corallina officinalis* occor in largest number. Numerous gastropods *(Bittium reticulatum, Pisania maculosa, Cantharus d'orbigny,* the species *Rissoa, Calliostoma, Gibbula* and others), otherways evading exposed localities (P_1 and P_6) were recorded among the thaluses of these algae. The starfish *Marthasterias glacialis, Echinaster sepositus, Coscinasterias tenu-*

ispina as well as *Ophiothrix fragilis*, sea cucumber *Holothuria tubulosa*, many sciaphilic sponges, *Chondrilla nucula, Agelas oroides, Petrosia ficiformis, Spongia officinalis, Hyppospongia communis, Spirasterella cunctatrix*, cnidarian *Caryophyllia* sp. and numbers of the other species are also present there.

The effects of substrate slope and locality wave exposure on the structure of biota may be illustrated by th example of the rocky shore of the recess of the southern Mana (P_7) coast.

The study area includes the entire transect of this cove (Fig.8), so that two completely differently sloping and differently wave exposed shores encounter here being inhabited by completely different macrobenthic species. Sloping, eroded shore descends plate-like towards the open sea (south) down to 2 m depth. In spite of well illuminated and suitably sloping shore, direct wave striking makes impossible settling of plant and animal species. Short algal forms dominate there. The red alga *Lithophyllum incrustans* covers most of the shelf along with the sea urchin *Paracentrotus lividus* in the sheltered part and the species *Arbacia lixula* on the wave exposed shore part. The species *Anemonia sulcata* is also frequent. Approaching the closed part of the cove it reaches maximum size and forms a dense coverage.

Apart from the alga *Padina pavonica* the sponges *Chondrilla nucula, Verongia aerophoba, Cliona celata*, shellfish species *Rocellaria dubia, Lithopaga lithopaga, Arca noae*, cnidarian *Balanophyllia italica*, barnacle *Balanus perforatus* and the starfish *Coscinasterias tenuispina* are also frequent.

The other shore part is sheltered from waves to a defined extent, but due to northern exposure and vertical position it is more poorly illuminated. Between the surface and bottom (at about 2 m) markedly sciaphilic animal and plant biota is encountered, dominated by the sponges *Hymeniacidon sanguinea, Petrosia ficiformis, Agelas oroides, Ircinia fasciculata, Spongia officinalis, Hippospongia communis, Spirastrella cuncatrix* and others, as well as algae *Pseudolithophyllum expansum, Peyssonnelia squamaria, Valonia utricularis, Halimeda tuna, Codium adhaerens* and others.

From everything said above it appears that the Biocoenosis of photophilic algae is present and well devloped on all sloping, rocky and well illuminated coasts of the Kornati archipelago not directly exposed to the open sea waves (P_2, P_3, P_4, P_5). These localities are overgrown by photophilic algal species of genre *Cystoseira* and *Sargassum* which are found on stone piles at depths exceeding 30 m.

The remainder of sloping shores directly exposed to the open sea (P_7) is overgrown by algal vegetation consisting of shorter photophilic forms, such as the species of genre *Lithophyllum, Cladophora, Ceramium, Corallina, Padina* and others.

Exposed and vertical shores of Purara (P_1) and Mana (P_6), belonging to the outer chain of Kornati Islands as well as vertical and north oriented shores of the small cove on the Mana (P_7) island, are more poorly illuminated which affected the distribution of sciaphilic animal and plant species, which to a smaller or greater extent may be found in the sublayer of branched photophilic algae of the genre *Cystoseira* and *Sargassum* (Precoralline aspect of coralline biocoenoses).

Biocoenosis of the meadows of marine phanerogams

Biocoenosis of the meadows of marine phanerogams is developed on sandy bottoms at the foot of rocky shores and in the shallower, sand-covered rock recesses.

Sandy accumulations of smaller surface area occur on the bottom of rocky folds (P_2, P_3, P_5) or among stone piles (P_4) at alreday 1 m depth. These sandy accumulations are not inhabited by any special flora and fauna down to 3 m depth, being therefrom overgrown by the Biocoenosis of marine phanerogams with the species *Posidonia oceanica* or the species *Cymodocea nodosa*.

The species *Cymodocea nodosa* occurs mainly on shallower and sheltered localities with bottoms covered by a thin sand layer. During our study it was recorded only from 10 m depth on the southern side of the island Ravni Žakan

(P_4) covering smaller and not densely overgrown surfaces.

After ŠPAN and ANTOLIĆ (in press) the species *Cymodocea nodosa* is a rare inhabitant of the Kornati area. This once again confirms the fact the this part of the Adriatic Sea is markedly dynamic what reduces sedimentation.

The species *Posidonia oceanica* is well developed all around the studied slightly slopnig sediment bottoms of both outer and inner islands of Kornati Archipelago. It occurs in batchy forms on sand covered rock recesses of Purara, Kameni Žakan, Ravni Žakan and Kornat at 3 m depth (P_5) and deeper (P_2, P_3, P_4). At depths exceeding 10 m, where sandy bottoms become continuous, this biocoenoses reaches its maximum development and is distributed down to 20 (P_4 and P_5), 30 (P_2) and 40 m (P_3 and P_8).

Abundant epiphytic flora and fauna may be recorded from the leaves of *Posidonia oceanica,* and somewhat more delicate leaves of the species *Cymodocea nodosa.*

Qualitative-quantitative analysis of epiphytic flora on the leaves of *Posidonia oceanica,* collected from the marine environment of "Kornati" National Park, revealed a total of 59 taxa belonging to the groups of red, brown and green alagae (ANTOLIĆ, 1985).

Sciaphilic species forming Precoralline aspect of coralline biocoenoses may be found on the rhizomes of *Posidonia oceanica.* Tunicata *Botryllus schlosseri* and *Halocynthia papillosa* are frequent, bryozoans *Schizoporella sanguinea, Porella cervicornis, Retepora* sp., *Myriapora truncata* are very numerous, as well as stony corals *Caryophyllia* sp., *Cladocora cespitosa,* sponges *Petrosia ficiformis, Ircinia fasciculata,* rhizopodian *Miniacina miniacea* and many other species.

Very diverse epiphytic flora is also present on posidonia rhizomes, not dealt with in this paper. Their numbers were described by ANTOLIĆ (1986) who reported 157 representatives of red, brown and green algae on the rhizomes of posidonia from the area of Dubrovnik.

This habitat is normally inhabited by sea cucumber species *Holothuria tubulosa, Holothuria polii,* sea urchins *Sphaerechinus granularis, Paracentrotus lividus, Psammechinus microtuberculatus* and *Spatangus purpureus, tunicate Microcosmus claudicans,* crab *Maja crispata,* the shellfish *Pinna nobilis* and many others.

To conclude, the Biocoenosis of marine phanerogam *Posidonia oceanica* is well developed on steep sandy bottoms of study localities P_2, P_3, P_4, P_5 and P_8, while the Biocoenosis of marine phanerogam *Cymodocea nodosa* was recorded only form the northeastern side of the Kornati Island at about 10 m depth.

The biocoenosis of marine phanerogam *Posidonia oceanica* is most abundant at 10-15 m depth at all mentioned localities, whereas it is distributed at greater depths (about 40 m) on the sandy bottoms of the islands K. Žakan (P_3) and Plešćina (P_8) than on the sheltered bottoms (about 20 m) of the islands R. Žakan (P_4) and Kornat (P_5).

Life communities at a circalittoral step

The circalittoral stretches from the lower boundary of the distribution of photophilic algae and the meadows of marine phanerogams down to about 200 m depth, where multicellular scyaphilic algae are developed.

Rather uniform living conditions are characteristic of this area; they are due to the reduced sea water movements and illumination.

Dependently on the nature of the substrate the settlements of hard bottoms, Coralline biocoenosis and the settlements of mobile bottoms, the Biocoenosis of coastal detritic bottoms and the Biocoenosis of terrigeneous mud are developed here.

The taxonomic analysis of plant and animal material collected from a part of circalittoral bottoms in the Kornati Archipelago (down to about 100 m depth) has identified so far 160 macrobenthic oprgansmis, or 46.4% of the total of determined biota of the study area. Of this number, 65 are plant and 95 animal species; animal species prevail over plant species, both by the biomass and the number of species at this bionomic step (Fig. 13, 14).

Coralline biocoenosis

This biocoenosis is developed on all hard, rocky bottoms as well as on bottoms fixed by biogenesis. Dependently on the place of development three aspects of this biocoenosis may be distingusihed: Precoralline aspect of coralline biocoenosis, Coralligene of the lower horizon of littoral rocks and Coralline plattau.

Precoralline aspect of coralline biocoenosis represents the initial stage of this biocoenosis. It is developed at all study localities in fairly shaded and diverse habitats. Its abundant settlements were recorded from the upper part of the steep rocks of purara (P_1), Mana (P_6 and P_7) and Plešćina (P_8), in the shaded parts of the settlements of the meadows of *Posidonia oceanica* (P_2, P_3, P_4, P_5, P_8), settlements of different species of genres *Cystoseira* and *Sargassum* (P_2, P_3, P_4 and P_5) as well as in different recesses, fissures and roofed parts of shaded shores from almost the sea surface down to greater depths which occur around all the islands of the Archipelago.

The characteristic species of this community are mainly non-calcified algae such as *Halimeda tuna, Udotea petiolata, Peyssonnelia squamaria, Callithamnion granulatum, Cladophora coelothrix* and some others, many of the already mentioned bryozoans *(Schizophorella sanguinea, Porella cervicornis, Flustra securifrons)*, cnidarians *Caryophyllia* sp. and *Leptopsammia pruvoti*, as well as *Eunicella cavolinii* particularly developed on vertical and rocky shores of Purara (P_1) and Mana (P_6). Sponges, *Spirastrella cunctatrix, Petrosia ficiformis, Chondrilla nucula, Chondrosia reniformis, Spongia officinalis, Agelas oroides*, tunicates, *Halocynthia papillosa* and many other, more or less sciaphilic species, occur in large numbers on shaded rocks.

The coralligene of the lower horizon of littoral rocks is frequent in the marine environment of Kornati Archipelago. It is encountered on the slopes of rocky shores below the zone of photophilic algae as well as in well shaded sites (caves) of infralittoral and circalittoral rocks. It reaches its maximum development on the southern vertical shores (cliffs) of the islands Purara (P_1) and Mana (P_6), from 20 m depth almost down to the bottom of the cliffs (45 m depth).

Apart from already mentioned sciaphilic species, encountered in the precoralline aspect of coralline biocoenosis, the specimens of gorgonaria are very well and densely developed here, among which the species *Eunicell cavolinii* and *Paramuricea chamaeleon* are dominant both by their abudance and magnitude. *Eunicella cavolinii* is a transient species and is developed at the boundaries between precoralline and coralline biocoenoses. Both these species are carriers of epibionts characteristic of this area, of which cnidarian *Parerythropodium coralloides* is most numerous. The specimens of a rare species *Gerardia savaglia* are present and very picturesque there.

Rocky slopes are covered by very picturesque calcifed algae *(Peyssonnelia polymorpha, Pseudolithophyllum expansum* and others) and sciaphilic, non-calcified species. Apart from sciaphilic species, very nice species of sponges are frequent and characteristic of this area. They are *Acanthella acuta, Axinella polypoides, A. cannabina, A. verrucosa and A. damicornis*, on which the cnidarian *Parazoanthuse axinellae* is very frequent epibiont.

The species *Eunicella stricta* is also present there. However, as distinct from the species *Eunicella cavolinii* it choses slightly less steep habitats of the southern shores of the islands Purara (P_1), Mana (P_6) and Kameni Žakan (P_3).

Coralline plateau is at the foot of the cliffs of the outer series of islands of the Archipelago (P_1 and P_6). The bottoms fixed by biogenesis, comprised of coralline fist-size clumps and pebless are developed between 50 and 100 m depth. The clumps and pebbles are bound together and mainly lie on sandy-muddy bottoms mixed with tiny detritus of coralline type. They are formed of shelly parts (shells of shellfish of the genres *Spondylus, Pecten, Chlamys* and *Ostrea)* bound together by a live material or its dead limestone parts. These, most frequently, are limestone - lithothamnium algae, of which *Lithothamnium fruticulosum* and *Pseudolithpohyllum expansum*, and different Polychaeta with limestone envelopes *(Serpula vermicularis* and *Protula tubularia).* The pebbles are frequently permeated by the sponges *Geodia conchilega, Suberites carnosus* and others. Such bound material is overgrown by another, very diverse epiflora and epifauna. So the sessile species *Miniacina miniacea* and *Argyrotheca cistellula* may occur with about 30 specimens in a pebble and the sponges *Acanthella acuta, Axinella damicornis, A. verrucosa* and *Petrosia ficiformis* are common on most of analyzed clumps. Smaller specimens of the species *Agelas oroides* and *Tethya aurantium* may be found at some places. Ascidians *Polycarpa pomaria* and *Halocynthia papillosa,* bryozoans *Schizoporella sanguinea, Porella cervicornis* and *Myriapora truncata* as well as shellfish species *Hiatella artica* and *Chlamys varia* are frequent epifauna on the clumps and pebbles.

Some representatives of sea cucumbers occur among the pebbles, such as *Stichopus regalis,* sea urchins *Echinocyamus pusillus, Spatangus purpureus* (fregments), starfish *Echinaster sepositus,* ophiurian *Ophiothrix fragilis* and many other species.

Lithothamnium pebbles of slightly smaller size extend at 30-50 m and deeper as a continuation of slightly sloping bottoms inhabited by posidonia meadows around Purara (P_2) and Kameni Žakan (P_3).

From everything brought out it may be concluded that all three aspects of Coralline biocenosis are well developed in a diverse and very picturesque marine environment of Kornati Archipelago, where all the prerequisites for its development are present, clean sea, rather stable temperature and salinity as well as very favourable hydrodynamical conditions. Namely, sessile organisms which make up a significant component of this community, inhabit sites with stable horizontal bottom currents which prevent sedimentation (ŠTIRN *et al.*, 1969).

So the Precoralline aspect of coralline biocoenosis is very well developed on all shaded sites of study localities, from almost the surface down to 20 m depth. The aspect of the lower horizon of littoral rocks reached its maximum development on the vertical shores of the series of outer islands of Kornati (Purara -P_1, and Mana P_6), whereas the stage of Coralline plateau reached its maximum development at the foot of the same localities (P_1 and P_6). Slightly less developed stage of Coralline plateau was recorded from the bottoms which are an extension of mobile bottom, overgrown by posidonia. These are the bottoms at depths exceeding 40 m on the western coast of Purara (P_2) and southern side of the island Kameni Žakan (P_3). However, this aspect is not developed on the northeastern side of the Kornat Island (P_5), southern side of the island Kameni Žakan (P_4) and western side of the island Pleščina (P_8) due to poor bottom currents which permit sedimentation of tiny mud particles.

Biocoenosis of coastal detritic bottoms

This bioconosis inhabits slightly sloping mobile bottoms which are an extension of the settlements of the meadows of marine phanerogam *Posidonia oceanica.* It is doveloped on the northeastern side of Kornat island (P_5) between 30 and 80 m depth.

It also develops on sandy-shelly bottoms where the fragments of shells of shellfish, gastropods, bryozoans and limestone algae prevail with poorer flora and fauna than those of the preceding biocoenosis. The red algae *Vidalia volubilis, Rytiphlaea tinctoria, Rhodophyllis divaricata, Aglaothamnion tenuissimum* and other are predominant. The gastropod *Turritella triplicata,* sponge *Suberites domuncula,* crab *Parthenope massena,* ascidian *Microcosmus sulcatus*, starfish *Astropecten irregularis,* sea cucumber *Holothuria forskali* and a smaller number of other species are also encountered there.

Biocoenosis of coastal terrigeneous mud

The Biocoenosis of coastal terrigeneous mud comes in a succession of the Biocoenosis of coastal detritc bottoms. It inhabits slightly sloping bottoms northeast of the Kornat Island (P_5) between 60 and about 80 m depth.

The illumination is poor and bottom currents weak making possible the sedimentation of fine, muddy particles preventing settlement of plant species.

Polychaete *Sternaspis scutata,* cnidarian *Alcyonium palmatum,* ascidian *Phallusia mammilata,* starfish *Anseropoda placenta,* sea cucumber *Trachythyone tergestina* and commercially important fish species hake *Merluccius merluccius* and red mullet *Mullus barbatus,* not separately dealt with in this paper, are characteristic species recorded during present study.

From the data collected from the mobile bottoms of the circalittoral of Kornati Archipelago down to 80 m depth, it may be concluded that the Biocoenosis of coastal terrigeneous mud are developed only on the bottoms along the northeastern side of the Kornat Island (P_5) in the inner part of the Archipelago, were the settling of fine muddy particles is more intensive than in the remainder of study localities.

CONCLUSIONS

Long-term studies of littoral biocoenoses of different localities of the Kornati Archipelago marine environment show the following:

A total of 342 macrobenthic forms were collected and identified of which 127 (36.8%) plant and 218 (63.2%) animal taxa.

Dependently on the type and slope of habitats, the level of wave, sea current and light exposure, benthic organisms are differently distributed. The biocoenoses of exposed islands are more diverse than the biocoenoses of sheltered island.

The Biocoenosis of supralittoral rocks is developed in the supralittoral of all study localities. It is poorer on the sheltered shores than on the outer, exposed ones. This primarily applies to lower vertical distribution of epilithic cyanophiceae. The coverage of rocky shores by animal species increases from vertical, directly wave exposed shore towards low and sheltered steeply sloping and exposed shores.

The Biocoenosis of upper mediolittoral rocks and Biocoenosis of lower mediolittoral rocks are developed at all localites of the mediolittoral. Both biocoenoses are better developed on rocky and exposed shores than on shelterd shores of other localities. This refers to macrobentic species and their vertical distribution, number and coverage.

The settlements of hard bottoms, Biocoenosis of photophilic algae and the settlements of mobile bottoms, Biocenosis of marine phanerogams were recorded from the infralittoral.

The Biocoenosis of photophilic algae is present and well developed on all steeply sloping and well illuminated shores of Kornati, not directly exposed to wave activity. The Biocoenosis of marine phanerogam *Posidonia oceanica* inhabits steeply sloping sandy bottoms. It is most abundant at about 10-15 m depth and reaches greatest depth of 40 m.

The Biocoenosis of marine phanerogam *Cymodocea nodosa* was recorded only from sandy bottoms of the northeastern side of the Kornat Island, at about 10 m depth.

The Coralline biocoenosis, Biocoenosis of coastal detritic bottom and Biocoenosis of coastal terrigeneous mud are developed in the circalittoral.

All three aspects of Coralline biocoenosis are very well developed. Precoralline aspect of coralline biocoenosis is very well developed on all rocky sites of study localities, from the sea surface itself down to about 30 m depth. The aspect Coralligene of the lower horizon of littoral rocks is maximum developed on the lower part of vertical shores of the outer series of the Archipelago. The aspect Coralline plateau reaches its peak development at the foot of the same localities. The settlement on the bottoms along the western coast of the island Purara and souther shores of the island Kameni Žakan is slightly poorer and completely absent from the remainder of the localities.

The Biocoenosis of coastal detritic bottoms and the Biocoenosis of coastal terrigeneous mud are developed only on the steeply sloping bottom along the northeastern side of the Kornat Island where settling of muddy particles increases with depth.

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Komparativna istraživanja litoralnih biocenoza Kornatskog otočja

Ivana GRUBELIĆ

Institut za oceanografiju i ribarsto, Split, Hrvatska

KRATKI SADRŽAJ

U radu su prikazani rezultati višegodišnjeg istraživanja sastava i rasprostranjenja biljnih i životinjskih organizama u litoralnim biocenozama Kornatskog otočja, koje su razvijene na ekološki različitim lokalitetima.

Istraživanja su obuhvatila makrobentoske oblike faune i flore na bionomskim stepenicama supralitoralu, mediolitoralu, infralitoralu i djelu cirkalitorala do 100 metara dubine.

Ovisno o vrsti i nagibu staništa, stupnju izloženosti valovima, strujama i osvijetljenosti, bentonski organizmi su različito raspoređeni u kornatskom podmorju. Izložene obale vanjskih otoka naseljene su raznovrsnijim biocenozama od zaklonjenijih. Na kosim, stjenovitim i dobro oplakivanim obalama broj biljnih i životinjskih vrsta je veći nego na okomitim i izloženim, te kosim i zaštićenim lokalitetima.

Na području istraživanja determinirane su slijedeće biocenoze: Biocenoza suprolitoralnih stijena, Biocenoza gornjih stijena mediolitorala, Biocenoza donjih stijena mediolitorala, Biocenoza fotofilnih alga, Biocenoza morskih cvjetnica - *Posidonia oceanica* i *Cymodocea nodosa,* Koraligenska biocenoza sa sva tri aspekta, te Biocenoza obalnog detritičnog dna i Biocenoza obalnog terigenog mulja.

Table A1. List of benthic flora and its relative abundance at individual bionomic steps (**S** – supralittoral, **M** – mediolittoral, **I** – infralittoral, **C** – cirkalittoral) of sampling stations (P1–P8) of the Kornati Archipelago

	P1				**P2**				**P3**				**P4**				**P5**				**P6**				**P7**				**P8**			
	PURARA I. S – cliff				PURARA I. W				K. ŽAKAN I. S				R. ŽAKAN I. S				KORNAT I. NI				MANA I. S – cliff				MANA I. S				PLEŠĆINA I. W			
	S	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**
RHODOPHYTA																																
Nemalion helminthoides (Vell.) Batt.	.	r	.	.	r	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	.	.
Liagora viscida (Forssk.) C. Ag.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	r	.	.	.	.	.
Gelidium spathulatum (Kütz.) Born.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	.	.	.	c	c	.	.	x	x	.	.	.	.	.
Amphiroa cryptarthordia Zanard.	.	.	c	.	.	x	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	.	.	.	.	.	x	.
Amphiroa rigida Lamour.	.	.	x	r	.	.	x	x	.	.	x	x	.	.	x	.	.	x	x	.	.	c	x	.	.	x	x	.	.	.	x	.
Corallina granifera Ellis et Sol.	.	c	x	.	.	cc	c	.	.	.	.	.	.	.	c	.	.	c	c	.	.	cc	c	.	.	x	x	.	.	.	c	.
Corallina officinalis L.	.	cc	x	.	.	cc	x	.	.	.	c	.	.	.	cc	.	.	cc	x	.	.	cc	cc	.	.	c	c	.	.	c	x	.
Dermatolithon cystoseirae (Hauck) Huvé	.	x	x	.	.	c	c	x	.	.	c	.	.	.	cc	.	.	cc	c	.	.	.	c	.	.	x	x	.	.	.	c	.
Dermatolithon confinis (Crouan) Boudour.	.	x	x	x	.	x	x	.	.	x	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	r	x	.	.	.	x	.
Fosliella farinosa (Lamour.) Howe	.	.	c	x	.	c	cc	cc	.	.	cc	cc	.	.	cc	.	.	cc	cc	.	.	.	c	.	.	.	.	.	.	.	cc	c
Fosliella lejolisii (Rosan.) Howe	.	.	c	.	.	.	cc	.	.	.	cc	cc	.	.	cc	.	.	.	cc	.	.	.	c	.	.	c	x	.	.	.	cc	c
Jania rubens (L.) Lamour.	.	x	x	.	.	x	x	x	.	.	x	.	.	.	c	.	.	x	x	.	.	x	x	.	.	c	x	.	.	x	c	.
Lithophyllum incrustans Phil.	.	cc	x	.	.	c	x	.	.	c	x	.	.	c	x	.	.	x	x	.	.	c	x	.	.	cc	x	.	.	c	x	.
Lithophyllum tortuosum (Esp.) Fosl.	.	cc	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	c	.	.	.	c	.	.	.	.	.	.
Lithothamnion fruticulosum (Kütz.) Fosl.	.	.	x	x	.	.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x
Melobesia membranacea (Esp.) Lamour.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phymatolithon calcareum (Pall.) Adey et Mc. Kibbin	.	.	.	x	.	.	x	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Phymatolithon lenormandii (Aresch.) Adey	.	cc	x	.	.	x	x	.	.	c	.	.	.	c	.	.	.	cc	x	.	.	c	c	.	.	.	.	.	.	c	x	.
Pseudolithophyllum expansum (Phill.) Lem.	.	x	x	r	.	x	x	x	.	.	c	x	.	.	x	x	.	.	x	.	.	x	x	x	.	x	x	.	.	.	x	x
Tenarea undulosa Bory	.	r	c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	x	c	.	.	.	.	.
Acrodiscus vidovichii (Meneg.) Zanard.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	x	.
.*Aeodes marginata* (Rouss.) Schmitz	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Acrosymphyton purpuriferum (J. Ag.) Sjöst.	.	.	r	.	.	.	r	.	.	.	r	r	.	.	.	.	.	x	x	.	.	.	.	.	.	r	r	.	.	.	r	x
Peyssonnelia polymorpha (Zan.) Schm.	.	x	x	x	.	.	x	x	.	.	x	x	.	.	x	x	.	x	x	.	.	c	x	x	.	x	x	.	.	.	x	x
Peyssonnelia rubra (Grev.) J. Ag.	.	x	x	r	.	.	x	x	.	.	x	x	.	.	x	x	.	x	x	.	.	x	x	x	.	x	x	.	.	.	x	x

Table A1. Continued

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Peyssonnelia squarmaria (Gmel.) Dec.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	x	x	x	.	.	x	.	.	.	x	x
Gracilaria bursa – pastoris (Gmel.) Silva		.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Hypnea musciformis (Wulf.) Lamour.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	x	x	.	.	x	x	.	.	.	x	.
Schottera nicaeensis Lamouroux	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	c	.	.	c	.	.	.	.	.	.
Catenella repens (Lightf.) Batt.	c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	cc	.	.	c	x	.	.	c	.	.	.	.	.	x	.
Rhodophyllis divaricata (Stackh.) Papenf.	.	x	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	x	x	x	.	x	c	x	.	c	x	.	.	x	x	x
Sphaerococcus coronopifolius Stackhouse	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	x	.
Champia parvula (C. Ag.) Harv	.	x	x	.	.	x	x	r	.	.	.	.	.	.	.	.	.	c	x	.	.	x	x	.	.	x	x	.	.	x	x	.
Chylocladia verticillata (Lightf.) Blid.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Gastroclonium clavatum (Roth) Ardiss.	.	.	.	.	.	x	.	.	.	x	x	.	.	x	x	.	.	x	c	.	.	x	x	.	.	c	c	.	.	x	x	.
Lamentaria sp.	.	.	.	.	.	.	x	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Botryocladia botryoides (Wulf.) Feldm.	.	cc	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	.	x	.
Botryocladia microphysa Kylin	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Rhodymenia ardissonei J. Feldm.	.	x	x	.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	c	x	.	.	x	x	.	.	.	x	.
Aglaothamnion furcellarie (J. Ag.) G. Feldm.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	.	x	.	.	cc	x	.	.	x	x	.	.	.	x	x
Aglaothamnion tenuissimum (Bonn.) G. Feldm.	.	.	r	.	.	.	x	x	.	.	x	x	.	.	x	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	x
Antithamnion cruciatum (C. Ag.) Näg.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	c	.	.	.	cc	c	.	.	x	.	.	.	x	x	.
Callithamnion corymbosum (Smith) Lyngb.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	.	.	.	.	.	.
Callithamnion granulatum (Ducl.) C. Ag.	.	cc	c	.	.	x	.	.	.	.	x	.	.	.	x	.	.	c	c	.	.	c	c	.	.	cc	c	.	.	x	x	.
Ceramium bertholdii Funk	.	.	.	.	.	.	x	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Ceramium ciliatum (Ell.) Ducl.	.	x	r	.	.	x	x	.	.	x	.	.	.	.	x	.	.	.	.	.	.	cc	x	.	.	c	cc	.	.	x	x	.
Ceramium codii (Rich.) G. Feldm.	.	c	c	r	.	.	c	.	.	.	cc	cc	.	.	c	.	.	x	cc	.	.	cc	cc	.	.	x	x	.	.	x	cc	.
Ceramium diaphanum (Lightf.) Roth	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	cc	x	.	.	.	x	.
Ceramium gracillimum var. *byssoideum* Harvey.	.	x	cc	.	.	cc	c	.	.	.	x	r	.	.	x	.	.	c	cc	.	.	c	c	.	.	cc	x	.	.	.	c	.
Ceramium rubrum var. *barbatum* (Kütz.) J. Ag.	.	.	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	x	x	.	.	cc	x	.	.	.	x	.
Ceramium tenuissimum (Lyngb.) J. Ag.	.	x	x	.	.	x	x	.	.	.	x	x	.	.	x	.	.	x	x	.	.	.	x	.	.	c	.	.	.	.	x	.
Crouania attenuata (Bonnem.) J. Ag.	.	x	x	.	.	.	x	.	.	.	x	c	.	.	x	.	.	c	c	.	.	x	x	.	.	x	x	.	.	x	x	.
Griffithsia barbata (Smith) C. Ag.	.	x	x	.	.	x	x	.	.	.	x	x	.	.	x	.	.	x	x	.	.	.	x	.	.	x	x	.	.	.	x	.
Griffithsia phyllamphora J. Ag.	.	c	.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	.	.	x	.	.	x	.	.	.	.	x	.

Table A1. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Lejolisa mediterranea Bornet.	.	.	x	.	.	.	c	.	.	.	c	cc	.	.	c	.	.	x	c	.	.	.	x	.	.	.	.	.	.	.	c	.
Monosporus pedicellatus (Smith) Solier	.	x	x	.	.	x	x	r	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	c	x	.	.	x	x	.
Ptilothamnion pluma (Dillw.) Thur.	.	.	x	c	.	.	x	c	.	.	x	x	.	.	x	x	.	x	x	.	.	x	x	x	.	cc	x	.	.	.	x	x
Spermathamnion flabellatum Born.	.	.	x	.	.	.	x	x	.	.	c	x	.	.	c	.	.	x	x	.	.	x	x	.	.	c	x	.	.	.	x	.
Spyridia filamentosa (Wulf.) Harv.	.	.	x	.	.	.	c	.	.	.	c	x	.	.	c	.	.	x	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Wrangelia penicillata C. Ag.	.	x	c	.	.	x	x	x	.	c	x	.	.	x	x	.	.	x	x	.	.	x	c	.	.	x	x	.	.	x	x	.
Dasya baillouviana (Gmel.) Montagne	.	.	x	.	.	.	x	.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	.	.	.	.	.	x	.
Dasya hutchinsiae (Harvey) Hooker	.	x	x	.	.	c	x	x	.	.	x	x	.	.	x	.	.	cc	x	.	.	c	x	.	.	x	x	.	.	x	x	.
Dasya ocellata (Grat.) Harv.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	c	c	.	.	x	.	.	.	.	x	.
Dasyopsis plana (C. Ag.) Zanard.	.	.	x	x	.	x	x	x	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Dasyopsis spinella (C. Ag.) Zanard.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Apoglossum ruscifolium (Turn.) J. Ag.	.	x	x	x	.	.	x	x	.	.	x	r	.	.	x	.	.	cc	x	.	.	c	c	r	.	x	x	.	.	.	x	x
Hypoglossum woodwardii Kütz.	.	x	x	.	.	.	x	x	.	.	x	x	.	.	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	.	x	.
Nitophyllum punctatum (Stackh.) Grev.	.	x	x	r	.	.	x	r	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	.	x	.
Boergeseniella fruticulosa (Wulf.) Kylin	.	.	c	.	.	.	c	c	.	.	x	x	.	.	c	.	.	x	c	.	.	.	x	.	.	x	x	.	.	.	x	.
Chondria dasyphylla (Woodw.) C. Ag.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	c	c	.	.	.	.	.
Chondria tenuissima (Good. et Woodw) C. Ag.	.	.	x	.	.	.	x	x	.	.	x	c	.	.	x	.	.	x	x	.	.	.	x	.	.	x	.	.	.	.	x	.
Dipterosiphonia rigens (Schousb.) Falk.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	c	x	.	.	x	x	.
Halodictyon mirabile (Huds.) Batt.	.	x	x	.	.	x	x	x	.	.	x	r	.	.	x	.	.	x	x	.	.	.	x	.	.	x	x	.	.	.	x	.
Herposiphonia tenella f. *secunda* (C. Ag.) Holl.	.	.	c	.	.	cc	c	x	.	.	x	x	.	.	x	.	.	c	x	.	.	r	r	.	.	x	x	.	.	.	x	.
Laurencia obtusa (Huds.) Lam.	.	x	x	x	.	c	c	x	.	cc	c	x	.	x	c	.	.	c	x	.	.	c	x	.	.	x	x	.	.	.	x	x
Laurencia papillosa (C. Ag.) Grev.	.	x	x	.	.	x	.	.	.	c	x	.	.	x	.	.	.	x	.	.	.	x	x	.	.	x	x	.	.	x	x	.
Laurencia pinnatifida (Gmel.) Lam.	.	.	.	.	.	x	x	.	.	c	r	r	.	x	x	.	.	x	x	.	.	x	x	.	.	c	x	.	.	.	x	x
Polysiphonia elongata (Huds.) Spreng.	.	.	.	x	.	.	x	x	.	.	x	r	.	.	x	.	.	x	x	.	.	x	x	.	.	.	x	.	.	.	r	.
Polysiphonia opaca (C. Ag.) Morr. et De Not.	.	x	.	.	.	cc	x	.	.	.	.	.	.	.	.	.	.	c	x	.	.	cc	x	.	.	c	x	.	.	.	x	.
Polysiphonia sertularioides (Grat.) J. Ag.	.	.	.	.	.	cc	.	.	.	c	.	.	.	.	.	.	.	cc	.	.	.	x	.	.	.	c	x	.	.	x	.	.
Polysiphonia sp.	.	.	x	x	.	.	x	x	.	.	x	cc	.	.	.	.	.	x	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Rytiphlaea tinctoria (Clem.) C. Ag.	.	.	.	.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	.	.	.	.	.	.	.	.	x	x
Vidalia volubilis (L.) J. Ag.	.	.	.	.	.	.	r	r	.	.	x	x	.	.	x	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	x

Table A1. Continued

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
PHAEOPHYTA																																
Ectocarpus confervoides (Roth) Le Jolis	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	.	.	.	c	.	.	.	.	x	.
Colpomenia sinuosa (Mert.) Derb. et Sol.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	r	r	.	.	.	.	.
Sphacelaria cirrosa (Roth) C. Ag.	.	x	cc	c	.	x	c	.	.	cc	cc	c	.	x	cc	.	.	x	c	.	.	c	cc	.	.	x	c	.	.	.	c	.
Halopteris filicina (Gratel.) Kütz.	.	.	x	x	.	.	.	.	.	.	r	c	.	.	x	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	x	x
Strypocaulon scoparium (L.) Kütz.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	x	.
Zanardinia prototypus Nardo	.	.	r	.	.	.	x	r	.	.	x	.	.	.	x	.	.	x	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Dictyopteris membranacea (Stackh.) Batt.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	x	.
Dictyota dichotoma (Huds.) Lamour.	.	x	x	.	.	x	x	x	.	.	x	x	.	x	x	.	.	x	x	.	.	x	x	.	.	x	c	.	.	.	x	.
Dictyota linearis (C. Ag.) Grev.	.	.	c	x	.	.	x	.	.	c	c	x	.	.	c	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Dilophus fasciola (Roth) Howe	.	x	.	.	.	.	x	.	.	x	c	.	.	c	c	.	.	.	x	.	.	x	c	.	.	x	x	.	.	.	x	.
Padina pavonica (L.) Thivy	.	.	x	.	.	x	x	.	.	x	c	.	.	.	c	.	.	x	x	.	.	r	x	.	.	x	x	.	.	.	x	.
Fucus virsoides J. Ag.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Castagnea mediterranea (Kütz.) Hauck	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Stilophora rhizodes (Turn.) J. Ag.	.	.	r	.	.	.	c	x	.	.	x	.	.	.	c	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Nereia filiformis (J. Ag.) Zanard.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.
Cystoseria adriatica Sauv.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Cystoseria barbata (Good. et Woodw.) J. Ag.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	c	.	.	x	c	.	.	.	.	.	.	.	.	.	.	.	.	.
Cystoseria compressa (Esp.) Gerl. et Nizam.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	x	.	.	.	.	.	.
Cystoseria compressa ssp. *rosetta* Erceg.	.	.	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	r	.	.	.	x	.
Cystoseria corniculata ssp. *laxior* Erceg.	.	.	.	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Cystoseria ercegovicii Giacc.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	x	r	.	.	.	.	.
Cystoseria stricta var. *spicata* (Erceg.) Giacc.	.	.	x	.	.	.	x	.	.	c	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	x	.	.	.	x	.
Sargassum vulgare C. Ag.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	x	.
Sargassum salicifolium J. Ag.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
CHLOROPHYTA																																
Palmophyllum crassum (Nacc.) Rabenh.	.	.	.	x	.	.	r	x	.	.	.	x	.	.	.	.	.	.	x	.	.	.	x	r	.	.	.	.	.	.	x	x
Chaetomorpha aered (Dillw.) Kütz.	.	.	x	.	.	x	.	.	.	.	x	.	.	.	x	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.
Chaetomorpha capillaris var. *crispa* (Schousb.) Feldm.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	x	.	.	.	c	.	.	.	.	.	.

Table A1. Continued

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Cladophora coelothrix Kütz.	.	c	cc	.	.	x	x	.	.	.	c	.	.	.	c	.	.	x	x	.	.	x	x	.	.	c	x	.	.	.	x	.
Cladophora dalmatica Kütz.	.	x	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	c	.	.	.	x	x	.	.	x	x	.	.	.	x	.
Cladophora pellucida (Huds.) Kütz.	.	c	x	r	.	x	x	r	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	x	x	.
Cladophora prolifera (Roth) Kütz.	.	.	.	.	.	.	x	r	.	.	x	.	.	.	x	.	.	x	x	.	.	.	x	.	.	.	.	.	.	x	.	.
Cladophora sp.	.	.	x	.	.	c	x	x	.	c	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	.	.	.	x	x	.
Anadyomene stellata (Wulf.) C. Ag.	.	x	x	.	.	r	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Valonia macrophysa Kütz.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Valonia utricularis (Roth) C. Ag.	.	x	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	x	.
Acetabularia acetabulum (L.) Silva	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	.	.	.	.	x	.
Dasycladus vermicularis (Scop.) Krassar	.	.	.	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Halimeda tuna (Ell. et Sol.) Lamour.	.	x	cc	.	.	x	x	x	.	x	x	c	.	x	x	.	.	x	c	.	.	x	cc	.	.	x	x	.	.	.	x	.
Pseudochlorodesmis furcellata (Zan.) Börg.	.	c	cc	x	.	c	c	c	.	.	c	c	.	.	c	.	.	x	c	.	.	c	cc	r	.	x	x	.	.	.	c	x
Udotea petiolata (Turra) Börg.	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	.	.	x	x	.	.	.	c	x	.	c	c	.	.	.	x	x
Bryopsis duplex De Notaris	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	.	.	r	x	.	.	x	x	.	.	.	.	.
Codium adhaerens (Cabrera) C. Ag.	.	r	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	.	c	.	.	.	.	.	.	.	x	.
Codium bursa (L.) C. Ag.	.	.	r	.	.	.	r	.	.	.	x	x	.	.	x	.	.	.	x	.	.	x	x	r	.	.	.	.	.	.	x	x
SPERMATOPHYTA																																
Cymodocea nodosa (Ucria) Asch.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Posidonia oceanica (L.) Del.	.	.	.	.	.	.	c	x	.	.	c	.	.	.	cc	.	.	.	cc	.	.	.	.	.	.	.	.	.	.	.	cc	.

Table A2. List of benthic fauna and its relative abundance at individual bionomic steps (S – supralittoral, **M** – mediolittoral, **I** – infralittoral, **C** – cirkalittoral) of sampling stations (P_1–P_8) of the Kornati Archipelago

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	PURARA I. S – cliff				PURARA I. W				K. ŽAKAN I. S				R. ŽAKAN I. S				KORNAT I. NI				MANA I. S – cliff				MANA I. S				PLEŠĆINA I. W			
	S	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**	**S**	**M**	**I**	**C**
RHIZOPODA																																
Miniacina miniacea (L.)	.	.	x	cc	.	r	r	cc	.	r	cc	cc	.	.	r	.	.	r	r	.	.	.	x	cc	.	.	.	.	.	.	x	c
PORIFERA																																
Clathrina coriacea (Mont.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.
Sycon raphanus (Schmidt)	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Leuconia aspera (Schmidt)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.
Geodia cydonium (Jameson)	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	x	.	.	.	.	.	.	.	.
Geodia conchilega Schmidt	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Penares helleri (Schmidt)	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Chondrilla nucula Schmidt	.	.	x	r	.	.	c	.	.	.	x	.	.	.	c	.	.	.	c	.	.	.	c	.	.	.	c	.	.	.	c	.
Chondrosia reniformis Nardo	.	.	x	x	.	.	.	.	.	.	.	x	.	.	x	.	.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.
Plakortis simplex Schuzle	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Tehtya aurantium (Pallas)	.	.	.	x	.	.	x	x	.	.	x	x	.	.	.	.	.	.	x	.	.	.	.	x	.	.	.	.	.	.	.	.
Spirastrella cunctatrix Schmidt	.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Timea unistellata (Topsent)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Suberites domuncula (Olivi)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Suberites carnosus (Johnston)	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Cliona viridis (Schmidt)	.	.	.	c	.	.	.	.	.	.	cc	c	.	.	.	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	.	.
Cliona celata Grant	.	.	c	.	.	.	c	.	.	.	.	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	c	.
Cliona schmidti (Ridley)	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	.	.
Axinella cannabina (Esper)	.	.	x	x	.	.	.	.	.	.	c	c	.	.	.	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	.	cc
Axinella polypoides Schmidt	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.
Axinella verrucosa (Esper)	.	.	.	x	.	.	.	.	.	.	x	c	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	x
Axinella damicornis (Esper)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	r	.	.	.	.	.	.	.	.
Acanthella acuta Schmidt	.	.	.	x	.	.	.	.	.	.	.	cc	.	.	.	.	.	.	x	.	.	.	c	c	.	.	.	.	.	.	.	.
Raspaciona aculeata Topsent	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	x	.

Table A2. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Hemimycale columella (Bowerb.)	.	.	x	.	.	.	.	.	.	.	x	c	.	.	.	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.
Hymeniacidon sanguinea (Grant)	.	r	x	.	.	r	c	.	.	.	.	.	.	.	.	.	.	r	r	.	.	.	.	.	.	.	c	.	.	.	r	.
Halichondria panicea (Pallas)	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Mycale massa (Schmidt)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	r	.	.	.	.	.	.	.	.
Mycale tunicata (Schmidt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	r	.	.	.	.	.	.	.	.
Crambe crambe (Thiele)	.	.	x	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	x	.
Myxilla rosacea (Lieberk.)	.	.	x	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.
Anchinoe tenacior Topsent	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Clathria coralloides (Olivi)	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Agelas oroides (Schmidt)	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.
Calyx nicaeensis (Risso)	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Petrosia ficiformis Poiret	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	x	.	.	x	.	.	.	x	.
Haliclona rosea (Bowerb.)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Spongia officinalis L.	.	.	x	r	.	.	x	r	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	r	.	.	x	.	.	.	x	x
Hypospongia communis (Lam.)	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	x	.	.	.	x	.
Cacospongia scalaris Schmidt	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Ircinia dendroides (Schmidt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Ircinia fasiculata (Pallas)	.	.	r	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	x	.
Ircinia muscarum (Schmidt)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.
Ircinia oros (Schmidt)	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Ircinia variablis Sarà	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	x	.	.	.	x	.
Verongia aerophoba (Schmidt)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.	c	.	.	.	x	.
Verongia cavernicola Vacelet	.	.	.	x	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.
CNIDARIA																																
Eudendrium rameum Pallas	.	.	.	.	.	.	c	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Sertularella sp.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Plumularia setacea (L.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	x	.
Aglaophenia pluma (L.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Antipathes subpinnata (Ell. et Sol.)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Table A2. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Alcyonium palmatum Pallas	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.
Cerianthus membranaceus (Spall.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Parazoanthus axinellae (O. Schm.)	.	.	c	c	.	.	.	.	.	.	cc	cc	.	.	.	.	.	.	c	.	.	.	cc	cc	.	.	.	.	.	.	c	cc
Gerardia savaglia (Bert.)	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Actinia equina (L.)	.	.	.	.	.	c	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.
Actinia cari Delle Chiaje	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	.	.
Bunodactis verrucosa (Penn.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Anemonia sulcata (Penn.)	.	.	.	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	c	.	.	.	.	.
Calliactis parasitica (Couch)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Caryophyllia sp.	.	.	x	r	.	.	x	r	.	.	r	.	.	.	r	.	.	.	r	.	.	.	x	x	.	.	r	.	.	.	x	.
Balanophyllia italica Michelin	.	.	x	x	.	.	c	.	.	.	x	x	.	.	c	.	.	.	c	.	.	.	x	.	.	.	c	.	.	.	x	.
Leptosammia pruvoti Lac. Duth.	.	.	c	c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	c	.	.	.	.	.	.	.	.
Cladocora cespitosa (L.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	r	.	.	.	.	.	.	.	.	.	.	x	.
Parerythropodium coralloides (Pallas)	.	.	c	c	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	x	.	.	c	c	.	.	.	.	.	.	.	.
Eunicella cavolinii (Koch)	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Eunicella stricta (Bert.)	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.
Paramuricea chameleon (Koch)	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	c	.	.	.	.	.	.	.	.
ANNELIDA																																
Palola sicilensis (Grube)	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.
Eunice harassii Aud. et Milne Edw.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Ditrupa arietina (O. F. Müller)	.	.	.	.	.	.	x	c	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Sternaspis scutata (Reiner)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.
Polycirrus aurantiacus Grube	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Serpula vermicularis L.	.	.	c	r	.	.	c	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	x	.	.	x	.	.	.	x	.
Pomatoceros triqueter (L.)	.	.	r	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	r	.	.	.	r	.
Vermiliopsis infundibulum (L.)	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.
Spirorbis pagenstecheri Quatref	.	.	r	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	x
Protula tubularia (Mont.)	.	.	c	r	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	.	x	.
Sabella pavonina Sav.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Spirographis spallanzani Viviani	.	.	.	.	.	.	.	.	.	.	x	x	.	.	x	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.

Table A2. Continued

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
ARTHROPODA																																
Chthamalus stellatus (Poli)	r	r	.	.	c	c	.	.	c	c	.	.	x	x	.	.	c	c	.	.	r	r	.	.	x	cc	.	.	c	c	.	.
Cthhamalus depressus (Poli)	x	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.
Balanus perforatus Brug.	.	.	.	.	.	.	c	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.
Scyllarus arctus (L.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Homarus gammarus (L.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Paguristes eremita (L.)	.	.	.	x	.	.	.	.	.	.	.	x	.	.	r	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.
Dardanus arrosor (Herbst)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Pagurus prideaux Leach	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Galathea strigosa (L.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Porcelana platycheles (Penn.)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.
Porcelana longicornis (Penn.)	.	.	.	.	.	.	c	.	.	.	c	.	.	.	c	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.
Ethusa mascarone (Herbst)	.	.	.	r	.	.	.	.	.	.	x	r	.	.	.	.	.	.	x	.	.	.	.	r	.	.	.	.	.	.	.	.
Ilia nucleus (Herbst)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Macropodia longirostris (Fabr.)	.	.	.	x	.	.	x	r	.	.	x	.	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	.	.	.	x	.
Inachus dorsettensis (Penn.)	.	.	.	x	.	.	x	.	.	.	x	r	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.
Pisa nodipes Leach	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	x	.
Lisa chiragra (Herbst)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Maja squinado (Herbst)	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Maja crispata Risso	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Lambrus angulifrons (Latr.)	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Parthenope massena (Roux)	.	.	.	r	.	.	r	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Pilumnus sp.	.	.	x	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Xantho poressa (Olivi)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Eriphia verrucosa (Forskal)	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Pachygrapsus marmoratus (Fabr.)	.	.	.	.	r	x	r	.	.	x	r	.	.	r	r	.	.	x	r	.	.	.	.	.	.	x	r	.	r	x	r	.
Ligia italica Fabr.	.	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.
MOLLUSCA																																
Middendorffia caprearum (Scacchi)	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	.	.	r	.	.
Chiton corallinus Risso	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.

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Table A2. Continued

	P_1				P_2				P_3				P_4				P_5				P_6				P_7				P_8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Chiton olivaceus Spengler	.	.	r	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	r	.	.	.	r	.	.	.	x	.	.	.	x	.
Haliotis lamellosa Lam.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	x	.
Diodora graeca (L.)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	x	.
Diodora italica (Defrance)	.	.	.	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	x	.
Emarginula elongata O. G. Costa	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	r	.
Patella aspera (Philippi)	.	c	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	c	.	.	.	x	.	.
Patella lusitanica Gmelin	x	x	.	.	x	x	.	.	x	c	.	.	x	x	.	.	x	x	.	.	x	x	.	.	x	c	.	.	x	x	.	.
Patella coerulea L.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.
Calliostoma zizyphinus (L.)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	r	.
Calliostoma conulus (L.)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Gibbula divaricata (L.)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	c	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	r	.
Gibulla varia (L.)	.	.	.	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.
Monodonta turbinata (Born.)	.	r	r	.	x	c	x	.	.	x	r	.	.	x	x	.	.	x	r	.	.	r	.	.	.	c	x	.	x	x	x	.
Jujubinus exasperatus (Penn.)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.
Clanculus corallinus (Gmelin)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Astraea rugosa (L.)	.	.	r	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	r	r	.	.	.	.	.	.	.	r
Littoriona neritoides (L.)	x	.	.	.	c	.	.	.	cc	.	.	.	c	.	.	.	c	.	.	.	x	.	.	.	c	x	.	.	c	.	.	.
Rissoa variabilis (V. Mühlfeld)	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Turritella triplicata (Brocchi)	.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Vermetus triqueter Bivone	.	.	.	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	r	.
Bittium reticulatum Da Costa	.	.	cc	.	.	.	cc	.	.	.	cc	.	.	.	x	.	.	.	c	.	.	.	cc	.	.	.	cc	.	.	.	x	.
Gourmya vulgata (Brug.)	.	.	.	.	.	.	r	.	.	.	c	.	.	.	x	.	.	.	c	.	.	.	.	.	.	.	x	.	.	.	x	.
Murex brandaris L.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Trunculariopsis trunculus (L.)	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Muricopsis cristatus (Brocchi)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Tritonalia aciculata (Lam.)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Pisania maculosa (Lam.)	.	.	.	.	.	r	x	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.	.	x	x	.	.	.	r	.
Cantharus d' orbigny (Payraudeau)	.	r	c	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Hinia incrassata (Ström.)	.	.	.	.	.	.	r	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	r	.
Columbella rustica (L.)	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	x	.

Table A2. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Pusia tricolor (Gmelin)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Mitra cornicula (L.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Raphitoma reticulata (Renier)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Conus mediterraneus (Lam.)	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	x	.
Umbraculum mediterraneus (Lam.)	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Hypselodoris elegans (Cantraine)	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Peltodoris atromaculata Bergh.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.
Antalis inaequicostatum (Dautzenb.)	.	.	.	.	.	.	r	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Brachyodontes minimus (Poli)	.	.	c	.	.	x	c	.	.	.	c	.	.	.	.	.	.	x	c	.	.	.	c	.	.	.	c	.	.	x	x	.
Lithophaga litophaga (L.)	.	.	x	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	x	.
Mytilus galloprovincialis Lam.	.	c	c	.	.	c	c	.	.	x	x	.	.	.	x	.	.	x	x	.	.	x	x	.	.	x	c	.	.	x	x	.
Arca noae L.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	c	.	.	.	x	.
Striarca lactea (L.)	.	.	.	x	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Pteria hirundo (L.)	.	.	r	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Pinna nobilis L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Chlamys varia (L.)	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	x	.
Spondylus gaederopus L.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Lima lima (L.)	.	.	r	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	x	.	.	.	.	r	.	.	.	.	.	.	.	.
Mantellum inflatum (Chemnitz)	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Anomia ephippium (L.)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	.	.
Ostrea edulis L.	.	.	c	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Chama gryphoides L.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.
Pseudochama gryphina (Lam.)	.	.	x	.	.	.	r	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	x	.
Venus verrucosa L.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Hiatella arctica (L.)	.	.	x	x	.	.	x	.	.	.	x	.	.	.	.	r	.	.	x	x	.	.	.	x	.	.	.	.	.	.	x	.
Rocellaria dubia (Penn.)	.	x	c	.	.	x	c	.	.	x	c	c	.	.	x	.	.	.	c	.	.	.	c	x	.	.	x	.	.	x	cc	.
TENTACULATA																																
Scrupocellaria reptans (L.)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	x	.
Flustra securifrons Pallas	.	.	cc	cc	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	c	c	.	.	.	.	.	.	.	.
Mollia patellaria (Moll.)	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.

Table A2. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Cellaria fistulosa L.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	.
Retepora sp.	.	.	x	x	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	.	.	x	c	.	.	.	.	.	.	.	.
Myriapora truncata (Pallas)	.	.	r	r	.	.	x	x	.	.	c	c	.	.	r	.	.	.	x	.	.	.	cc	cc	.	.	.	.	.	.	x	x
Schizoporella sanguinea Norman	.	.	x	c	.	.	x	x	.	.	x	c	.	.	x	.	.	.	x	c	.	.	x	c	.	.	.	.	.	.	c	.
Porella cervicornis Pallas	.	.	r	x	.	.	x	x	.	.	c	c	.	.	.	.	.	.	x	x	.	.	c	c	.	.	.	.	.	.	x	.
Hippodiplosia foliacea Ell. et Sol.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	r	.
Crisia eburnea (L.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Tubulipora flabellaris Fabr.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Lichenophora radiata Aud.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Frondiphora verrucosa (Lamouroux)	.	.	.	x	.	.	x	x	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	x	.
Argyrotheca cistellula Wood.	.	.	x	c	.	.	.	x	.	.	x	c	.	.	.	r	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	x
ECHINODERMATA																																
Antedon mediterranea (Lamm.)	.	.	.	.	.	.	.	.	.	.	c	c	.	.	c	.	.	.	c	.	.	.	.	.	.	.	.	.	.	.	.	.
Holothuria tubulosa Gmelin	.	.	.	.	.	.	x	x	.	.	x	x	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Holothuria forskali Delle Chiaje	.	.	.	.	.	.	.	r	.	.	r	r	.	.	x	x	.	.	x	x	.	.	r	.	.	.	.	.	.	.	.	x
Holothuria polii Delle Chiaje	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Stichopus regalis Cuv.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x
Trachythyone tergestina (M. Sars)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.
Arbacia lixula (L.)	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.
Sphaerechinus granularis Lam.	.	.	.	.	.	.	x	.	.	.	c	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	.	.	.	.	r	.
Psammechinus microtuberculatus (Blainv.)	.	.	.	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	c	.	.	.	x	.
Paracentrotus livadus Lam.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.
Echinocyamus pusillus (O. F. Müller)	.	.	.	x	.	.	.	x	.	.	.	x	.	.	x	r	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.
Spatangus purpureus O. F. Müller	.	.	.	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Marthasterias glacialis (L.)	.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	r	.	.	.	r	.	.	.	x	.	.	.	x	.
Coscinasterais tenuispina (Lam.)	.	.	x	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	x	.	.	.	r	r	.	.	x	.	.	.	r	.
Echinaster sepositus Gray	.	.	x	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.
Anseropoda placenta (Linck)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.
Asterina gibbosa (Penn.)	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.
Hacelia attenuata Gray	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.

Table A2. Continued

	P1				P2				P3				P4				P5				P6				P7				P8			
	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C	S	M	I	C
Astropecten irregularis (Linck)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.
Ophiothrix fragilis (Abild)	.	.	.	c	.	.	x	x	.	.	c	c	.	.	.	.	.	.	c	.	.	.	x	x	.	.	.	.	.	.	x	x
Ophioderma longicauda Linck	.	.	.	.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Ophiura ophiura (L.)	.	.	.	r	.	.	x	r	.	.	x	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
TUNICATA																																
Distoma adriaticum Drasche	.	.	.	.	.	.	.	.	.	.	x	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
Distaplia rosea Della Valle	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Aplidium conicum Olivi	.	.	.	r	.	.	.	.	.	.	x	x	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.
Aplidium proliferum (Milne Edw.)	.	.	x	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Didemnum maculosum (Milne Edw.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Ascida mentula (Müller)	.	.	.	r	.	.	x	.	.	.	.	r	.	.	r	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.
Ascida virginea (Müller)	.	.	.	x	.	.	r	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.
Phallusia mammilata (Cuvier)	.	.	.	r	.	.	.	r	.	.	.	x	.	.	.	r	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	r
Phallusia fumigata Grube	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Polycarpa pomaria (Savigny)	.	.	x	.	.	.	r	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	r	.
Distomus variolosus Gaertner	.	.	.	.	.	.	x	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.
Botryllus schlosseri (Pallas)	.	.	.	.	.	.	x	r	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.
Brtrylloides leachi (Savigny)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.
Halocynthia papillosa L.	.	.	x	x	.	.	r	.	.	.	x	x	.	.	r	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	x	.
Microcosmus claudicans (Savigny)	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	r	.	.	.	.	.	.	.	.	.	.	.	.	.
Microcosmus sulcatus Coquebert	.	.	x	.	.	.	r	r	.	.	x	.	.	.	r	.	.	.	x	.	.	.	x	x	.	.	.	.	.	.	x	r
VERTEBRATA																																
Blennius galerita L.	.	x	.	.	.	x	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	x	.	.	r	.	.
Blennius nigriceps Vinc.	.	.	r	.	.	.	x	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.
Blennius sanguinolentus Pall.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.	.	.	x	.	.	.	.	.
Chromis chromis (L.)	.	.	.	.	.	.	x	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	x	.	.	.	.	.