Similarity of littoral biocoenoses in the National Park "Kornati"

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The results of a long-term (1979-1981) study on macrozoobenthos structure in the littoral biocoenoses of the Kornati Archipelago are presented. Qualitative similarity of different study localities was expressed with the similarity index (QS) using modified SORENSEN statistical method (GAMULIN-BRIDA, 1960). The method is based on the common animal species, where

$$QS = \frac{2c}{a+b} \times 100$$, a the number of species at A locality, b at B locality,

c the number of species common to compared localities A and B.

The study was performed at eight (P1-P8) ecologically different localities (Fig. 1) and concerned macrozoobenthic forms only at different bionomic levels (supralittoral, mediolittoral, infralittoral and a part of circalittoral down to 100 m depth). The zoological material was collected by direct observations and material collection from a square surface of 1/16 square metres down to 50 m by SCUBA divers and by the indirect method using grab, dredge and trawls at depths from 50 to 100 m.

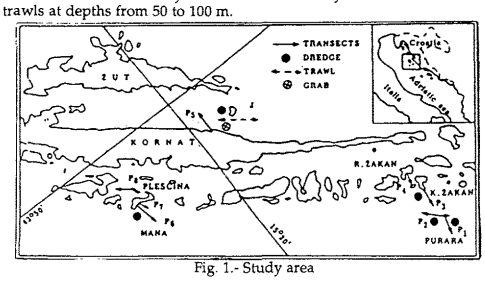

Fig. 1.- Study area

Bottom type and habitat slope, as well as the level of exposure to the waves and marine currents and local illumination are basic factors affecting the distribution of benthic organisms.

Southerly exposed coasts of the outer series of Kornati Islands (Islands Purara P1 and Mana P6) are characterized by vertical cliffs descending down to 50 m under the sea, with a plain with soft bottom formed below it. Soft bottoms occur as small sandy surfaces at 1 m depth already on other slope and rocky coasts of mentioned islands as well as on the coasts of more protected islands. Southern coasts of outer islands are also exposed to stronger illumination and stronger wave effects. All these factors caused benthic fauna to differ in structure and composition between studied localities, which is expressed by the similarity index in this paper (QS) (Fig. 2).

	P1	P6	P3	P5	P2	P8	P4	P7
P1		■	⁄	⁄	⁄	⁄	●	●
P6	81		⁄	⁄	⁄	⁄	●	●
P3	65	69		⁄	⁄	⁄	⁄	⁄
P5	62	59	74		⁄	⁄	⁄	⁄
P2	60	59	72	70		■	⁄	⁄
P8	60	59	68	66	82		⁄	⁄
P4	48	46	64	63	70	62		⁄
P7	46	39	54	58	54	50	56	

■ 75 - 100 %
⁄ 50 - 74 %
● 25 - 49 %
○ 0 - 24 %

Fig. 2. A comparison of similarity indexes (QS) between the studied localities on the basis of common animal species

The obtained values show greatest similarity in animal structure (QS = 82) between benthic populations from the western coast of Purara Island (P2) and western coast of Plescina Island (P8), as well as between the benthic populations on the southern shores of Purara (P1) and Mana (P6) islands owing to their great similarity in biotopes and spatial orientation.

The lowest similarity was recorded between the benthic populations on the southern vertical coast of outer islands Purara (P1) and Mana (P6) and those on the slope and shallow shores of Mana (P7) and Ravni Zakan (P4) islands, which differ ecologically, as well (QS P6 - P7 = 39, QS P1 - P7 = 46, QS P6-P4 = 46, QS P1 - P4 = 49).

Relatively low similarity in animal structure of benthic populations (QS = 56) was recorded from the Islands Ravni Zakan (P4) and Mana (P7). No greater similarity was due to the fact that both biotopes occur on slight slopes and in shallow water, spatially differently situated. The former is situated in the sheltered and the latter in the unsheltered part of Kornati Islands.

Similarity of animal structure between the rest of study localities expressed as the similarity index (QS) of 50 to 70 points to the fact that they are intermediate between vertical, exposed and deep localities and slightly sloping, protected and shallow localities.

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An account on bivalves populations in the Northern Adriatic Sea

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In the northern Adriatic Sea bivalve species important in bottom communities, are occasionally under stressed environmental conditions (DEGOBBIS *et al.*, 1991), sometimes associated with mass mortalities such as those registered in 1974, 1983, 1988, and 1989 (JAKLIN & ZAHTILA, 1990; STACHOWITSCH, 1991).

From 1978 to 1991 bivalves were collected by dredges, grabs, and Scuba divers. In total 65 bivalve species were identified which number varied between 1 and 24 per station and per sample. The species numbers increased towards the west coast of the Istrian peninsula, and at stations located along the western coast of Istria, in comparison to stations located along the Italian coast (Fig. 1). Occasionaly, the highest species numbers, at stations 101 and 107, indicated probably an optimum species numbers in the bottom community, like in 1985 (Aug.), 1986 (Dec.), 1989 (Aug.), and 1990 (Nov.) (Fig. 2). The bivalve species composition was almost the same in these findings.

The species decrease especially in spring at stations 101 in May, June and July (1978, 1983, 1987, and 1988) could be attributed to the increased Po River discharge causing changes of some marine environmental factors. Late summer and early autumn species decreases were related to anoxic or/and hypoxic conditions in the bottom layers, after phytoplankton "blooms". The evidences sre clear at station 107 in 1979 (Dec.), 1984 (Dec.), 1988 (Oct.), and at 101 and 107 in 1989 (Dec.) (Fig. 2). The result of decreased oxygen content near the bottom, in autumn 1977, was observed in a sample from March 1978 with a few specimens of *Corbula gibba* and *Myrtea spinifera*. Several species with a wide ecological distribution such as *Corbula gibba, Myrtea spinifera, Nucula nitida, Pitar rude,* and some others like *Cultrensis adriaticus, Thyasira flexuosa,* and *Mysia undata* survived the critical periods depending on the degree of dissolved oxygen concentration in a particular sampling area. The recovery of bivalve populations begins in spring when most of the bivalve species start to reproduce. Such recovery is conspicous at station 107 from December 1989 (4 species) to November 1990 (20) with a decrease in April 1990 (13) (Fig. 2).

In conclusion, the recovery of bivalve populations was quite successful and rapid with almost all species noted previously in this area in the "normal" years. But the question is for how long, and how many such disastres will have to suffer some sensitive species before they completly disapper from the northern Adriatic Sea

Figure 1. The highest species numbers at various research stations from 1978 to 1990.

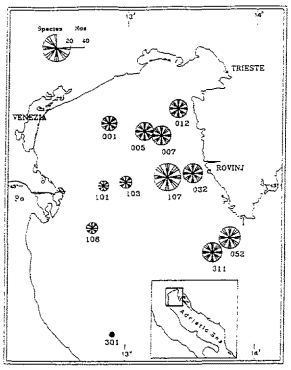
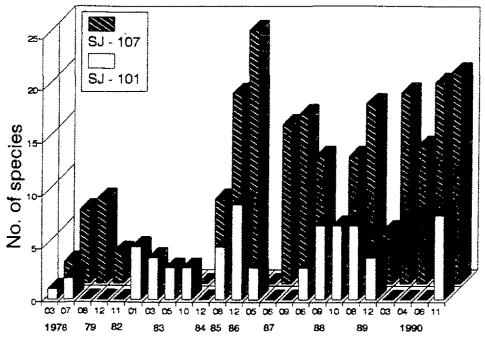


Figure 2. Bivalve species numbers at two stations surveyed.



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