Study of the effects of Makarska Port (Middle Adriatic) on the changes in benthic algal settlements

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A study of the zero state of benthic algal settlements in the wider area of Makarska Port were carried out in 1991 to provide the basis for forecast of possible effects of intended building of marina in this port.

The study was performed on a total of seven transects, three laid out in the port (zones B and C) and four out of it (zone A) on hard and sediment supralittoral, mediolittoral, infralittoral and partly circalittoral bottoms and a rather large number of additional stations in all the zones of study area (Fig. 1). Direct SCUBA diving method and indirect dredging method on 20-60 m depths were applied.

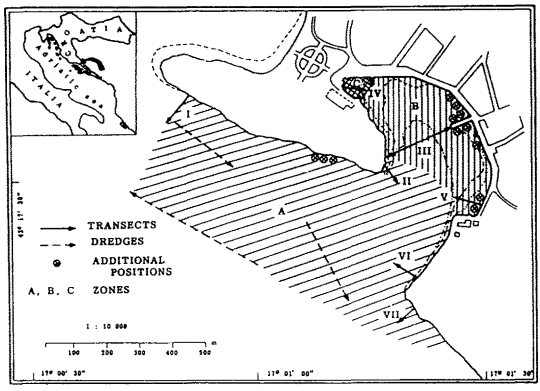

Fig. 1. Study area

A total of 269 taxa of benthic algae were determined: 172 or 63.9% Rhodophyta, 46 or 17.1% Phaeophyta and 51 or 19.0% Chlorophyta (Table 1). Obtained inventory is relatively rich but not typical for clean Middle Adriatic coastal waters. Their qualitative composition and structure resemble those of the settlements in the port areas and adjacent to them, where the numbers and percentages of Chlorophyta exceed those of Phaeophyta. Some earlier studies in different preserved Eastern Adriatic areas regularly reported prevalence of the numbers and percentages of Phaeophyta over those of Chlorophyta.

Of the total of 269 determined taxa, 252 were distributed out of the port (zone A) whereas the number of determined taxa was 130 in the zones B and C, not exceeding 48 taxa in zone C (Table 1). Settlements wherefrom 102 taxa of benthic algae were determined, were formed between 20 and 60 m on detritic-sandy bottoms of the zone A. This is indicative of the fact that they were not exposed to the pollution of the port waters. Marine phanerogams are almost completely absent from the study area; a poor settlement of *Posidonia oceanica* was recorded from 15 m depth at transect V.

Comparing the data on species composition and structure of benthic algal settlements in the Makarska area to those in the Split area (SPAN and ANTOLIC, unpublished results) showed far smaller number of taxa in the latter area (169), 163 in zone A and 48 in zones B and C, and only 25 in zone C (Table 1), even though it is much larger and better seasonally studied area. Presented data show that changes in the benthic algal settlements have the same trend in both study areas, but that their extent and intensity are not so pronounced in Makarska.

To conclude, even though the pollution level in the Makarska port area is lower than in the Split port area its extent caused the regression of benthic algal settlements so that present situation calls for their protection and healing.

Table 1. Numbers (N) and percentages (%) of benthic algae taxa in the wider area of Makarska and Split ports (zones:A - out of the port; B - inside the port; C - special transect in the western most part of the port) and throughout the study area (T)

Z O N E S:	A		B		C		T	
	N	%	N	%	N	%	N	%
Makarska port								
RHODOPHYTA	164	65.1	83	63.8	27	56.3	172	63.9
PHAEOPHYTA	41	16.3	20	15.4	7	14.6	46	17.1
CHLOROPHYTA	47	18.6	27	20.8	14	29.1	51	19.0
TOTAL	252		130		48		269	
Split port								
RHODOPHYTA	91	55.8	23	51.1	9	36.0	97	57.4
PHAEOPHYTA	35	21.5	9	20.0	1	4.0	35	20.7
CHLOROPHYTA	37	22.7	13	28.9	15	60.0	37	21.9
TOTAL	163		45		25		169	