

**GUT CONTENTS OF THE SEA-URCHIN
PARACENTROTUS LIVIDUS IN AN IONIAN EMBAYMENT
(AMVRAKIKOS GULF - GREECE)**

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There is increasing interest, during last decades, in the study of sea-urchin *Paracentrotus lividus* feeding habits, as the species is one of the most important elements of the hard bottom benthos, often determining the dynamics of marine phyto-benthic communities. In the present study *P. lividus* gut contents from two stations of the Amvrakikos Gulf area were examined over three seasonal samplings (4/91, 7/91, 1/92). The two stations were as follows:

- a) Station A, located in the Amvrakikos Gulf, a semi-enclosed eutrophic area characterized by an overpopulation of small body-size sea urchins and by lack of macrophyto-benthic biomass due to overgrazing (PANCUCCI & PANAYOTIDIS, 1994).
- b) Station I, in the Ionian Sea close to the entrance of the Gulf, characterized by oligotrophic conditions (PANAYOTIDIS *et al.*, 1994).

The aim of the study was:

- 1) to give an estimation of relative abundances of plants, animals and detritus in gut contents,
- 2) to give a profile of flora and fauna of the examined area as it is reflected in gut content analysis.

Gut content analysis was performed by the method of "Contacts" proposed by JONES (1968) and further developed by NEDELEC (1982).

The results were based on the analyses of 12,000 contacts originated from 60 individual specimens. The analyses concerned four main groups of organisms present: Rhodophyceae, Phaeophyceae, Chlorophyceae and marine Angiosperms. A number of other groups are also reported (blue-green algae, diatoms, dinoflagellates, ciliates, foraminiferans, hydrozoa, sponges, bryozoa and crustaceans).

The two stations appear to be statistically different mainly due to great variations between vegetal and detritus abundances, especially between those of January in St. A and April in St. I. The low vegetal values in the sampling of January are reflecting the unfavorable period for marine vegetation in the study area. The following table resumes the main results.

Stations	St. A			St. I		
	4/91	7/91	1/92	4/91	7/91	1/92
Plants	43.5	34.1	21.6	78.9	65.5	50.6
Animals	1.0	2.8	2.5	5.6	4.0	6.9
Detritus	55.5	63.1	75.9	15.5	30.5	42.5

Thus, *P. lividus* populations living in the Amvrakikos Gulf seem to be adapted to eutrophication conditions, by a detritophagous feeding habit. The hypothesis of changes in the feeding habits could also explain the small body size of the sea urchins, observed in the Amvrakikos Gulf (PANCUCCI *et al.*, 1993).

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**RECENT OBSERVATIONS ON THE MACROFOULING ON
OFFSHORE PLATFORMS AT RAVENNA**

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Off the coast at Ravenna there are various gas-drilling platforms positioned at varying distances from the coast and at varying depths. In 1975-76, the macrofouling on two platforms (PCWA and AGO-A) was studied using samples taken from the platform piles and especially by immersing panels in order to determine the settlement patterns of its main components (RELINI *et al.*, 1976).

This paper describes the results obtained using samples taken in 1993 (contract between Univ. Genova and CEOM Palermo) from the PCWA and ANTARES platforms positioned, respectively, at 7 and 10.5 km from the shore and on bottoms at 12 m and 14 m. For each platform a pile was chosen as representative of the macrofouling present on the whole platform. In March and September 1993 samples were obtained by scraping an area of 600 cm² using three or four different exposures at the same depth. The levels considered were 0.5, 5.5 and 11 m on the PCWA and 0.5, 7 and 12 m on the ANTARES. By means of photographs and video shots the macrofouling over the whole length of the chosen pile and also those nearby was described. The density, weight and size of the organisms, in particular of the mussels, were determined.

A total of 41 taxa were recognized, of which 35 were species. More than 90% of the taxa were common to both platforms. On the PCWA the macrofouling is characterized by a dominance of mussels up to a depth of around 9-10 m. In the midst of the mussels, or as their epibionts, one finds barnacles, other bivalves, serpulids, hydroids and sea-anemones. Non sessile fauna is represented by brittle stars, flat worms, ribbon worms, amphipods and decapods. Near the bottom mussels disappear and oysters dominate, in particular *Crassostrea gigas*, together with sea-anemones and zoanthid *Epizoanthus arenaceus* (Delle Chiaje); the latter cover broad surfaces, at times even higher up, especially when the mussels are eliminated. Also present are: barnacles (*B. trigonus*), hydroids (*Obelia*), serpulids (*Pomatoceros*, *Hydroides*, *Serpula*), which settle both directly on the piles and on other organisms; bryozoans are extremely scarce.

The macrofouling on the ANTARES is very similar both quantitatively and qualitatively speaking. Up to approx. 10-11 m depth mussels dominate accompanied by most of the organisms described in reference to the PCWA. Near the bottom, and only more rarely higher up, one finds large colonies of bryozoan *Schizoporella errata* which contribute to differences in the fouling compared to that found on the PCWA. At this level there are also *Crassostrea gigas*, barnacles, hydroids, serpulids, but *Epizoanthus arenaceus* and sea-anemones are missing.

Using the Kulczynski indices of similarity one finds a greater similarity between the samples obtained at different exposures but at the same depth than between different depths. This last factor (depth) is more discriminative than the seasonal factor. Wet weights show higher values in the samples taken on the surface or at medium depths due to the massive presence of mussels (Table I). There are no large differences in the fouling or mussel weights between the two platforms and the two seasons, even though the highest values were registered in September on the PCWA (- 1 m) with 1558.6 g/dm², out of which 1553 g/dm² were due to mussels. One can draw the conclusion that over a period of 5-6 months it is possible to reach fouling weights of 155 kg/m², which thus exceed the 100 kg found on the one-year panels during the experiment carried out in 1975-76. On the whole there are no substantial differences between the fouling found off Ravenna in 1975-76 and that found in 1993. Thus it is possible to confirm what emerged in 1976: the macrofouling on the platforms off Ravenna is relatively homogeneous, as it is composed of a small number of species, some of which are represented by a large number of individuals, and up to a depth of 9-10 m it is dominated by mussels, which in the space of only a few months reach extremely high values of density and biomass.

depth	1993										1975-76			
	PCWA fouling		PCWA mussels		ANT. fouling		ANT. mussels		PCWA fouling of panels					
	W	S	W	S	W	S	W	S	6 M Oct	9 M Jan	12 M Apr			
0.5 m	Mar	808.3 ± 247.9		791.9 ± 257.9		586.9 ± 220.4	582.7 ± 222.9							
	Sep	1147.2 ± 387.1		1142.2 ± 387.7		639.3 ± 212.4	627.6 ± 205.8							
5.5 m	Mar	358.3 ± 41.7		355.9 ± 42.1						256.2	468.4	883.4		
	Sep	279.4 ± 137.9		274.9 ± 140.7										
7 m	Mar					756.2 ± 75.5	752.6 ± 75.6							
	Sep					138.9 ± 49.9	111.1 ± 52.3							
11 m	Mar	74 ± 19.5		49.7 ± 28.2						36.2	108.8	202.2		
	Sep	45.1 ± 26.9		0.21 ± 0.19										
12 m	Mar					122.3 ± 56.8	10 ± 14.2							
	Sep					118.9 ± 10	30.9 ± 19.4							

Table I: Wet weight of fouling and mussels (g/dm²).

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