Waste influence on Zooplankton Distribution in Valencia Coastal Waters (Spain)

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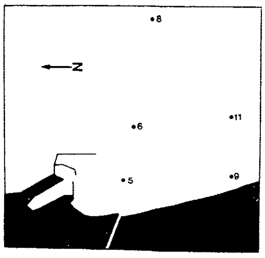

Fig.1.- Localization of sampling points.

The study zone corresponds to the mouth of a waste disposal channel from urban origin, mainly from the city of Valencia (Fig. 1). Twelve sets of samples were collected between May 1989 and January 1990 at six stations of different deep: 9(5m), 5(10m), 6 and 11(20m) and 8(40m). Salinity, dissolved inorganic nitrogen (nitrite, nitrate plus ammonium), dissolved phosphorous, total phosphorous, dissolved silica and chlorophyll *a* have been analized in each sample. The zooplankton studied, corresponds to vertical samples of water column, taken with a net 1m long and 53μm mesh.

st. \ prm.	SAL. (1) $\bar{x}$	SAL. (1) sd	P.S.R. (2) $\bar{x}$	P.S.R. (2) sd	P.T. (2) $\bar{x}$	P.T. (2) sd	N.I.D. (2) $\bar{x}$	N.I.D. (2) sd	SiO_4 (2) $\bar{x}$	SiO_4 (2) sd	Cla (3) $\bar{x}$	Cla (3) sd
5	36.72	1.13	0.27	0.22	1.72	0.66	11.99	22.25	2.02	1.78	11.12	13.42
6	37.14	0.44	0.22	0.28	1.35	0.76	8.47	9.84	1.62	1.48	4.24	3.69
8	37.53	0.30	0.09	0.05	0.74	0.23	3.14	1.79	0.94	0.52	0.86	0.91
9	36.92	0.66	0.31	0.28	1.81	1.17	9.77	6.93	1.85	1.54	8.47	11.61
11	37.27	0.43	0.18	0.09	1.20	0.55	7.08	6.22	1.38	0.89	3.58	5.45

Table 1.- Average values ($\bar{x}$) and standard deviations (sd) of physicochemical parameters at the stations. (1)‰, (2)μ at-gl^{-1}, (3) mg/m^3.

In table 1 the physicochemical data appear in the form of mean values and standard deviation in each one of the stations considered. St. 5 is the one showing the highest influence of waste disposal as it presents a lesser degree of salinity and a greater standard deviation. The contents of nutrients an silica are in general greater, showing a higher productivity in terms of chlorophyll *a*. We must underscore the increase in phosphorous due to the influence of continental waters used for agriculture purposes. Seasonal variability of these parameters as well as those referring to zooplankton composition differs according to the zones due to continental outflow irregularities and littoral dynamic factors.

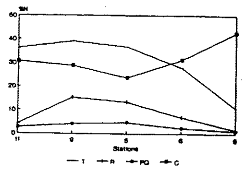

Fig.2 -Distribution of more abundant taxa in samples. T-Tintinnids, R-Rotifers, PQ-Polychaetes, C-Copepods.

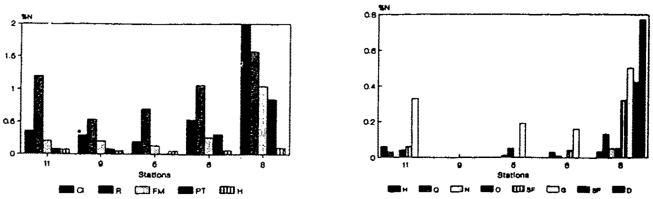

Fig. 3.- Percent abundance of different taxa. Positive gradient in open waters. 3A.- Cl-Cladocerans, R-Radiolarians, FM-Foraminipherans, PT-Pteropods, H-Hydromedusae. 3B.- H-Heliozoans, Q-Chaetognaths, N-Nemerteans, O-Ophiuroids, SF-Siphonophores, G-Gasteropods, SP-Salps, D-Doliolids.

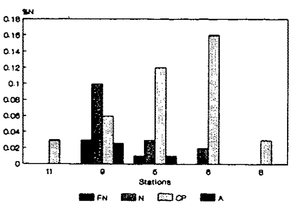

Fig.4.- Percent abundance of different taxa. Negative gradient in open waters. Fn-Phoronids, N-Nematods, Cp-Cirriped larvae, A-Ascidian larvae.

The zooplankton community is described by porcentual values of the commonest taxa. The most abundant taxa were copepods and tintinnids. The distribution of the zooplankton groupings presents a gradient that goes from 5 and 9 in the most eutrophic areas to 8 and 11 in the those of a lesser continental influence. Fourteen among the 24 taxa that were found reached their maximum values in these areas of less eutrophy (Fig. 2 and 3).

On the contrary 7 taxa present an opposite gradient showing minimum values and even disappearance in these areas (Fig. 2 and 4). Only in the case of the Appendicularians and bivalve and holoturian larval forms are particular preferences not found. The taxa belonging to more open waters correspond to heliozoans, siphonophors, salps, doliolids and chaetognaths. Nematods, phoronid and ascidian larvae might mean that their specific composition is better suited to the eutrophic conditions of the zone.

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Planktonic Protista associated with "color-tides" in Izmir Bay (Aegean Sea)

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One of the most important factors affecting the seawater color is the quantity of organisms living within the body. Generally, during red tides, 10^6 - 10^8 cells /l densities of protists give their pigment colors to the seawater. However, this range may decrease to 10^3 - 10^5 cells /l when the cell sizes increase (JACQUES and SOURNIA, 1979; STEIDINGER and HADDAD, 1981; STEIDINGER, 1983).

In coastal seas and in the bays, the red-tides have been known as most important events changing the seawater color and sometimes causing PSP (paralytic shellfish poisoning) and NSP (neuro-toxic shellfish poisoning). Yet, though some species of diatoms, dinoflagellates and ciliates are not poisonous, they may excessively grow in convenient circumstances and may create green-, yellow-, etc. tides. This event may cause biological pollution especially in the bays where the nutrient budgets have been supported continuously with agricultural and domestic inputs. Furthermore, these protists whose high cell densities cause decrease of the depth of euphotic zone have negative effects on the biota indirectly by stimulating toxic extracellular nitrite production by phytoplankton living under low light intensities in the presence of adequate nitrate.

In the present study, the planktonic protists caused different type color-tides (toxic and non-toxic) of Izmir Bay were determined and their effects on the biota were summarized. The material has been collected with the project support of FAO-MAP (MED POL) TUR/24-H.

As could be seen from Table I, 4 species of diatoms (2 centric, 2 pennate), 11 species of dinoflagellates, 1 species of euglenoid flagellate and 1 species of photosynthetic symbiotic ciliate are responsible for color-tides and their excessive growth in the eutrophicated waters of Izmir Bay cause changes of seawater color.

Undoubtedly, A. minitum, G. polyedra and G. spinifera are the most important species among others because they have caused PSP sometimes. Although there exist some reports about the toxicity of P. micans and P. triestinum blooms, there are not clear evidences on the subject from Izmir Bay.

During the blooms of non-toxic color-tides the super increases of dissolved O_2 and CO_2 in seawater (produced by phytoplankton as a result of photosynthesis during the day and night) may cause gas bubbles and hypoxia illnesses respectively in many crustaceans and fishes. Especially hypoxia is the main reason of the mass emergences of the crab Carcinus mediterraneus Gerniausky, 1884 onto land on the nights during the blooms.

Table I: The planktonic protists responsible for color-tides in Izmir Bay.

Species	Blooming month	Color of the sea	Max.cells in a lt.	Tox.
BACILLARIOPHYCEAE				
Coscinodiscus granii Gough	1,2,6,7,10	Greenish -orange	$2 \cdot 10^3$	-
Nitzschia closterium(Ehrenberg) W.Smith	1,2,3	Pale olive -green	10^5	-
Phaeodactylum tricornutum Bohlin	6,7	Pale brown	10^7	-
Thalassiosira rotula Meunier	10,11,12	Greenish -brown	$2 \cdot 10^4$	-
PYRROPHYCEAE				
Alexandrium minitum Halim	3,4,5,6	Reddish -brown	10^7	PSP
Ceratium furca(Ehrenberg)Claparède et Lachmann	3,4	Brownish -orange	$4 \cdot 10^4$	-
Gonyaulax polyedra Stein	5,6	Reddish -brown	$5 \cdot 10^4$	PSP
Gonyaulax spinifera(Claparède et Lachmann)Diesing	5,6	Reddish -brown	$2 \cdot 10^4$	PSP
Noctiluca scintillans(Macartney) Ehrenberg	1,2,3	Pink -patches	$2 \cdot 10^4$	NH_3
Oxytoxum scolopax Stein	5,6,7	Pale -orange	$2 \cdot 10^4$	-
Prorocentrum micans Ehrenberg	1,2,5,6	Yellowish -orange	$9 \cdot 10^7$	?
Prorocentrum triestinum Schiller	6,7,8	Pale -orange	$6 \cdot 10^4$	?
Protoperidinium longipes Balech	4,5,8,9	Pale -orange	$2 \cdot 10^4$	-
Protoperidinium steini(Jörgensen) Balech	5,6,7,8	Pale -brown	$7 \cdot 10^4$	-
Protoperidinium trochoideum (Stein)Balech	5,6	Brownish -orange	$6 \cdot 10^6$	-
EUGLENOPHYCEAE				
Eutreptia sp.	7,8,9	Light -green	$7 \cdot 10^5$	-
CILIATA				
Mesodinium rubrum(Lohmann) Hamburger and Buddenbrock	1,2,3,9	Reddish -orange	$9 \cdot 10^4$	-

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