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Anthropoid Factors Influence in the Mesozooplankton Community at Santa Cruz de Tenerife Dock (Tenerife, Canary Islands)

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ABSTRACT

Over a period of six months, from July to December 2002, with the aim to study the mesozooplanktonic community and the influence it may have on the conditions in the area, there have been made a number of samples in fixed station located at the mouth of the Fishing Dock in Santa Cruz de Tenerife (D) and in a second neritic station that has been used as a reference (E-1).

Besides the possible pollution caused by the constant inputs and outputs of vessels, there is a continuous effluent brine into the mouth of the Fishing Dock of Santa Cruz de Tenerife coming from the facilities of the Desalination Plant of Santa Cruz de Tenerife (desalination by reverse osmosis), whose salinity ranges between 60.98 and 67.18 PSU with a rejection flow of about 390 m^3/h.

Throughout the period studied in station D, it was found a lower population density, with an average value of 274.467 specimens/m^3 compared to 402.12 specimens/m3 found in the E-1, with a lower diversity of groups or taxonomic categories than those found in the reference station.

1. Introduction

The Fishing Dock of Santa Cruz de Tenerife is located on the road to San Andrés village. The fishing dock is used not only by the Spanish fleet but by the Russian, Korean and Japanese. There is a marina too. The effluent from the Desalination Plant of Santa Cruz de Tenerife (continuous brine outlet) empties close to the mouth Desalination facilities (reverse osmosis) are located in the East Dock and were inaugurated in November 2001 (Figure 1).

Studies on the plankton community in the Port of Castellón, particularly the qualitative analysis of zooplankton, shows a higher specific diversity in outer harbor waters, more influenced by coastal waters that by internal ones (San Feliu and Muñoz, 1965) . This paper attempts to provide an overview of the mesozooplancton community's evolution in an area, which is influenced by anthropogenic factors (vessels traffic or the presence of a continuous supply of water with high salinity), with respect to a close neritic area.

The interest of the study of the plankton community lies in that it is the basis of all marine food chains; specifically most of mesozooplankton components are currently considered a key

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Figure 1: Desalination plant tube

factor in control of both phytoplankton populations and rates of carbon flux to the seafloor.

Concerning to their classification, several authors have used the size of plankton (Sieburth et al., 1978), without reaching a final agreement; currently one of the most common classification catalogues mesozooplankton as the set of planktonic animals whose dimensions range from 0.2-20 mm (Horwood and Driver, 1976).

Regulation of carbon fluxes by mesozooplankton is based on its ability to compact matter, both organic and inorganic, in larger fecal pellets, thus increasing their sedimentation rates. This mediation becomes more important in oligotrophic seas and oceans, as in the case of Canary Islands waters.

On the other hand, the herbivorous nature of many mesozooplankton members is also one of the major factors responsible for control of phytoplankton populations.

2. Materials and Methods

The samples have been collected in vertical hauls from July to December 2002, in two stations located in the north-east part of Tenerife Island (Canary Islands). Station D is situated at the start of the fishing dock, bottomed at 16 meters, with coordinates 28º29'N 16º12.47'W; the second station, E-1, is located in front of the Las Teresitas beach (28º29.767'N 16º10.550'W), bottomed at 64 meters (Figure 2).

At station D proximities is situated the drainage of the Desalination Plant of Santa Cruz de Tenerife city, which continuously emits an effluent brine, with salinity ranges between 60.98 and 67.18 PSU and a reject flow about 390 m^3/h.

Sampling began in July 2002, and were conducted in both seasons for six consecutive months until 27 December of the same year to observe the evolution of the mesozooplankton community in the area; Table 1 shows the characteristics and conditions at sampling time. Vertical hauls have been done between 12.5 and 50 meters depth to surface, using a Juday-Bogorov plankton net with 56 cm mouth diameter (0.246 m^2) and 250 μm net (net mesh size); filtered water volumes of 3.08 m^3 and 12.3 m^3 respectively were obtained. Samples were properly labeled and fixed immediately on board with 4% formaldehyde previously neutralized in the laboratory with Borax. Finally they were stored for later studies.

Figure 2: Sampling stations location

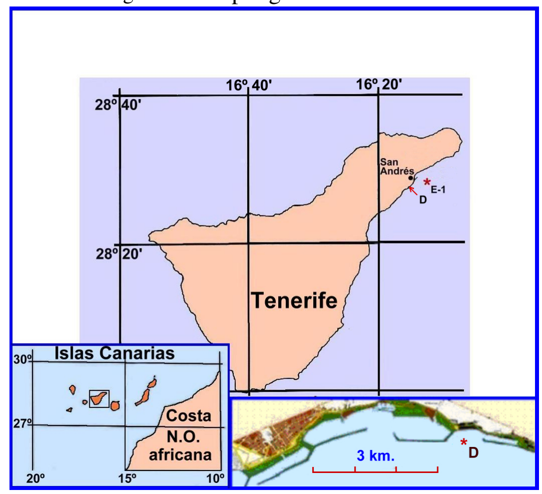


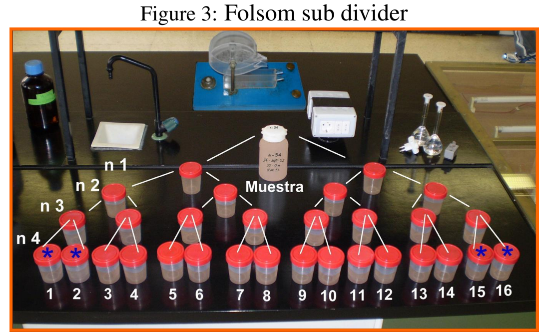
Table 1: Samples data

Date	Hour		Tª(ºC)	
	D	E-1	D	E-1
24 July	11.23	08.50	22.0	21.0
27 August	08.25	08.50	21.0	21.0
24 September	09.20	10.00	22.0	22.0
29 October	08.30	09.00	22.0	22.0
28 November	08.15	08.40	20.5	20.5
27 December	08.30	08.55	19.0	19.0

Source: authors

Once in the laboratory, we proceeded to the subdivision of samples until level fourth (16 subsamples) with a Folsom sub divider, carrying out the total count of taxa of 4 subsamples and weighting the results to the total sample (Figure 3).

Figure 3: Folsom sub divider



A Bogorov plate and a binocular microscope was used for counting and determinate taxa. The data obtained were subjected to the calculation given by Horwood and Driver (1976) expressing the results in numbers of specimens per m^3 and percentage. Table 2 shows effluent values of salinity (PSU), temperature and reject flow (m^3/h) at sampling days (IDAM Santa Cruz de Tenerife).

Table 2: Samples data

Date	Salinity (PSU)	Temperature (ºC)
24 July	63.86	24.1
27 August	62.14	23.7
24 September	61.27	23.6
29 October	61.49	23.4
28 November	63.30	22.3
27 December	62.93	22.1

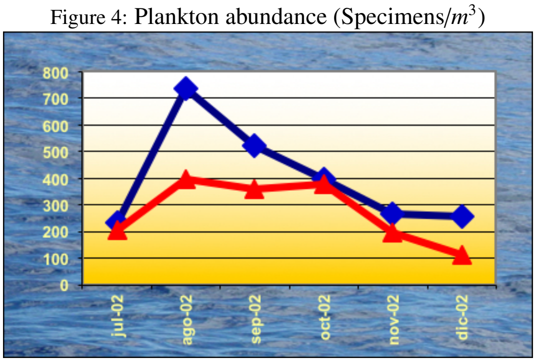
Source: authors

3. Results

The samples analysis at the laboratory revealed the following results (Table 3,4) in terms of population density (specimens $/m^3$) and percentage (%) respectively. Over the period studied, only four taxonomic groups have presented a higher percentage than 2% relative to the overall mesozooplankton in the station D: copepods, amphipods, crustaceans and invertebrates larvae and fish eggs.

Data from population densities are shown in Figure 4. In both stations the mesozooplankton community roughly follows the same pattern of distribution, but always with lower values in the station D. The density average found for the sampling period was of 274.46 specimens/m^3 at station D and 402.12 specimens/m^3 at station E-1.

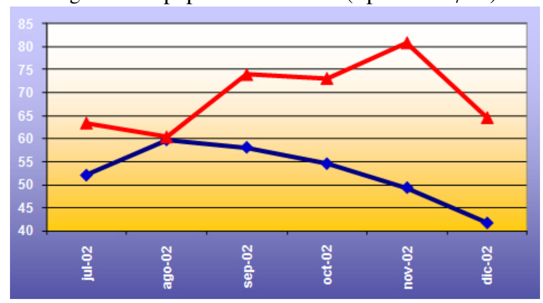
Figure 4: Plankton abundance (Specimens/m^3)



In percentage terms, the taxonomic group or category with greater representation in both stations are copepods; station D percentage ranged from a maximum of 80.92% in November and a minimum of 60.53% in August, while values of station E-1 ranged from a maximum of 59.76 in August and a minimum of 41.71% in December (Figure 5).

Qualitatively, some taxonomic groups were not present at the hauls made at station D, such as amphipods, Euphausiids, salps and molluscs larvae. In the case of Ostracods was found just one specimen of the species Halocypris inflate in August.

Figure 5: Copepods abundance (Specimens/m^3)



4. Conclusions

Quantitatively, it has been found in all samples lower values of density population (specimens/m^3) of mesozooplancton community in the station D than those values in the reference station E-1.

Copepods were the dominant group in all the samples of both stations; is also emphasizes that its percentage in the mesozooplancton is higer in the samples from station D, but not so its population density. The minimum percentage value at the station D has been found in August, which coincides with the maximum percentage value of this taxonomic group at station E-1.

Only four raxonomic groups from all the samples studied have been shown a percentage higher than 2% in relation to the total of mesozooplankton: copepods, apendiculariaceae, crustacean and invertebrates larvae and fish eggs. Emphasizes the high percentage of crustacean larvae found at the station D for the months of July and August (4.40% and 11.84% respectively) compared to the percentages found at station E-1 for the same months (3.64 and 2.96% respectively).

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Table 3: Taxa abundase (specimens/m^3)

Taxones	24-Jul		27-Ago		24-sep		29-Oct		28-nov		27-Dic	
	D	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**
COPEPODA	131.17	121.30	238.96	440.00	266.23	304.39	276.62	216.26	159.74	131.05	71.43	107.97
CLADOCERA	2.60	1.30	-	0.65	19.48	13.01	1.30	2.60	-	0.33	-	-
OSTRACODA	-	0.33	1.30	2.28	-	12.36	-	3.90	-	2.60	-	1.63
MYSIDACEAE	-	-	2.60	2.60	-	-	-	0.98	-	-	1.30	0.33
EUPHAUSIACEAE	-	-	-	-	-	-	-	0.33	-	-	-	-
AMPHIPODA	-	0.33	-	0.65	-	-	-	-	-	-	-	-
CRUSTACEAN LARVAE	9.09	8.46	46.75	21.79	3.90	7.15	2.60	1.63	2.60	2.28	3.90	1.95
CHAETOGNATHA	3.90	3.25	1.30	14.96	-	9.11	-	6.50	-	2.60	-	1.30
APPENDICULARIACEAE	-	7.15	11.69	115.12	33.77	113.82	53.25	81.63	24.68	15.61	20.78	67.97
PTEROPODA	1.30	2.60	3.90	5.85	1.30	2.28	-	3.58	-	2.60	-	2.60
SIPHONOPHORA	1.30	1.95	6.49	7.15	2.60	5.85	11.69	8.46	-	8.46	-	5.53
SALPIDAE	-	1.30	-	0.33	-	-	-	-	-	-	-	-
DOLIOLIDAE	-	0.98	2.60	3.58	2.60	2.60	1.30	1.63	-	0.98	-	-
HYDROMEDUSAE	2.60	2.28	2.60	4.55	1.30	3.90	1.30	4.23	-	1.95	-	0.65
FISH EGGS	54.55	80.65	74.03	108.29	27.27	45.85	27.27	61.14	4.61	95.93	10.39	67.64
FISH LARVAE	-	-	1.30	1.95	27.27	-	1.30	0.33	-	0.33	-	-
POLYCHAETA	-	0.65	1.30	4.23	1.30	0.33	1.30	0.98	-	0.65	-	-
MOLLUSCAN LARVAE	-	-	-	-	-	0.65	-	0.33	-	-	-	-
ECHINODERM LARVAE	-	-	-	2.28	-	2.28	-	1.63	1.30	-	2.60	0.65
PYROSOMIDA	-	-	-	-	-	-	-	-	-	-	-	0.62
TOTAL	**206.49**	**232.52**	**394.81**	**736.26**	**359.74**	**523.58**	**377.92**	**396.10**	**197.40**	**265.37**	**110.39**	**258.86**

Table 4: Taxa abundase (%)

Taxones	24-Jul		27-Ago		24-sep		29-Oct		28-nov		27-Dic	
	D	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**	**D**	**E-1**
COPEPODA	63.52	52.09	60.53	59.76	74.01	58.14	73.20	54.60	80.92	49.39	64.71	41.71
CLADOCERA	1,26	0,55	-	0.09	5.42	2.48	0.34	0.66	-	0.12	-	-
OSTRACODA	-	0.14	0.33	0.31	-	2.36	-	0.99	-	0.98	-	0.63
MYSIDACEAE	-	-	0.66	0.35	-	-	-	0.25	-	-	1.18	0.13
EUPHAUSIACEAE	-	-	-	-	-	-	-	0.08	-	-	-	-
AMPHIPODA	-	0.14	-	0.09	-	-	-	-	-	-	-	-
CRUSTACEAN LARVAE	4.40	3.64	11.84	2.96	1.08	1.37	0.69	0.41	1.32	0.86	3.53	0.75
CHAETOGNATHA	1.89	1.40	0.33	2.03	-	1.74	-	1.64	-	0.98	-	0.50
APPENDICULARIACEAE	-	3.08	2.96	15.64	9.39	21.74	14.09	20.61	12.05	5.88	18.82	26.26
PTEROPODA	0.63	1.12	0.99	0.80	0.36	0.43	-	0.90	-	0.98	-	1.01
SIPHONOPHORA	0.63	0.84	1.64	0.97	0.72	1.12	3.09	2.13	-	3.19	-	2.14
SALPIDAE	-	0.56	-	0.04	-	-	-	-	-	-	-	-
DOLIOLIDAE	-	0.42	0.66	0.49	0.72	0.5	0.34	0.41	-	0.37	-	-
HYDROMEDUSAE	1.26	0.98	0.66	0.62	0.36	0.75	0.34	1.07	-	0.74	-	0.25
FISH EGGS	26.42	34.64	18.75	14.71	7.58	8.76	7.22	15.44	4.61	36.15	9.41	26.13
FISH LARVAE	-	-	0.33	0.27	-	-	0.34	0.08	-	0.12	-	-
POLYCHAETA	-	0.27	0.33	0.57	0.36	0.06	0.34	0.25	-	0.25	-	-
MOLLUSCAN LARVAE	-	-	-	-	-	0.12	-	0.08	-	-	-	-
ECHINODERM LARVAE	-	-	-	0.31	-	0.43	-	0.41	0.66	-	2.35	0.25
PYROSOMIDA	-	-	-	-	-	-	-	-	-	-	-	0.25