Zooplankton of the meromictic coastal Lagoon of Cullera (Spain)

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The lagoon at Cullera, on the Spanish mediterranean coast (RODRIGO *et al.*, 1992), had, in 1980-81, a permanent sea water wedge, that caused a strong stratification of the water, with a steep gradient of salinity and the presence of an anoxic water layer (fig. 1). The result was a vertical and horizontal heterogeneity of physicochemical parameters and zooplankton (MIRACLE and VICENTE, 1983; MIRACLE *et al.*, 1988).

Samples were taken bimonthly during the period of august 1980 to october 1981, from the vertical profile and from three different sampling points, at the mouth (1), the center (2) and source of the lagoon (3) (fig. 1).

Freshwater zooplankton dominated in the lagoon, and only in autumn-winter the presence of some marine/brackish water species was observed. Generally, copepods and rotifers were more abundant in samples from point 3, less influenced by sea water intrusion, and cladocerans were more abundant in samples from point 2.

Table 1 shows the more abundant species of zooplankton. In addition to these species, another 9 species of copepodes, 5 species of cladocerans, 20 species of rotiferes, nauplii of cirripeda, ostracodès, nematodes and protozoans (Rhizopodea) were found. The presence of marine copepodes (*Acartia clausi, Acartia grani, Oithona nana*) and parasites of fish (*Ergasillus sieboldi*) were noticed.

Zooplankton was dominated by the permanent copepods *Calanipeda aquae-dulcis, Acanthocyclops robustus* and *Metacyclops minutus* (in spring), the cladoceran *Moina micrura* (in summer) and rotifers of the genus *Brachionus, Hexarthra, Notholca, Synchaeta* and *Polyarthra*. The larvae of the polichaete *Mercierella enigmatica* and ciliates of the genus *Euplotes*, were also abundant during spring and autumn (table 1).

Some of these species, i. e., *Hexarthra fennica, Notholca salina, Synchaeta tremula* and *Synchaeta grimpei*, are located in the oxic-anoxic boundary where they show high population densities.

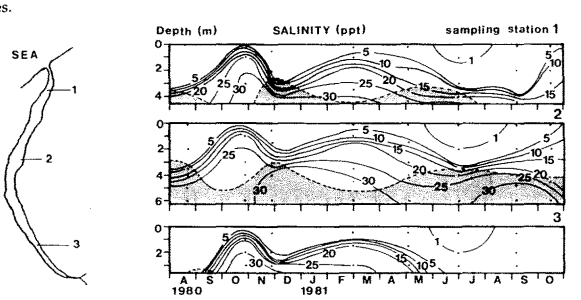

Fig. 1.- Salinity isopleths in Cullera lagoon at 3 sampling stations located as shown in the outline on the left. The anoxic water layer is shaded.

Table 1.- Most abundant zooplankton species of Cullera lagoon (occurrence > 10 % of samples), with indication of their maximum density, as well as the seasons (Sp, spring, Sm summer, A, autumn, W, winter,) and the sampling stations (1, 2, 3) where this maximum was reached. Also values of temperature, conductivity and pH corresponding to each species maximum density are indicated.

Especies	Seasons of maximum	Sampling station$_{max}$	Density$_{max}$ (ind l^{-1})	T^{ºC}	Conduct. (mS cm^{-2})	pH
Copepodes						
Calanipeda aquae-dulcis	Sm, A	2	314.0	19.0-23.0	6.3-47.0	7.0-7.8
Acanthocyclops robustus	Sm	3	380.7	22.5-25.5	1.1-4.5	7.4-7.9
Metacyclops minutus	Sp	3	22.7	16.9-22.2	1.7-30.7	7.5-8.2
Ergasillus sieboldi	A	2	1.4	23.0	26.0	5.0-8.7*
Cladocerans						
Moina micrura	Sm	2	72.9	26.0-30.0	2.0-8.8	7.7-8.6
Rotifers						
Brachionus plicatilis	A	3	1043.0	19.0-22.0	6.3-47.6	7.0-7.8
Brachionus calyciflorus	Sm	2	764.7	30.0	2.0	8.6
Brachionus angularis	Sm	2	145.7	25.0	1.6-40.5	6.9-8.6*
Brachionus urceolaris	A	2	17.5	22.5	6.6-26.5	4.8-8.7*
B. quadridentatus	Sp	2	5.2	20.0	2.0	6.0
Brachionus leydigi	W	2	0.2	14.0-14.5*	3.1-12.5*	7.6-8.6*
Keratella tropica	Sm	2	7.6	30.0	2.0	8.6
Keratella cochlearis	Sp	3	1.6	16.9-22.2	1.7-30.7	7.5-8.2
Keratella quadrata	Sm, A	3	0.7	8.0-26.0*	1.1-49.0*	6.9-8.6*
Notholca salina	A	3	47.3	9.0-18.0	1.3-45.6	7.1-8.4
Notholca marina	A	1	4.7	8.0-16.0	2.2-45.2	7.9-8.5
Euclanis dilatata	Sp,Sm	3	3.5	16.9-22.2	1.7-30.7	7.5-8.2
Mitilina ventralis	Sm	3	0.7	22.5-25.5	1.1-43.0*	7.4-7.9
Lophocharis salpina	A	3	9.0	9.0-18.0	1.3-45.6	7.1-8.4
Trichotria tetractis	Sm	2	1.0	25.5-26.0	1.2-4.0	7.4-7.8
Colurella adriatica	A	3	0.7	9.0-10.5	1.4-49.0*	8.4
Lepadella ovalis	Sm, A	3	2.2	26.0	1.1-47.8*	7.8-7.9
Lepadella rhomboides	Sm	3	1.2	16.0-26.0*	1.1-47.3*	7.8-7.9
Lecane luna	Sm	2	0.7	23.0-25.8	1.1-49.6*	4.7-8.7*
Lecane ungulata	A	3	5.5	9.0-18.0	1.3-45.6	7.1-8.4
Lecane hastata	Sm	3	1.5	22.5-25.5	1.1-4.5	7.4-7.9
Lecane bulla	Sm	2	1.5	22.5-25.5	1.1-4.5	7.4-7.9
Lecane closterocerca	Sm, A	3	2.0	9.0-10.5	1.3-11.0	8.4
Lecane hamata	Sm	3	1.7	26.0	1.1-1.2	7.8-7.9
Trichocerca elongata	Sm	3	3.0	26.0	1.1-1.2	7.8-7.9
Asplanchna brightwelli	Sm	2	19.2	30.0	2.0	8.6
Synchaeta tremula	A	2	872.3	20.0-23.0	12.1-29.4	5.0-8.7*
Synchaeta oblonga	Sp	1	188.7	18.0	21.6	7.6
Synchaeta pectinata	Sp	3	5.3	16.9	30.7	7.5
Synchaeta grimpei	W	2	235.2	13.0-14.0	41.9-52.0	7.3
Polyarthra vulgaris	Sm	2	167.3	23.0-25.8	1.3-40.5	5.0-8.7*
Hexarthra oxyuris-fennica		Sm, A	2	689.0	20.0-23.0	12.1-42.4
6.9-8.6*						
Polichaeta larvae						
Mercierella enigmatica	Sp, A	2	268.2	22.5-23.0	26.0-29.4	7.5
Ciliophora	A	3	1656.0	7.9-26.2*	1.1-52.7*	4.7-8.7*

* Range corresponding to the presence of the species, because the species had not a marked maximum or the parameter was not measured at the species maximum.

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