

The annual regeneration of the Elefsis bay zooplanktonic ecosystem, Saronikos gulf.

by

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Summary

The quantitative and qualitative annual variations of zooplankton in the Elefsis bay, from January 1973 till June 1974, have been studied; the bay is a very eutrophicated area due to urban and industrial wastes. In Spring, biomass values as high as 96.1 mg/m^3 have been estimated. 90 to 99.5 per cent of the specimens represents the copepod *Acartia clausi*. No other species capable of flourishing has been found because of undetermined inhibiting factors.

Résumé

Les variations annuelles, quantitatives et qualitatives, du zooplancton dans la baie d'Elefsis, golfe de Saronikos ou d'Athènes, ont été étudiées pendant 12 croisières de janvier 1973 à juin 1974. La baie est très eutrophisée, ceci étant dû aux rejets domestiques et industriels. Au printemps la biomasse atteint des valeurs très importantes, jusqu'à 96.1 mg/m^3 . A la fin de l'été, celle-ci descend jusqu'à zéro, peut-être à cause des conditions anaérobiques. Le copépode *Acartia clausi* constitue 90 à 99.5 pour cent des individus. Il n'existe pas d'autres espèces, capables de se développer dans ce milieu, cela peut-être est dû à des facteurs limitants, non encore connus.

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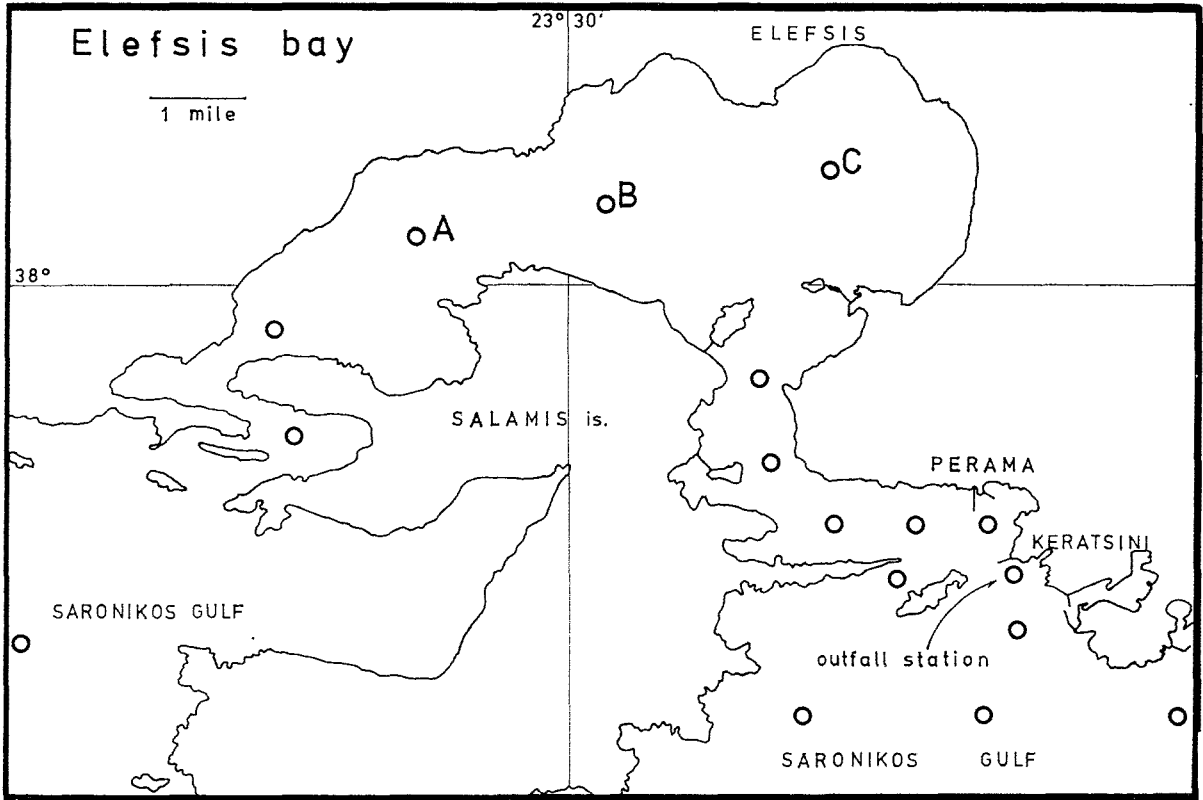
This study, based on zooplankton samples collected during 12 cruises, from January 1973 till June 1974, at 11 stations, deals with the quantitative and qualitative annual variations of zooplankton in the Elefsis bay (Fig. 1).

Little is known about the relations between eutrophicated waters, due to urban and industrial wastes, and the tendencies of various species of zooplankton to flourish in such waters [CITARELLA 1973, CRISAFI 1973]. For the Elefsis bay preliminary results have been already reported [YANNOPOULOS *et al.* 1973].

Sampling has been carried out by vertical hauling from the bottom to the surface, with a WP-2 nylon net, mesh size 0.24 mm and the biomass has been calculated in mg/m^3 of dry weight.

The Elefsis bay, with maximum depth 35 m. at B station, should be considered isolated from the Saronikos Gulf but it may exchange water, the amount depending each time on circulation pressures, through two narrow channels located at the western and the eastern part of the bay. Results from cruise 11 (Table I), show that water of the open Saronikos Gulf entered the bay from the eastern channel and replaced a large portion of its water mass; the water of the bay flowed out through the western channel.

Rapp. Comm. int. Mer Médit., 23, 9, pp. 109-111, 1 fig. (1976).



During winter, temperatures of the water column varied from 11.34 to 10.63° C and they were generally lower 2 to 3 degrees than the surface temperatures of the open Saronikos Gulf. During summer, temperatures varied from 24.86 to 14.97° C and the thermocline occurred at the depth of 10 to 15 meters; surface temperatures were about the same with those of the open Saronikos Gulf.

Salinity was between 38.178 to 37.940 ‰ during winter and between 38.550 to 38.090 ‰ during the summer.

Oxygen ranged from 6.55 to 5.67 ml O₂/l H₂O during winter and from 6.20 to 0.17 (!) ml O₂/l H₂O during the summer. Beneath the thermocline oxygen tends to deplete and the forementioned minimum value refers to the bottom layers; if the predominant north winds, at summer, are not strong enough to circulate surface water down to the bottom, then, the lack of oxygen is permanent and fish killing may occur as happened in 1971 and 1973.

The Eastern coast of the bay is the main industrial area of Athens vicinity; due to various wastes, nutrient values of the bay are 20 times higher than the ones of the Saronikos Gulf [COACHMAN *et al.* 1973].

The 80 % of the species, in phytoplankton samples taken from the bay, are dinoflagelletes. For the Saronikos Gulf the main group are diatoms [GUTENBERG 1973].

Table I.

Cruise N°	2		3		4			5			6			7				
Date	27.1.73		14.3.73		20.5.73			17.6.73			22.8.73			20.10.73				
Stations	B	C	A	B	C	A	B	C	A	B	C	A	B	C	A	B	C	
Biomass (mg/m ³)	78.4	43.2	96.1	59.6	25.0	21.7	15.0	17.8	9.3	10.7	8.3	0.2	0.05	0.0	0.8	3.1	0.2	
<i>Acartia clausi</i>	98	99	99	99	99.5	93	91	98	89	96	94	50	31	(5)	99	99.5	99	
	71		8		81			9			10			11				
	16.11.73		14.12.73		21.1.74			16.2.74			4.4.74			7.6.74				
	B	C	A	B	B	C	A	B	C	A	B	C	A	B	C	A	B	C
	0.7	2.8	2.6	3.4	19.7	37.2	90.5	57.2	62.6	71.4	91.1	62.2	11.8	18.0	25.6			
	95	99	75	75	97.5	97.5	96	97	97	83	88	97.5	12	13	36			

Table I, presents data on the quantitative (mg/m^3 of dry weight) and qualitative (percentage of *Acartia clausi*) composition of zooplankton samples collected at stations A, B, C, of the Elefsis bay. It should be mentioned that results obtained from stations in the channels show a direct relation between the species diversity and the origin of their water mass, that is, if they have quality of the Elefsis bay, of the Saronikos Gulf, or of both, mixed in various proportions.

During spring the biomass values from the bay are more than 10 times larger than the usual ones from the Saronikos Gulf. At late summer and during autumn, because of the lack of oxygen and possibly because of others, not yet determined, synergistic factors, due to the high eutrophication and the pollution of the bay, the biomass values drop almost to zero. The regeneration of the bay begins in late winter of the next year.

The copepod *Acartia clausi*, is the species, which contributes the 90 to 99.5 per cent in all samples. Other species always found but in ratio less than 1 % are *Calanus* sp, *Centropages* sp, *Temora stylifera* and *Podon* sp; also brachyura larvae and chaetognata. In samples obtained during the night the Mysids, *Anchialina* sp, *Gastrossaccus* sp, and *Mesopodopsis* sp, were always found. The fact that *A. clausi* constitutes the zooplanktonic population of the Bay should lead us to the conclusion that the special factors which build up this eutrophicated ecosystem and characterize its environment, favors *A. clausi* only and inhibit the growth of all the other species of zooplankton.

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