ANNUAL CYCLE OF CLADOCERANS IN THE SARONIKOS GULF (HELLAS)

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Marine cladocerans, occurring predominantly in coastal waters, may significantly contribute to zooplankton especially from early spring to late autumn. Forty-three samples were collected by oblique hauls at 7 and 15 days intervals from a coastal station (about 12 m depth) in the Eastern Saronikos Gulf (Aegean Sea, Eastern Mediterranean) during the period January through December 1989. A 200 µm net (WP2) equipped with a Hydrobios flowmeter was used. Two major peaks of total zooplankton abundance (> 5000 ind. m^{-3}) were recorded (Fig. 1); the first was due to the copepod maximum (4623 ind. m^{-3}) in late April whereas the second was due to the cladoceran maximum (5170 ind. m^{-3}) in late June. The cladoceran population, formed by six species (KIORTSIS & MORAITOU-APOSTOLOPOULOU, 1975), clearly predominated the zooplankton community during summer and early autumn. *Penilia avirostris*, attaining very high numbers from June to August (max 3130 ind. m^{-3}), was mainly responsible for the cladoceran peak in late June (Fig. 1). *Evadne tergestina*, the second most abundant cladoceran, occurred in a pattern similar to that of *P. avirostris* (DELLA CROCE & ANGELINO, 1987). *Podon polyphemoides* showed a significant presence in spring and early summer and *Evadne spinifera* from late spring to early autumn (Fig. 1). Finally, *Evadne nordmanni* and *Podon intermedius* occurred for short periods in mid-late spring and winter, respectively (Fig. 1). Rapid increases due to parthenogenetic reproduction should be responsible for the sharp fluctuations in abundance of all six species. The circular mapping of the samples in the MDS plot (Fig. 2) reflects a complete annual cycle with three main groups representing three main assemblages: (a) a winter assemblage (I: 1, 2, 3, 5, 42) due to the occurrence of *P. intermedius*, (b) a spring assemblage (II: 6 to 13) due to the occurence of *P. polyphemoides* and *E. nordmanni* and (c) a summer-autumn assemblage (III) characterised by the remaining species. Taking into account that temperature varies from 13°C (February) to 25°C (August), *P. avirostris* and E. tergestina can be characterized as thermophilic, *P. intermedius* and *E. nordmanni* as stenothermic but occurring in different seasons, whereas *P. polyphemoides* and *E. spinifera* as more eurythermic species (Fig. 1).

Penilia avirostris predominated the cladoceran community; this could be related with the generally low algal biomass available in the area (CHRISTOU & VERRIOPOULOS, 1993) taking into account the organism's capability for adaptation in low levels of resources (PAFFENHOFER & ORCUTT, 1986). MORAITOU-APOSTOLOPOULOU AND KIORTSIS (1973) suggested that salinity may affect cladoceran populations. In the study area salinity exhibits very weak annual variations within a range of about 1‰. As well, cladocerans are provided with a salt gland (the nuchal organ) and can sustain a wide range of salinities (MEURICE & GOFFINET, 1982). Knowledge of feeding habits of marine cladocerans is still poor. *Penilia avirostris* has been found to feed on small particles including bacteria (e.g. PAFFENHOFER & ORCUTT, 1986). *Evadne* spp. and *Podon* spp. seem to feed largely on discrete particles and perhaps detritus (KIM *et al.*, 1989), whereas *Podon intermedius* has been reported as a raptorially-feeding herbivore (JAGGER *et al.*, 1988). Finally, gut content examination of five species of marine cladocerans revealed that feeding was largely limited to centric diatoms and a few exceptions of pennate diatoms and dinoflagellates, all smaller than 35µm in size (KIM *et al.*, 1989). In the present study temperature and food resourses can be considered as the major regulators of cladoceran annual cycle. Taking into account : (a) the effect of temperature, (b) that food in terms of chlorophyll may act as a limiting factor for zooplankton in the area (CHRISTOU & VERRIOPOULOS, 1993), and (c) the implications of cladocerans with the microbial food web, future study on the effect of the various food resources available in the area may reveal mechanisms controlling the seasonality and succession of cladocerans.

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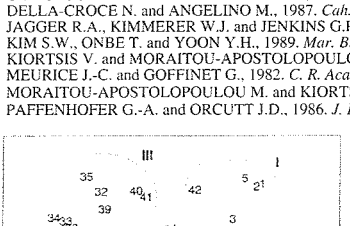

Fig. 2. MDS plot of cladoceran species abundances, Saronikos Gulf, 1989. Dates of the 42 samples are: 1=30/1, 2=20/2, 3=7/3, 4=20/3, 5=27/3, 6=3/4, 7=11/4, 8=17/4, 9=24/4, 10=2/5, 11=8/5, 12=15/5, 13=22/5, 14=29/5, 15=5/6, 16=12/6, 17=20/6, 18=26/6, 19=3/7, 20=10/7, 21=17/7, 22=24/7, 23=31/7, 24=10/8, 25=16/8, 26=22/8, 27=28/8, 28=6/9, 29=13/9, 30=23/9, 31=2/10, 32=11/10, 33=18/10, 34=24/10, 35=30/10, 36=6/11, 37=13/11, 38=20/11, 39=27/11, 40=4/12, 41=12/12, 42=27/12. From the total set of 43 samples, the one sampled on 12/1 was excluded from the analysis (absence of cladocerans). Symbols are as in Fig. 1.

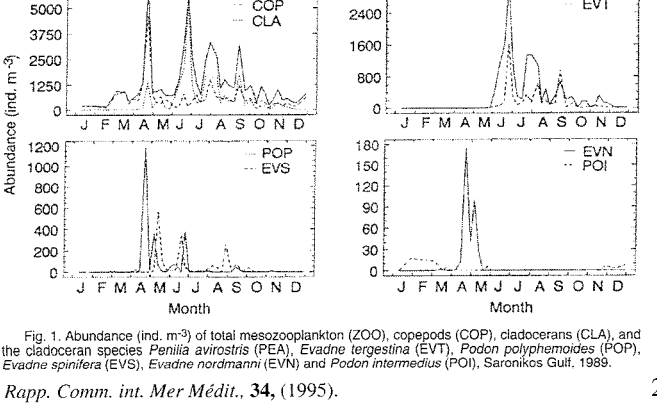

Fig. 1. Abundance (ind. m^{-3}) of total mesozooplankton (ZOO), copepods (COP), cladocerans (CLA), and the cladoceran species *Penilia avirostris* (PEA), *Evadne tergestina* (EVT), *Podon polyphemoides* (POP), *Evadne spinifera* (EVS), *Evadne nordmanni* (EVN) and *Podon intermedius* (POI), Saronikos Gulf, 1989.