

## Parasitic Infestations in coastal Mediterranean Pelagic Copepods

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Although descriptions of parasitic infestations of copepods by dinoflagellates date back to the last century, to date little information is available on the occurrence and incidence of parasitism in marine copepods. Most of the available information is contained in the monographs of Chatton (1920) and Sewell (1951). The vast majority of other papers contain only brief observations on the presence of internal parasites.

During the course of our studies on planktonic copepods in the Gulf of Naples, we have observed that most copepod species belonging to common genera such as *Calanus*, *Clausocalanus*, *Ctenocalanus*, *Centropages*, *Acartia*, *Oncaea* and *Corycaeus* are infested with internal dinoflagellate parasites and unidentified forms of protozoa, fungi and bacteria. Such infections can generally be grouped into two main categories including coelomic parasites that invade the entire body cavity of their hosts and parasites of the digestive tract. The commonest form of coelomic infection has been observed in *Panaeolanus parvus* infested by *Syndinium* sp. that induces drastic changes in the external morphology of the host (Fig. 1a). This is the most devastating form of infection since it always leads to sexual castration (Fig. 1b) and, most probably, death of the host. Ianora et al. (1987) report infection rates of up to 30% for this species.

Another common form of coelomic infestation is due to bacteria that do not induce any apparent changes in the external morphology. Internally, however, infection seems to lead to sterility since mature oocytes have never been observed in such individuals (Fig. 2a). Occasionally, copepods have been found infested by unidentified fungal and protozoan parasites (Figs 2b and 2c). In the former, the parasite is dispersed in the entire body cavity whereas in the latter case the parasite occupies most of the prosome having compressed the stomach onto the dorsal part of the carapace. In both cases,

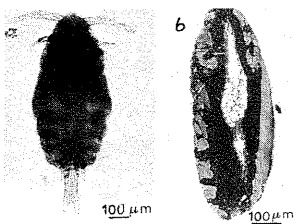


Fig. 1. *Paraeolanus parvus* infested by *Syndinium* sp. (a) dorsal view; (b) histological section showing the complete destruction of the gonads.

the gonads of the host are completely destroyed.

The most common form of infestation by parasites that lie within the digestive tract of their hosts is due to dinoflagellates belonging to the genus *Blastodinium* (Fig. 3a). Such infestations seem to be less devastating since, at the histomorphological level, the gonads contain oocytes in different stages of development (Fig. 3b). However, we have never observed mature oocytes in such individuals and specimens of different species maintained in the laboratory do not produce eggs.

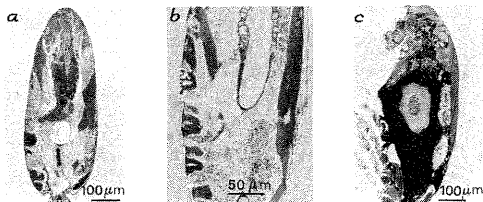


Fig. 2. Histological section of (a) *Clausocalanus furcatus* infested by bacteria; (b) *C. pergens* infested by fungi; (c) *C. arcuicornis* infested by a protozoan.

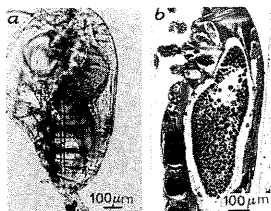


Fig. 3. *Clausocalanus lividus* infested by *Blastodinium* sp. (a) lateral view; (b) histological section.

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## Salinity a decisive factor in the length of Cephalothorax of *Acartia clausi* from three different areas (Greece and Ivory Coast)

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The purpose of this paper was to study and complete the data relating to the influence of environmental factors (primarily salinity) on the body size of *Acartia clausi* (Copepoda).

We thus, compared the length of cephalothorax of female adult *Acartia clausi* living a) in Greek waters and especially in Saronicos gulf with a common Mediterranean sea salinity, in Amvrakikos gulf (brackishwater area), source: Moraitou-Apostolopoulou et al. 1976 & 1986. b) in the lagoon of Ebrié - Ivory Coast (brackishwater area), source: Saint-Jean & Pagano 1984 and unpublished data.

### MATERIAL AND METHODS:

Sampling was carried out at different periods during 1978-79, 1981 and 1983 for Greece and every month in 1981-82 and 1984-85 for Ivory Coast. Simultaneous measurements for temperature, salinity and phytoplankton were also performed. About 100 mature female *Acartia* were examined from each sample. In order to estimate the interacting influences of different environmental parameters we performed correlations and regression analysis between the length of cephalothorax and the three environmental factors.

### RESULTS:

The ranges of salinity, temperature, phytoplankton and length of cephalothorax were:

|            | Salinity (%) | Temperature (°C) | Phytoplankton | cephalothorax (μm) |
|------------|--------------|------------------|---------------|--------------------|
| Saronicos  | 37.7-38.2    | 13.7-23.7        | 1 - 492 *     | 941 - 995          |
| Amvrakikos | 7.0-36.0     | 7.0-27.0         | 669 - 1634 *  | 919 - 950          |
| Ebrié      | 0.0-30.0     | 25.0-31.0        | 2 - 128 **    | 604 - 933          |

\* 103 cell/ml \*\* mg( chla + pheopig.)/m<sup>3</sup>.

The correlations between the length of cephalothorax of *Acartia* and the environmental factors are shown in table 1.

|                          | simple   | Temp. (°C) | Sal. (%)  | Conc. (phytopl.) |
|--------------------------|----------|------------|-----------|------------------|
| GREECE (n=7)             | 0.520 NS | 0.881 ***  | 0.747 *   | -0.081 NS        |
|                          | partial  | 0.450 NS   | 0.528 NS  |                  |
| IVORY COAST Tot. (n=114) | 0.168 NS | 0.795 ***  | 0.137 NS  |                  |
|                          | partial  | -0.055 NS  | 0.791 *** | -0.113 NS        |
| S > 7% (n=38)            | 0.462 ** | 0.615 ***  | -0.101 NS |                  |
|                          | partial  | 0.447 **   | 0.580 *** | -0.146 NS        |
| S < 7% (n=76)            | 0.236 *  | 0.474 ***  | 0.407 *** |                  |
|                          | partial  | 0.011 NS   | 0.301 **  | 0.175 NS         |

Tab. 1. - Simple and partial correlations between cephalothorax and Temperature, Salinity & Phytoplankton concentration. NS no significant, \* 95%, \*\* 99%, \*\*\* 99.99% significant.

The correlations proved that, among the three environmental factors considered, salinity appears to be the primary factor influencing the formation of the body size of *Acartia clausi* for the three examined areas.

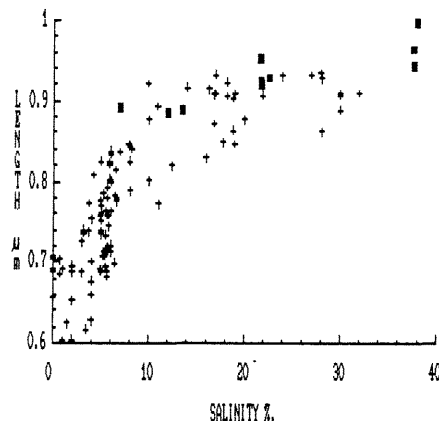


Fig. 1.- Relationship length - salinity for Greece (■) and Ivory Coast (+).

For low salinities, between 0 and 7‰, the relationship length-salinity is expressed by an important increase; for higher salinities, 7-38.5‰, the increase is less important (fig.1). There is no statistically significant (t-test) difference between the examined areas: linear models for S > 7‰ with slopes of 0.0034 and 0.0028 for the Ivory Coast and Greece respectively and intercepts of 0.86 and 0.82.

### CONCLUSION:

From the study of the data the following were observed: a) increases in salinity leads to increased length of cephalothorax, b) temperature and phytoplankton concentration play a secondary role as opposed to what happens when salinity does not vary (marine environments).

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