

Marine Cladocera in the Gulf of Mexico and the Caribbean Sea

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Abstract : Cladocera of the Gulf of Mexico and the Caribbean Sea have been studied on the basis of samples collected during the Cooperative Investigations of the Caribbean and Adjacent Regions (CICAR). Although the distribution of Cladocera is mainly coastal, one species, *Evadne tergestina* has been found offshore also, where it may establish seasonal populations. *E. spinifera* was recorded in the area for the first time. *Penilia avirostris* was found mainly in coastal waters, whilst no *Podon* were recorded among the sorted Cladocera. This work makes clear that adequate sampling in space and time is required in the area in order to obtain more comprehensive information on this group.

Résumé : Les Cladocères du Golfe de Mexico et de la Mer des Caraïbes ont été étudiés à partir d'échantillons récoltés dans le cadre du CICAR (voir abstract). Bien que la distribution des Cladocères soit surtout côtière, une espèce : *Evadne tergestina* a été aussi trouvée au large où elle peut constituer des populations saisonnières. *E. spinifera* est décrite dans cette région pour la 1^{re} fois. Ce travail montre l'importance d'un échantillonnage adapté dans l'espace et dans le temps pour obtenir l'information la plus complète sur ce groupe.

INTRODUCTION

Marine Cladocera occur predominantly in coastal waters and have been regarded mainly as neritic species. Reproduction takes place by parthenogenesis and the eggs laid in the brood pouch develop there into free-swimming young. Males then appear and fertile females bear resting eggs which have been generally assumed to develop as a result of sexual reproduction.

Despite their importance in the plankton, the available material has been often inadequate to improve our knowledge of the biology and distribution of marine Cladocera compared to fresh water forms. Dolgopolskaja (1958) has reviewed earlier investigations ; more recent studies include those of Della Croce (1964) and Della Croce and Venugopal (1972 ; 1973).

Papers on marine plankton of the Gulf of Mexico and the Caribbean Sea report scattered information on Cladocera, but no comprehensive review could be carried out at a certain extent prior to the "Cooperative Investigations of the Caribbean and Adjacent Regions" (CICAR).

This work attempts to study the marine cladocerans of the area as a whole, based upon the material collected during the CICAR and deposited at the Centro de Preclasificación Oceanica de Mexico (CPOM).

MATERIAL AND METHODS

The CPOM received plankton samples collected by national and foreign research vessels. After sorting of the samples collected in different months (march, may, august and September) and years (1971-1974) over hundreds of stations, Cladocera were found mainly in the Gulf of Campeche, the Yucatan Channel, the Gulf of Honduras and in the waters of western Florida.

Preservation of the samples (10 to 13 years old) did not affect taxonomic determinations of the sorted specimens. For each species, the total number of specimens per whole samples are not given. Samples have been collected with different nets.

Environmental data were obtained from the CPOM (1977).

RESULTS

Evadne tergestina Claus, *Evadne spinifera* P.E. Müller, and *Penilia avirostris* Dana were obtained from the sorted samples.

Evadne tergestina Claus

According to the distribution map by Dolgopolskaja (1958), this species presented no records in the area where it has been collected afterwards in coastal waters of Florida and Cuba (Hopkins, 1966 ; Cruz, 1966).

In the sorted samples, *Edvane spinifera* was present either alone (25 stations) or in association with *Penilia avirostris* (57 stations) ; the records indicate that *E. tergestina* occurred in coastal and open waters of the Gulf of Mexico (Gulf of Campeche) as well as of the Caribbean Sea (south from Yucatan Channel up to the Gulf Honduras) in august and September with temperature and salinity at surface ranging respectively from 27.04 to 30.92 °C and from 34.70 to 38.03 ‰. At this time of the year, females reproducing parthenogenetically were found to carry up to 5 embryos; sexual reproduction with females bearing or forming resting eggs was observed (Fig. 1).

Evadne tergestina was also found in the samples collected in and off-shore of the western Florida in march (16.38-21.19°C ; 31.58-37.00 ‰) and in may (22.91-25.54 °C ; 29.92-36.88 ‰). Only females reproducing by parthenogenesis were found and carried up to 8 embryos (Fig. 1).

E. tergestina shows a neritic as well as an oceanic distribution, the latter one being particularly evident in the Indian Ocean (Della Croce & Venugopal, 1972) and in Eastern Pacific (Longhurst & Seibert, 1972). The species has to be considered also a member of the oceanic epiplankton.

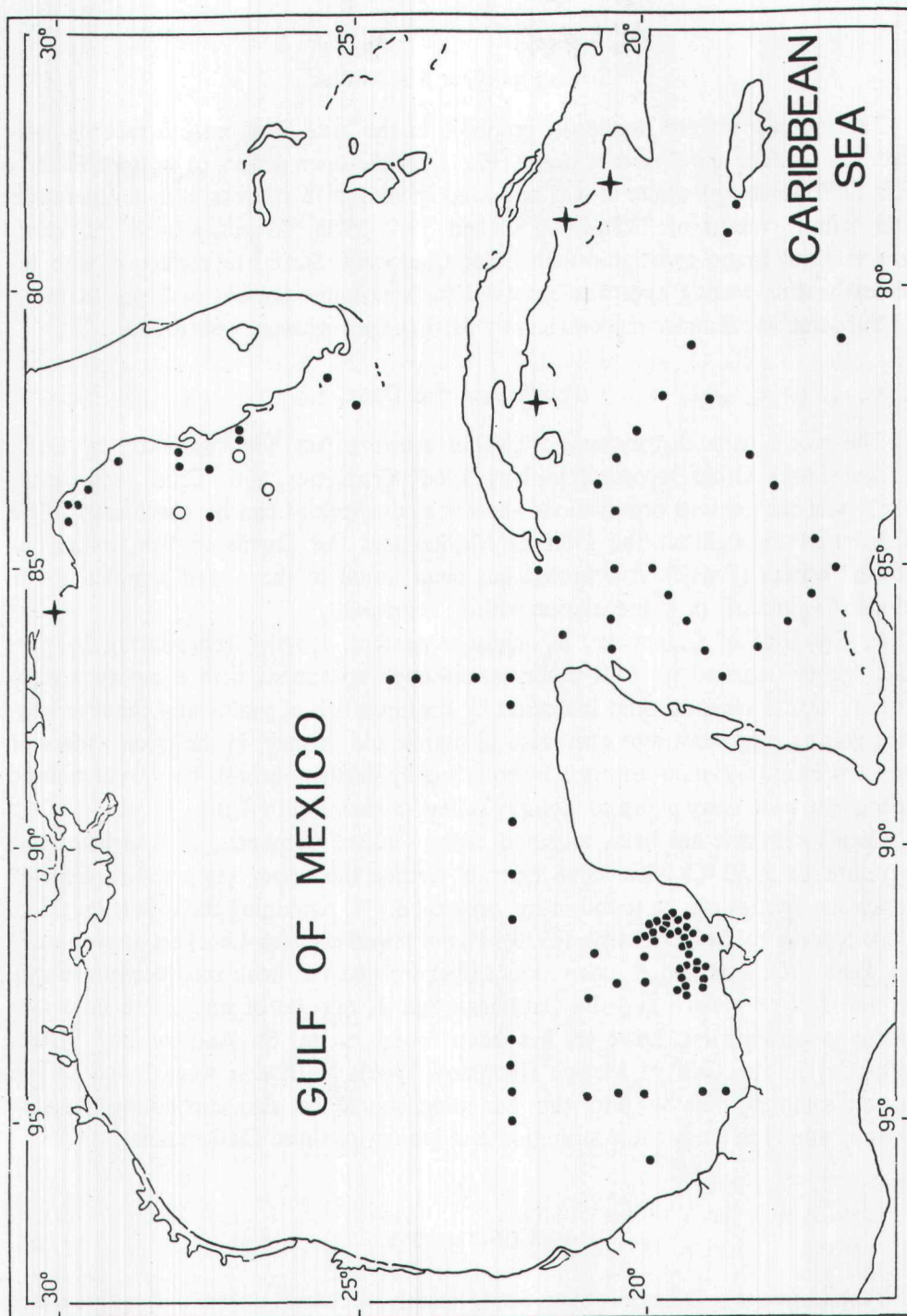


Fig. 1 - *Evadne tergestina*. Distribution in the Gulf of Mexico and the Caribbean Sea. Black stars : previous records ; black dots : present records. White dots : *Evadne spinifera*.

Evadne spinifera P.E. Müller

The species was not previously recorded in the area. The present records indicate that *Evadne spinifera* may occur (Fig. 1) in the open waters of western Florida (off St. Petersburg) where it was collected in May at 3 stations with temperature and salinity values of 23.36-24.00°C and 35.41-35.98 ‰ respectively. *E. spinifera* was not found associated with other Cladocera. Sexual reproduction with females bearing resting eggs was observed for specimens present in 2 out of the 3 sorted samples ; females reproducing by parthenogenesis were also found.

Penilia avirostris Dana

The world wide distribution of *Penilia avirostris* has been reviewed by Della Croce (1964). Other records (Hopkins, 1966 ; Grahame, 1976 ; Cruz, 1966 ; Bird, 1983) and the present observations show that the species can be considered to be distributed throughout the Gulf of Mexico and the Caribbean Sea, mainly in coastal waters (Fig. 2). *P. avirostris* has been found in the sorted samples either alone (68 stations) or in association with *E. tergestina*.

In the Gulf of Campeche, in August-September, females reproducing by parthenogenesis carried up to 4 embryos, although specimens with 8 embryos were noted ; sexual reproduction, indicated by the presence of males and females bearing resting eggs were also observed. In March and in May, in the open waters of western Florida, *Penilia avirostris* reproducing by parthenogenesis only were found ; specimens were carrying up to 6 embryos, few of them up to 9-10.

Penilia avirostris has been collected in the Gulf of Campeche at a surface temperature of 30.92 °C. This value extends further the upper temperature limit at which the species can be found in the oceans ; 8.7 °C remaining the lower limit.

According to Dolgopolskaja (1958), *Podon polyphemoides* Leuckart as well as *P. leuckarti* G.O. Sars and *P. intermedius* Lilljeborg had not been recorded previously in the Gulf of Mexico and the Caribbean Sea. It may be of interest to note that *Podon polyphemoides*, however, has been found in the St. Andrew Bay System (Florida) in the Gulf of Mexico (Hopkins, 1966). No *Podon* were found in the sorted samples ; this suggests that sampling should be also carried out in very coastal waters to study the distribution and biology of these Cladocerans.

CONCLUSIONS

Penilia avirostris Dana has been found mainly in coastal waters and with surface temperature of 30.92°C, extending the upper temperature limit at which the species can be found

Evadne tergestina Claus has been recorded in coastal and open waters where it may establish seasonal populations. The species, already belonging to the neritic

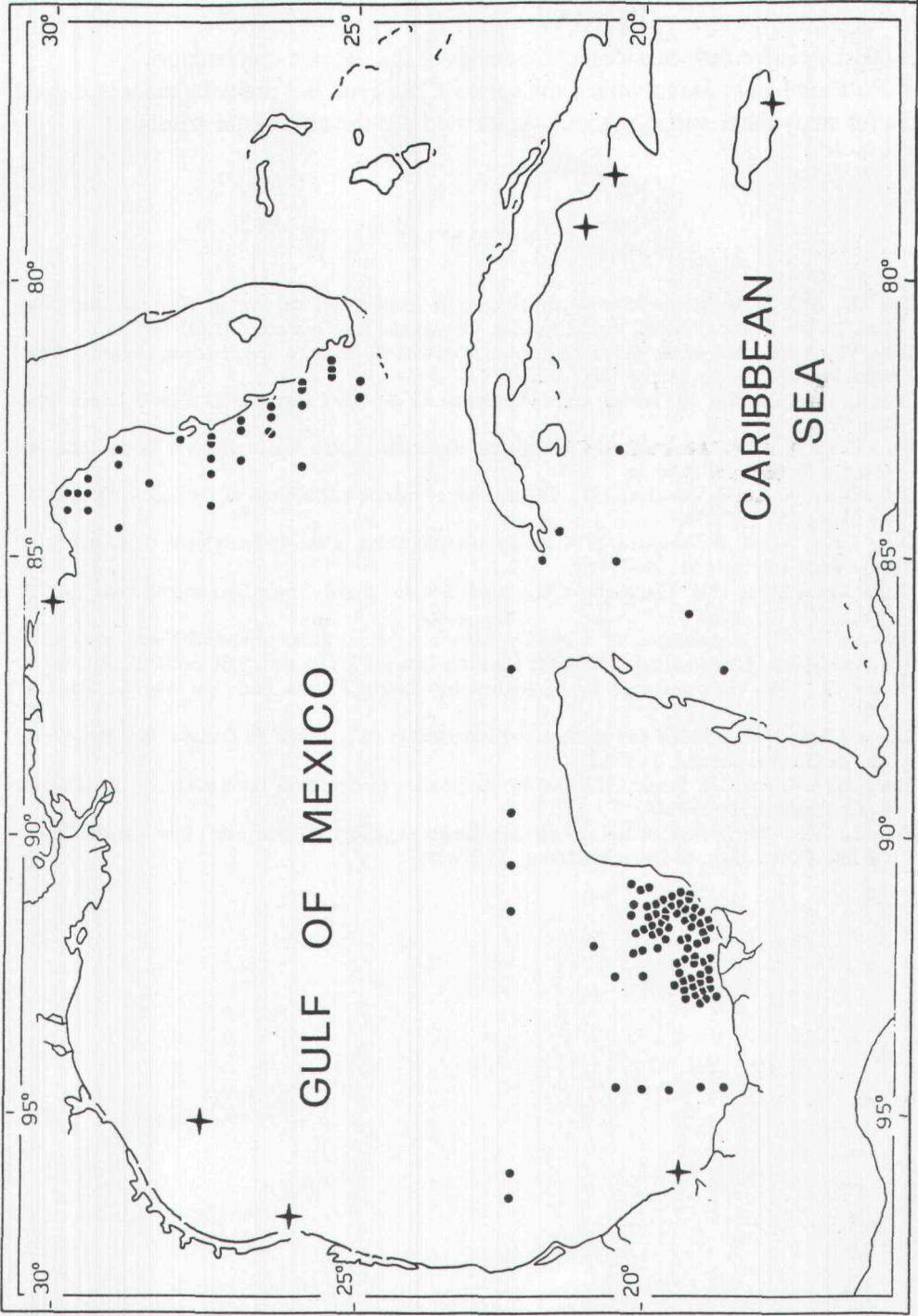


Fig. 2 - *Penilia avirostris*. Distribution in the Gulf of Mexico and the Caribbean Sea. Black stars : previous records ; black dots : present records.

plankton, can be now considered a member of the oceanic epiplankton.

No *Podon* were found among the sorted Cladocera, but previous records suggest that to study them sampling should be carried out in very coastal waters.

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