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A record of high rhizocephalan infection on *Hexapanopeus schmitti* Rathbun(Crustacea : Decapoda: Xanthidae) in the Northeast of Brazil.

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Abstract

During a survey of the decapod fauna of the sublittoral region of the estuaries of the State of Rio Grande do Norte, a high percentage of infection on *Hexapanopeus schmitti* Rathbun by a rhizocephalan pararite was observed in one of the estuaries. Morphological changes associated with the parasitism were clearly manifested by the host. Single as well as multiple infections were also recorded. Hosts between 3.1 mm and 8.0 mm carapace width were observed to be infected, though largest percentage of parasitism occured within the size range of 5.1 and 7.0 mm.

Infection of brachyuran crabs by rhizocephalan parasites has been reported from different parts of the world by several authors (Hartnoll, 1967; Rainbow *et al.* 1979; Srinivasagam, 1982; O'Brien and Wyk, 1984; Wardle Tirpak, 1991; and Galil and Innocenti, 1999) In most of the cases, these parasites appear to be serious burden to the crab population in the region. However, examples of large scale infections affecting a single species have also been reproted (Srinivasagam, 1982; Galil and Innocent, 1999).

Although previous studies have catalouged most of the species of Decapoda occuring within the intertidal region of the Northeast of Brazil, the sublittoral region remains largely unexplored. The present investigation was initiated in 1998 with the objective of collecting decapods of the sublittoral region of some of the easily accessible estuaries. During analysis of the material from one of the estuaries (Galinhos, Fig. 1), it was observed that a large percentage of the population of *Hexapanopeus schmitti* Rathbun, a species common where the substratum is covered with broken coral stones and sponges, was infected with an unknown rihizocephalan parasite. It is also interesting to note that the same crab species is free of the rhizocephalan infection in a nearby estuary (Guaraira, Fig. 2) where the crab is also common in the sublittoral region. We present here some aspects of the parasitism observed on *H. schmitti* - rhizocephalan association.

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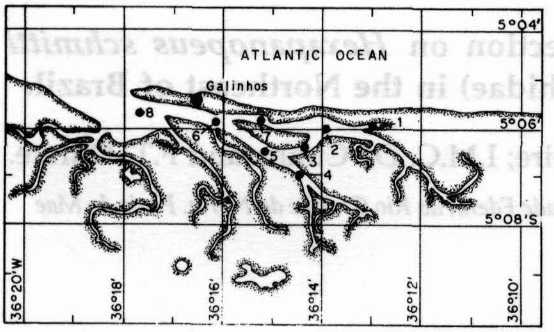

Fig. 1. *Map of the estuary of Galinhos/RN, Brazil showing the sampling stations.*

Material and methods

Two estuaries along the coast of the State of Rio Grande do Norte, Brazil located in Galinhos and Guaraira (Figs. 1 and 2) were investigated. Sampling was done with a dredge (mouth frame measuring 50 cm x 15 cm. fitted with 1 cm mesh collecting bag) towed from a boat. Depth of sampling varied between 3 and 5 m depending upon the tide. Collected material was sorted within a rectangular sieve. Water samples were collected from the surface and bottom from which salinity, temperature and dissolved oxygen were determined.

A total of 193 specimens of *H. schmitti* were collected during four samplings in the estuary of Galinhos between March and September 1999 and another 209 specimens were obtained from Ruaraira in May 1999. The specimens were sexed, measured (length and width of carapace) with a calibrated ocular micrometer and the presence, number and size (width) of the parasites were also recorded. Parasitism was recognised only when an externae was evident. It was not possible to establish the initial internal phase of parasitism.

Results

Physico-chemical parameters from the seven stations within the Galinhos estuary (Table 1) showed only marginal variations. The estuary was hypersaline (salinity between 40‰ and 45‰) attributable to the extensive salinas operating within the region. Salinity values decreases towards the mouth of the estuary.

Table 2 presents an overall picture of the parasitism observed among the population of *H. Schmitti* in Galinhos. Between 44.6% and 56.5% of the population of the area was infected and most of them had one parasite although multiple parasitism involving two to three parasites was not uncommon.

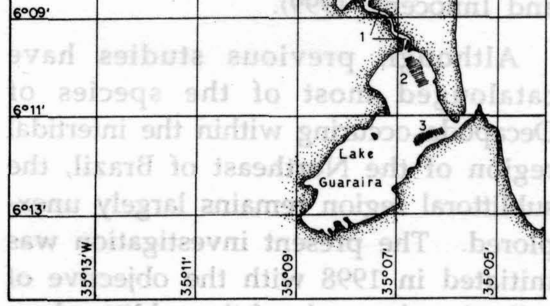

Fig. 2. *Map of the estuary of Guaraira/RN, Brazil showing the sampling stations.*

Table 1 - *Observed values of physico-chemical parameters in the estuary of Galinhos*

Stations		2	3	4	5	6	7	8
Temperature °C	Surface	26.0	26.5	26.0	26.5	26.5	26.0	26.5
	Bottom	26.5	26.0	26.0	26.0	26.0	26.0	26.5
Salinity‰	Surface	42	43	44	43	40	43	40
	Bottom	43	45	44	45	42	43	40
O_2 mg/l	Surface	7.6	7.0	4.0	4.3	4.3	4.8	4.5
	Bottom	6.8	6.0	4.5	4.5	4.6	4.8	5.0

The morphological changes associated with parasitism in male host specimens with externae (Figs 3 and 4) were clearly evident as described below.

- Broadened and separated abdominal segments without any pleopods (Fig. 3, C and D).
- Broadened and separated abdominal segments (3 to 5) with well developed first male pleopods but no other pleopods.
- Broadened and separated abdominal segments with well developed male and female pleopods.
- A typical first male pleopods (Fig. 4).

Among the parasitized females, most had a full complement of some have fully developed pleopods, while there are several specimens presenting full complement of four pairs of ill developed or incomplete pleopods or some of the pairs are totally missing.

Externae were found on crabs from 4.0 mm to 8.0 mm carapace width with the highest percentage between 5.1 to 7.0 mm (Fig. 5). The population of non-infested *H. schmitti* from Guaraira (Fig. 6) is within the size range of 3.1 mm to 7.0 mm and males are larger than females. The largest parasitized specimen which is also the largest specimen so far collected was 8.0 mm in carapace width.

Discussion

Invesigations carried out in the past have dealt with the several aspects of parasitism by rhizocephalans. The study of Hartnoll (1967) on two species of crabs

Table 2 - *Sampling data from the estuary of Galinhos*

Date of sampling	Numbef of hosts: Total	Number parasitized	% parasitized	Number of parasites/host
23-03-99	23	13	56.5	10 with one, 3 with two.
16-08-99	38	18	47.4	9 with one, 6 with two, 3 with three.
10-09-99	67	40	59.7	22 with one, 13 with two, 5 with three.
21-10-99	65	29	44.6	18 with one, 5 with two, rest with evidence of parasitism.

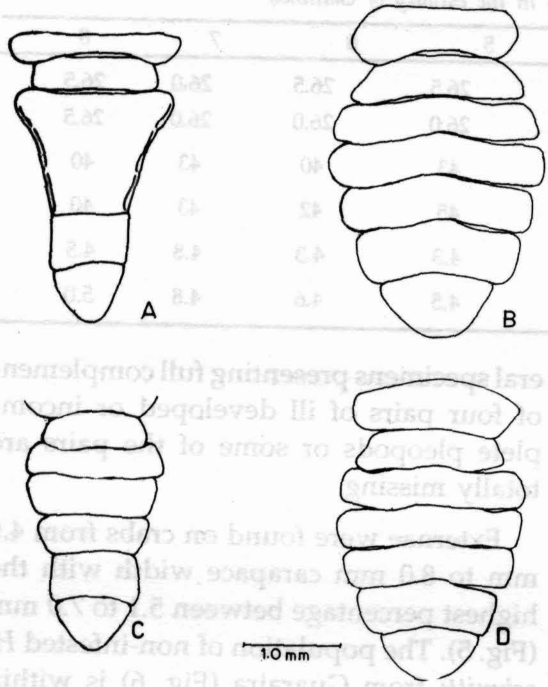

FIG. 3. *Male abdomens of H. schmitti. A. Normal abdomen. B. Normal female abdomen. C & D. Abdomens of parasitized males.*

from Jamaica is of special interest, not only because of its comprehensive nature but also because of an excellent review of earlier studies. Subsequently, O'Brien and Wyk (1985) analyzed the effects of rhizocephalans on growth of different hosts and gave a critical analysis of the existing information.

One of the consequences of sacculinid rhizocephalans is that their hosts are parasitic anecdysis (O'Brien and Wyk, 1984), besides the morphological changes associated with feminization of males and parasitic castration. Parasitism has also been shown to affect adversely the growth of the host in comparison with the non infested adult population (O'Brien and Wyk, 1984). However, the population of *H. schmitti* studied here has no apparent negative effect on the size of the infected host. In fact, mean size of infected hosts was greater than that of uninfected hosts. The statistical test applied on the parasitized and non-parasitized population (Table 3, Fig. 8 and 9) has substantiated this observation. It is probable that infection has taken place when the hosts are larger and that large scale infection is a recent development (Fig. 7, Table 4) as a consequence of environmental changes which may be propitious for the pro liferation of the parasites. Further evi-

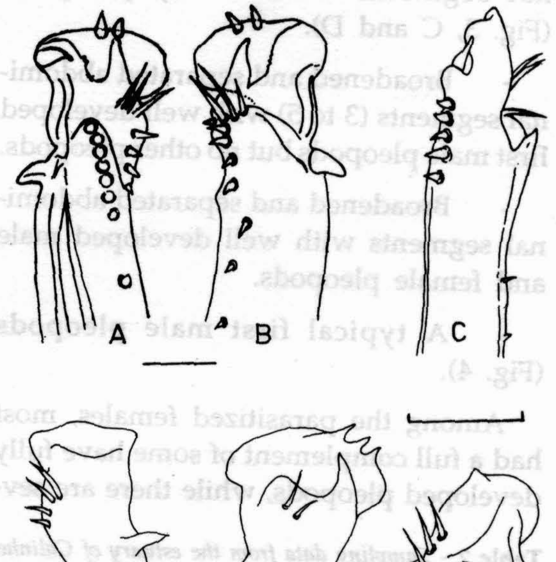

Fig. 4. *A-F. First male pleopods of H. Schmittie. A & B. Non-parasitized male. C-F. Parasitized males. Scale = 0.2 mm (A&B smaller scale; rest larger scale)*

Table 3 - *Morphometric details of host/parasite relationship*

Range of carapace width (mm)	Size of sacculinid parasite (mm)			
	Single infection		Multiple infection	
	Minimum size	Maximum size	Minimum size	Maximum size
4.5-5.0	1.2	3.3	0.8+1.2=2.0	2.2+2.5+2.7=7.4
5.1-5.5	1.0	4.2	2.5+2.8=5.3	3.0+3.3=6.3
5.6-6.0	0.8	5.3	2.5+3.0=5.5	2.7+2.8+3.3=8.8
6.1-6.5	1.0	4.7	2.0+2.3=4.3	2.5+5.0=7.5
6.6-7.0	1.2	5.0	1.3+2.2=3.5	3.3+3.5=6.8
7.1-7.5	-	-	3.3+3.3=6.6	4.0+4.5=8.5
8.0	-	-	-	3.0+3.3+4.3=10.6

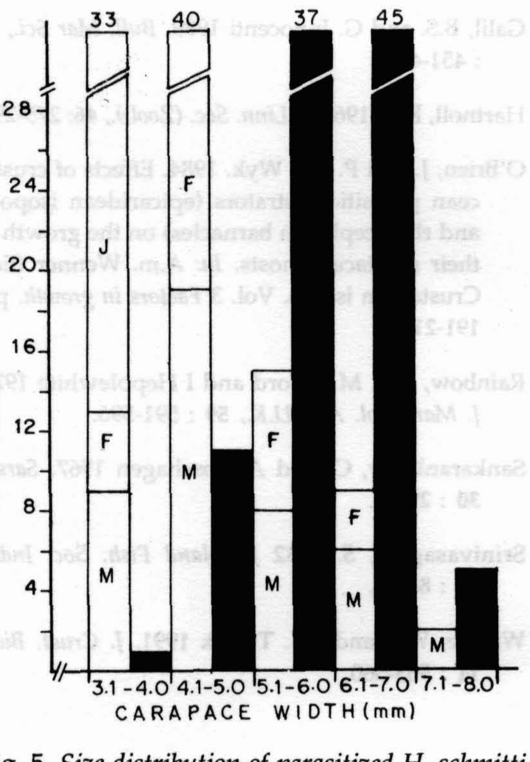

Fig. 5. *Size distribution of parasitized H. schmitti collected from the Estuary of Galinhos. M=male; F=female; J=juvenile; dark column = parasitized crabs.*

dence is available to substantiate this view, since smaller size externae are seen on all size of the host. When multiple infection occurred the parasites are normally of the same size indicating that the hosts were parasitized at the same time. Past studies have shown that sequential parasitism is prevented by the already settled female (Rainbow *et al.* 1979).

High percentage of infection by rhizocephalan parasites has been reported from confined areas such as bays and lagoons (Hartnoll, 1967, Srinivasagam, 1982, Galil and Innocenti, 1999). The parasitism reported here is also a localised phenomenon confined to a hypersaline ecosystem and it will be of interest to investigate whether the parasite will eventually spread to other areas. However, if the parasite is adapted to hypersaline conditions, lower salinity of the open sea may serve as an effective barrier against its spread.

Galil and Innocenti (1999) reporting on the parasitism of *Charybdis longicollis* Leene gave convincing evidence that the

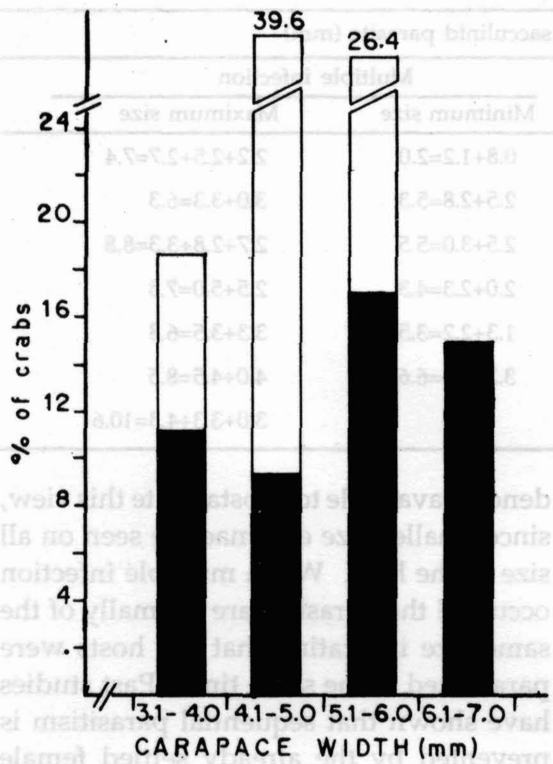

Fig. 6. *Size distribution of non-parasitized H. schmitti collected from the estuary of Guaraira. Dark column = male; blank column=female.*

parasite *Heterosaccus dollfusi* Boschma, which was previously known from the Gulf of Suez, is an introduced species not seen in the Israeli coast before 1992. In the absence of previous studies of this region, there is no data to ascertain whether the parasite was an introduced species. However, extensive salt production of alien species is very often attributed to the ships plying across the globe (Sankarankutty and Fosshagen, 1967).

It is not easy to explain why parasitism has been confined to one species since we have other brachyuran (*Hexapanopeus manningi* Sankarankutty and Ferreira, *H. caribbaeus* (Stimpson), *Pilumnus diomedeae* Rathbun, *P.reticulatus* Stimpson, *Menippe nodifrons* Stimpson, *Calappa ocellata* Holthuis, *Callinectes danae* Smith, *Cronius tumindulus* (Stimpson) and a few others which are yet to be identified) inhabiting the same biotope, unless the parasite is host specific. Monitoring of the ecosystem on a long-term basis is warranted to assess the impact of parasitism on the biodiversity of the brachyuran fauna.

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