Rev. Biol. Trop., 35(2): 269-275, 1987.

Apparent parasitism of *Sabella melanostigma* (Polychaeta) by *Ammothella spinifera* (Pycnogonida) from the Gulf of California

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(Received November 21, 1986)

Abstract: Juveniles of the ammotheid pycnogonid ? *Ammothella spinifera* were found apparently as ectoparasites on the sabellid polychaete *Sabella melanostigma* from Bahía Concepción, Gulf of California. Nineteen out of 23 sabellids were parasitized (83% incidence) by one to five ($\bar{x} = 1.5$) juveniles that prefered the abdomen over the thorax (25 *vs.* 9). Four adult *A. spinifera* were found in less close association with sabellids, as well as 12 other annelids without ectoparasites.

Pycnogonids or sea spiders are "aberrant" arthropods which exclusively live in the sea. Most species are dioecious; males fertilize, collect and stick to their ovigers the ova released by the female. Typically a protonymph larva hatches from the egg; this larva has three pairs of appendages but is unable to swim (Hedgpeth & Haderlie 1980). It undergoes development by the gradual addition of pairs of legs to the posterior region of the body (King 1974). Many species of pycnogonids are parasites, either as adults or as juveniles. Quite an array of invertebrate hosts is recorded in the literature, including sessile or motile, soft-bodied or hard-bodied animals (Stock 1979, 1981). However, reports on pycnogonid-polychaete associations are scanty (Fry & Stock 1978). Besides a vague indication (Helfer & Schlottke 1935), the only reliable report was made by one of us (Stock 1959) who found a juvenile of ? *Hannonia* sp. ectoparasitic on the cirratulid polychaete *Audouinia australis* (= *Cirriformia filigera*).

In this paper we report the apparent ectoparasitism of polychaetes by pycnogonids for the first time in America: juveniles of the pycnogonid ? *Ammothella spinifera* were found on the polychaete *Sabella melanostigma* from Bahía Concepción, Gulf of California.

METHODS

Bahía Concepción is on the western coast of the Gulf of California, in the state of Baja California Sur (Fig. 1A). Summer mean surface temperature in adjacent waters is 30.6°C, and winter mean surface temperature is 17.2° C (Robinson 1973). During a prospective faunistic program reported elsewhere (Salazar-Vallejo 1985), some sabellids were collected by hand by A. Carvacho and R. Ríos in a mangrove channel on the western shore of the bay, between Santispac and Coyote (Fig. 1B). Sabellids were sampled (16 June 1980) along with adjacent sediment in 0.5 m depth during low tide. They were fixed *in toto* in a 10% formaldehyde solution in sea water, next they were washed and later preserved in 50% isopropanol. The specimens remain in the Colección de Referencia from the CIB. To facilitate the comparison of different stages, we divided the body of the juvenile in two regions, oral and pedal. Oral region extends from the chelifores to the insertion of the ovigers, pedal re-

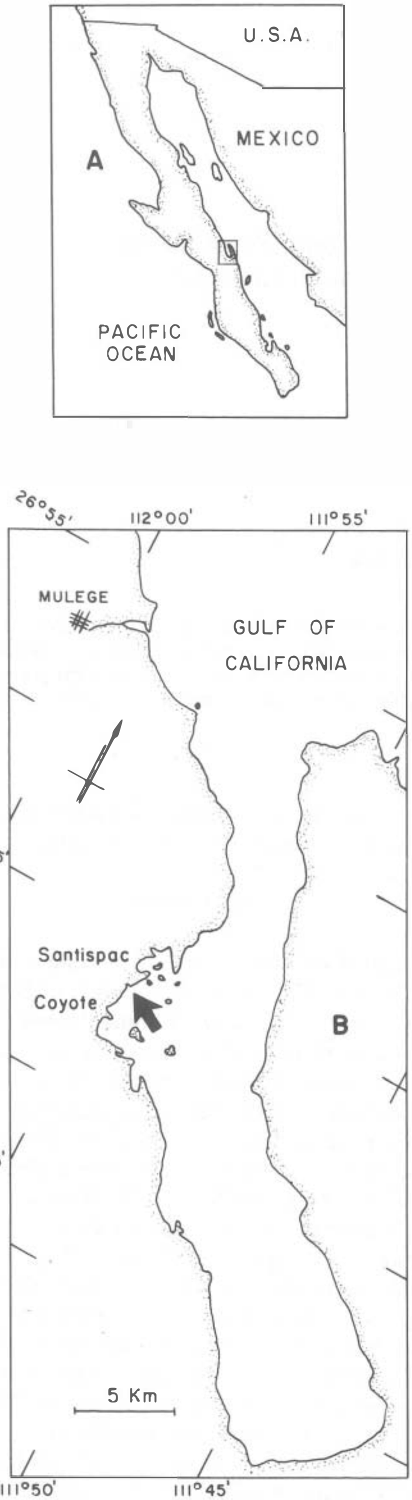

Fig. 1 A. Geographic placing of Bahía Concepción, B.C.S., México. B. Bahía Concepción, arrow points the collecting site.

gion includes the legs and the abdomen (*Cf.* Fig. 5).

RESULTS

From the 23 examined worms of the sabellid species *Sabella melanostigma,* 19 were apparently parasitized (83% incidence) by one to five ($\overline{x}$ = 1.5, SD = 1.2) juveniles of a pycnogonid tentatively identified as ? *Ammothella spinifera.* There were 34 juveniles, nine of them on thoracic segments while the remaining 25 were on abdominal segments (74% preference). The juveniles were usually attached to the annelid body by their chelifores, close to the nephridiopores, causing a depression on the annelid body wall that often coincided with the mouth opening at the proboscis tip of the pycnogonids. Some of the larger juveniles even curved their legs around the sabellid.

Pycnogonid growth was synchronized. On the basis of differences between the oral and pedal regions, and by the differentiation of the appendices, ? *A. spinifera* development was divided in six stages.

Stage I. Specimens reach a total length (TL) of 0.18 mm. The pentagonal body was almost entirely restricted to the oral region (Fig. 2A). It was provided with three pairs of appendages, the anterior chelifores, and the ventrolateral palps and ovigers. The chelifores were employed to anchor the juvenile on the sabellid body wall. Other body lobes were the ventrally directed proboscis and the primordium of the pedal region, but the proboscis was smaller than the chelifores.

Stage II. Specimens reached a TL of 0.33 mm. The leg primordia became prominent as low folds on the pedal region (Fig. 2B). Palps and ovigers became articulated and its distal segment differentiated into hooks (Fig. 2C), apparently improving the attachment to the sabellid. Proboscis acquired three lips which could be used in sucking (Fig. 2D) and became subequal to the chelifores and larger than the pedal region.

Stage III. Specimens had an oval contour with a TL of 0.9 mm. Legs appeared synchronously as subequal elongate lobes in the body wall (Fig. 3A). The chelifores showed two lateral dactyli with small distal denticles (Fig. 3B), the medial side of the dactylus was depressed fitting to the other side. Proboscis length became larger than chelifores (Fig. 3C), the filter

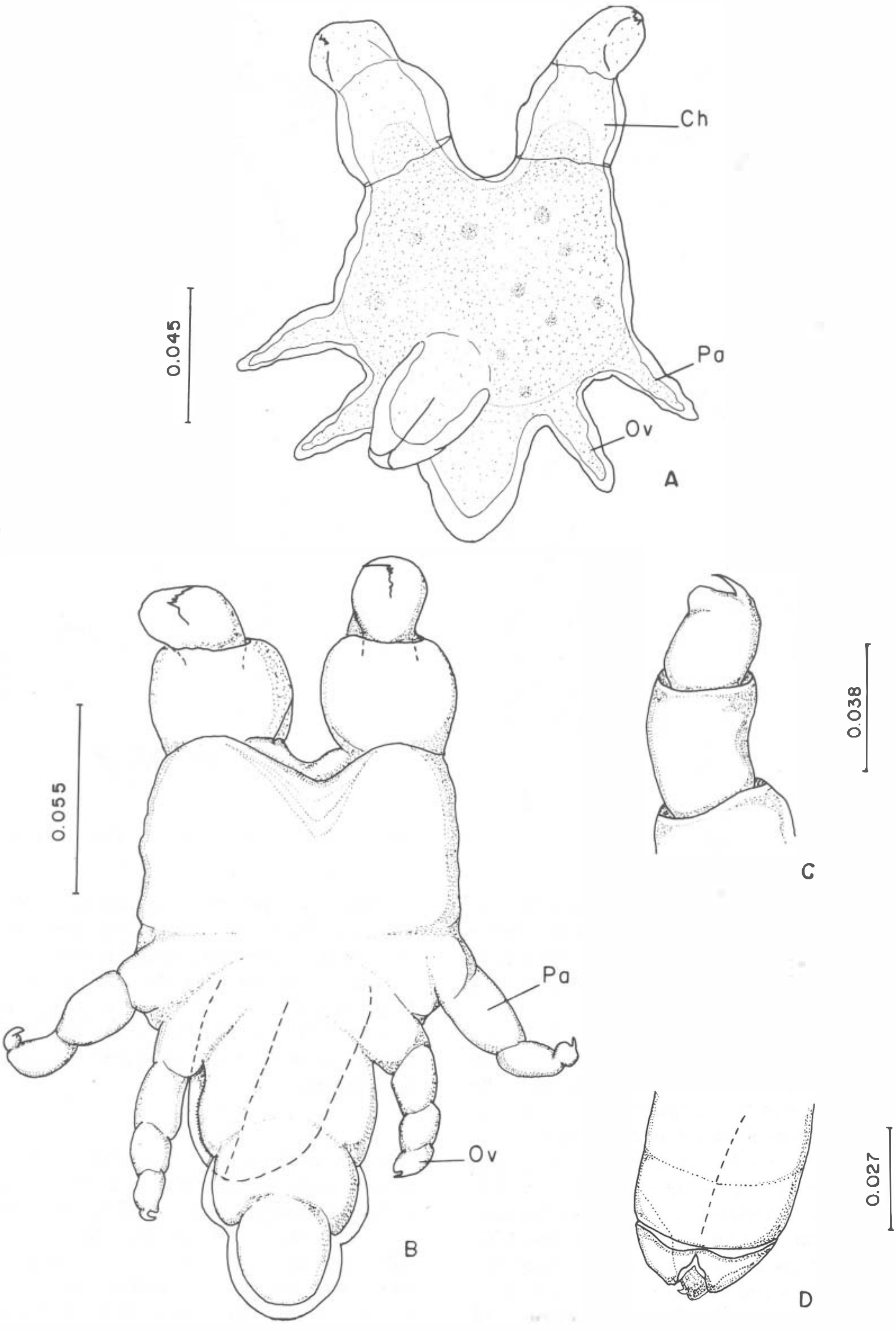

Fig. 2.? *Ammothella spinifera,* A. Stage I juvenile in ventral view, B. Stage II juvenile in dorsal view, C. Same, right palp in side view, D. Same, probo scis (Ch: chelifore, Ov: oviger, Pa: palp, Pr: proboscis; scales in mm).

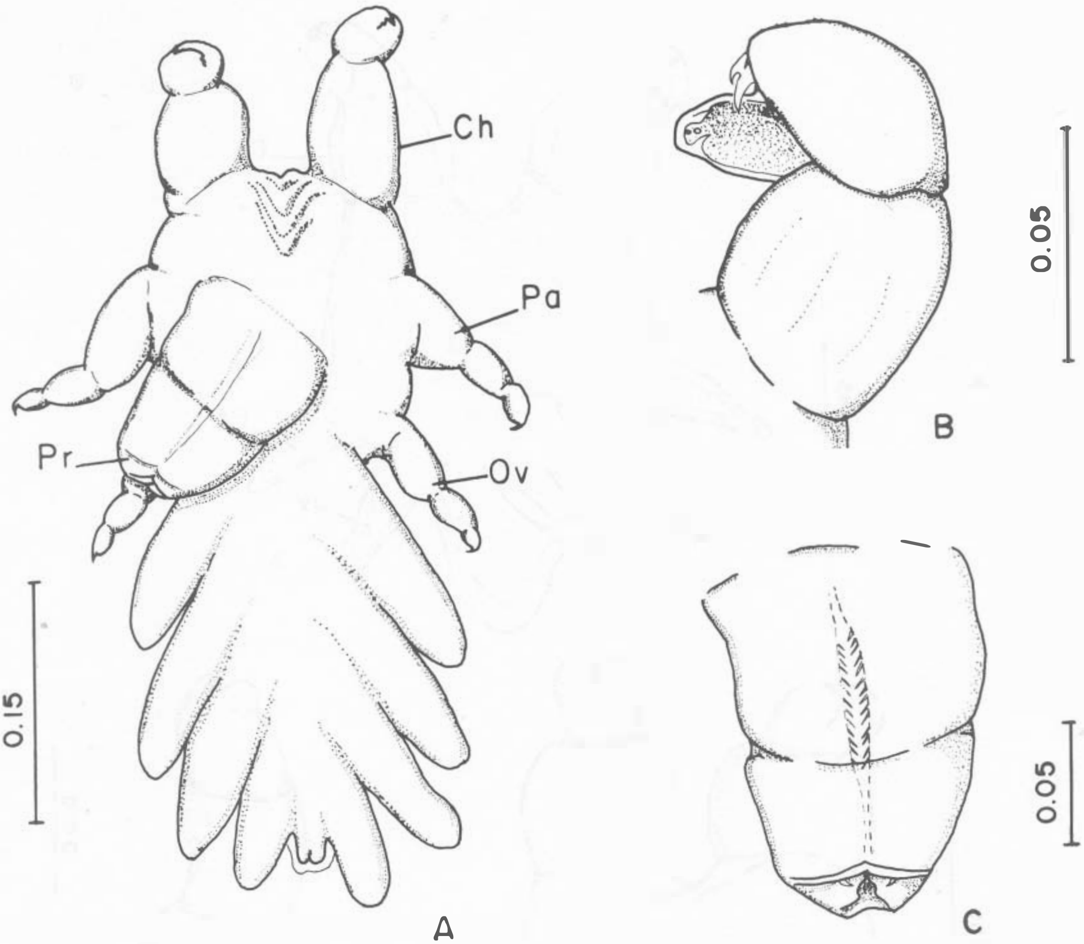

Fig. 3 ? *A. spinifera* Stage III juveniles, A. Ventral view, B. Chelifore from another specimen, C. Proboscis (scales in mm).

apparatus setules are well-developed inside it, the three lips were provided with small denticles. At this stage, the pedal region became as long as the oral one, and the posterior end showed a bilobed abdomen.

Stage IV. Specimens reached a TL of 1.0 mm. Legs were provided with three small conical lobes, the claw primordia (Fig. 4A). The pedal region was then larger than the oral one.

Stage V. Specimens reached a TL of 1.2 mm. The pedal region has enlarged and was then twice as long as the oral one (Fig. 4B). The legs were clearly articulated and almost of the same size. Each one had three blunt distal claws (Fig. 4C) but the main one was thicker and corrugated. The palps and ovigers retained their distal hooks. On the dorsal side of the anterior end there were some pigmented cells (ocular primordia?).

Stage VI. Specimens reached a TL of 1.9 mm. The legs have enlarged, the pedal region became three times as long as the oral one (Fig. 5A). Each leg was provided with three claws (Fig. 5C, D) but the main one was slightly smaller then the auxilliaries. On the anterior end there were four lensed eyes in trapezoidal arrangement (Fig. 5B).

Other associates. In the sabellid sample, there were also 20 specimens of annelids, crustaceans and adult pycnogonids (Table 1). None of the soft-bodied had any pycnogonid on it. Adult pycnogonids (3 ♀♀, 1 ♂) had an average length of 6 mm; the male had seven egg- masses on its ovigerous appendages, each one included about 30 eggs. The mean diameter of some eggs was 0.09 mm.

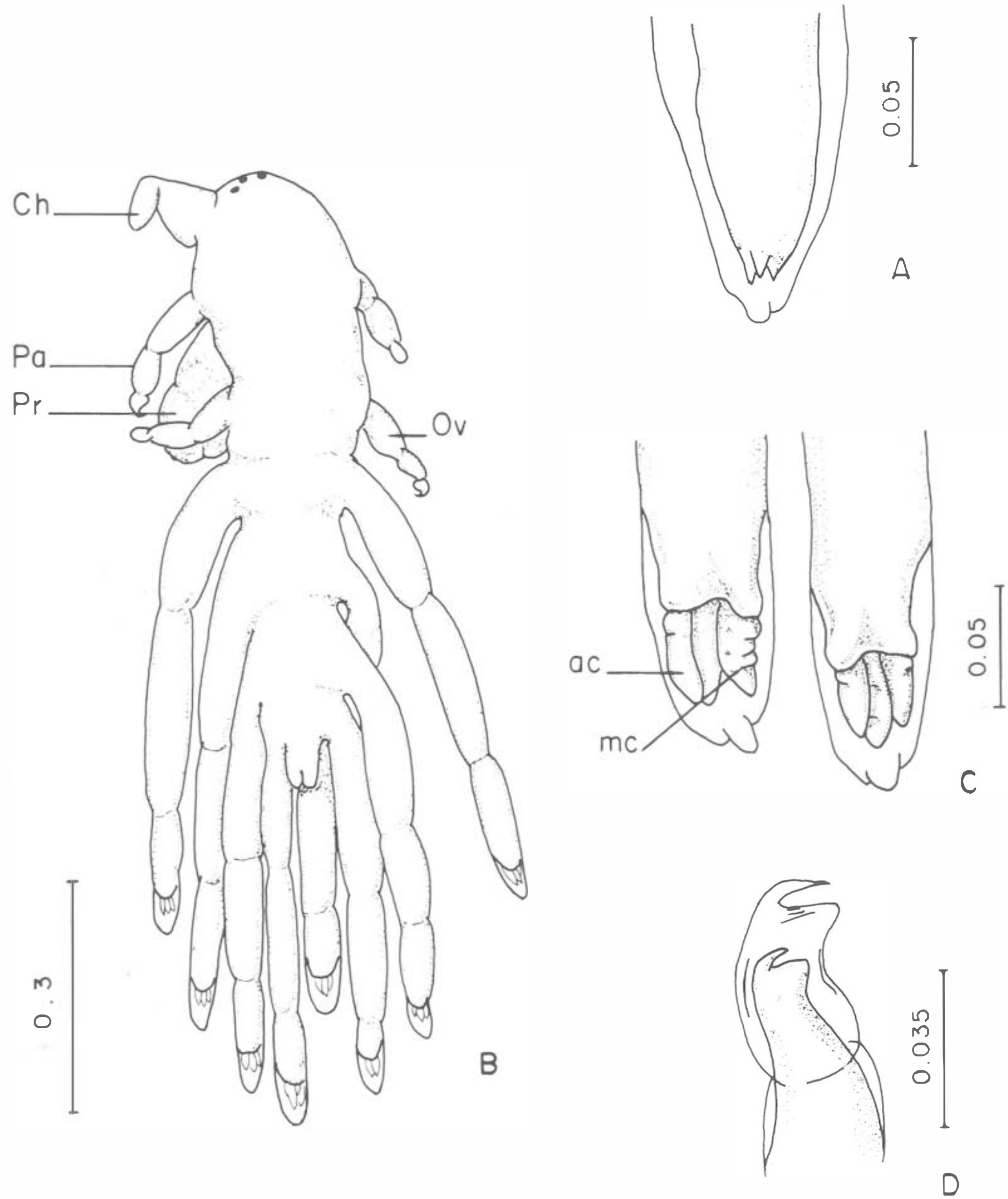

Fig. 4. ? *A. spinifera,* A. Stage IV juvenile leg tip; Stage V juvenile, B. Dorsal view, C. Tips from two legs, D. Right palp in side view (ac: accesory claw, ma: main claw; scales in mm).

DISCUSSION

Only one report (Stock 1959) has been published on a pycnogonid-polychaete parasitic association but it described only one stage in the development of the pycnogonid. Therefore, our report is the first record of this association for America, the second in the World, and the first one that describes earlier developmental stages of pycnogonids associated with polychaetes.

The sabellid *Sabella melanostigma* Schmarda had a high juvenile incidence (83%) and the juvenile pycnogonids prefered the abdomen over the thorax (3:1). This preference might be explained by the different roles of sabellid ne-

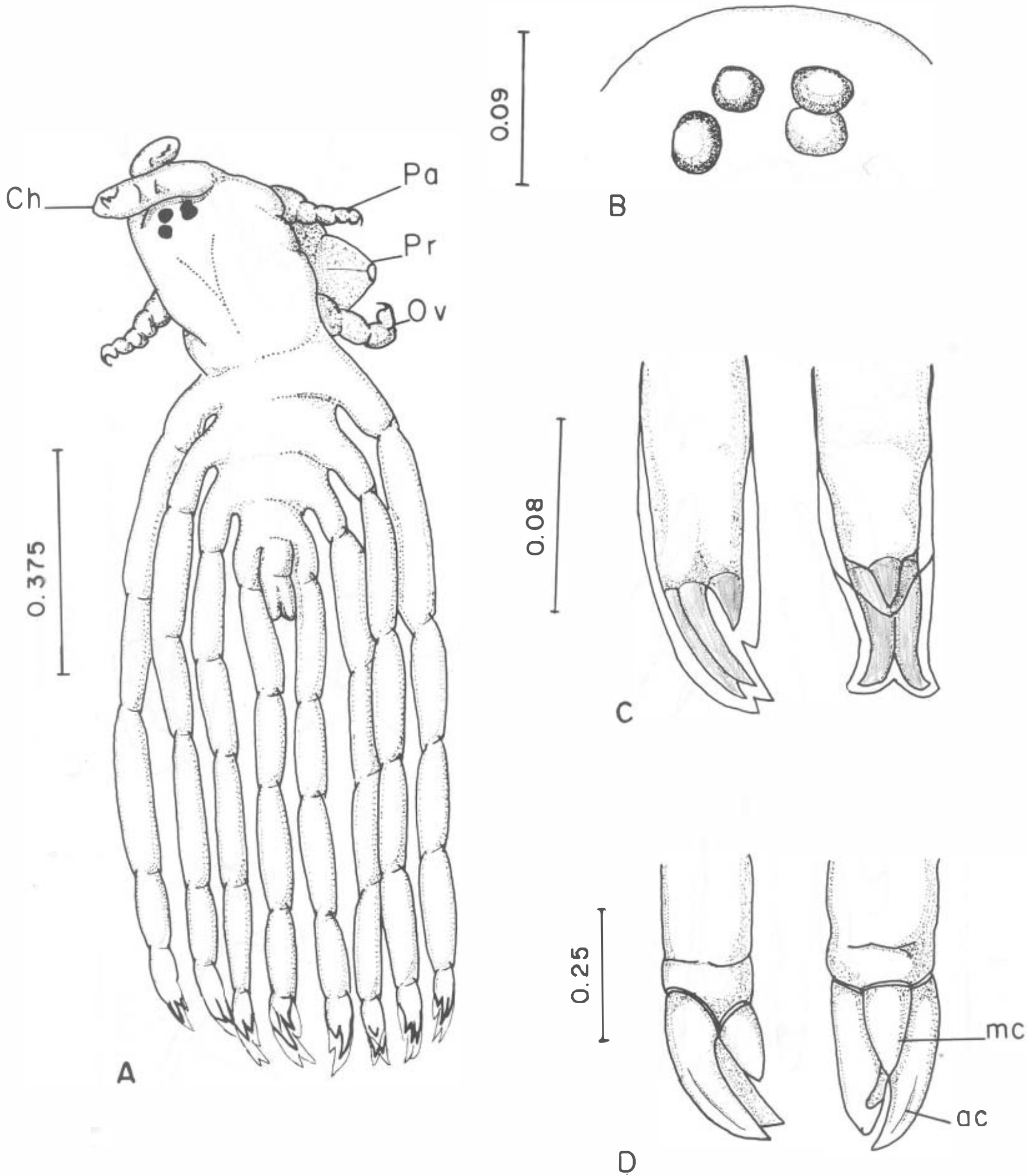

Fig. 5. *? A. spinifera* Stage VI juveniles, A. Dorsal view, B. Eyes, C. Tips from two legs, D. Tips from two legs from another specimen (scales in mm).

phridia; thoracic ones are excretory and the abdominal ones release mature reproductive cells from the coelom (Fauvel 1959).

In pycnogonid development, legs and segments are added one pair at a time to the posterior body region (King 1974). However, in *? A spinifera* all legs are formed at the same time. Ohshima (1937) desribed a similar development for *Nymphonella tapetis,* a pycnogonid parasitic on bivalves.

It is very difficult to assign a species name to almost any juvenile pycnogonid. In our specimens, the largest juveniles do not reach a TL of 2 mm whereas the adult pycnogonids averaged 6 mm in length, and larger juveniles lack the characteristic hollow spines of the adults.

TABLE 1

Animals associated with a *Sabella melanostigma* Schmarda, 1861 sample from Bahía Concepción, B.C.S., México (number of specimens in parentheses)

ANNELIDA
- Oligochaeta
  - Tubificidae
    - *Limnodrilus* sp. (2)
- Polychaeta
  - Cirratulidae
    - *Cirriformia punctata* (Grube, 1859) (3)
  - Orbiniidae
    - *Scoloplos acmeceps* Chamberlin, 1919 (1)
- Syllidae
  - *Branchiosyllis exilis* (Gravier, 1900) (2)
  - *Haplosyllis spongicola brevicirra* Rioja, 1941 (1)
  - *Odontosyllis polycera* (Schmarda, 1861) (1)
  - *Typosyllis variegata* (Grube, 1860) (1)
- Terebellidae
  - Unidentified fragment

CRUSTACEA
- Amphipoda unidentified (2)
- Tanaidacea unidentified (1)

PYCNOGONIDA
- Ammotheidae
  - *Ammothella spinifera* Cole, 1904 (4)

However, two facts indicate that the juveniles do belong to *A. spinifera.* First, four adults including an egg-carrying male were found in the sabellid sample, and second, egg size is smaller than stage I juveniles.

The reasons why we regard this association as parasitism are indirect: 1) the early development of the proboscis suggests its sucking role, 2) the proboscis often fitted on a depression on the annelid body wall, and 3) the reduced space available inside the sabellid tube (or rather, between the sabellid and its tube) should be energetically-poor since these polychaetes lack ventilatory currents and move out their feces with the aid of a ciliated groove. Thus, the sabellid should be the energetic support for the development of ?*A. spinifera.*

ACKNOWLEDGMENTS

A. Carvacho and R. Ríos kindly entrusted us this interesting sample. R. Pineda and J. W. Hedgpeth made some important suggestions. The manuscript was reviewed and notably improved by the comments of G. Sibley and two anonymous reviewers. The drawings were completed by R. Lomelí.

RESUMEN

Se encontraron juveniles del picnogónido amotéido *Ammothella spinfera?* aparentemente como ectoparásitos del poliqueto sabélido *Sabella melanostigma* de la Bahía Concepción, Golfo de California. De 23 sabélidos examinados, 19 estaban parasitados (83%de incidencia) por uno a cinco ($\bar{x}$ = 1.5) juveniles que preferían el abdomen al tórax (25 contra 9). También se encontraron cuatro adultos de *A. spinifera* en asociación menos estrecha con los sabélidos, y 12 anélidos más sin ectoparásitos.

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