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Morphology of shallow-water sea spiders from the Colombian Caribbean

(Arthropoda: Pycnogonida)

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Scanning EM redescriptions of nine pycnogonid species belonging to the families Ammotheidae, Phoxichilidiidae, and Callipallenidae are provided and referenced to earlier light microscopical descriptions of the respective species. Specimens were collected at various locations and different infralittoral habitats around Santa Marta along the Caribbean coast of Colombia.

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Introduction

Most Pycnogonida or sea spiders of the tropical, coastal seas are very small (1-2 mm body length) and have cryptic habitats in the phytal zone or close to coelenterates, sponges and other benthic organisms (Arnaud & Bamber 1987). In the present paper we examine nine species of pycnogonids found at different infralittoral habitats in the area of Sta. Marta at the Caribbean coast of Colombia. The last comprehensive study on the pycnogonids of this area is by Müller (1990) with the description of 50 species, including seven new to science (see also Müller & Krapp (in press)). Since then only a few studies dealt with the Colombian pycnogonids, including reports about three species new for this area (*Nymphon surinamense* Stock, 1975, *Anoplodactylus insignis* Hoek, 1881, *Pallenopsis schmitti* Hedgpeth, 1943) by Arango (2000). The material for these studies was collected at Tayrona national park and around Cartagena.

In the present study we contribute to the knowledge of some species of sea spiders from the Santa Marta region, mainly from unprotected coasts that are intensely used for fishing and tourism. For documentation we used the scanning electron microscope (SEM) that allows a direct and detailed analysis of the species-specific morphological characters, and we provide SEM (re)descriptions of the species. The present study aims to contribute to a pictorial atlas of Colombian pycnogonids. The classical studies on Caribbean pycnogonids that we refer to are by Marcus (1940), Hedgpeth (1948), Stock (1975, 1986) and Child (1979). For synonymy and detailed taxonomy see Müller (1990, 1993a), Müller & Krapp (in press).

Animals and Methods

Sampling and fixation. The pycnogonids for the present study were collected at various locations between the airport bay of Santa Marta, west of the city, and the Cabo Arrecifes, about 30 km east of the city in the Tayrona national park. A detailed description of the sampling sites including the Bavarian State Collection's storage number is given below for each of the studied specimens. In order to find pycnogonids from different habitats, samples were taken around corals and other coelenterates, from coral rubble, under stones and by whirling up sediment. Of these techniques, the under stone method, i.e. taking stones out of the water and checking the under stone benthic communities for pycnogonids proved to be the most successful way. The collected animals were fixed in 3 % formaldehyde-borax in sea water and the next day transferred to 70 % ethanol.

Cleaning of specimens. In order to get Scanning EM pictures of sufficient quality as well as for light microscopy most specimens had to be cleaned. For that, different methods were used: KOH solution in combination with an ultrasonic cleaner, some drops of dish-washing fluid in 70 % ethanol, 30 % H_2O_2 in 70 % ethanol (see Bolte 1996 for details), and a "Da Vinci" brush size N°00. Among these, the H_2O_2-method was most helpful and allowed to obtain rather clean specimens, even of the genus *Achelia* and *Ammothella* which are known to carry lots of epibionts and dirt on their cuticle.

Microscopy. First, pycnogonids were analysed with a Leica DMRBE light microscope. For documentation a Spot-insight colour digital camera was used. In addition to conventional pictures, focus series were made and pictures with extended field of depth were generated on PC using the program Auto-Montage (Syncroscopy).

Afterwards, specimens were dehydrated in a graded acetone series, critical-point-dried in a BAL-TEC CPD030, sputtered with gold in a Polaron "Sputter coater" and examined in a Leo 1430VP scanning EM at 17-30 kV.

Scanning EM descriptions of the collected pycnogonids

Ammotheidae

Achelia Hodge, 1864

Achelia sawayai Marcus

Achelia sawayi Marcus 1940: 81-86, Figs 10a-f, 17

Material. Adult ♂ (ZSM-A-20071594); Casa Grisales, Bahia del Rodadero, Santa Marta; on stone with algae. 0.5-1.0 m. 11.10.2004; Juvenile (ZSM-A-20071595); Playa Brava, Bahia de Taganga, Santa Marta; under stone, 0-0.5 m, 09.12.2004; Juvenile (ZSM-A-20060998); Playa Brava, Bahia de Taganga, Santa Marta; under stone, 0-0.5 m, 09.12.2004; Adult ♂ (ZSM-A-20060999); Bahia del Rodadero, Santa Marta; under stone. 0.5-1.0 m. 14.12.2004; Adult ♀ with eggs in the legs (ZSM-A-20071596); Bahia del Rodadero, Santa Marta; under stone, 0.5-1.0 m, 14.12.2004; Adult ♂ carrying eggs on ovigera (ZSM-A-20071597); Bahia del Rodadero, Santa Marta; under stone. 0.5-1.0 m. 18.12.2004.

Description (Figs 1-4)

Light microscopical descriptions of this species are given by Müller (1990), Müller & Krapp (in press), Hedgpeth (1948), Stock (1955), and Child (1992). Living animals are sand-coloured. No special pigmentation of the gut. Body circular (Figs 1D, 2C, 3A,B), segmentation lines not visible (Figs 1D, 2C, 3C-E), dorsodistal spination absent. Ocular tubercle relatively flat, deprived of apical protrusion; four strongly pigmented eyes and two lateral sense organs present (Figs 1D, 4A,E).

Short abdomen orientated upwards (Figs 1D, 2C, 4A), inserted directly between walking legs 4 and having distally two laterodorsal short spines (Fig. 4A). Proboscis oval, with pointed tip (Fig. 4D).

Chelifores composed of a long article and chelae that are well developed in juveniles (Figs 1B,G) but deformed in adults (Figs 2C, 4A,B).

Palps with 8 articles in adults (Figs 2F, 4F) and 6 in juveniles (Fig. 1F). Ovigera with 10 articles in both sexes, articles 8-10 equipped with serrated spines (Fig. 4G-I). Male ovigera with spines on all articles. In specimen examined eggs were carried between 5th and 2nd ovigera article (Fig. 4G).

Coxa 1 of all legs with 3 distal spines inserted on protrusions. In juveniles (Fig. 1E) these are less pronounced than in adults (Figs 3D, 4C). Coxa 2 equipped with 2 spines, 2× length of coxa 1; coxa 3 with bristles ventrodistally, same length as coxa 1. Length of femur 3× coxa 1. Adult male with strong protrusion (cement gland) at the dorsodistal edge of the article. Femur of ovigerous female swollen and filled with eggs (Fig. 2B). Tibia 1 0.2× as long as tibia 2. Both tibiae rather thin. Tarsus as long as wide, with several spines, ventrally with setae and distally with a single spine (Fig. 4K). Propodus slightly curved (Figs 1H, 2H, 3G, 4K), heel absent. Sole consists of a row of 6-9 thin short spines (Figs 3G, 4K), dorsomedially with 3-5 long thin spines (Figs 3G, 4K). Distal tip of propodus with curved main claw and two accessory claws at its dorsal side. Length of accessory claws 0.75× main claw (Figs 2H, 3G, 4K).

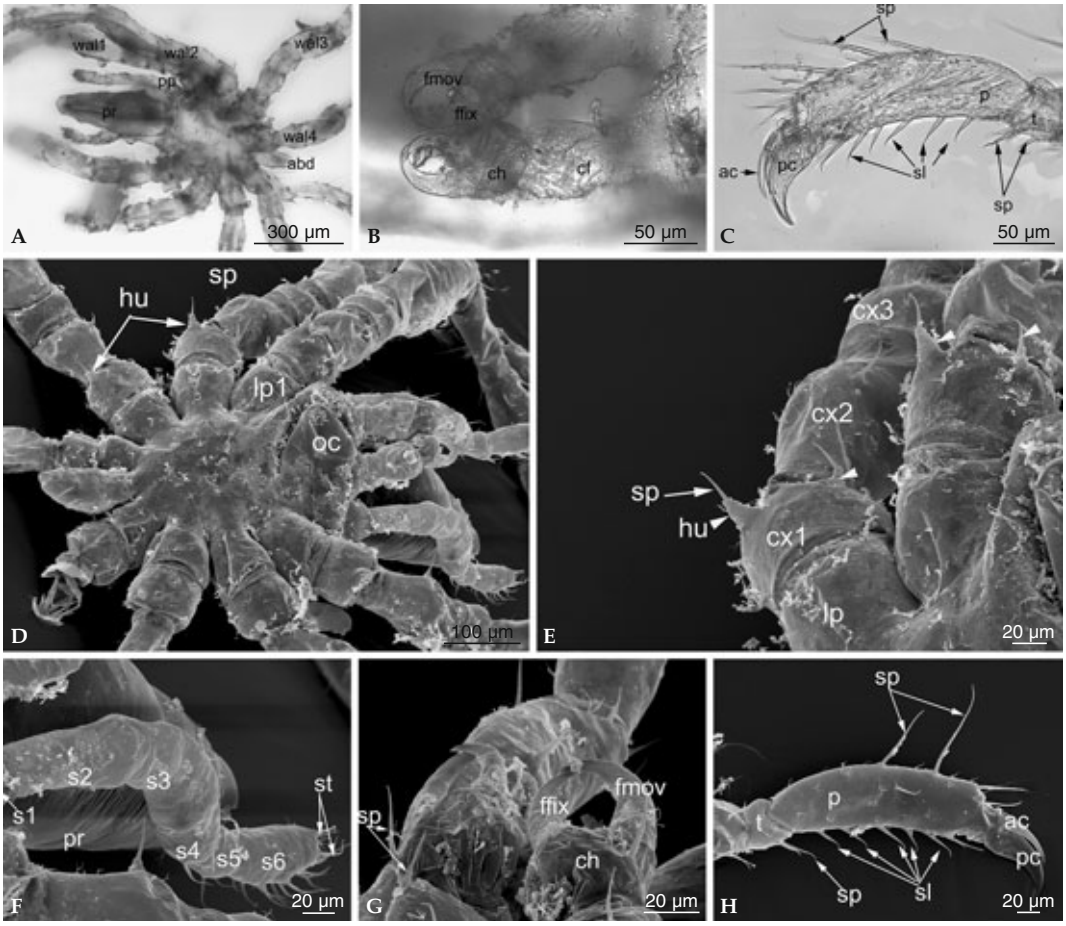


Fig. 1. *Achelia sawayai* Marcus, 1940, juvenile. **A.** Ventral view with walking legs (**wal1-wal4**), pedipalps (**pp**) and proboscis (**pr**). **B.** Chelifores (**cf**) with well developed chelae (**ch**) equipped with movable (**fmov**) and fixed fingers (**ffix**). **C.** Propodus (**p**) and tarsus (**t**) of 3rd walking leg with spines and sole (**sl**). Note accessory claws (**ac**) next to primary claw (**pc**). **D.** Dorsal view. Note lateral processes (**lp**) and humps (**hu**) with spines (**sp**) on coxa 1. **E.** Dorsal view of lateral processes and coxal articles (**cx1-cx3**). **F.** Lateral view of 6-jointed pedipalp (**s1-s6**) with setae on the 3 distal articles (**st**). **G.** Closeup of chelae. Note spines at their base and well-developed movable and fixed finger (**fmov** and **ffix**). **H.** Tarsus (**t**) and propodus (**p**), lateral view. **Abd**, abdomen; **Ac**, accessory claw; **hu**, hump; **oc**, ocular tubercle; **pc**, principal claw; **sl**, sole; **sp**, spine. A-C light microscopy, D-H SEM.

Remarks. *Achelia sawayai* is a small species. Its colour can be explained as an adaptation to the habitat, i.e. infralittoral stones with algae. Due to variability of the spination and the presence of a very similar species, *Achelia gracilis* Verrill, 1900, the determination of *A. sawayai* is not trivial. However, the number of spines on coxae 1 of legs 1 and 2 (3 in *A. sawayai* and 4 in *A. gracilis*) turned out to be a good distinctive feature.

This species is distributed along the Atlantic coast from Georgia (USA) to Brazil and Bahamas Is. In addition, in the Atlantic and Indian Ocean, samples have been reported from West Africa, Cape Verde Is. and Madagascar (Child 1979). In the Pacific, the species is known from Fiji (Müller 1990a), and French Polynesia (Müller 1989, 1990b).

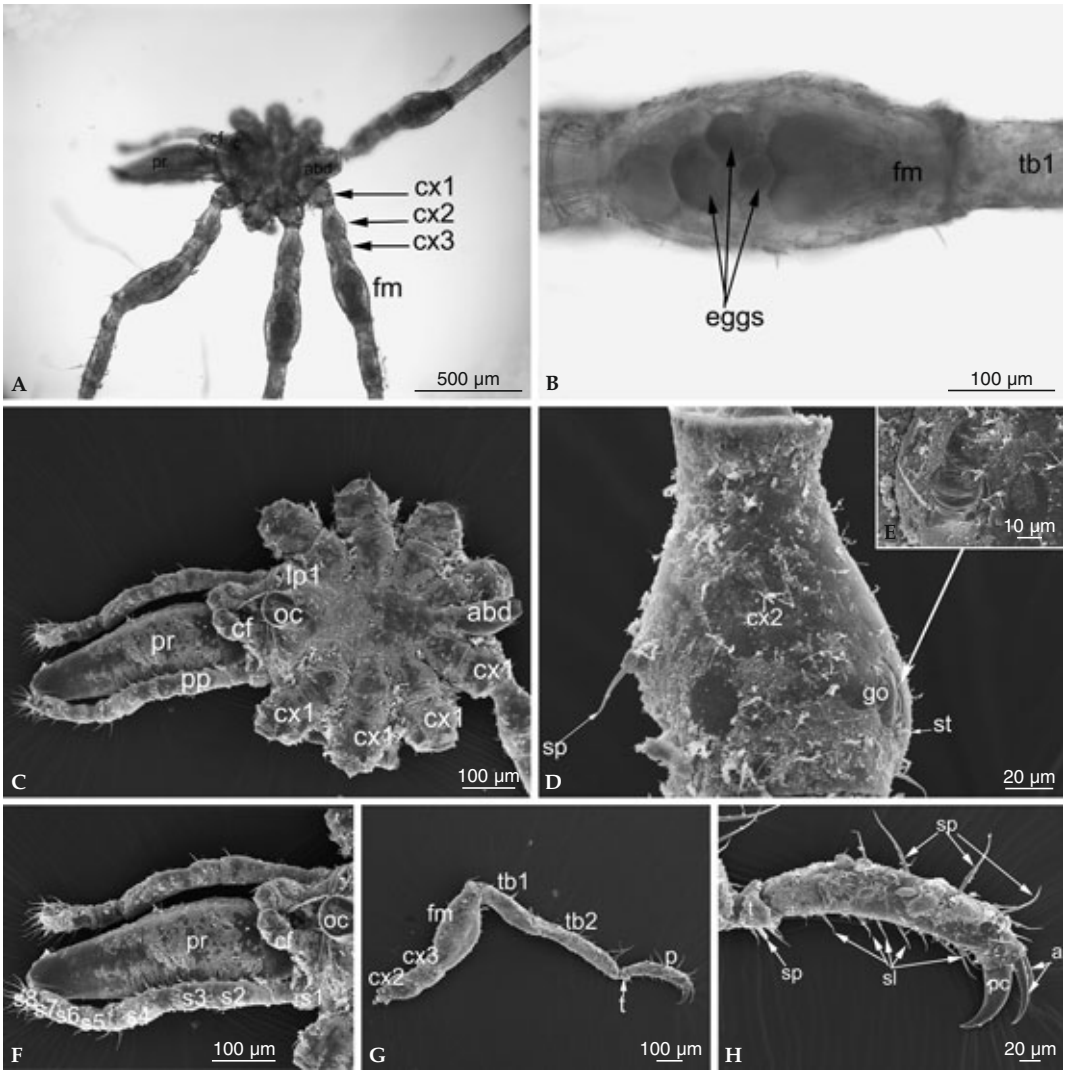


Fig. 2. *Achelia sawayai* Marcus, 1940, female. **A.** Dorsal survey; note thickened coxae (**cx1-3**) and femora (**fm**). **B.** detail of walking leg with eggs. **C.** Dorsal survey. **D.** coxa 2 with genital opening (**go**) and neighbouring seta (**st**). **E.** Detail of D. **F.** Dorsal view of proboscis (**pr**), 8-jointed palps (**s1-s8**), chelifores (**cf**) and ocular tubercles (**oc**). **G.** Lateral view of walking leg. **H** Propodus and tarsus. **Abd,** abdomen; **ac**, accessory claw; **fm**, femur; **lp1-lp4**, lateral processes; **p**, propodus; **pc**, primary claw; **pp**, pedipalp; **pr**, proboscis; **sl**, sole; **sp**, spine; **t**, tarsus; **tb1**, **tb2**, tibia 1 and 2. A, B, light microscopy, C-H, SEM.

Ammothella Verrill, 1900

Ammothella exornata Stock

Ammothella exornata Stock, 1975: 974-978, figs 7c-d.

Material. Exuvy (ZSM-A-20061000), Bahia del Rodadero, Santa Marta; from substrate. 18.12.2004; Juvenile (ZSM-A-20061032); Playa Brava, Bahia de Bahia de Taganga, Santa Marta; from stone, 0-0.5 m, 27.12.2004; Juvenile (ZSM-A-20071598); Playa Brava, Bahia de Taganga, Santa Marta; from stone, 0-0.5 m, 27.12.2004; Adult ♂ (ZSM-A-20071599); Playa Brava, Bahia de Taganga, Santa Marta; under stone, 0-0.5 m, 27.12.2004; Juvenile (ZSM-A-20061033); Playa Brava, Bahia de Taganga, Santa Marta; under stone, 0-0.5 m, 05.01.2005.

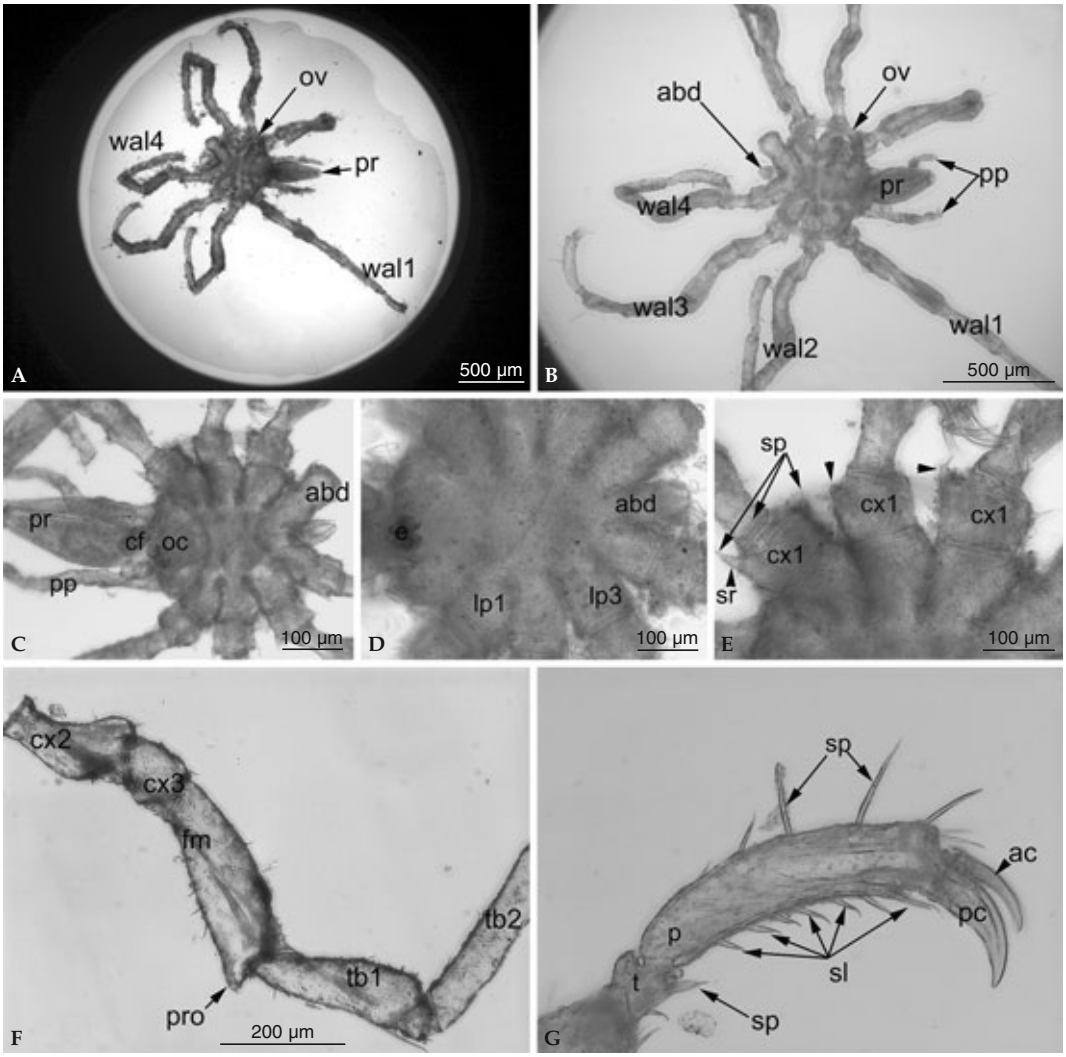


Fig. 3. *Achelia sawayai* Marcus, 1940, male, light microscopy. **A, B.** Surveys of whole animal, ventral view. **C.** Ventral view at higher magnification showing short abdomen (**abd**), flat ocular tubercle (**oc**), short reduced chelifores (**cf**) and funnel shaped proboscis (**pr**). **D.** Dorsal view of trunk; note absence of segmentation. **E.** Dorsal view of leg insertion showing spinulation (**sp** and arrowheads) of 1st coxae (**cx1**). **F.** survey of walking leg from coxa 2 (**cx2**) to tibia 2 (**tb2**). **G.** Propodus (**p**). **Ac**, accessory claw; **Cx3**, coxa 3; **fm**, femur; **lp1**, **lp3**, lateral processes 1 and 3; **ov**, ovigera; **pc**, primary claw; **pp**, pedipalp; **sl**, sole; **t**, tarsus; **tb1,** tibia 1; **wal1-4**, walking legs 1-4.

Description (Figs 5-7)

Living animals are sand-coloured with ganglia visible ventrally (Fig. 5B). Body slightly oval in shape (Fig. 5A), segmentation line between 3rd and 4th segment absent. (Fig. 6B), dorsally with numerous cone-shaped protuberances on all segments including the abdomen (Fig. 6C) that are less pronounced in juveniles (Fig. 5B,D). Slit organs or epidermal gland openings on the tip and at the sides of these (Fig. 5E, 6E-G).

Ocular tubercle 2× as high as wide, with apical sense organ and two lateral sense organs. At the left and the right base of eye tubercle two protuberances, each with a distal gland pore (Figs 5D,I, 7I). Further pores on branched protuberances at the sides of eye tubercle (Fig. 7I). Small protuberance at the posterior base of tubercle (Figs 6B, 7I). Eyes strongly pigmented, anterior 2 about ⅓ deeper on the tubercle than the 2 posterior ones.

Abdomen not separated from body, i.e. confluent

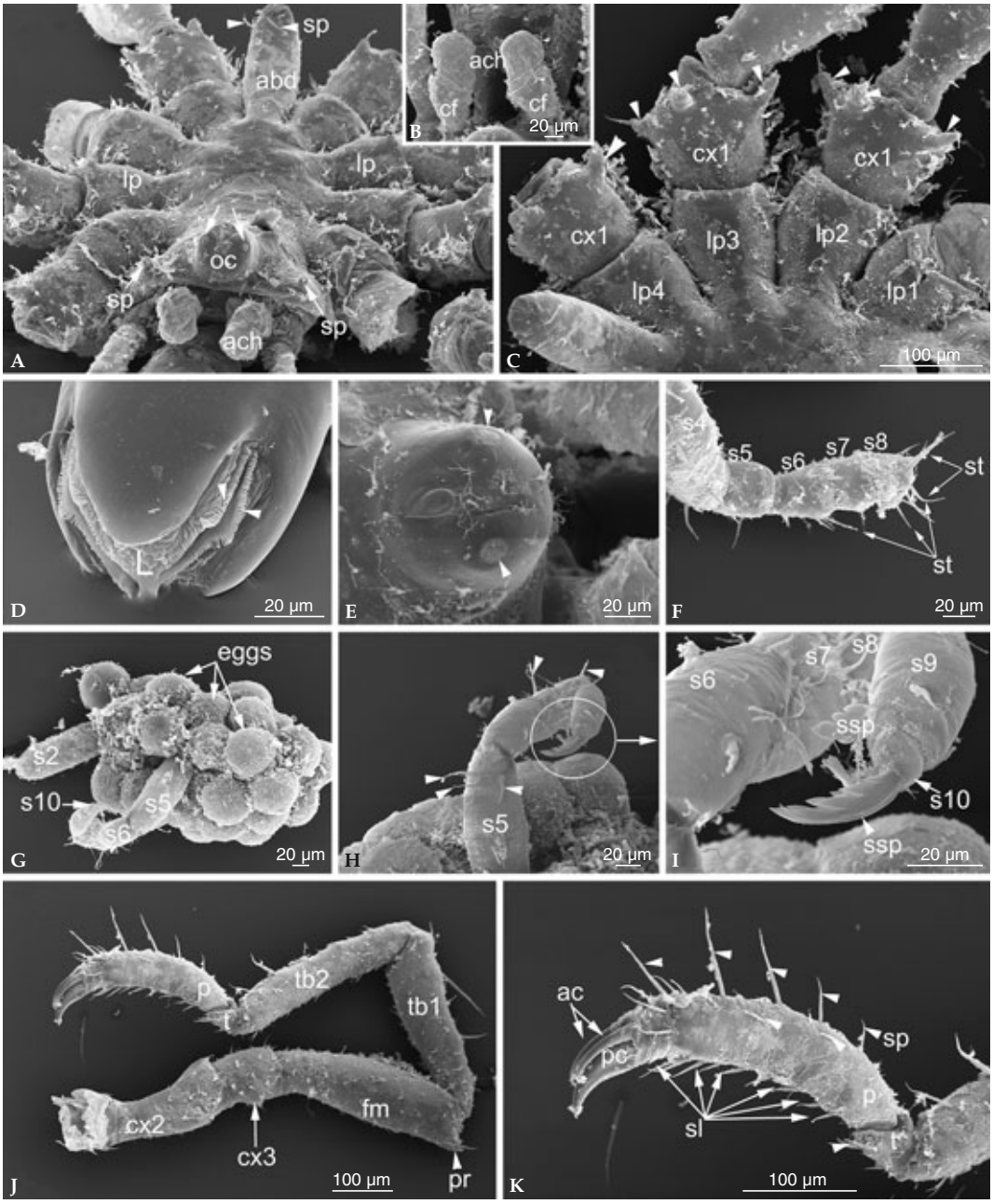


Fig. 4. *Achelia savayai* Marcus, 1940, male, SEM. **A.** Frontal view showing lateral sense organs (arrows) on ocular tubercle (**oc**), adjacent spines (arrow and **sp**) and those on the abdomen (arrowhead and **sp**). **B.** Closeup of chelifores (**cf**) with atrophied chelae (**ach**); arrowheads characteristic spines. **C.** Dorsal view of lateral processes (**lp1-4**) and 1st coxae (**cx1**); arrowheads spinulation. **D.** Tip of proboscis with mouth and haircoat (arrowheads) of the "lips". **E.** Ocular tubercle with lateral sense organs (arrowheads). **F.** Distal pedipalp articles s4 to s8 with setae (**st**). **G**. 10-jointed (**s2-s10**) ovigera with eggs attached to it. **H, I.** Closeups of distal ovigera articles (**s5-s10**) with setae (arrowheads) and serrated spines (**ssp**). **J.** 3rd walking leg with process (**pr**) at the distal tip of the femur (**fm**). **K.** propodus with spines (**sp**) and sole (**sl**). **Ac**, accessory claw; **cx2**, coxa 2; **cx3**, coxa 3; **p**, propodus; **pc**, principal claw; **t**, tarsus; **tb1**, tibia 1; **tb2**, tibia 2.

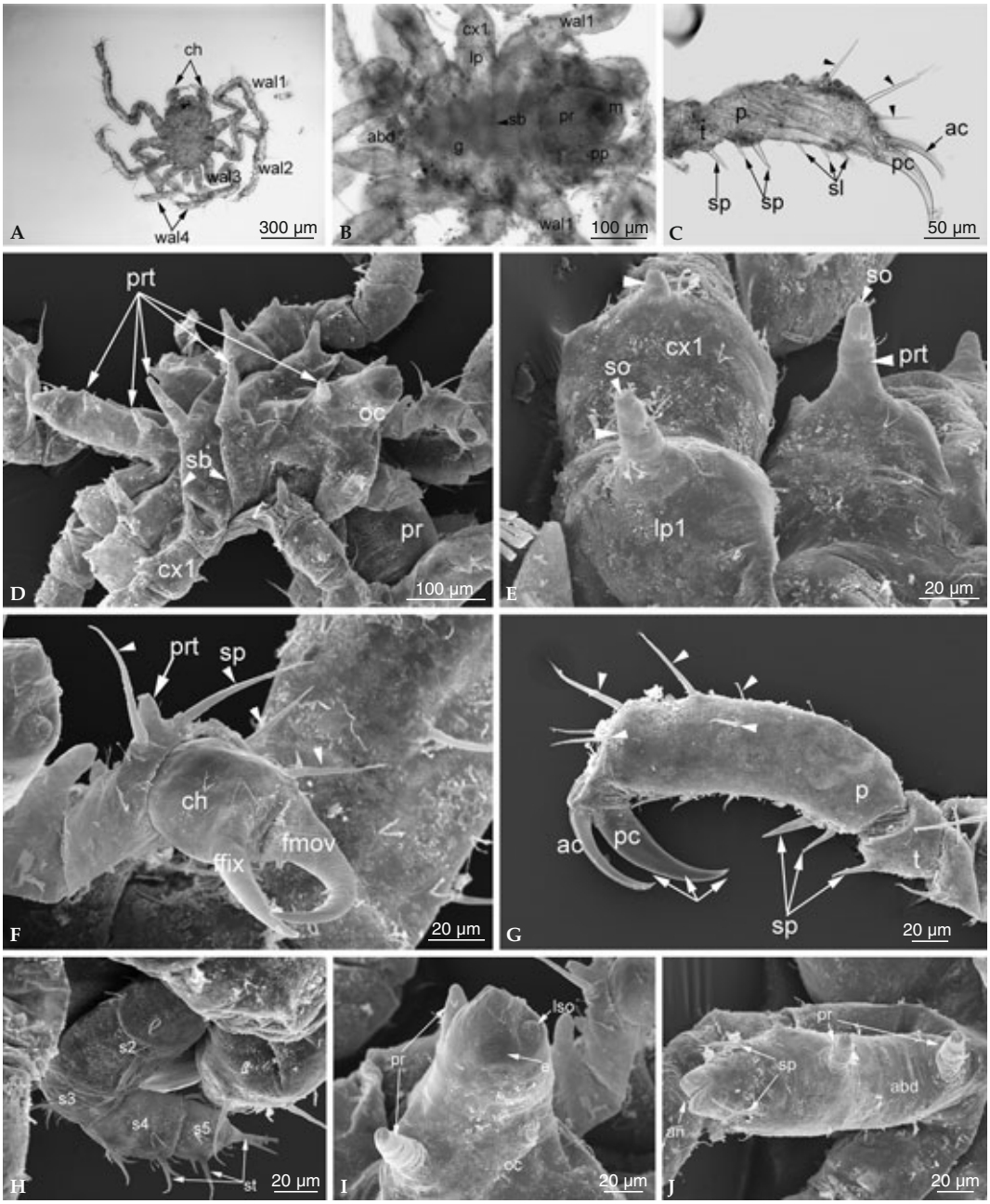


Fig. 5. *Ammothella exornata* Stock, 1975, juvenile. **A.** Survey viewed from dorsally. **B.** Ventral view of trunk and base of legs showing suture between segments (**sb**) and blunt proboscis (**pr**). **C.** tarsus (**t**) and propodus (**p**) with spinulation and sole (arrowheads, **sp**, **sl**). **D.** Dorsolateral view of dorsal trunk protrusions (**prt**). **E.** Protrusions on lateral processes (**lp**) and coxa 1 (**cx1**) (**prt**, arrowheads) with slit-shaped gland opening on top (**so**). **F.** Chelifore (arrowheads and **sp**: spinulation). **G.** Propodus of walking leg no. 3 (arrowheads and **sp**: spinulation). **H.** Closeup of 5 jointed palps (**s1-s5**). **I.** Ocular tubercle (**oc**) with lateral processes (**pr**), eye cuticle (**e**) and lateral sense organ (**lso**). **J.** Dorsal view of abdomen. **Abd**, abdomen; **ac**, accessory claw; **an**, anus; **ch**, chelifore; **ffix**, fixed finger of chelae; **fmov**, movable finger of chelae; **g**, ganglion; **m**, mouth; **p**, propodus; **pc**, primary claw; **pp**, pedipalp; **pr**, proboscis; **prt**, protrusion; **sl**, sole; **t**, tarsus; **wal**, walking leg.

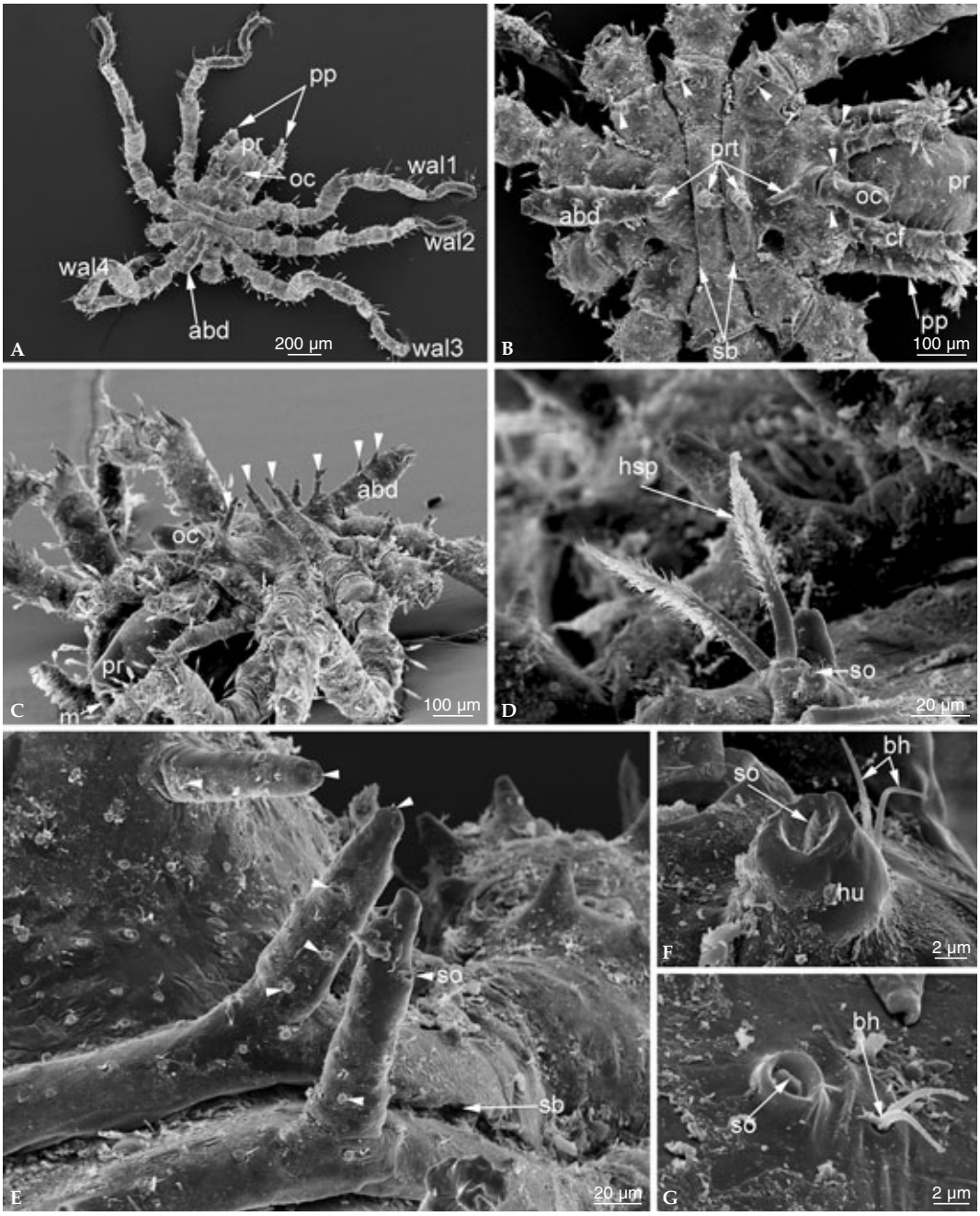


Fig. 6. *Ammothella exornata* Stock, 1975, male. **A.** Dorsal survey. **B.** Trunk and base of walking legs with spines (arrowheads) and large protrusions on the midline (**prt**); note segmentation lines. **C.** Anterolateral view; arrowheads spines on midline of body and abdomen. **D.** Detail showing hairy spine (**hsp**). **E.** Detail showing some of the dorsal protrusions (**prt**), each with several slit organs (**so**). **F, G.** Slit-shaped gland pores with neighbouring branched hair (**bh**). **Abd**, abdomen; **cf**, chelifores; **hu**, hump; **m**, mouth; **oc**, ocular tubercle; **pp**, pedipalps; **pr**, proboscis; **sb**, segment border; **wal1-4**, walking legs.

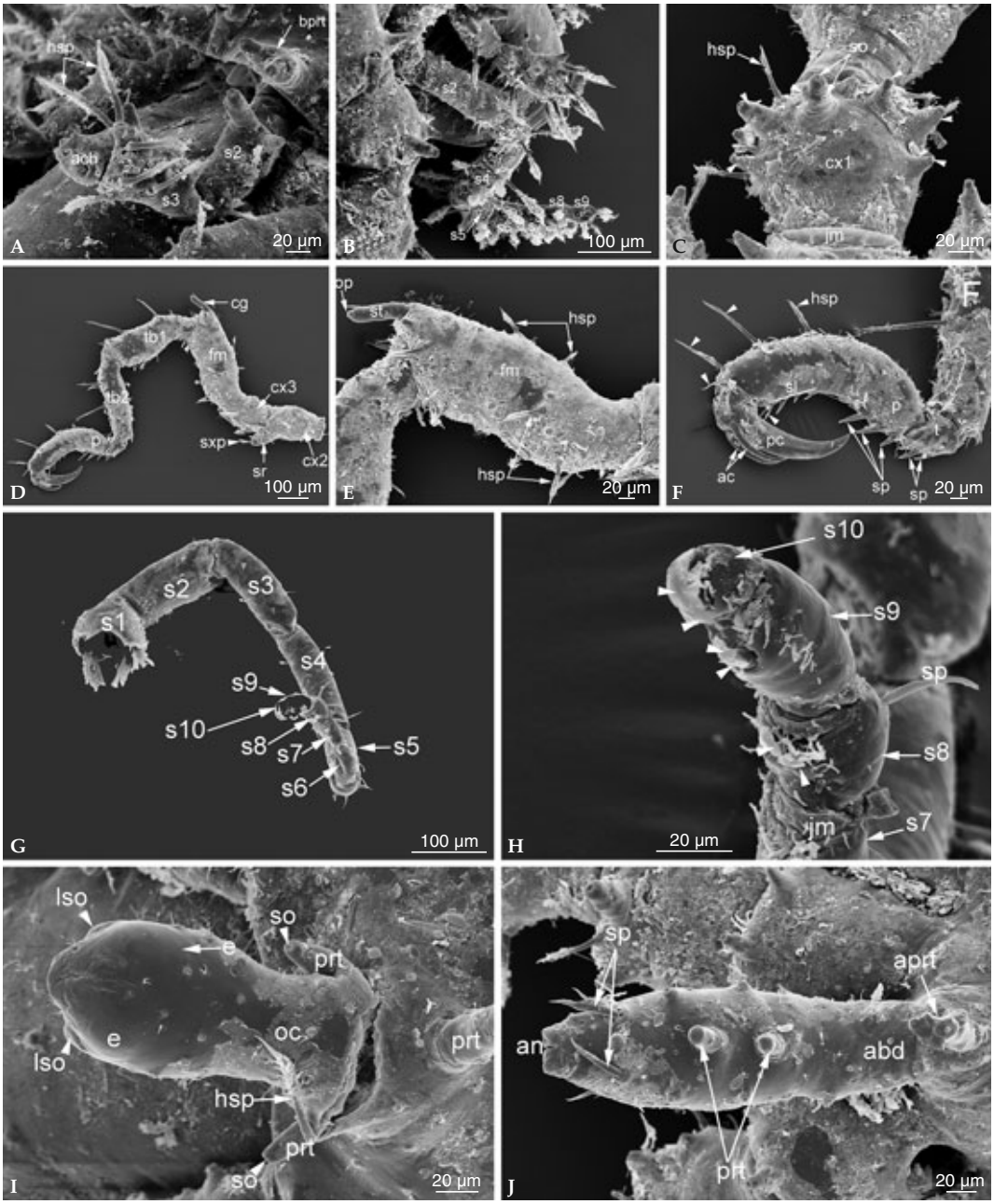


Fig. 7. *Ammothella exornata* Stock, 1975, male. **A.** Chelifores with rudimentary chelae (**ach**) and hairy spines (**hsp**). **B.** Palps. **C.** 1st coxa (**cx1**) with spination (arrowheads) and "slit"-shaped gland pores (**so**). **D.** Survey of walking leg with sexual organ on coxa 2 (**cx2**) including spur (**sp**). **E.** Femur (**fm**) with distal seta (**st**) and several hairy spines (**hsp**). **F.** Propodus (**p**) of 3rd walking leg with well visible accessory claws (**ac**); **Hsp** and arrowheads hairy spines. **G.** 10-jointed ovigera. **H.** Distalmost ovigera articles (**s7-s10**) with spine and feathered hairs (**arrowheads**). **I.** Ocular tubercle (**oc**) with eyes (**e**) and lateral sense organs (**lso**). In the neighbourhood, hairy spines (**hsp**) and protrusions with slit organs (**prt** and **so**) are seen. **J.** Survey of abdomen with anus (**an**), spinulation (**sp**) and protrusions (**prt** and **aprt**). **Bprt,** branched protuberance; **Cx3**, coxa 3; **fm**, femur; **Jm**, joint membrane; **p**, propodus; **pc**, principal claw; **s1-s10**, articles of body appendages; **sl**, sole; **sp**, spine; **t**, tarsus; **tb1**, tibia 1; **tb2**, tibia 2.

with the 3rd externally visible body segment (Figs 6B, 7J); with 3 small protuberances and two small spines on each side of the anus (Fig. 7J).

Chelifores with 3 articles, 1st and 2nd of equal length and with numerous spines and protrusions. Chelae rudimentary in adults (Fig. 7A), in juveniles well developed and dentated (Fig. 5F).

Palps with 9 articles in adults (Fig. 7B) and 5 in juveniles (Fig. 5H). 2nd and 4th article the longest, articles 7-9 short, of equal length. Ovigera with 10 articles and serrated spines from article 8-10 (Figs 7G,H). Ovigera absent in juvenile stages.

Legs 1-4 long, coxae 1 with several distal protuberances in adults (Fig. 7C), only a few in juveniles (Fig. 5E). Second coxa 0.33× as long as first coxa. Coxa 2 of legs 3 and 4 of males ventrodistally with genital pores on protuberances (Fig. 7D). Coxa 3 equal in length to coxa 1. Femur robust, 2× as long as wide, with long, seta-shaped cement gland dorsodistally (Fig. 7E). Tibia 1 wider than tibia 2 but of same length, both thinner than other leg articles (Fig. 7D), equipped with numerous bristles. Tarsus 0.2× as long as wide, with two spines on ventral side in adults and one in juveniles. Propodus curved, with 3 proximal, thick spines in adults and further distally a sole composed of 3-7 small spines, depending on developmental stage (Figs 5G, 7F). Two or 3 hairy spines dorsally on propodus. Length of main claw 0.6× as long as propodus. Length of accessory claws 0.5× as long as main claw.

Remarks. *Ammothella exornata* is a small and robust species. It was collected mainly at dim-light habitats under stones. Adults of this species can easily be determined by the dorsal protuberances and the fusion of segments 3 and 4. The cuticular gland pores are either found at the tips of small protrusions or surrounded by a ring, and neighboured by a branched hair. *Ammothella exornata* is commonly found in the Caribbean Sea, e.g. St. Martin and Bonaire (Stock 1975), Panama (Child 1979), Belize (Child 1982), Martinique (Müller 1990) and Colombia (Müller 1990).

Ammothella spinifera Cole

Ammothella spinifera Cole, 1904: 275-277, pl. 12. fig. 8, pl. 20, figs 7-9, pl. 21, figs 1-6.

Material. Adult ♀ with eggs in legs (ZSM-A-20060987), Casa Grisales, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 12.10.2004; Juvenile (ZSM-A-20071600), Casa Grisales, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 12.10.2004; Adult ♀ with eggs in legs (ZSM-A-20071601), Casa Grisales, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 18.11.2004; Adult ♂ (ZSM-A-20060988), Casa Grisales, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 18.11.2004; Adult ♀ with eggs in legs (ZSM-A-20060991), Inca-Inca, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 26.11. 2004; Adult ♀ (ZSM-A-20060982), Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 26.11.2004; Juvenile (ZSM-A-20060990), Inca-Inca, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 04.12.2004; Adult ♂ carrying eggs (ZSM-A-20071602), Inca-Inca, Bahia del Rodadero, Santa Marta; under stone; 0-0.5 m; 05.12. 2004.

Description (Figs 8-11)

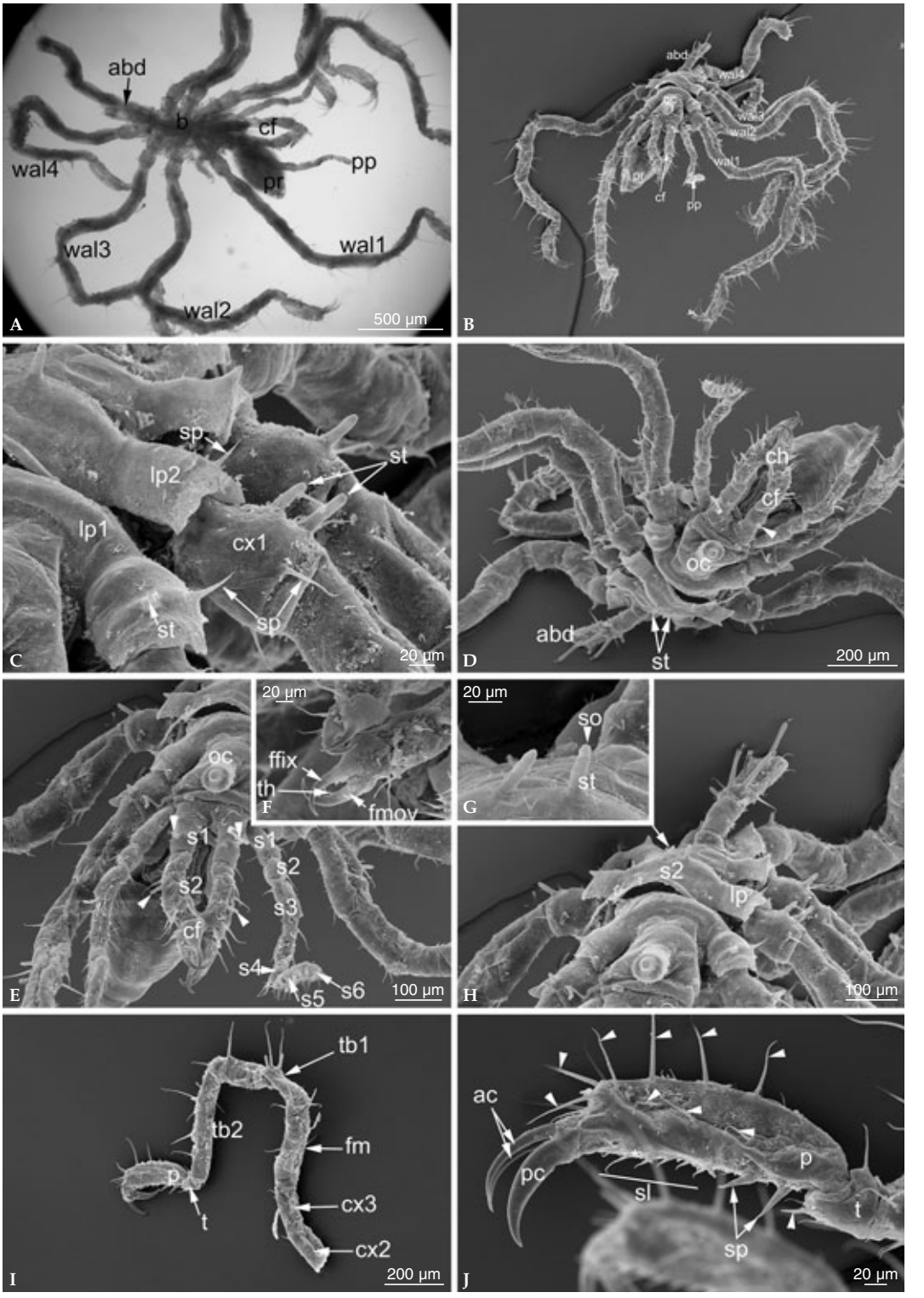
Living animals sand-coloured to light brown. Body slender, with very long walking legs (Fig. 8A). Segmentation lines between all body segments (Figs 9B, 11C). On the dorsal side of the 2nd body segment, in some specimens also on the 1st, several long setae are inserted (Figs 8G,H). In juveniles, these have the shape of short protrusions (Fig. 8G). Each body segment with 2 lateral spines of medium length (Figs 8C, 9B,D, 11C).

Eye tubercle 2× as long as wide, with one apical sense organ on its pointed tip and two lateral sense organs (Figs 9C, 10C, 11L). Eye pigmentation in some specimens rather weak.

Abdomen slightly curved and 2× as long as eye tubercle (Figs 10D, 11J), slightly flattened on the dorsal side; dorsally and laterally setae and spines of varying size, shape and number are inserted (Fig. 11J). Segmentation line between segment 4 and abdomen (Fig. 11J).

Chelifores composed of 3 articles. 1st article slightly shorter than 2nd. Juveniles with developed, but not very strong chelae (Fig. 8E). Chelae rudimentary in adults (Fig. 9C).

Fig. 8. *Ammothella spinifera* Cole, 1904, juvenile. **A.** Survey of whole animal from dorsal. **B.** frontal view. **C.** Dorsodistal spinulation made of spines (**sp**) and setae (**st**) on lateral processes (**lp1**, **lp2**) and 1st coxae (**cx1**). **D.** Dorsal view showing 2 spines on body segment 2 (**st**). **E.** Frontal view of anterior part of body with eye tubercle (**oc**), chelifores (**cf**) and palps (**s1-s6**). **F.** Detail of chelae with still well-developed movable and fixed fingers (**fmov** and **ffix**) equipped with teeth (**th**). **G.** Detail of thorax with dorsal setae (**st**) and gland pore (**so**). **H.** Frontal view of thorax. **I.** Lateral survey of walking leg 3. **J.** Detail of propodus (**p**) with spinulation (arrowheads, **sp**). **Abd**, abdomen; **Ac**, accessory claw; **b,** body; **Cf**, chelifores; **Ch**, chelae; **Cx1-3**, coxae; **Fm**, femur; **Oc**, ocular tubercle; **P**, propodus; **Pc**, primary claw; **Pp**, pedipalps; **Pr**, proboscis; **S2**, body segment 2; **Sl**, sole; **T**, tarsus; **Tb1-2**, tibia 1 and 2; **Wal1-wal4**, walking legs. A Light microscopy, B-J SEM. ▷



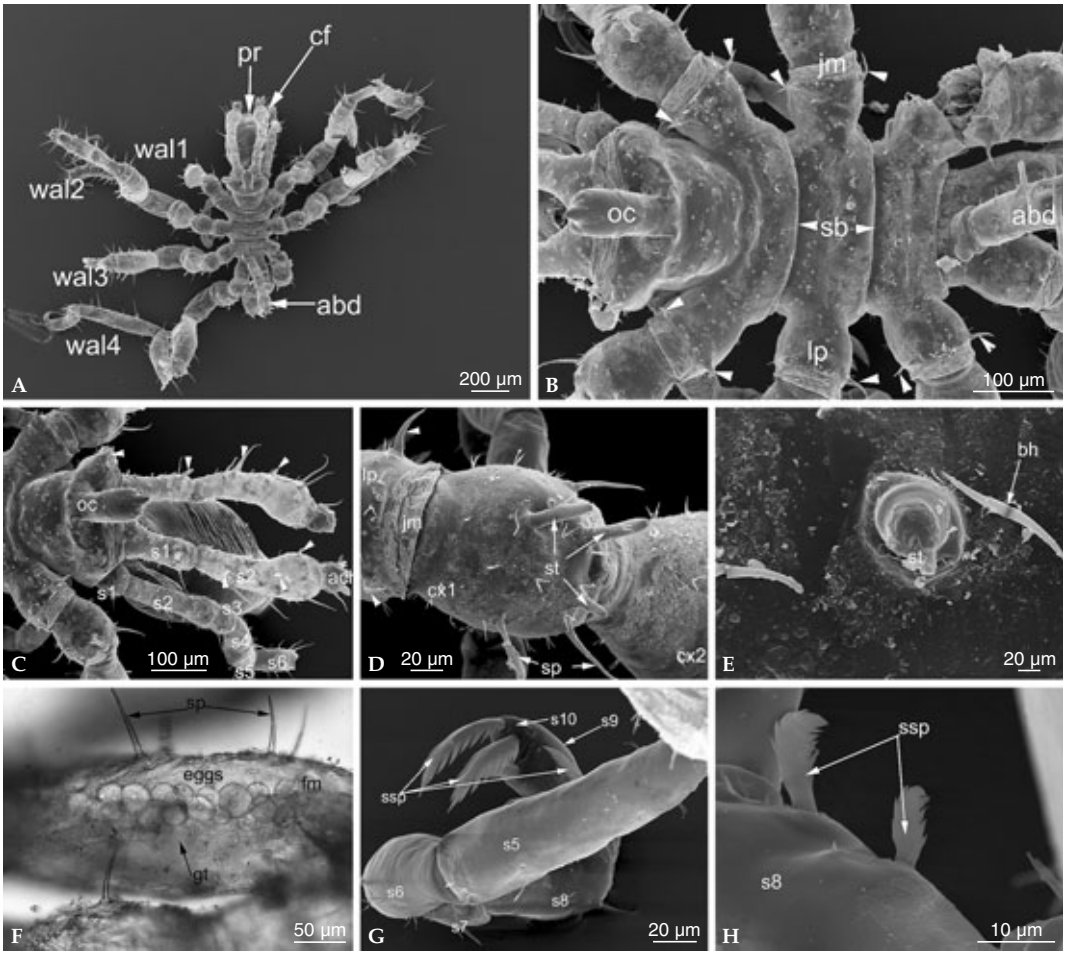


Fig. 9. *Ammothella spinifera* Cole, 1904, female. **A.** survey of whole animal. **B.** Dorsal view with segment borders and spinulation (arrowheads). **C.** Anterior part of the animal with rudimentary chelae (**ach**), long eye tubercle (**oc**), and spinulation pattern (arrowheads). **D.** Detail of coxa 1 (**cx1**) of walking leg 1 with spines (**sp**) and setae (**st**). **E.** Detail of setae (**st**) on 2nd article including branched hair (**bh**). **F.** Femur (**fm**) with eggs inside (light microscopy) and lateral branch of the gut (**gt**). **G.** Detail of distalmost ovigera articles with serrated spines (**ssp**). **H.** Same as in G, ovigera article 8. **abd**, abdomen; **an**, anus; **cf**, chelifores; **cx1-3**, coxae; **fm**, femur; **jm**, joint membrane; **lp**, lateral process; **oc**, ocular tubercle; **p**, propodus; **pr**, proboscis; **s1-s10**, articles of body appendages; **sb**, segment border; **sp**, spine; **st**, setae; **t**, tarsus; **tb1**, **tb2**, tibiae; **wal1-wal4**, walking legs.

Palps composed of 9 articles (Figs 8E, 9C, 11B); 2nd and 4th articles the longest, followed by articles 5, 6 and 9. Articles 1, 7 and 8 the shortest, equal in length. Ovigera with 10 articles (Figs 9G, 11F-H); on the 3 distalmost of these several serrated spines are inserted (Figs 9G,H, 11G). 7th and 8th article each with 2 large, proximal spines (Fig. 11F). Coxa 1 with 2-4 long dorsal setae (Figs 8C, 9D, 11D) having a rounded tip with cuticular gland pore (Fig. 11E). 2nd coxa 2× as long as 1st coxa, and in females distally wider than in males. Coxa 3 of same length as coxa 1 (Figs 8I, 10A). Femur 2× as long as wide, distally armed with small spines (Fig. 10A). Male femur with dorsal cement gland protuberance at 0.2× to 0.21× the length of the femur. Spination in females less pronounced than in males. Adult ovigerous females may have 50-100 eggs in femora (Fig. 9F). Tibiae of approx. same length, of a slender shape and equipped with several dorsal and lateral spines. Tibia 1 with 2 proximal long setae and 2 long spines. Both tibiae distally have two long and slender spines inserted at the tip of protuberances (Figs 8I, 10A). Tarsus as long

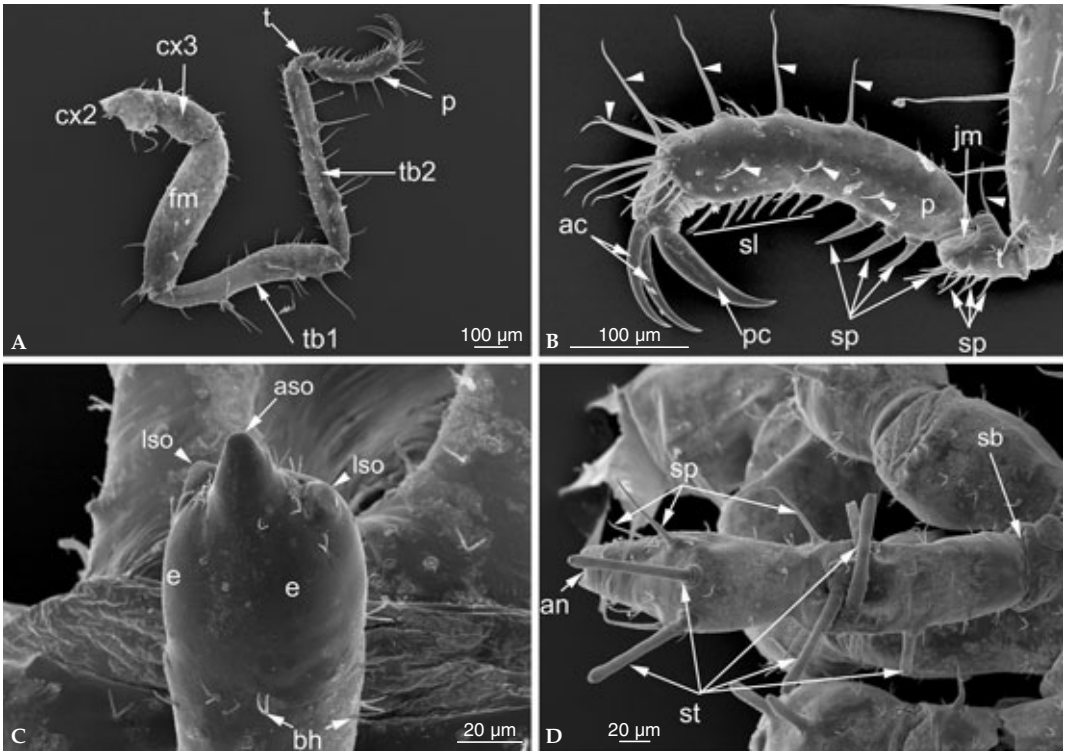


Fig. 10. *Ammothella spinifera* Cole, 1904, female. **A.** Survey of walking leg 3. **B.** Tarsus (**t**) and propodus (**p**) with their typical spinulation (**sp**, **arrowheads**) and sole (**sl**). Note length of accessory claw (**ac**) compared to principal claw (**pc**). **C.** Eye tubercle with eyes (**e**), lateral and apical sense organs (**lso**, **aso**) and branched hairs (**bh**). **D.** Abdomen with setae (**st**). **an**, anus; **cx1-3**, coxae; **fm**, femur; **jm**, joint membrane; **p**, propodus; **sb**, segment border; **sp,** spine; **st**, setae; **t**, tarsus; **tb1**, **tb2**, tibiae; **wal1-wal4**, walking legs.

as wide, with strong spine and several thin spines ventrally (Figs 8J, 10B, 11H). Dorsally with a single thin spine on protuberance. Propodus curved, with 3 strong, pointed basal spines ventrally in adults (Figs 10B, 11H), and 2 in juveniles, respectively (Fig. 8J). Sole composed of several small spines plus 1 pair of distal spines in adults. In addition there are 3 to 5 long, thin spines dorsomedially (Figs 10B, 11H), and several thin spines distal to the accessory claws. Main claw 0.5× as long as the propodus, only slightly curved, as accessory claws. Accessory claws 0.75× as long as main claw (Figs 10B, 11H).

Remarks. A rather reliable feature to determine *A. spinifera* seems to be the presence of a pair of dorsal spines near the posterior margin of the second trunk segment. Müller (1992) reported on specimens from Barbados, lacking any spines at the posterior margin of the second trunk segment. Remarkably in *A. spinifera* we observed a pair of spines distally on the sole, as in *A. exornata*. Child (1979) characterizes *A. spinifera* as highly variable species recorded for the Pacific coast from California to Panama, the Colombian coast, Barbados and Martinique (see also Müller 1990).

Ammothella sp.

Material. Juvenile (ZSM-A-20071603), Bahia del Rodadero, Santa Marta; from brown algae on buoy; 0-0.3 m; 14.12.2004; Juvenile (ZSM-A-20060993), Bahia de Taganga, Santa Marta; under stone; 0-0.5 m; 05.01.2005

Description (Fig. 12)

Living pycnogonid sand-coloured to transparent yellowish. Body of oval shape, with very long legs (Fig. 12A). Segmentation completely visible (Fig. 12B,C). Dorsal side of trunk smooth except for small branched hairs and gland pores distributed over the whole body surface (Fig. 12C). Spines and protrusions absent distally as well as in the region of the coxae.

Eye tubercle with 4 pigmented eyes, 4× as long

as wide, with pointed tip and one apical and 2 lateral sense organs as well as some branched hairs (Fig. 12B). Abdomen 1.5× as long as eye tubercle (Fig. 12B), dorsoproximally with 2 short setae, and 2 longer setae further distally. Abdomen fused with trunk segment 4 (Fig. 12B).

Chelifores robust, composed of 3 articles (Fig. 12B). 1st of these short and thin, 2nd becomes wider distally, thus being club-shaped. This article with long lateral and club-shaped dorsal bristles showing an irregular pattern. Chelae with some long spines at their base. Inner sides of fingers with pointed teeth. Palps made of 9 articles with numerous spines (Fig. 12B). Of these, 2 and 4 are the longest. Ovigera as yet not developed in our specimen.

Legs very long and slender (Fig. 12D-J), with several spines and setae laterally and distally on each article. Coxa 2 dorsodistally with 2 long setae. 2nd coxa 2× as long as coxa 1, having 2 dorsal setae and a couple of thin spines (Fig. 12D). Femur rather thin, 4× as long as coxa 3. Dorsomedially and distally with a single long, thin spine. Further distally on each side one seta. Distal tip of femur on each side with one slender spine (Fig. 12E). Tibia 1 slightly longer than tibia 2, both are thin and are armed with a similar number of spines arranged in a corresponding way. At ⅓ of the length of tibia 1, are 2 setae and on the side 2 long spines**.** In the distal area and at the tip with further setae and several spines. Tibia 2 with several long spines dorsally (Fig. 12F) and smaller spines everywhere on the surface (Fig. 12G). Tarsus 0.25× as long as wide, equipped at the ventral side with one robust and several small spines (Fig. 12H). Propodus slender, slightly curved, at its base armed with two large, pointed spines (Figs 12H). Sole with row of 6 small spines and anterior pair of spines (Fig. 12I). Main claw 0.75× as long as propodus. Accessory claws very long and thin, 0.8× as long as propodus (Fig. 12I).

Remarks. *Ammothella* sp. is a small, slender species sampled from brown algae on a buoy. It was not possible to determine this species, since it is a juvenile not similar to juveniles of other Caribbean species of *Ammothella*. The eye tubercle is much longer than in other *Ammothella* species. The most similar species are *A. spinifera* and – to a lesser extent – *A. appendiculata*. However, our specimen can easily be distinguished form *A. appendiculata* as having no distal spination, and even the juveniles of *A. spinifera* possess at least precursors of the spines of the 2nd segment that are missing in our pycnogonid. This also accounts for the spination of the legs: e.g., the setae of coxa 1 are lying side by side and not in a longitudinal row as in *A. spinifera*, and the other leg articles are different from the two other *Ammothella* as well. Another obstacle is the absence of ovigera in our juvenile. Hence, our specimen might be a juvenile of a previously undescribed species. Since we found only one single individual, further samples and studies will be necessary to assign this individual to a species.

Phoxichilidiidae

Anoplodactylus Wilson, 1878

***Anoplodactylus micros* Bourdillon**

Anoplodactylus micros Bourdillon, 1955: 591-592, pl. I, figs 3-8

Material. Subadultus (ZSM-A-20071604); Bahia del Rodadero, Santa Marta; under stone, 0-0.5 m, 05.12. 2004.

Description (Fig. 12)

Living animal of greenish colour. Ganglia and gut visible. Body oval, slender. Segmentation line visible between segments 1 and 2, fused between 2nd to 4th segments (Fig. 13A,B). Lateral processes with a distal knob (Fig. 13E), tipped with a spine only on 1st segment. Walking legs separated from each other 0.3× as wide as their diameter (Fig. 13B,G).

Eye tubercle 2× as long as wide, with pointed apical protrusion (Fig. 13B,J). Eyes well pigmented, in the upper half of eye tubercle, at the base of the apical protrusion; left and right lateral organs in same position (Fig. 13J). Abdomen 2× as long as wide, directed upwards, with 2 dorsal spines (Fig. 13K).

Chelifores with 2 articles. 1st article 2× as long as 2nd (Fig. 13C). Fingers of chelae robust, with 2 pointed teeth on each inner side. Base of chelae with bristles (Fig. 13D).

Coxae 1-3 with terminal flat tubercle. The latter distally with one short and one thin spine (Fig. 13G). Coxa 3 1.5× as long as of coxa 1 and 2. Femur the longest leg article, followed by tibiae 1 and 2. Terminal tubercles more pronounced on femora and tibiae than on other leg articles, as well as spines which are longer and thicker (Fig. 13H). At the right and at the left, a smaller and thinner spine is found on these leg articles.

Propodus robust und curved (Fig. 13F). Tarsus wider than long and equipped with 2 ventral spines. In addition a dorsal protuberance is found (Fig. 13F). Dorsal side of propodus with median row of 3 regularly arranged medium-length-spines. On both sides of this row a short spine is inserted at ⅓ of the length of the propodus. Heel at proximoventral side of propodus with 1 spine. In addition on heel 2 thin

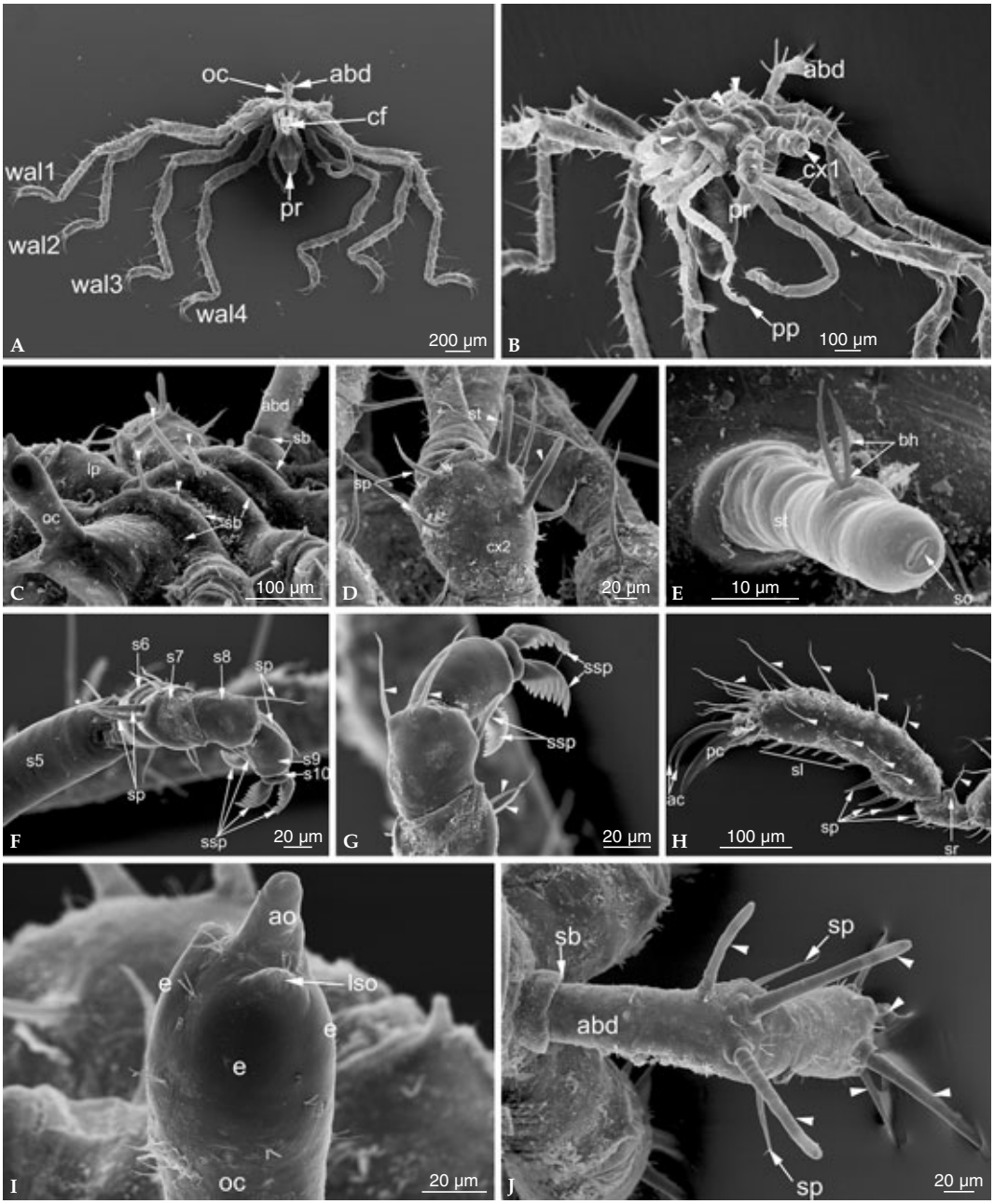


Fig. 11. *Ammothella spinifera* Cole, 1904, male. **A.** Survey of whole animal, viewed from frontal. **B.** Anterolateral view showing dorsal spinulation of body (arrowheads). **C.** Closeup of dorsal body spinulation (arrowheads) and segment borders (**sb**). **D.** 1st coxa with spines and two median setae (**st**). **E.** Coxal protrusion with gland pore (**so**) and branched hair (**bh**). **F.** Ovigera with serrated spines (**ssp**). **G.** Closeup of serrated spines (**ssp**) at top of ovigera and hairs (arrowheads). **H.** 3rd propodus with spinulation (arrowheads, **sp**) and sole (**sl**). **I.** Tip of eye tubercle (**oc**) with eyes (**e**), lateral and apical sense organs (**lso**, **ao**). **J.** Abdomen (**abd**) with setae and spines (arrowheads, **sp**) and well visible segment border (**sb**); **s5-s10** articles of body appendages; **abd**, abdomen; **ac**, accessory claw; **cf**, chelifores; **cx1-3**, coxae; **lp**, lateral process; **oc**, ocular tubercle; **pc**, principal claw; **pp**, pedipalps; **pr**, proboscis; **sr**, spur; **wal1-wal4**, walking legs.

bristles are inserted medially, and 1 thin spine at the base (Fig. 13I).

Lamella located distally at ⅔ of the propodus' length. 2 small bristles each inserted at its base and tip (Fig. 13F). Main claw 0.6× as long as propodus. 2 very small accessory claws at the base (Fig. 13F). Absence of ovigera and segmentation indicates juvenile stage of the studied pycnogonid.

Remarks. *Anoplodactylus micros* is a rather small, thin species. The studied individual was found near the shore under a stone, close to *Millepora* corals. The shape of the propodus and of the spine at its base are distinctive features of *A. micros*. We note absence of a segmentation line between segments 2 and 3 compared to the 2 individuals described in Müller (1990) and Müller & Krapp (in press) that have this border. To date, reports of *A. micros* are restricted to the Caribbean (Müller 1990).

Anoplodactylus monotrema Stock

Anoplodactylus monotrema Stock, 1979: 15-18, figs 4-5

Material. Adult ♀ (ZSM-A-20071605); Casa Grisales, Bahia del Rodadero, Santa Marta; from stone with algae, 0.5 m, 10.12.2004; Juvenile ♂ (ZSM-A-20071606); Playa Brava, Bahia de Taganga, Santa Marta; under stone, 0.5 m, 09.12.2004.

Description (Figs 14, 15)

Living animal coloured yellowish to orange. Ganglia and gut well visible (Fig. 14B). Body oval, wide and robust (Figs 14A, 15A). Segmentation reduced (Fig. 15A). A small hair inserted distally on each segment. Walking legs also robust (Fig. 15A,G).

Eye tubercle flat, only slightly higher than wide (Figs 14B,C, 15D). Eyes strongly pigmented (Fig. 14C). Apical sense organ at the tip and 2 lateral sense organs present (Fig. 15D). Proboscis short and frontally flattened (Fig. 14D).

Abdomen of almost same height as eye tubercle; several hairs close to anus (Fig. 15A,E).

Chelifores 2-jointed, article 1 larger (Fig. 15B). Chelae relatively strong, located directly on top of mouth. Several small, pointed teeth at inner sides of the fingers (Fig. 15C), several hairs distributed all over them.

Ovigera with 2 to 3 articles; borders between them not well visible (Fig. 14D).

Coxa 1 with distal groove and 2 laterodistal hairs. Coxa 2 and 3 of same length, deprived of grooves and hairs. Femur 2× as long as coxa 3; distal protrusion with spine at tip. Tibia 1 similar to femur, distal protrusion with spine also present. Tibia 2 thinner than tibia 1. At ¾ of its length, a protuberance with spine is seen (Fig. 15G). Tarsus 2× as wide as high, with lots of hairs (Fig. 15F,H). Propodus robust, slightly curved (Figs 14E, 15F,H). Heel with 2 strong spines and 2 setae neighbouring them (Fig. 15I). Sole with medial row of small spade-shaped spines (Fig. 15F) and 2 lateral rows of hairs with rounded tips (Fig. 14E). Main claw 0.75× as long as propodus. Accessory claws very short and rudimentary (Fig. 15F,H).

Remarks. Our Colombian individuals of *Anoplodactylus monotrema* are well characterized by propodus characters and the absence of coxal spines. The heel spines described here are missing in earlier descriptions. Most remarkable are the spade-shaped spines of the sole that are of different form than those of the heel. Ovigera composed of 5 articles found in males of this species seem to be fully developed late in ontogeny, as our subadult male had only 2 to 3 articles that were hard to distinguish. This species has often been mixed with *Anoplodactylus robustus* (Dohrn 1881). A good differential character, however, is the toothed finger of the chelae.

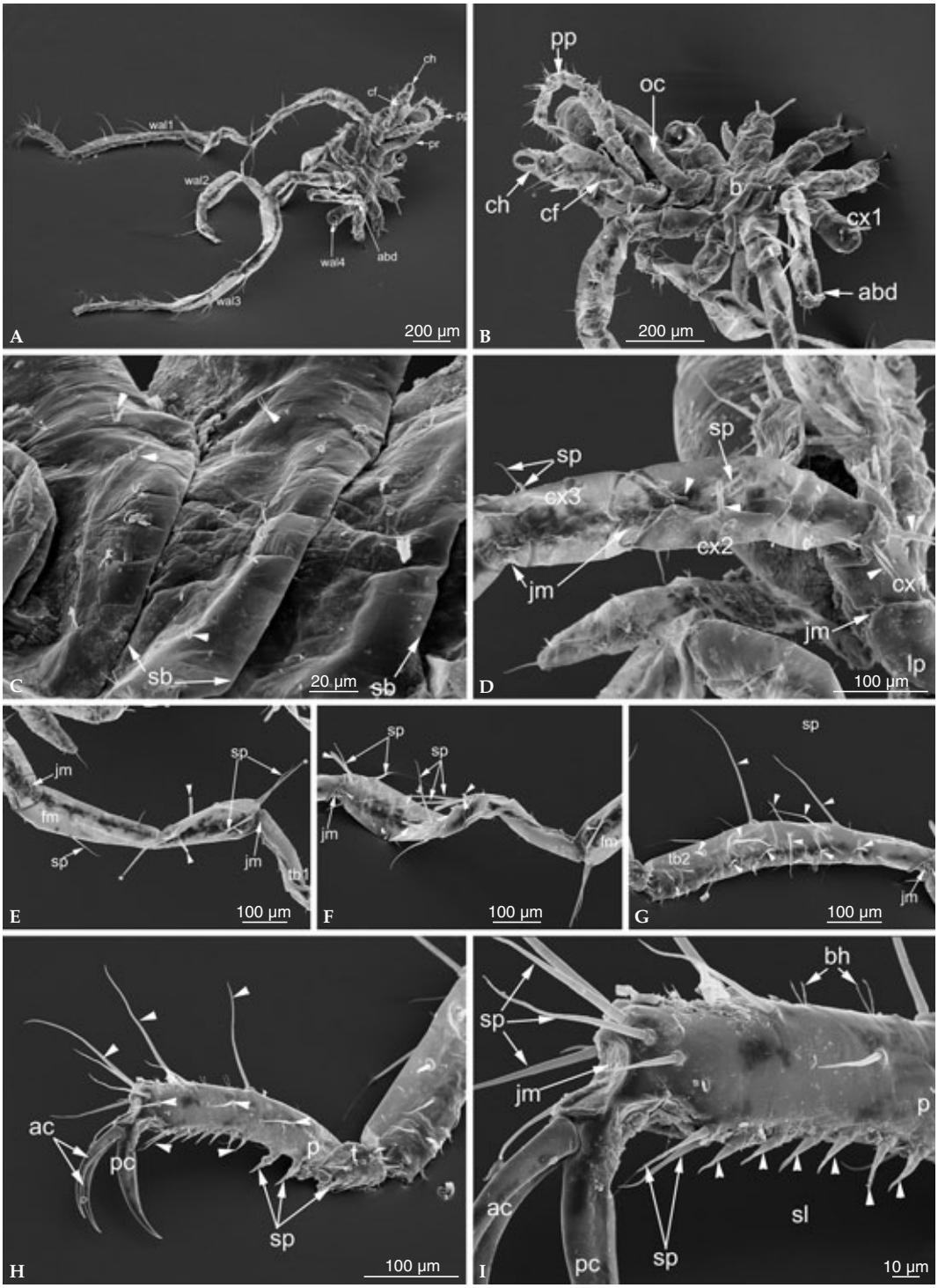
A. monotrema is distributed in the Western Atlantic Ocean from Florida to Brazil, and the first record for Colombia is that of Müller (1990).

Anoplodactylus pectinus Hedgpeth

Anoplodactylus pectinus Hedgpeth, 1948: 234-236, fig. 34.

Material. Adult ♀ (ZSM-A-20071607); Piedra del ahogado in Playa Cristal (Playa del muerto), Nenguangue, Nationalpark Tayrona, Santa Marta; from stone in coral rubble, 20 m, 13.10.2004.

Fig. 12. *Ammothella* sp., juvenile. **A.** Survey of whole animal. **B.** Dorsal view of trunk (**b**). Note presence of well developed chelae (**ch**) on chelifores (**cf**) and long ocular tubercle (**oc**). **C.** Dorsal aspect of trunk with well visible segment borders (**sb**). On the surface of the body larger spines or protrusions are absent; arrowheads: branched hairs. **D.** Dorsal view of coxa 1-3 (**cx1-3**). **E-H.** Series of fotos showing the structure of walking leg 3 from coxa 3 to propodus (**p**); arrowheads and **sp** indicate position of spines and hairs; note long hair at the tip of femur (asterisk). **I.** Detail of propodus with appendages; arrowheads and **sp** indicate spinulation of sole. **Abd**, abdomen; **ac**, accessory claw; **bh**, branched hair; **ch**, chelifore; **cx1**, coxa 1; **fm**, femur; **jm**, joint membrane; **lp**, lateral process; **p**, propodus; **pc**, principal claw; **pp**, pedipalp; **pr**, proboscis; **sl**, sole; **sp**, spine; **t**, tarsus; **tb1**, tibia 1; **wal1-wal4**, walking legs. ▷



Description (Fig. 16)

Living animal sand-coloured. Body slender (Fig. 16A,B). Trunk segments 1-3 separated by well visible borders (Fig. 16B). Segments 3 and 4 fused. Lateral projections of thorax smooth, deprived of additional structures (Fig. 16B). Legs thin, become thinner distally (Fig. 16A,F).

Eye tubercle of cylindrical shape, distally flattened. Two lateral sense organs on its distolateral sides. Apical sense organ absent (Fig. 16E). Eye pigmentation the strongest in the upper eye parts. Abdomen 3× as long as eye tubercle, directed upwards. 2 spines close to anus.

Chelifores with 2 articles (Fig. 16C,D). 1st of these 2× as long as chelae. Both fingers of chelae slender, strongly curved, and equipped with small pointed teeth on inner sides (Fig. 16D). Some spines on outer sides of fingers.

Palps absent as is characteristic of this genus. Ovigera only in males, made of 6 articles.

Lateral projections very slender, of the same length as coxa 1 (Fig. 16B). The latter only slightly longer than wide. Coxa 2 1.5× as long as coxa 1 (Fig. 16F). Ventrodistally with median genital porus in the form of a small thickening. Coxa 3 of same length as coxa 1. Femur 4× as long as coxa 3. Femur more robust than other leg articles, with distal protrusion equipped with long slender spine (Fig. 16F). Tibiae of equal length. As with femur, a distal thin spine is inserted on tibia 1. Similar spine at ⅔ of the length of tibia 2. Tarsus as long as wide, with several ventral bristles and small spine (Fig. 16G). Propodus 4× as long as wide. Heel with 2 spines (Fig. 16G,H). Anterior spine comb-shaped and stronger than posterior spine (Fig. 16H,I)). Sole made of numerous small, slightly curved spines (Fig. 16H). Main claw not very robust, deprived of accessory claws (Fig. 16G).

Remarks. *Anoplodactylus pectinus* is a slender species that can be unequivocally determined using the comb-shaped spine on the heel (Child 1979). It seems closely related to the *A. tenuicorpus*-complex (Arango & Krapp 2007, Bartolino & Krapp 2007) from the Indo-Pacific. The species in this complex are much more slender and delicate than *A. pectinus*, do not have a heel and are also characterized by the multiple cup or pore shaped cement glands; *A. pectinus* has a single cribriform cement gland.

A. pectinus is distributed in the Atlantic Ocean from Mexiko to Panama (Child 1979) and from Madagascar and Batan Island in the Pacific (Child 1988). The first record from Colombia is that of Müller (1990 & in press), who found it at depths between 1 and 5 m, while the specimen studied here are from 20 m.

Anoplodactylus sp.

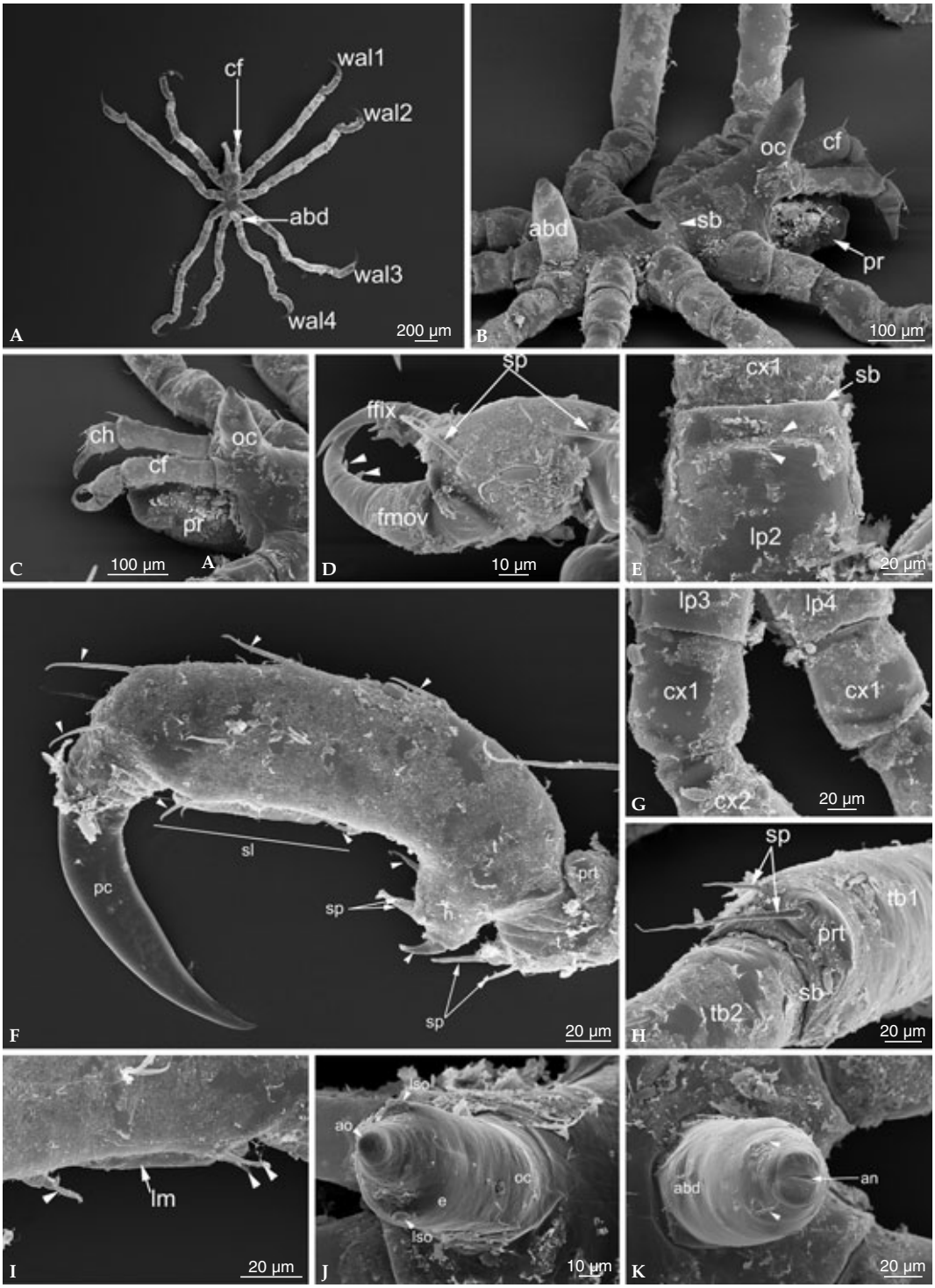
Material. Subadult ♀ (ZSM-A-20061034); Casa Grisales, Bahia del Rodadero, Santa Marta; from stone with algae; 0-0.5 m; 11.10.2004.

Description (Fig. 17)

Living animal of dark green colour. Body of oval shape (Fig. 17A,B). Legs robust, 3.5× as long as trunk. Proboscis short, with blunt tip (Fig. 17B). Body segments with well developed margins. (Fig. 17B). Eye tubercle flat, with 4 dark-pigmented eyes. Abdomen short. Chelifores of same length as proboscis, chelae in front of mouth (Fig. 17A). 2 small teeth on inner finger (Fig. 17F). Palps absent as well as ovigera in female specimen.

Coxa 1 with 2 to 3 small setae located distally, and a mediodistal small groove (Fig. 17A,B). Coxa 2 almost 2× as long as coxa 1, also with small distal bristles. Coxa 3 of same length as coxa 1 (Fig. 17A,B). Femur slightly swollen, no eggs visible (Fig. 17C). Femur 2× as long as coxa 2. Thin distal spine present (Fig. 17C). Tibia 1 slightly wider and longer than tibia 2. Both tibiae with short distal spine (Fig. 17C). Tarsus longer than wide; at its dorsal side a short seta is inserted. Ventral side with several setae (Fig. 17D,E). Heel with 1 spine on 1st leg, 2 spines on 2nd and 4th leg, and 3 spines on 3rd leg (Fig. 17D,E). Two setae of equal length at the heel's bases. Sole made of a median row of thick spines and 2 lateral rows of shorter and thinner setae (Fig. 17D,E). Main claw 0.75× as long as propodus (Fig. 17D).

Fig. 13. *Anoplodactylus micros* Bourdillon, 1955, male. **A.** Dorsal survey of whole animal. **B.** Lateral view of trunk and proximal leg sections; note pronounced segment border between segment 1 and 2 (**sb**). **C.** Lateral view of ocular tubercle (**oc**) and chelifores (**cf**) with chelae (**ch**). **D.** chela with dentated (arrowheads) fingers and spines (**sp**). **E.** Lateral protrusion and coxa 1 (**cx1**) of second walking leg (**lp2**); note small median spine (arrowheads). **F.** Tarsus (**t**) and propodus (**p**) of walking leg no. 3 showing specific spinulation (arrowheads, **sp**). **G.** Coxa 1 and lateral processes (**lp3**, **lp4**) of 3rd and 4th legs. **H.** Lateral view of distal tip of tibia 1 (**tb1**) with spines (**sp**). **I.** Detail of lamella (**lm**) in the propodus' sole area; arrowheads: spines. **J.** Ocular tubercle (**oc**) with eye (**e**) and lateral (**lso**) and apical (**ao**) sense organs. **K.** Abdomen with anus (**an**) and 2 small spines at the base of the anus flaps (arrowheads). **Abd**, abdomen; **cf**, chelifore; **cx1-cx3**, coxa 1-3; **h**, heel; **oc**, ocular tubercle; **pc**, primary claw; **pr**, proboscis; **prt**, protrusion; **sb**, segment border; **sl**, sole; **wal1-wal4**, walking legs 1-4. ▷



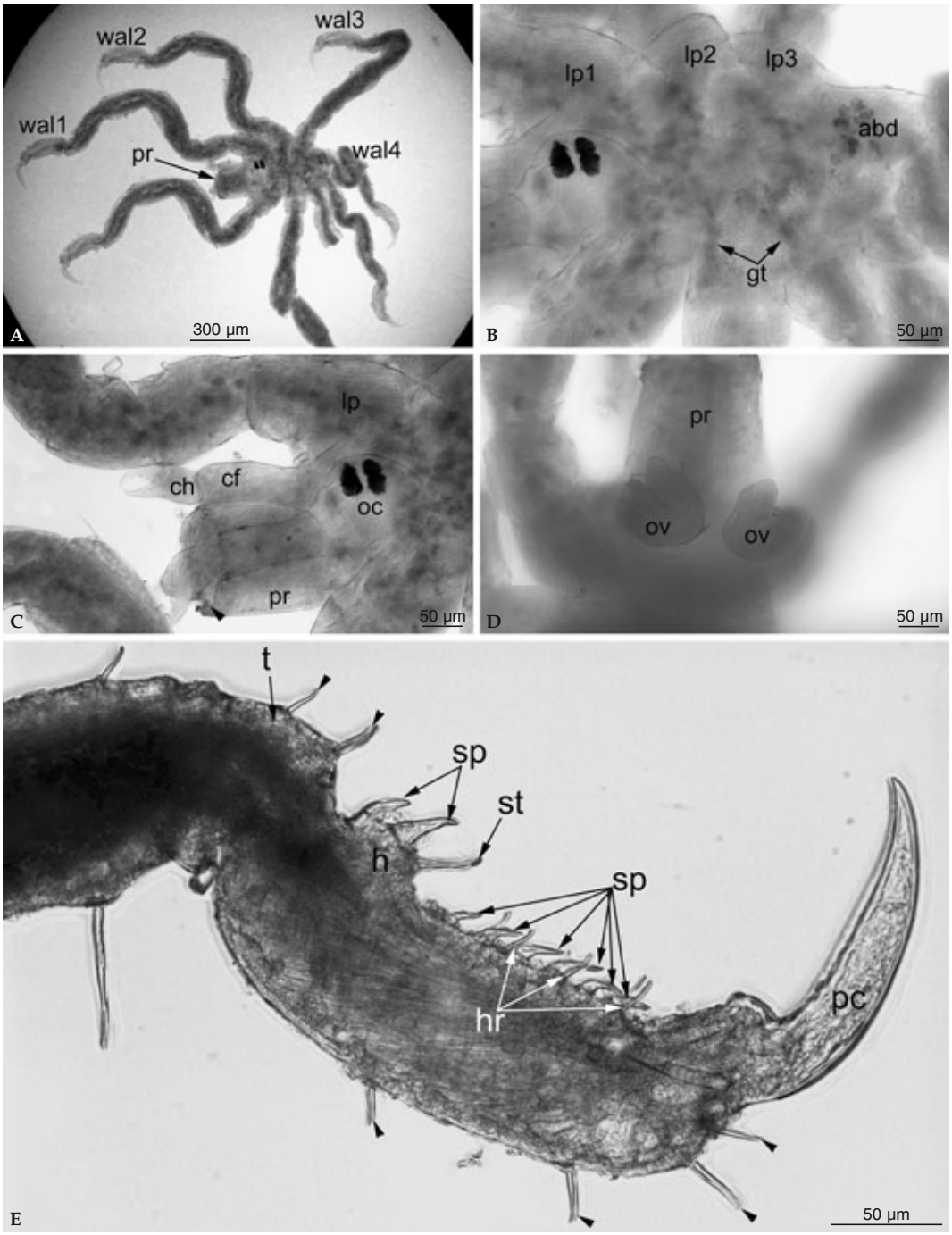


Fig. 14. *Anoplodactylus monotrema* Stock, 1979, juvenile (male), light microscopy. Dorsal view of whole animal. **B.** Dorsal view of trunk and leg base; note pigmented gut (**gt**) and short abdomen (**abd**). **C.** Anterior part of body with slender chelifores (**cf**) and chelae (**ch**); well pigmented eyes are seen in the ocular tubercle (**oc**). **D.** Ventral view of short proboscis (**pr**) and ovigera (**ov**). **E.** tarsus (**t**) and propodus (**p**) of 3rd leg showing spinulation (arrowheads); the heel is equipped with two spines (**sp**) and seta (**st**), sole made of three rows of spines (**sp**) and hairs (**hr**). **lp1**-**lp3**, lateral protrusions of legs 1-3; **pc**, primary claw; **pr**, proboscis; **wal1-wal4**, walking legs 1-4.

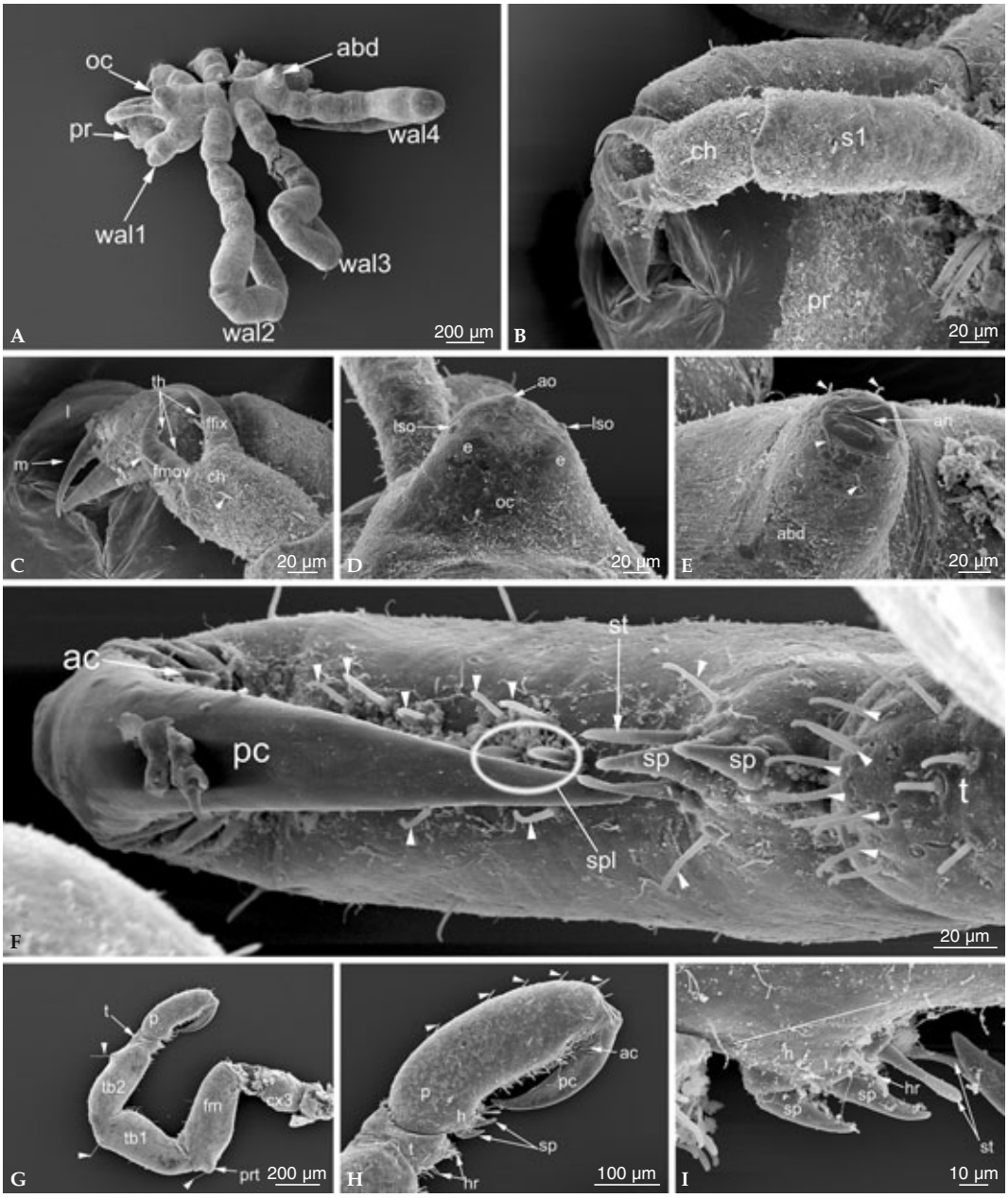


Fig. 15. *Anoplodactylus monotrema* Stock, 1979, female. **A.** Dorsolateral view of whole animal. **B.** 1-jointed chelifore (**s1**) and chela (**ch**). **C.** detail showing teeth (**th**) on both the movable (**fmov**) and fixed (**ffix**) finger; arrowheads: hairs. **D.** Ocular tubercle with eyes (**e**), lateral (**lso**) and apical (**ao**) sense organs. **E.** Abdomen with anus (**an**) and surrounding hairs (arrowheads). **F.** 3rd propodus, viewed from ventrally, with primary (**pc**) and short accessory claw (**ac**); on tarsus (**t**) as well as on propodus (**p**) numerous spines and hairs are seen (arrowheads). Among these, note strong spines (**sp**) and setae (**st**) on heel. The median row of the sole is composed of spade shaped spines (**spl**). **G.** Walking leg 3 with hairs (arrowheads), and protrusion on femur (**prt**). **H.** Lateral view of propodus showing arrangement of hairs on the outer edge (arrowheads). **I.** Detail of heel (**h**) with spines (**sp**), hairs (**hr**) and setae (**st**). **abd**, abdomen; **ac**, accessory claw; **cx3**, coxa 3; **fm**, femur; **h**, heel; **hr**, hairs; **l**, lips of proboscis; **m**, mouth; **oc**, ocular tubercle; **pc**, primary claw; **pr**, proboscis; **tb1,2,** tibia 1 and 2; **wal1-wal4** walking legs 1-4.

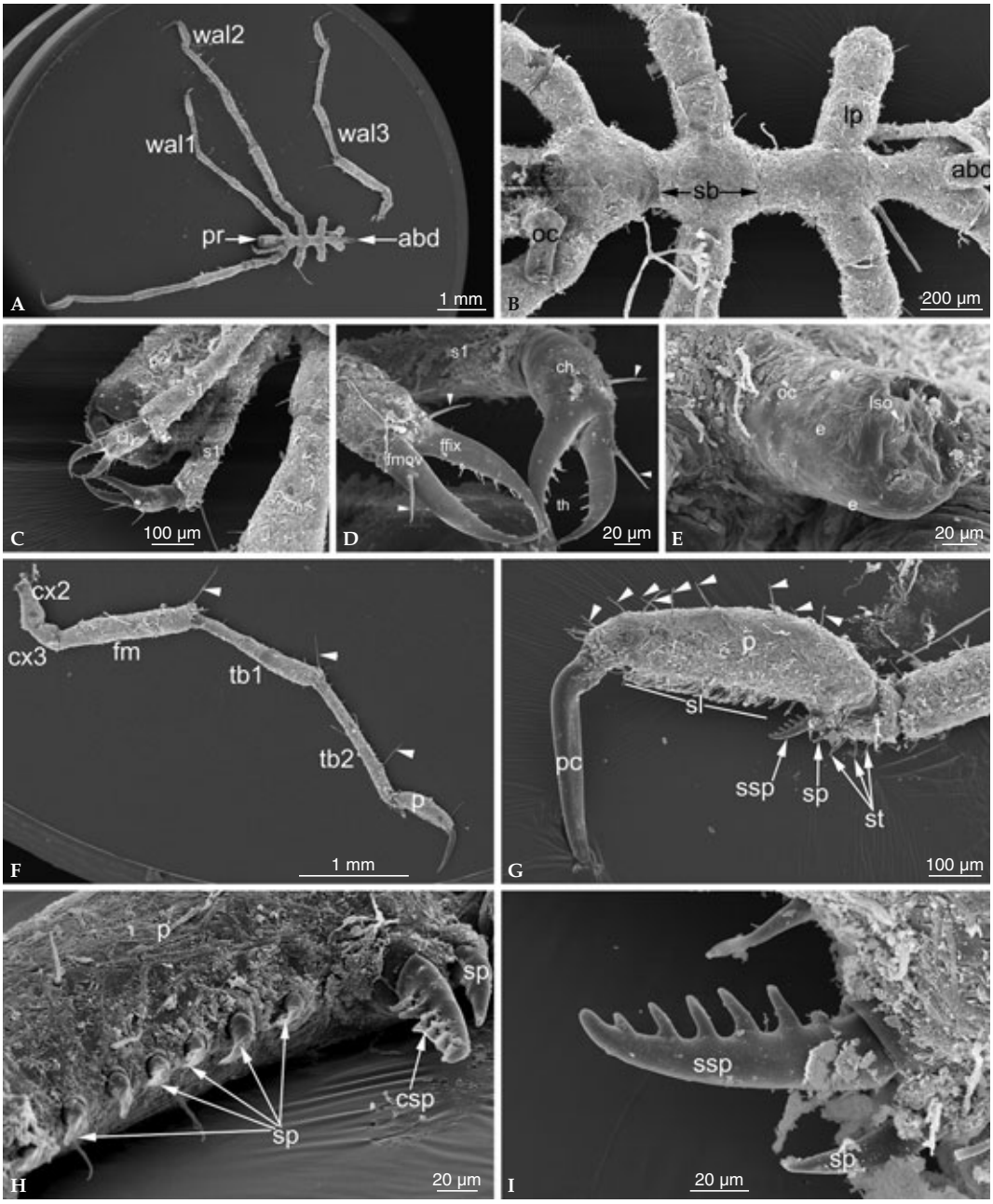


Fig. 16. *Anoplodactylus pectinus* Hedgpeth, 1948, female. **A.** Survey, dorsal view. **B.** Trunk and base of legs; note segment borders (**sb**). **C.** Chelifores made of one basal article (**s1**) and chelae (**ch**). **D.** Detail showing teeth of movable and fixed finger (**fmov** and **ffix**) and arrangement of hairs (arrowheads). **E.** Ocular tubercle with eyes (**e**) and lateral sense organ (**lso**). **F.** Survey of walking leg showing articulation and spinulation (arrowheads). **G.** Survey of propodus (**p**) and tarsus (**t**) with dorsal hairs (arrowheads), and spines (**sp**) and setae (**st**) at the ventral side; note large serrated spine (**ssp**) at the base of propodus. **H.** Sole of propodus with its spines (**sp**) and adjacent protrusions. **I.** detail showing the serrated spine (**ssp**). **Abd**, abdomen; **cx1-3**, coxa 1-3; **fm**, femur; **lp**, lateral processes; **oc**, ocular tubercle; **p**, propodus; **pc**, primary claw; **pr**, proboscis; **sl**, sole; **tb1,2**, tibia 1 and 2; **wal1-wal3,** walking legs 1-3.

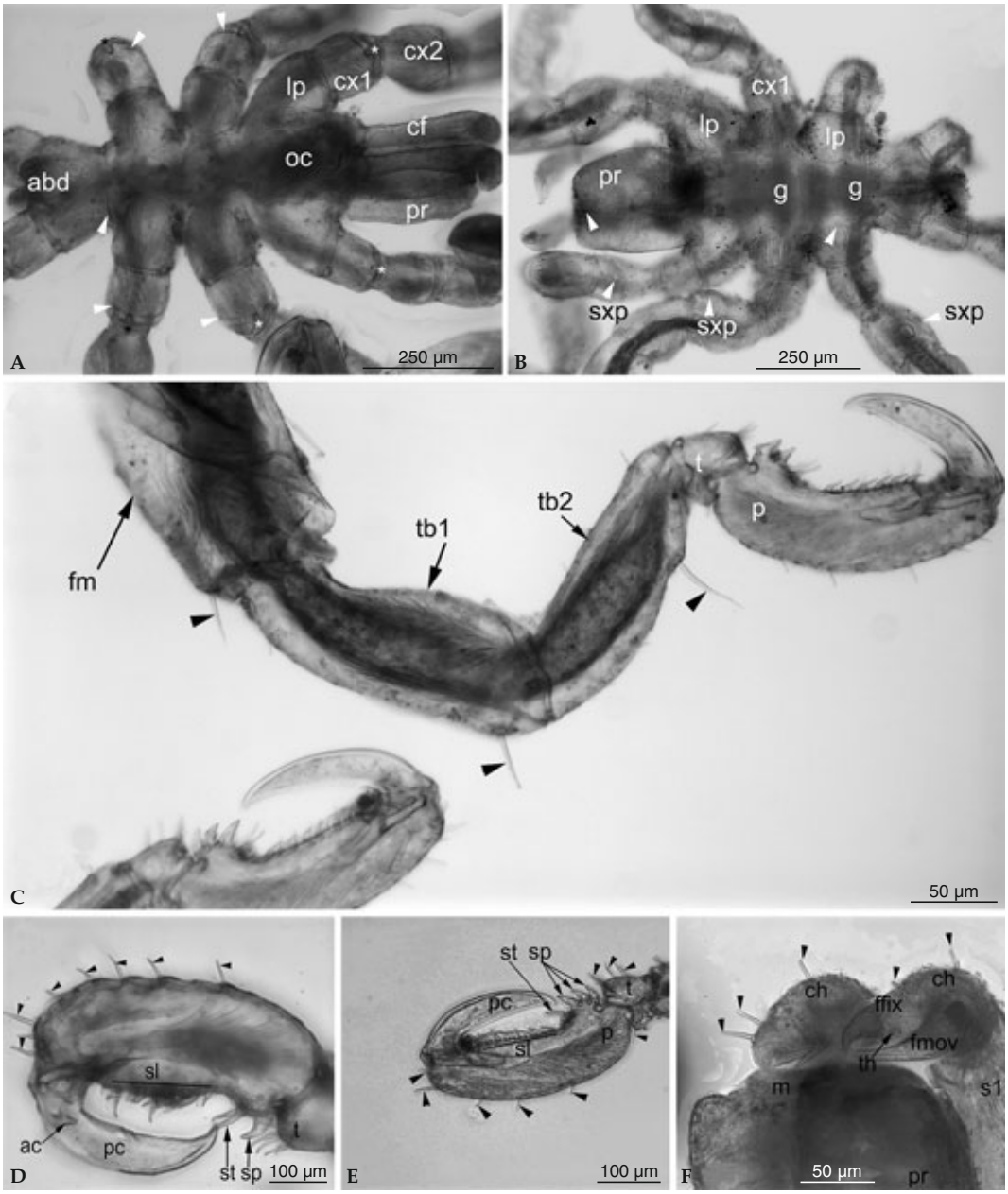


Fig. 17. *Anoplodactylus* sp., female. **A.** Dorsal view of trunk and base of legs; arrowheads and asterisks spinulation of 1st coxae (**cx1**); note relatively short abdomen (**abd**) and flat ocular tubercle (**oc**). **B.** Ventral view with ganglia (**g**), and blunt proboscis. **C.** Survey of leg from femur (**fm**) to propodus (**p**); arrowheads: spines. **D, E.** Closeups of 1st and 3rd propodus; spinulation of dorsal side and tarsus indicated by arrowheads; heels have varying numbers of appendages: the 1st leg has one spine (**sp**) and a pair of setae (**st**), the 3rd three spines and a pair of setae. **F.** Chelae (**ch**) with chelifore article (**s1**), fixed (**ffix**) and movable (**fmov**) fingers; note small tooth (**th**) on fixed finger and characteristic distribution of setae (arrowheads). **Ac**, accessory claw; **cf**, chelifore; **cx1,2**, coxa 1, 2; **Lp**, lateral process; **pc**, primary claw; **pr**, proboscis; **sl**, sole; **t**, tarsus; **tb1,2**, tibia 1 and 2.

Remarks. It was not possible to determine this pycnogonid since it differs strongly from *A. monotrema* due to the segmentation, the varying number of heel spines and the 2 setae at the heel's base. On the other hand, the studied individual also differs from *A. robustus* and *A. virecens*, the two other Caribbean species our subadult ♀ might belong to: Due to its segmentation our specimen strongly differs from *A. robustus*, and due to the toothed fingers of the chelae it differs from *A. virescens*. In addition, the bristles and the groove on coxa 1 are not mentioned in earlier descriptions. Another very similar species is *A. brevirostris* from the Philippines. However, the latter species differs from ours in having one further spine on the heel of leg 4.

Hence, our specimen might belong to a previously unknown species closely related to *A. monotrema*. Since we found only a subadult, single individual, further samples and studies will be necessary to assign this individual to a species.

Callipallenidae

Callipallene Flynn, 1929

***Callipallene brevirostris* (Johnston)**

Pallene brevirostris Johnston, 1837: 380, pl. 12, figs 7-8.
Callipallene brevirostris: Flynn, 1929: 252. Change of combination.

Material. Adult ♂ (ZSM-A-20071607); Bahia Concha, Parque Nacional Tayrona, Santa Marta; from *Sargassum cymosum*, close to coelenterate colonies, on a stone with various algae on top, 20 m, 26.10.2004.

Description (Fig. 18)

Living animal of light red colour. Body robust, slender (Fig. 18A). Segmentation of body well visible (Fig. 18A,B). Laterodistal parts of trunk deprived of spines (Fig. 18B). Legs separated from each other ½ of their diameter, very long and slender (Fig. 18B). Eye tubercle small, flat, equipped with 2 lateral sense organs (Fig. 18B). Abdomen short, on both sides armed with a spine (Fig. 18B).

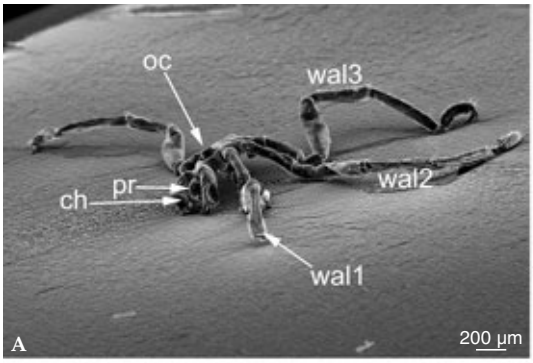
Chelifore with 2 articles, together with the cylindrical proboscis separated from trunk by a short neck. Posterior setae on 1st article. Chelae dorsally curved, fingers distally with several setae (Fig. 18C), a row of several roundish, blunt teeth on inner side. Chelae located directly in front of mouth. The latter made of 3 lips with numerous hairs (Fig. 18D). Palps absent in this genus.

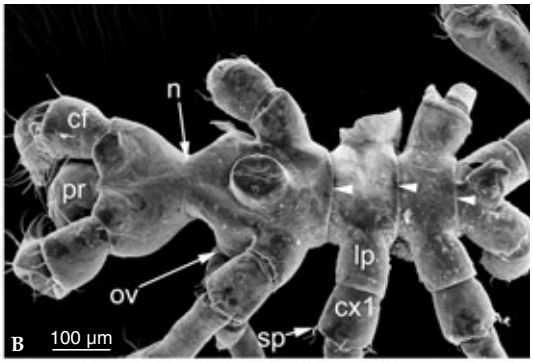
Ovigera with 10 articles, and medium number of bristles (Fig. 18E,F). 5th article with distal protrusion and a thin spine on top. This article is the longest, followed by the 4th. Other ovigera articles of same length. Distalmost 4 articles each with 5-7 serrated spines on ventral sides (Fig. 18E,F). On the figure only 2 of them are visible.

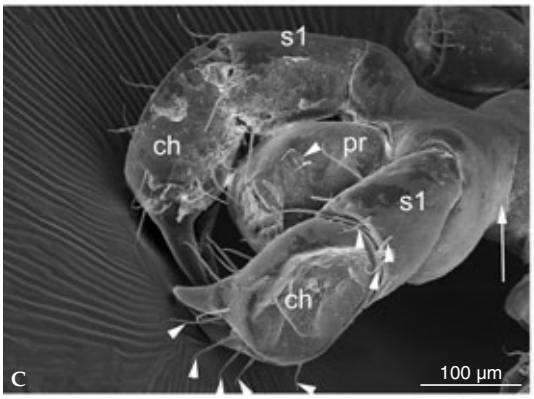
Coxa 1 of all legs with some thin setae distally (Fig. 18B,G). Coxa 2, 2.5× as long as coxa 1; also with some setae distally. Coxa 3, 0.6× as long as coxa 1, also with distal setae (Fig. 18G). Femur slightly wider than following leg articles, but of approx. same length. Tibia 2 slightly longer. All leg articles with several small setae dorsally and dorsodistally (Fig. 18G). Tarsus as long as wide, with ventral spine and several small setae (Fig. 18H). Propodus curved, 4 long alternating spines on the proximal part (Fig. 18H). Sole with median row of strong small spines and 2 lateral setae of medium length. Further setae on the dorsal and lateral parts of the propodus (Fig. 18H). Main claw 0.3× as long as propodus. Accessory claws 0.75× as long as main claws. Auxiliaries with tiny denticles at base (circle in Fig. 18H).

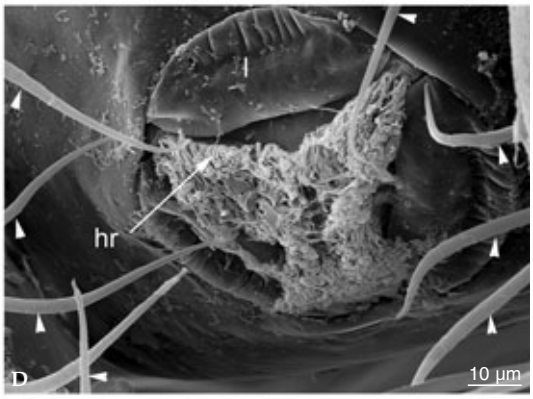
Remarks. *Callipallene brevirostris* is a rather large pycnogonid. Our specimen was the only pycnogonid we found directly on algae, where it sat well hidden due to its colour. The flat eye tubercle and the segmentation of the last segment are distinctive features with respect to *Callipallene longicoxa*, a very similar species. Müller (1990), Müller & Krapp (in press) report this species close to the shore, while our specimen is from a SCUBA sample from a depth of 20 m. *C. brevirostris* is common in the Mediterranean and Northern Atlantic (Stock 1987), previously reported from Colombian coasts in Müller (1990 & in press).

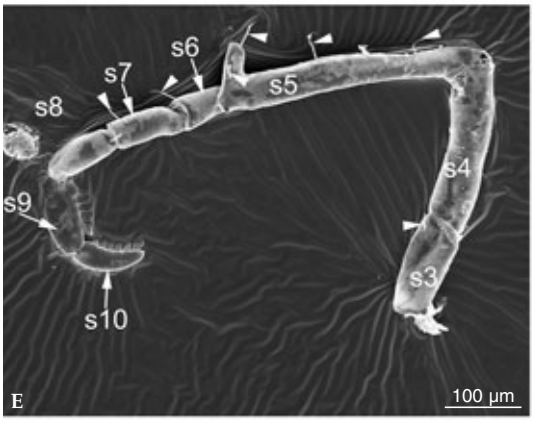
Fig. 18. *Callipallene brevirostris* (Johnston, 1837), female. **A.** Survey of whole animal. **B.** Dorsal view of trunk and ▷ lag bases; arrowheads indicate segment lines. **C.** Anterior view of chelifores composed of one basal article (**s1**) and the chelae (**ch**); spinulation indicated by arrows. **D.** Detail of mouth with lids (**l**), hairs (**hr**) and adjacent setae (arrowheads). **E.** Survey of ovigera from article 3 to 10 (**s3-s10**); arrowheads: hairs; note protrusion on **s5**. **F.** Closeup of serrated spines (**ssp**, arrowheads) on **s9** and **s10**. **G.** walking leg 3; some of the characteristic hairs are indicated by arrowheads. **H.** propodus with 4 basal spines (**sp**) and characteristic arrangement of hairs (arrowheads); **circle**, rough area at the base of the accessory claws (**ac**). **Cf**, chelifore; **ch**, chelae; **cx1-3**, coxa 1-3; **fm**, femur; **lp**, lateral process; **n**, neck; **oc**, ocular tubercle; **ov**, ovigera; **p**, propodus; **pc**, primary claw; **pr**, proboscis; **sp**, spine; **t**, tarsus; **tb1,2**, tibia 1 and 2; **wal1-wal3**, walking leg 1-3.

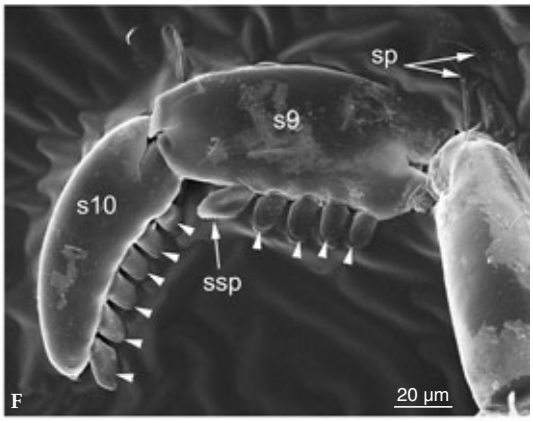


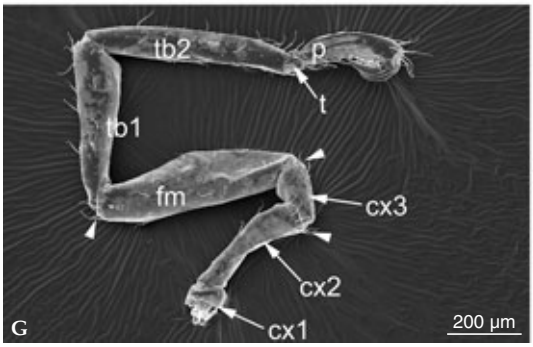


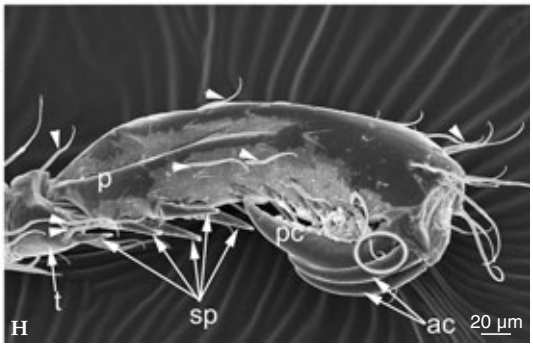












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