

## **A new species of the genus *Acarothrix* (Acari: Halacaridae) from Brunei Darussalam and India**

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**Abstract:** *Acarothrix grandocularis* sp. nov. is described from specimens collected in Brunei Darussalam and India. The new species is characterized by the presence of dorsal seta 1 on the posterior part of anterior dorsal plate, a triangular posterior margin of anterior dorsal plate, basifemur II with two setae, large ocular plates, two costae on posterior dorsal plate, dorsal seta 2 on anteromedial part of ocular plate, dorsal setae 3-5 present on posterior dorsal plate, and tibiae I-IV with 1-1-1-0 bipectinate setae. All specimens of the new species were collected from pneumatophores of mangroves in estuarine habitats.

**Résumé :** Une nouvelle espèce du genre *Acarothrix* (Acari : Halacaridae) de Brunei Darussalam et d'Inde. Une nouvelle espèce, *Acarothrix grandocularis* sp. nov. est décrite sur la base de spécimens récoltés Brunei Darussalam et en Inde. La nouvelle espèce est caractérisée par la soie dorsale 1 sur la partie postérieure de la plaque antérodorsale, le bord postérieur de la plaque antérodorsale triangulaire, le basifémur II avec deux soies, des grandes plaques culaies, deux côtes sur la plaque postérodorsale, la soie dorsale 2 sur la partie antéromédiane de la plaque oculaire, les soies dorsales 3-5 sur la plaque postérodorsale et des soies bipectinées aux tibias I-IV: 1-1-1-0. Tous les spécimens décrits ici ont été récoltés dans une zone estuarienne, sur les pneumatophores des mangroves.

**Keywords:** Halacaridae; Taxonomy; *Acarothrix*; Mangrove; Brunei; India

## Introduction

*Acarothrix* is a small genus of halacarid mites that was proposed by Bartsch (1990) and has *A. palustris* Bartsch, 1990 as the typespecies. The genus has been recorded from Southern China, Singapore, northern Australia, south eastern Africa and Florida. All species are known from tropical or warm temperate regions and live in muddy environments characterized by fluctuating salinities. *A. palustris* was described from the upper intertidal muddy zone of the Tolo Channel, Hong Kong (Bartsch, 1990). Bartsch (1997) reported *A. longiunguis* Bartsch, 1997 from a mangrove area in northern Australia and Proche (2002) described *A. umgenica* Proches, 2002 from the Beachwood mangroves in Durban, Kwazulu-Natal, South Africa; *A. ampliata* Bartsch, 2004 was described from the Little Manatee river, which empties into Tampa Bay, Florida, Gulf of Mexico (Bartsch, 2004). Bartsch (2006) described *A. ampliomeris* Bartsch, 2006 from the northern coast of Singapore, among mangroves and sandy sediments. She also reported *A. palustris* from this region of Singapore, in a *Cladophora* mat on muddy and sandy sediments, and from the river Padam on the southern coast of Singapore, among sediment, green algae and epibiota on *Avicennia pneumatophores*.

## Materials and Methods

Halacarid mites were collected from scrapings of the algal turf on *Rhizophora* mangrove pneumatophores at Batu Marang (4°58'N-115°1'E), Brunei Darussalam and also from algal turf growing on *Avicennia* mangrove pneumatophores at Chorao island, North Goa (15°30'45.74"N-73°52'11.25"E), India. Mites were sorted under a binocular microscope, cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared with a camera lucida. The positions of setae and gland pores on dorsal plates are given in a decimal system, with reference to the length of a plate, from the anterior to the posterior margin. Type specimens will be deposited in the museum of Montenegro, Podgorica, Montenegro; 1 male and 1 female will also be kept in first author's personal collection. The following abbreviations are used in the text and figure legends: AD, anterior dorsal plate; AE, anterior epimeral plate; ds<sub>1-6</sub>, dorsal setae<sub>1-6</sub> on idiosoma; GA, genitoanal plate; GO, genital opening; OC, ocular plate(s); PAS, parambulacral seta(e); PD, posterior dorsal plate; PE, posterior epimeral plate(s); PGS, perigenital setae; P<sub>1-4</sub>, first to fourth palpal segment; SGS, subgenital setae.

## Systematics

### Family Halacaridae Murry, 1877

Subfamily Copidognathinae Bartsch, 1983

### Genus *Acarothrix* Bartsch, 1990

#### Diagnosis

Four-segmented palps attached laterally on gnathosoma; 2<sup>nd</sup> palpal segment with 1 dorsal seta, 3<sup>rd</sup> palpal segment without any setae, 4<sup>th</sup> palpal segment with 3 setae in basal whorl. Genital sclerites of male with 4 pairs of SGS and 1 pair of external genital acetabula. GA of female with 3 pairs PGS. Genital sclerites of female with a single pair of SGS near anterior end of the foramen. Tibiae I-IV with 2 ventral setae each. Tarsi I-IV with 2, 3-0-0-0 ventral setae. Solenidion on tarsi I-II in dorsolateral position.

#### *Acarothrix grandocularis* sp. nov.

(Figs 1-3)

#### Material Examined

Holotype: 1 ♀ from algal turf growing on Rhizophora mangrove pneumatophores at Batu Marang (4°58'N-115°1'E), Brunei Darussalam, March 2011, coll. T. Chatterjee & D.J. Marshall. Paratypes: 1 ♀, 1 ♂ from algal turf growing on Rhizophora mangrove pneumatophores at Batu Marang (4°58'N-115°1'E), Brunei Darussalam, March 2011, coll. T. Chatterjee & D.J. Marshall. 2 ♀♀, 2 ♂♂, from algal turf growing on Avicennia mangrove

pneumatophores at Chorao island, North Goa (15°30'45.74"N-73°52'11.25"E), India, 20<sup>th</sup> May 2011, coll. T. Chatterjee & B. Ingole.

#### Description

Female. Idiosoma (Fig. 1A & B) 291-298 µm long. All dorsal plates separate. Lateral margin of idiosoma with very delicate ceratogemental membrane and accumulation of debris. Areolae and costae on dorsal plates slightly raised with porose panel; remainder of plates panelled (Fig. 2A). AD 66-69 µm long, 84-89 µm wide, 3 areolae (1 anterior and 2 posterior); 1<sup>st</sup> pair of gland pores near anterolateral edge of posterior areolae; ds<sub>1</sub> at 0.68-0.72 of overall length of AD, posterior to posterior areolae; posterior margin of AD triangular. OC elongate 98-105 µm long, 45-50 µm wide, each with 2 corneae, gland pore near lateral margin of OC near the posterior side of posterior cornea, pore canaliculus at lateral margin of OC posterior to posterior cornea. PD 200-205 µm long, 129-138 µm wide (length to width ratio about 1.45-1.58), with a pair of longitudinal porose costae (costae 2 porose panels wide). Setae ds<sub>3</sub>-ds<sub>5</sub> on PD. Position of third pair of dorsal gland pores not

clear in the available specimens; a pair of gland pores on posterior part of PD attached laterally on costae.

AE 105-110  $\mu\text{m}$  long, 170-179  $\mu\text{m}$  wide, with 3 pairs of ventral setae and a pair of epimeral pores. PE with 3 ventral setae and 1 dorsal seta. GA 144-148  $\mu\text{m}$  long and 93  $\mu\text{m}$  wide. GO 65-68  $\mu\text{m}$  long and 40-41  $\mu\text{m}$  wide, anterior margin of GA truncate; GA longer than AE. Distance between anterior end of GO and that of GA 47- 49  $\mu\text{m}$ , about 0.72 times of GO length. Three pairs of PGS present, anterior pair inserted 23  $\mu\text{m}$  from anterior end of GO and 24  $\mu\text{m}$  from anterior margin of GA; 2<sup>nd</sup> and 3<sup>rd</sup> pair adjacent to middle and posterior side of GO. Pair of SGS located at the anterior end of genital sclerites. Ovipositor extending anteriorly beyond GO, not reaching insertion of anterior PGS.

Gnathosoma (Fig. 1D) 86-91  $\mu\text{m}$  long, rostrum triangular, tip of rostrum not surpassing the anterior end of P<sub>2</sub>. Palp consisting of 4 segments. P<sub>1</sub> and P<sub>3</sub> without any setae. P<sub>2</sub> with 1 dorsal seta. P<sub>4</sub> with 3 long proximal setae and 1 minute distal seta. Proto and deuto- rostral setae at the tip of rostrum, tritorostral setae (long maxillary setae of rostrum) anterior to middle of rostrum, gnathosomal base with a pair of setae. Rostral sulcas extending posteriorly to just beyond the tritorostral setae.

Chaetotaxy of legs (Fig. 3A-D): trochanters I-IV 1-1-1-0, 1; basifemora I-IV 2-2-2-2; telofemora I-IV 5-5-2-2; Genua I-IV 4-4-3-3; tibiae I-IV 6-6-5-5; tarsi I-IV (excluding PAS) 6-4-4-3. Telofemora III –IV with 2 dorsal setae, devoid of any ventral setae. Tibiae I-IV with 1-1-1-0 bipectinate ventromedial setae. Pectinate seta fan shaped anteriorly. Tarsus I with 3 dorsal setae, 1 solenidion, 2 ventral setae, 2 doublet eupathid PAS. Tarsus II with 3 dorsal setae, 1 solenidion, 2 single eupathid PAS. Tarsus III with 4 dorsal setae (distance between 2 basal setae little less than height of the tarsus) and 2 PAS. Tarsus IV with 3 dorsal setae and 2 PAS. All tarsi with 2 lateral claws, a small bidentate medial claw, and a carpite. Lateral claws smooth ventrally.

Male. Idiosoma 278-291  $\mu\text{m}$  long. Structure and armature of body parts resemble those of female, except for GA region (Fig. 1C). Figure 2B-F shows gnathosoma (palp not drawn), chelicera, palp, OC and outline of areolae on AD with gland pores and setae, for a male collected from India. GA 143  $\mu\text{m}$  long, 102  $\mu\text{m}$  wide, anteriorly truncate. GA longer than AE. Spermatopositor extending near the anterior end of GA. Anterior end of GA almost truncate. GO 47  $\mu\text{m}$  long, 35  $\mu\text{m}$  wide; distance between anterior end of GO and that of GA 54  $\mu\text{m}$ , about 1.1 times length of GO. GO surrounded by 14-20 PGS; 4 pairs of SGS present, 1<sup>st</sup> and 2<sup>nd</sup> pair setiform, 3<sup>rd</sup> pair spur like and 4<sup>th</sup> pair spiniform.

## Remarks

In *Acarothrix longiunguis* and *A. palustris*, the posterior margin of AD is rounded, while in the new species it is triangular; in *A. ampliata*, setae  $ds_1$  are inserted on the anterior part of AD, while in *A. grandocularis* sp. nov. They are located on the posterior part of AD; in *A. ampliumeris* setae  $ds_2$  are inserted on the membranous cuticle, while in the present species they are inserted on the anterior margin of OC. Setae  $ds_3$  are located on OC in *A. ampliata*, *A.*

*ampliumeris*, *A. longiunguis*, and *A. palustris*, while in *A. grandocularis* they are inserted on PD. A pair of costae, two porose panels wide are found in the present species, while costae are absent in *A. ampliumeris*, *A. longiunguis* and *A. umgenica*. Very faint line-like costae are found in *A. ampliata*. *A. ampliumeris* has a bipectinate seta on tibia IV, while all the setae on this segment in *A. grandocularis* are smooth. The distance between the anterior end of GO and that of GA is about 1.8 times of GO's length in males of *A. umgenica*, while about 1.1 times in males of *A. grandocularis*. Moreover the new species differs from the other described *Acarothrix* species in having 2 setae on basifemur II.

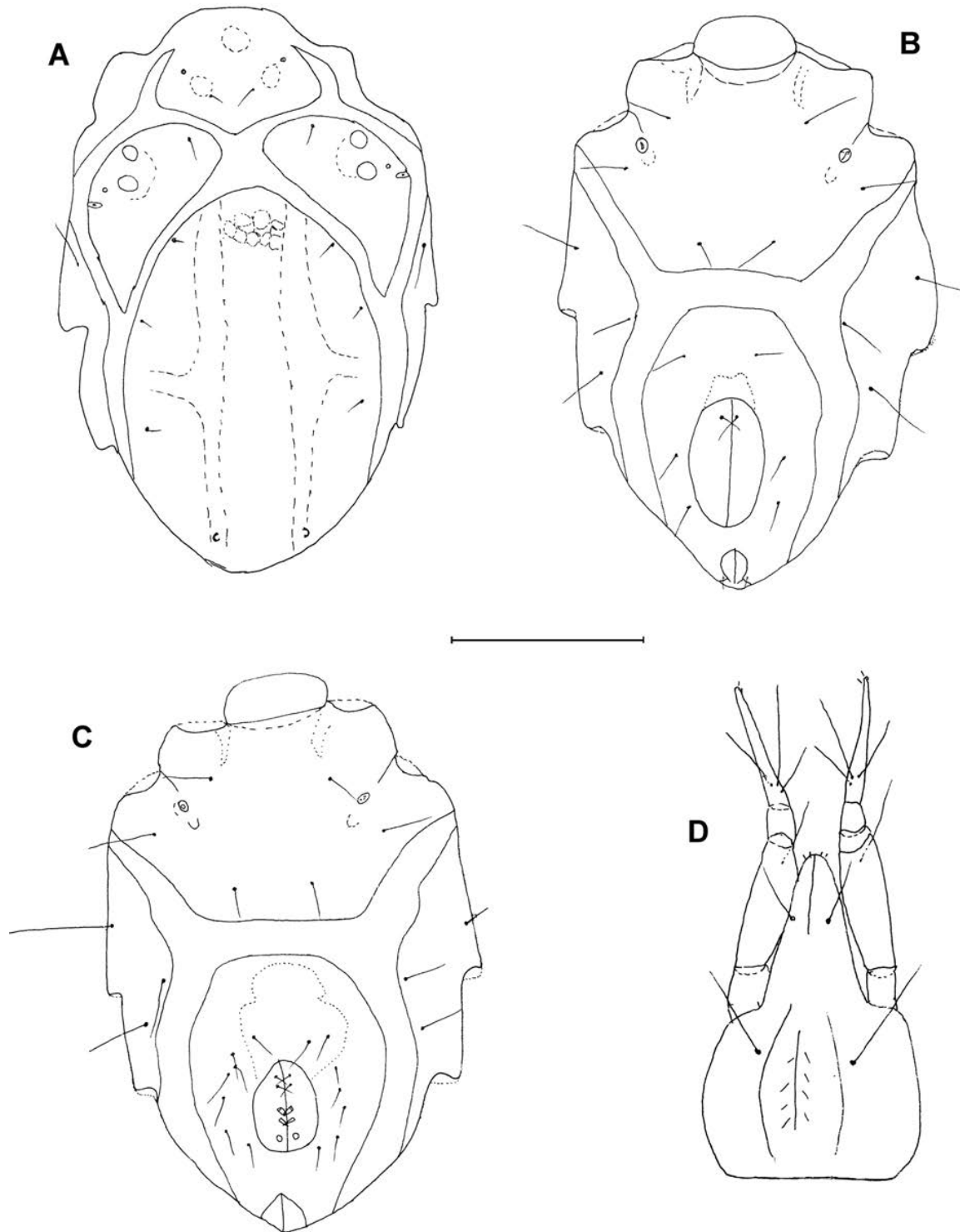
Scanning Electron microscopic observations of the present species will be undertaken to show details of cuticular ornamentations, position of gland pores and setae, and the nature of PAS.

## Acknowledgements

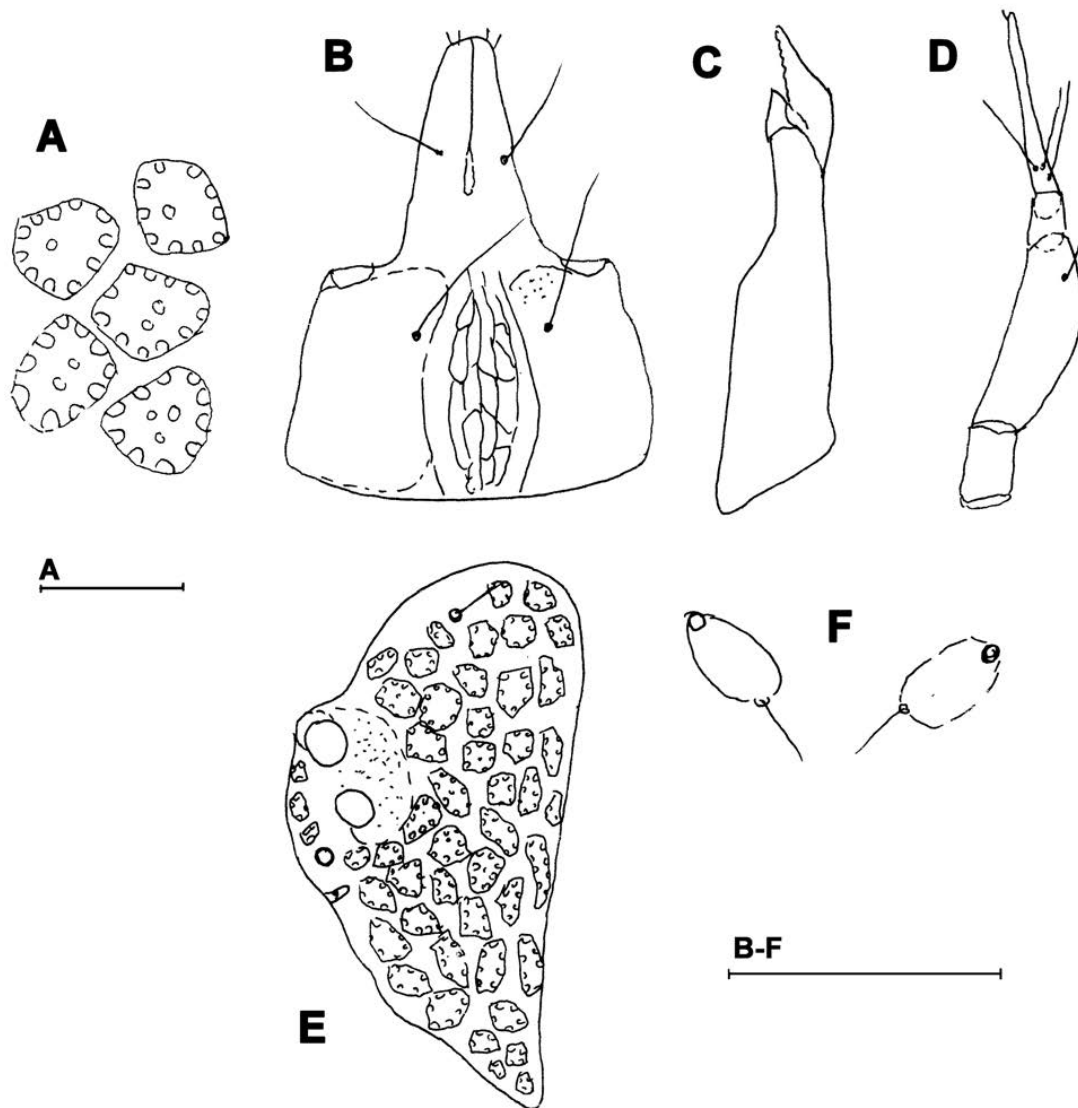
Brunei material was collected under the project "Aquatic mite diversity in Brunei Darussalam" of University Brunei Darussalam [Grant UBD/PNC2/2/RG/1(163)].

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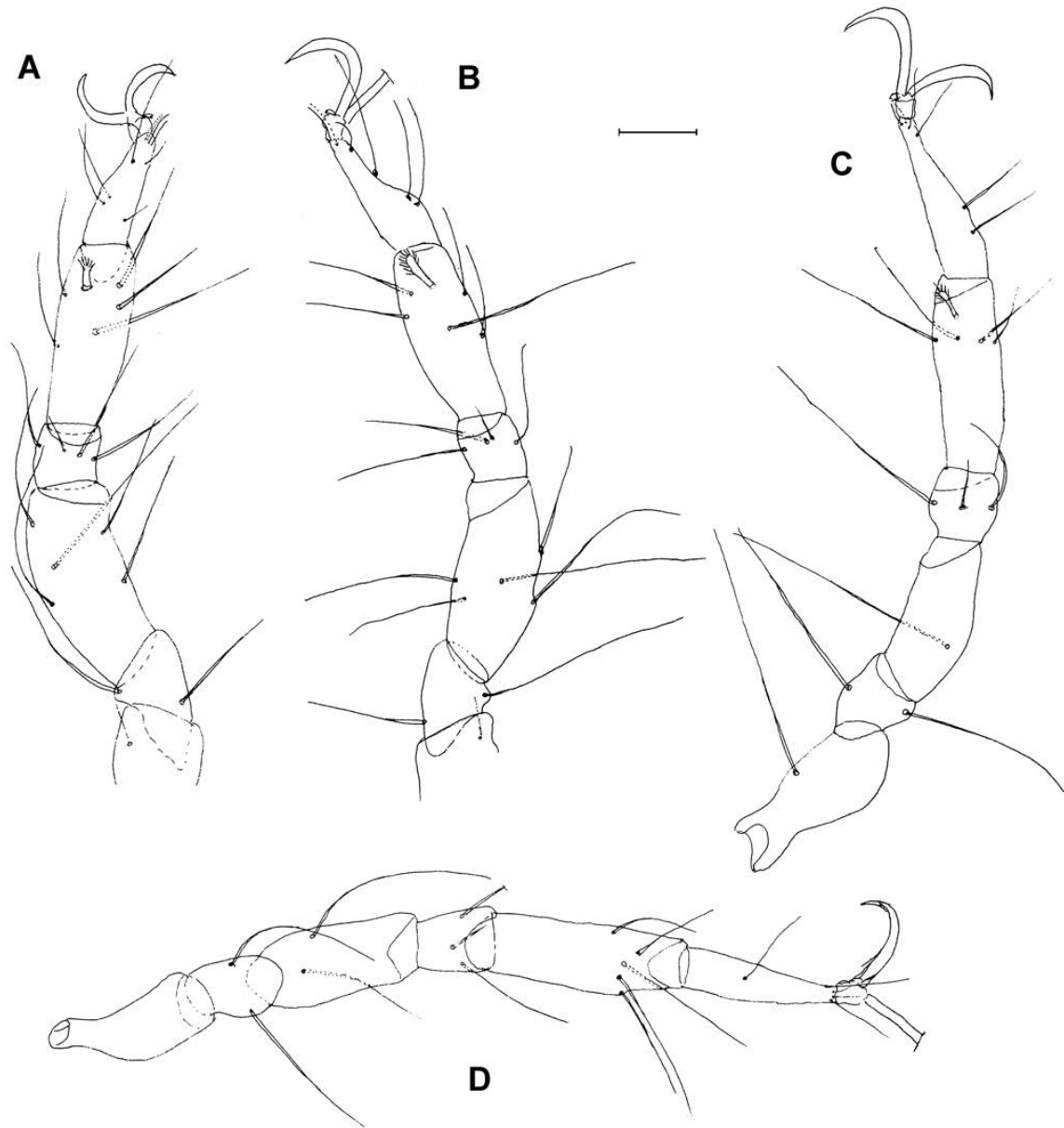
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**Figure 1.** *Acarothrix grandocularis* sp. nov. (specimens from Brunei Darussalam). **A.** Idiosoma dorsal, female. **B.** Idiosoma ventral, female. **C.** Idiosoma ventral, male. **D.** Gnathosoma, female. Scale bars: A-C = 100  $\mu$ m, D = 50  $\mu$ m.



**Figure 2.** *Acarothrix grandocularis* sp. nov. **A.** Female from Brunei Darussalam. **B-F.** Males from India. **A.** Panels between two costae on PD. **B.** Gnathosoma (palp not shown). **C.** Chelicera; **D.** Palp. **E.** OC. **F.** Outline of areolae on AD showing gland pores and setae. Scale bars: A= 20  $\mu$ m, B-F = 50  $\mu$ m.



**Figure 3.** *Acarothrix grandocularis* sp. nov. **A-D.** Female from Brunei Darussalam, Legs I-IV. Scale bar: 20  $\mu$ m.