

# *Copidognathus andhraensis* (Halacaridae: Acari), a new record from Singapore, supplemental description and notes on the habitat

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(with 21 figures)

## Abstract

*Copidognathus andhraensis* Chatterjee, Annapurna & Chang, 2004, a member of the *Copidognathus tricornatus* group, is re-described on the basis of individuals recently collected in Singapore. The species has been extracted from colonies of bryozoa.

**Key words:** Acari, Halacaroida, *Copidognathus andhraensis*, re-description, bryozoa, Singapore.

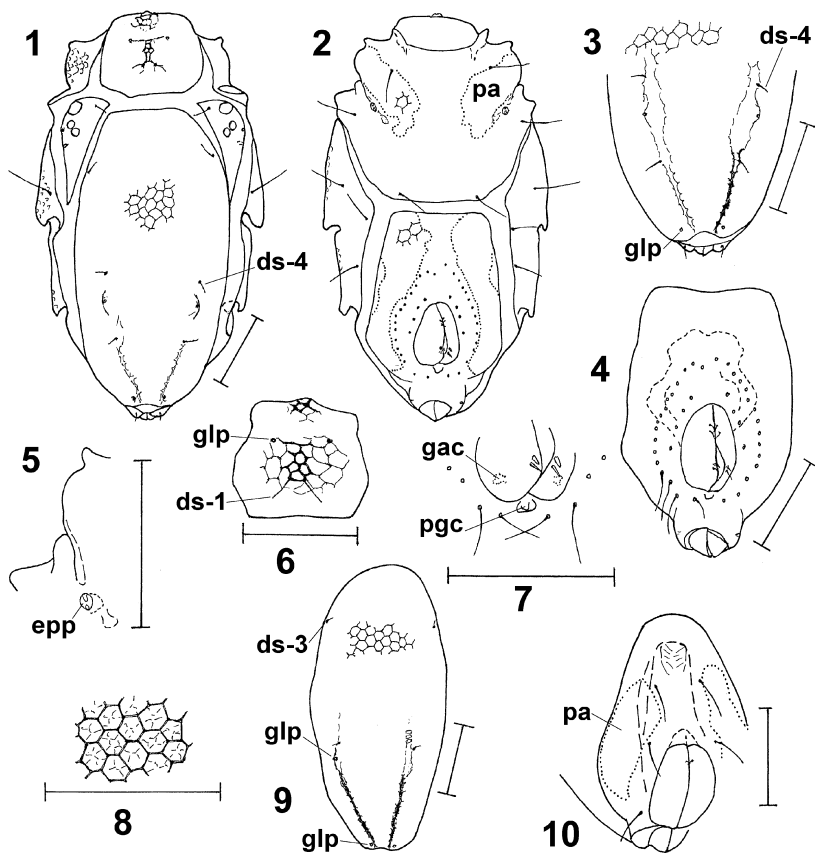
## Introduction

In a recent survey, Bartsch (2009) listed 22 names of halacarid species collected on the shores of Singapore. Since, records of another 13 shallow water species are in press or ready to be submitted for publication (Bartsch 2013). Still more species from Singapore are in the author's collection, amongst others *Copidognathus andhraensis* Chatterjee, Annapurna & Chang, 2004. On the basis of the new record, the original description by Chatterjee *et al.* (2004) is supplemented.

## Material and methods

Epiflora and epifauna from the water line of a floating platform was collected, washed over a 100 µm net and sorted while the mites were still alive. The mites were preserved in 70 % ethanol. For microscopical studies the mites were cleared in lactic acid and mounted on slides in glycerine jelly. Slides are deposited in the Arachnid Collections of the Raffles Museum of Biodiversity Research, Singapore (ZRC.ARA), the Zoological Museum, Hamburg (ZMH) and the author's halacarid collection.

The epimera, legs, their segments and claws are numbered from I to IV, from anterior to posterior.



**Figs. 1-10.** *Copidognathus andhraensis* Chatterjee, Annapurna & Chang. **1.** idiosoma, dorsal, male; **2.** idiosoma, ventral, male; **3.** posterior part of posterior dorsal plate, male; **4.** genitoanal plate, male; **5.** right part of anterior epimeral plate, male (punctate areola not illustrated); **6.** anterior dorsal plate, male; **7.** posterior part of genital opening, male; **8.** reticulate pattern of posterior dorsal plate just posterior to level with *ds-3*, female; **9.** posterior dorsal plate, female; **10.** genitoanal plate, female. Scale = 50  $\mu$ m (*epp*, epimeral pore; *ds-1*, *ds-3*, *ds-4*, first, third and fourth dorsal seta; *gac*, genital acetabulum; *glp*, gland pore; *pa*, punctate areola; *pgc*, postgenital cone)

***Copidognathus andhraensis* Chatterjee, Annapurna & Chang, 2004**

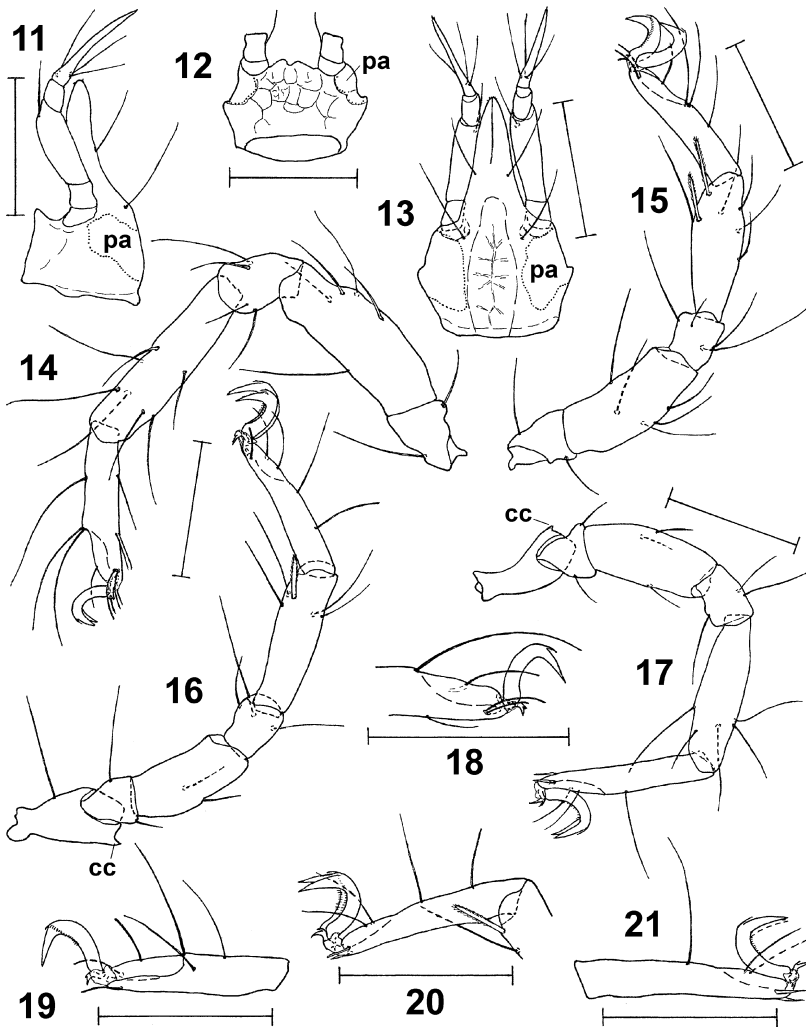
*Copidognathus andhraensis* Chatterjee et al. 2004: 75-77, figs 1A-H, 2A-D.

**MATERIAL EXAMINED AND COLLECTING DATA.** One male (ZRC.ARA), one male (ZMH Acc. No. A24/13) and one female (author's collection), South China Sea, Singapore, Pulau Ubin, floating platform in front of OBS Camp 1, 1°25'N, 103°56'E, bryozoa growing just beneath water line, 24 October 2012; coll. I. Bartsch.

**COLOUR.** Integument transparent. Body content uniformly light-brown.

**DESCRIPTION.** Idiosomal length of female 280 µm, of male 232 and 269 µm, width of the latter 129 and 150 µm. Major part of dorsal plates evenly reticulated; polygons about 6-8 µm wide and very faintly and irregularly subdivided (Fig. 8). A small frontal area of anterior dorsal plate somewhat raised and lamelliform slightly extending beyond truncate anterior margin of plate. In a median areola of anterior dorsal plate polygons smaller than in remainder of plate; polygons as long as wide (Fig. 6) or narrow, longer than wide (Fig. 1), their walls raised and thicker than in other areas. Position of gland pore and first pair of dorsal setae as illustrated (Figs 1 and 6). Ocular plate with three corneae, a large anterior one and two smaller posterior ones, a seta near medial corner of plate, and gland pore and canaliculus in lateral margin. Posterior dorsal plate of female somewhat more than twice as long as wide (Fig. 9); that plate of male wider than in female, its length slightly less than twice the width. Position of pairs of third to fifth dorsal setae as illustrated (Fig. 1), in single female available fifth pair of dorsal setae vestigial (Fig. 9). Anterior pair of gland pores on posterior dorsal plate at the level of insertion of leg IV; pores on small, dome-like areas. Posterior pair of gland pores near end of plate, immediately lateral to costae (Figs 3 and 9). Integument around anterior pair of gland pores smooth. In female only left gland pore present. Sharply delimited narrow costae restricted to posterior third of plate; costae slightly widened at the level of anterior pair of gland pores and more or less vanished at the level of fourth pair of dorsal setae. Integument within costae smooth.

Major part of anterior epimeral plate with smooth integument; porosity restricted to pair of oblong areolae within area representing first pair of epimera (Fig. 2). Surface within these punctate areolae with polygonal ornamentation. Epimeral pores 5 µm in diameter; with two protruding teeth (Fig. 5). Posterior epimeral plates extending anteriorly far beyond aperture of leg III, posteriorly only slightly beyond aperture of leg IV. Marginal parts reticulated; punctate areolae lacking. Female genitoanal plate with ovate anterior margin; two oblong punctate areolae extending anteriorly to or just beyond anterior pair of perigenital setae (Fig. 10). Genital opening in posterior part of genitoanal plate. Ovipositor extending anteriorly halfway between anterior pair of pgs and margin on genitoanal plate. Pair of subgenital setae minute. Male genitoanal plate with truncate anterior margin. Pair of punctate areolae extending to anterior margin of genitoanal plate (Fig. 2). Male genital opening removed from anal cone; distance from anterior margin of genital opening to that of genitoanal plate equalling 1.2 times length of genital opening. Genital opening surrounded by 40-41 perigenital setae, four pairs close to and 32-33



**Figs. 11-21.** *Copidognathus andhraensis* Chatterjee, Annapurna & Chang, 2004. **11.** gnathosoma, lateral, male; **12.** gnathosomal base, dorsal, male; **13.** gnathosoma, ventral, male; **14.** basifemur to tarsus I, medial, female; **15.** basifemur to tarsus II, medial, female; **16.** leg III, medial, female; **17.** leg IV, medial, male; **18.** tip of tarsus I, lateral, female (medial setae and claw omitted); **19.** tarsus II, medial, male; **20.** tarsus and tip of tibia III, medial, male; **21.** tarsus IV, medial, male (lateral fossary seta and claw in broken line). Scale = 50  $\mu$ m (cc, cuticular cone; pa, punctate areola)

setae in a wide ring around opening (Fig. 4). Perigenital setae slender. A small postgenital cone present immediately posterior to genital opening and still within ring of setae (Fig. 7). Male genital sclerites with three pairs of slender setae and one pair of somewhat shorter and wider subgenital setae. A single pair of small internal genital acetabula in posterior part of genital opening (Fig. 7). Spermatopositor large, extending anteriad beyond ring of perigenital setae.

Gnathosoma 1.6 times longer than wide. Rostrum slender, evenly triangular in ventral aspect, longer than gnathosomal base and extending almost to end of the level of third palpal segment (Figs 11 and 13). Basal pair of maxillary setae on gnathosomal base close to rostrum, distal pair in about middle of rostrum. Two pairs of rostral setae very small. Major part of ventral flank of gnathosomal base evenly punctate; punctuation extending dorsad; dorsal flank reticulate. Tectum with small median notch (Fig. 12).

Legs slender. Telfemora of legs I and II about as long as these legs tibiae, telfemora III and IV shorter than tibiae. Telfemora, genua and tibiae with short articular membranes, tarsi with fossa membranes. Telfemora I and II 2.9 and 2.5 times longer than high, respectively, telfemora III and IV 2.3 times. Leg chaetotaxy as usual within the genus *Copidognathus*, from trochanter to tarsus (parambulacral setae and famulus excluded) leg I with 1, 2, 5, 4, 7, 7, leg II with 1, 2, 5, 4, 7, 4, leg III with 1, 2, 2, 3, 5, 4, and leg IV with 0, 2, 3, 3, 5, 3 setae. Trochanters III and IV with cuticular cones (Figs 16 and 17). Tibia I with three long, smooth ventral setae (Fig. 14). Tibia II with two bipectinate setae in ventromedial and one smooth and slender seta in ventral position; both bipectinate setae situated close together, the posterior one on the level of slender ventral seta (Fig. 15). Tibia III ventrally with one bipectinate and one long, slender seta (Fig. 20); tibia IV with two slender setae. Three fossary setae on tarsus I large, equal in length and shape; solenidion 17  $\mu\text{m}$  long, on lateral fossa membrane (Fig. 18). On tarsus II dorsal and dorsomedial fossary setae shorter than dorsolateral seta (Fig. 19) and dorsal fossary seta slightly thinner than other setae. Length and position of solenidion same as on tarsus I. On tarsi III and IV paired fossary setae situated on fossa membranes, both setae equal in length but shorter than dorsal fossary seta. Tarsus I with pair of doubled parambulacral setae, tarsus II with singlets, on both tarsi setae eupathid. On tarsus III medial parambulacral seta eupathid, lateral seta slightly flattened, on tarsus IV both lateral and medial parambulacral setae slightly flattened, much shorter than on tarsi I and II (Fig. 21).

All tarsi with small bidentate median claw and large, rather wide, flattened paired claws. Paired claws II to IV with pectines extending along inner flank of claws; tines of pectines delicate.

**DISTRIBUTION.** Eastern India (Andhra Pradesh) and Singapore (new record).

**REMARKS.** There are differences between the description of the type from eastern India and that of the individuals from Singapore, namely the position of the pair of gland pores on the anterior dorsal plate (distance between pores about the same as between the pair of setae (Chatterjee *et al.* 2004:

fig. 1A and B) versus distance more than twice that between setae); the position of the seta on the ocular plate (lateral to the anterior cornea (Chatterjee *et al.* 2004: fig. 1A and C) versus distinctly medial to that cornea); the shape of the costae on the posterior dorsal plate (wide versus narrow) and the absence (Chatterjee *et al.* 2004: fig. 1A and D) versus presence of gland pores on this plate; the shape of the claws, especially those on tarsi I and II (rather slender (Chatterjee *et al.* 2004: fig. 2A and B) versus wide). These differences are expected to be negligible, a few may be due to character variability or anomalies.

*Copidognathus andhraensis* belongs to the *tricorneatus* group, a natural species group characterized by a combination of following external characters: (1) dorsal plates reticulated; (2) middle part of anterior dorsal plate raised, gland pores situated in anterior margin of that areola, distinctly removed from lateral margins of the plate, pair of setae posterior to gland pores; (3) ocular plate extending posteriad to about the level of insertion of leg III, posterior cornea often divided; (4) posterior dorsal plate elongate, generally about twice as long as wide, with narrow, raised costae; (5) ventral plates often with sharply delimited punctate areolae; (6) males with small postgenital cone; (7) legs slender; (8) tibiae I to IV ventrally with 0, 2, 1, 0 bipectinate and 3, 1, 1, 2 slender, smooth setae; (9) claws generally wide. At present 14 species have been attributed to this group, namely, *C. andhraensis*, *C. dictyotellus* Bartsch, 1998, *C. dictyotus* Bartsch, 1993, *C. hummelincki* (Viets, 1936), *C. kagamili* Newell, 1950, *C. leptoporus* Otto, 2001, *C. longipes* Bartsch, 1973, *C. megaloporus* Otto, 2001, *C. mucronatus* Viets, 1928, *C. quadricostatus* (Trouessart, 1894), *C. sophiae* Pepato & Tiago, 2005, *C. tricorneatus* (Viets, 1938), *C. trouessarti* (Voinov, 1896), and *C. xaixaiensis* Procheş, 2002 (Bartsch 1997, 1998, Otto 2001, Procheş 2002, Chatterjee *et al.* 2004, Pepato & Tiago 2005). Not all species share the above mentioned combination of characters.

The most obvious characters of *Copidognathus andhraensis* are the pair of sharply delimited punctate areolae on the epimeral plates I and the genitoanal plate, ovate on the former and arranged on either side of the genital opening on the latter plate, the short costae on the posterior dorsal plate, and the absence of punctate foveae on both the anterior and posterior dorsal plate. The short costae on the posterior dorsal plate are unique within the *tricorneatus* group, but similar ovate areolae on the anterior epimeral plate and genitoanal plate are found in *C. dictyotus*, a species known from the eastern coast of the Malayan Peninsula, island Babi Besar, South China Sea (Bartsch 1993).

Differences between these two species are: *C. andhraensis* has a more slender posterior dorsal plate, its single pair of short costae is restricted to the posterior half of the plate and the integument within the costae is smooth, whereas in *C. dictyotus* the posterior dorsal plate bears two pairs of costae, the medial pair extends anteriad almost to the anterior margin of the plate and includes two small areolae with delicately punctate integument. Further differences between *C. andhraensis* and *C. dictyotus* are the slightly longer punctate areolae on the anterior epimeral plate, the absence of punctate areolae on the posterior epimeral plates (in *C. dictyotus* present), the shorter female genitoanal plate with an ovate anterior margin (in *C. dictyotus*

plate longer, distinctly surpassing the anterior pair of perigenital setae and its anterior margin truncate).

**HABITAT.** The *Copidognathus andhraensis* individuals from Singapore are from bryozoans (about 10 halacarid specimens in all), no halacarids were found amongst the immediately adjacent growing algae and sponges. It is likely that *C. andhraensis* regularly live on bryozoans. It is not known if the species feeds on these organisms, on epizoa or on any part of a surrounding biofilm.

Both bryozoans and hydrozoans are inhabited by halacarid mites. Gordon (1972) and Scholz & Hillmer (1995) identified halacarids as associates of marine bryozoans, and also freshwater bryozoans may be colonized by a large number of a halacarids (Taticchi *et al.* 2008). Bartsch (1980, 1991) found the marine halacarids *C. quadricostatus* and *C. trouessarti*, both related to *C. andhraensis*, on subtidal bryozoan colonies which were part of the epibios on boulders and stones. In the North Sea and Baltic, *Halacarellus balticus* (Lohmann, 1889) and *Lohmannella falcata* (Hodge, 1863) are regularly found on and amongst colonies of the bryozoan *Membranipora* sp. and the hydrozoans *Cordylophora caspia* (Pallas, 1771) and *Gonothyraea loveni* (Allmann, 1859) (Bartsch 1972, 1979 and unpublished). The halacarid genus *Bradyagaue* seems to be specialized for a life on hydrozoans and possibly other stolonaceous organisms (Newell 1971, Bartsch 1988: fig. 44.2.b). Though, these halacarids are not bound to bryozoans or hydrozoans, the freshwater species *Porohalacarus alpinus* (Thor, 1910), mentioned by Taticchi *et al.* (2008), inhabits a wide range of niches in oligo- and mesotrophic waterbodies (Bartsch 2006), and the marine *Halacarellus balticus* and *Lohmannella falcata* are known to be eurytopic (Bartsch 1979).

Unfortunately, the details about the substratum inhabited by halacarid species of the *tricornatus* group are sparse. No information is given for the type specimens of *Copidognathus andhraensis* (Chatterjee *et al.* 2004), but most species have been extracted from rubble and boulders covered by a rich epifauna or from algae, from substrata which often are colonized by both bryozoans and hydrozoans.

### Acknowledgements

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### Zusammenfassung

Zwischen den kürzlich in Singapur gesammelten marinen Milben befand sich auch *Copidognathus andhraensis* Chatterjee, Annapurna & Chang, 2004. Die Beschreibung dieser zur Verwandtschaftsgruppe der *Copidogna-*

*thus tricornatus* Gruppe gehörenden Art wurde überarbeitet. *Copidognathus andhraensis* wurde auf Bryozoen gefunden und lebt offenbar mit diesen vergesellschaftet.

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