

TAPAS CHATTERJEE*

SCANNING ELECTRON MICROSCOPIC OBSERVATIONS
OF *COPIDOGNATHUS BALAKRISHNANI* CHATTERJEE
(ACARI: HALACARIDAE) WITH NOTES ON SPECIES OF THE
COPIDOGNATHUS BALAKRISHNANI GROUP

Abstract

The halacarid mite *Copidognathus balakrishnani* Chatterjee, 2000 belongs to a natural group of closely related species, referred to as the ‘*balakrishnani* group’. *C. balakrishnani* was earlier described based on the specimens from Cochin back water in Kerala, India. The specimens used in the present study were collected in Goa, India, from algal turf of mangroves. This is first record of this species outside Kerala. Scanning Electron microscopic observations of some characters of *C. balakrishnani* is presented. Characters of the ‘*balakrishnani* group’ species are also discussed.

Keywords: SEM, *Copidognathus balakrishnani*, *balakrishnani* group, distribution

* Department of Biology, Indian School of Learning, I.S.M. Annexe, P.O. – I.S.M., Dhanbad-826004, Jharkhand, India, e-mail: drtchatterjee@yahoo.co.in

Introduction

Copidognathus is a species rich genus with more than 300 species of halacarid mites. The first author of this study has already reported many new species and new recordings of *Copidognathus* from India (e.g. Chatterjee 1991a, 1991b, 1991c, 1992, 1996, 1997, 1999a, b, 2000; Chatterjee, Annapurna 2002; Chatterjee, De Troch 2003; Chatterjee et al. 2003; Chatterjee, Chang 2004; Chatterjee, Guru 2013). *C. balakrishnani* Chatterjee, 2000 was originally described from intertidal algae in Cochin back water, Kerala, India (Chatterjee 2000). The specimens used in the present study were collected in Goa, India, from algal turf of mangroves, makes it the first recording of the species outside Kerala.

Material and Methods

Specimens for scanning electron microscopy (SEM) were prefixed overnight at 4°C in 2.5% glutaraldehyde, followed by post fixation in 2% cold osmium tetroxide. After dehydration through a graded series of ethanol (50–100% at 10% interval) for 30 minutes each, the material was critical point dried, and coated with a platinum-palladium mix in a high evaporator, and then examined with a scanning electron microscope.

The following abbreviations are used in the text and figure legends: AD, anterior dorsal plate; AE, anterior epimeral plate; ds_{1–5}, dorsal setae 1–5 on the idiosoma; GA, genitoanal plate; GO, genital opening; OC, ocular plate(s); PAS, par-ambulacral seta(e); PD, posterior dorsal plate; PGS, perigenital setae; P_{1–4}, first to fourth palpal segment; SGS, subgenital setae.

Results and Discussion

Copidognathus balakrishnani Chatterjee, 2000.

Copidognathus balakrishnani Chatterjee, 2000, 255–259, Figs. 10–17.

Material Examined: Three females and one male from algal turf growing on *Avicennia* mangrove pneumatophores at Chorao Island, North Goa (15°30'45.74"N, 73°52'11.25"E), India, 20th May 2011, coll. T. Chatterjee.

Description: The original description of this species is given in Chatterjee (2000) based on the specimens collected from Kerala, India. Some characters referred in that paper are described in more details according to present SEM study based on the specimens collected from Goa (Figs. 1–5).

Setae ds_3 - ds_5 on PD. PD with four costae, made up of porose panel. Area between two middle costae reticulated three to five panels wide, each panel with four to eight subpanels. Area between middle costa and lateral costa two to three panels wide. Lateral and middle costae join anteriorly.

Epimeral pore ovate. In female, the anterior margin of GA arched, ovate; the distance between the anterior margin of GO and that of GA subequal with the length of GO. In male, the anterior margin of GA slightly arched, the distance between the anterior margin of GO and that of GA almost equal with the length of GO. In male, four pairs SGS, 1st, 2nd and 4th pair thread like, 3rd pair small spine like.

Rostrum short, ventrally triangular in shape, 0.47 of gnathosomal base and about 0.32 of total gnathosomal length, reaching base of P₄. Gnathosoma ventrolaterally with panels. Tritorostral setae almost at the middle of the rostrum. Rostral sulcus long, going beyond the tritorostral setae. Tectum truncate. Dorsal part of gnathosoma also paneled.

Gut content greenish black in colour.

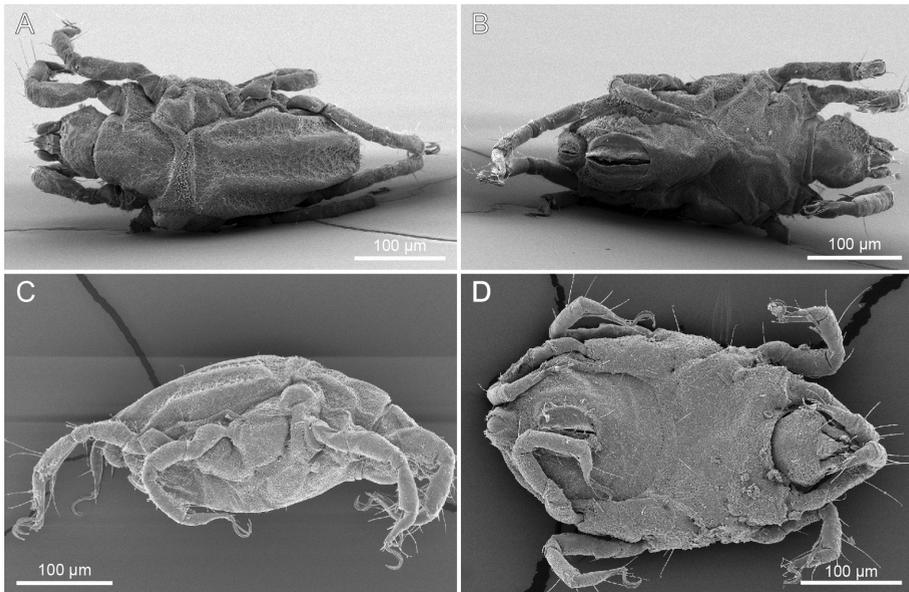


Figure 1. *Copidognathus balakrishnani* Chatterjee 2000. A. Female, dorsal view B. Female, ventral view C. Female, lateral view D. Male, ventral view

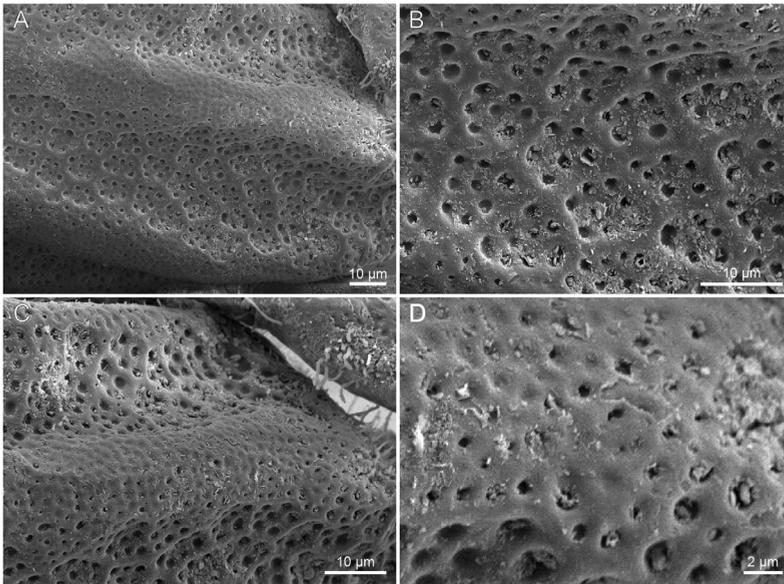


Figure 2. *Copidognathus balakrishnani* Chatterjee 2000, Female. A & C. Parts of middle costae and panels on PD B. Magnified view of panels between two middle costae D. Magnified view of middle costa (part) on PD

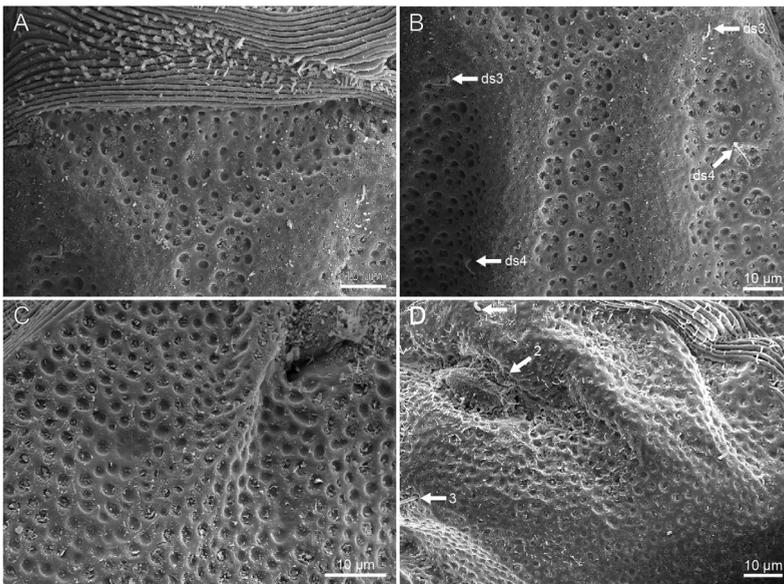


Figure 3. *Copidognathus balakrishnani* Chatterjee 2000, Female. A. Anterior part of PD showing panels B. Part of PD showing ds₃ and ds₄ C. Part of AE near epimeral pore D. Magnified view of Part of AE (arrow indicating: 1. Ventral seta near first coxal region anterior to the epimeral pore, 2. Epimeral pore, 3. Ventral seta near 2nd coxal region posterior to epimeral pore)

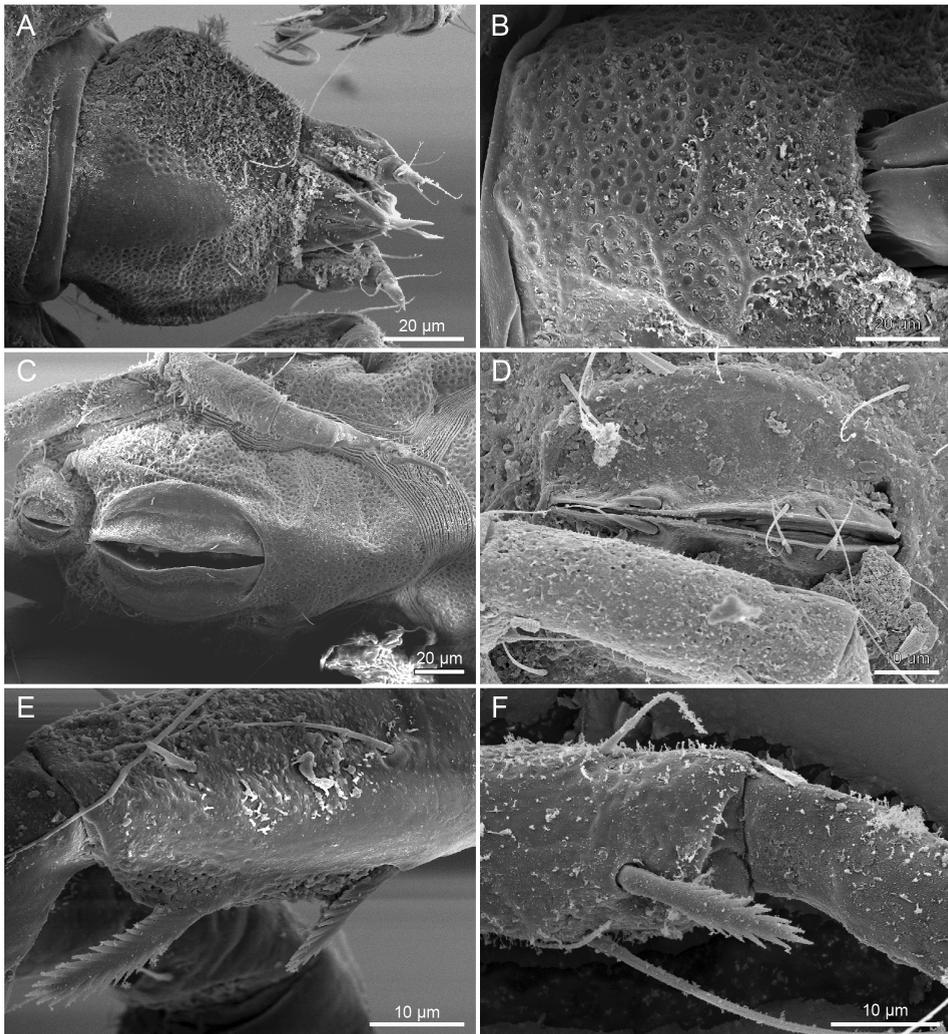


Figure 4. *Copidognathus balakrishnani* Chatterjee 2000, A–C, E & F: female; D: male.
A. Ventral side of gnathosoma **B.** Part of dorsal side of gnathosomal base
C. GA; **D.** Part of GO, male **E.** Part of tibia I; female **F.** Part of tibia IV

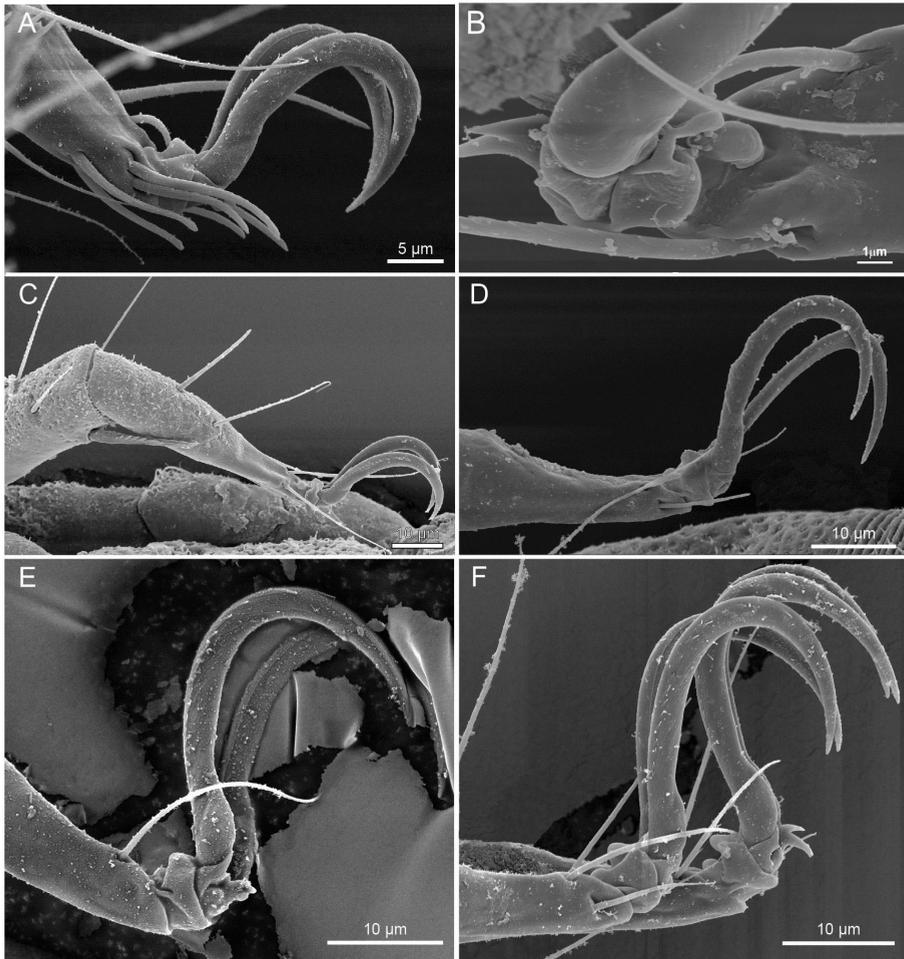


Figure 5. *Copidognathus balakrishnani* Chatterjee 2000, A, B, D–F: female; C: male.
 A. Tip of tarsus I B. Tip of tarsus II (part) C. Part of tibia and tarsus of leg III
 D, E. Tip of tarsus III F. Tip of tarsus IV

Areolae and costae on dorsal plates with porose panel. AD with an anterior and two posterior (pyriform) areolae made up of porose panels. Setae ds_1 located anterior to posterior areolae on AD. Setae ds_2 placed on anteromedian part of OC.

Pectinate setae on tibiae I–IV: 2-2-1-1. Figures 4E and 4F showing ventromedial pectinate setae of tibiae I and IV respectively. Tarsi III and IV each with four and three dorsal setae respectively. The distance between two basidorsal setae of tarsus III slightly lesser than height of that segment. Tarsus I with two eupathid doublet PAS. Tarsus II with two single eupathid PAS. Tarsi III and IV with 1 lat-

eral PAS, medial PAS absent. All tarsi with carpite, two lateral claws and a small bidentate median claw. Lateral claw ventrally completely smooth.

Remarks: This species was earlier described based on the specimens from Cochin back water in Kerala, India. The specimens used in the present study were collected in Goa, India, from algal turf of mangroves. The specimens are considered conspecific with *Copidognathus balakrishnani*, which makes it the first recording of the species outside Kerala. The specimens in the Goa population showed only minor differences from specimens at the type locality. These differences included variations in the anterior ends of the costae on PD, where the middle and lateral costae join. More specimens from both areas to be studied to know the intraspecific variability on this trait.

Chatterjee (2000) reports the presence of two PAS in tarsi III and IV. However, the observations made in the present study demonstrate that this is an artifact, and that both tarsi contain only lateral PAS, and medial PAS are absent.

Figure 3B shows position of ds3 and ds4 in one specimen, one side the distance between ds3 and ds4 46 μm , while on other side 28 μm . It indicates distances varying so much between two halves in same specimen. So specific determination based on the distances between ds3 and ds4 or ds4 and ds5 should be done with caution.

Species of *Copidognathus balakrishnani* group

Copidognathus balakrishnani Chatterjee, 2000 shares several similarities with *C. caloglossae* Procheş, 2002, *C. lutarius* Bartsch, 2003 and *C. rhombognathoideus* Bartsch, 2006. *C. caloglossae* Procheş, 2002 was reported associated with the algal complex, 'Bostrychietum', covering the pneumatophores of the mangrove tree *Avicennia marina* at Richards Bay, Isipingo and Beachwood mangrove forests in KwaZulu-Natal, South Africa, and at Inhambane, Mozambique (Procheş et al. 2001; Procheş 2002; Procheş, Marshall 2002). *C. lutarius* was reported among the turf of *A. marina* on the east coast of the Burrup Peninsula, Dampier, Western Australia (Bartsch 2003). Bartsch (2006) described *C. rhombognathoideus* from algae on sediments, as well as pneumatophores and stems of mangroves in Singapore. *C. rhombognathoideus* was also reported by Chatterjee et al. (2012) from algal turf growing on *Rhizophora* mangrove pneumatophores at Batu Marang, Brunei Darussalam. Chatterjee et al. (2012) proposed that these four species can be assigned to natural group, referred to as the '*Copidognathus*

balakrishnani group'. This group is characterized by short rostrum, small palps; areolae and costae with porose panel; PD with 4 costae; pectinate setae on tibiae I–IV: 2-2-1-1; tarsi III–IV with lateral PAS, medial PAS absent, setae ds_2 on OC, setae ds_3 - ds_5 on PD. All these species were described from low salinity zones associated with mangroves and algae.

C. balakrishnani differs from *C. lutarius* Bartsch, 2003, *C. rhombognathoides* Bartsch, 2006 by the nature of its panels between the costae. In *C. balakrishnani* the area between the two costae consists of reticulated panels, while in *C. lutarius* and *C. rhombognathoides* foveated panels are present (panels are not reticulated). Each panels subdivided (with many subpanels inside) in *C. balakrishnani*, while simple fovea (without any subdivision/subpanel inside) is present in *C. lutarius* and *C. rhombognathoides*. Costae on PD are uniformly porose in *C. balakrishnani*, while small groups of panels are formed in *C. caloglossae*. Setae ds_2 are present near half way ventrolaterally on OC in *C. caloglossae*, while those setae are on the anteromedian corners in the other three species.

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References

- Bartsch I. 2003. Mangrove halacarid fauna (Halacaridae, Acari) of the Dampier region, Western Australia, with description of five new species. *Journal of Natural History*, 37: 1855–1877.
- Bartsch I. 2006. Copidognathines (Acari: Halacaridae) in mangroves of Singapore. I. Description of three species. *The Raffles Bulletin of Zoology*, 54: 83–92.
- Chatterjee T. 2000. Two new species of *Copidognathus* (Halacaridae, Acari) from Kerala. *Journal of the Bombay Natural History Society*, 97: 253–259.
- Chatterjee T. 1991a. *Copidognathus eblingi*, A new species of Halacaridae (Acari) from Andaman Islands (Indian Ocean). *Journal of the Bombay Natural History Society*, 88 (1): 88–92.
- Chatterjee T. 1991b. *Copidognathus gitae*, a new species of Halacaridae (Acari) from Visakhapatnam Coast, Bay of Bengal. *Journal of the Bombay Natural History Society*, 88 (2): 272–275.

- Chatterjee T. 1991c. A new species of *Copidognathus* (Halacaridae: Acari) from Chilka lagoon, Bay of Bengal. *Journal of the Bombay Natural History Society*, 88 (3): 406–409.
- Chatterjee T. 1992. *Copidognathus krantzi*. A new species of Halacaridae (Acari) from Nicobar Islands (Indian Ocean). *Journal of the Bombay Natural History Society*, 89 (1): 106–109.
- Chatterjee T. 1996. Record of *Copidognathus tamaeus* Bartsch (Halacaridae: Acari) from Indian Ocean. *Journal of the Marine Biological Association of India*, 38 (1/2): 141–143.
- Chatterjee T. 1997. A new species, *Copidognathus pseudosidellus* (Halacaridae: Acari) from Andaman Islands. *Journal of the Andaman Science Association*, 13: 94–98.
- Chatterjee T. 1999a. First record of *Copidognathus faubeli* Bartsch (Halacaridae: Acari) from the Indian Ocean. *Journal of the Bombay Natural History Society*, 96 (1): 170–171.
- Chatterjee T. 1999b. A new species of *Copidognathus* (Halacaridae: Acari) from Andaman Islands. *Journal of the Bombay Natural History Society*, 96(3): 447–450.
- Chatterjee T. 2000. Two new species of *Copidognathus* (Halacaridae: Acari) from Kerala. *Journal of the Bombay Natural History Society*, 97(2): 235–239.
- Chatterjee T. & Annapurna C. 2002. *Copidognathus waltairensis*, a new species of Halacaridae (Acari) from Visakhapatnam coast (Bay of Bengal). *Proceedings of Andhra Pradesh Academy of Sciences*, 6: 69–72.
- Chatterjee T. & De Troch M. 2003. *Copidognathus andamanensis*, a new marine Halacaridae (Acari) from Andaman Island (India). *Bulletin De L'Institut Royal Des Sciences Naturelles De Belgique, Belgium, Entomologie*, 73: 51–56.
- Chatterjee T., Annapurna C. & Chang C.Y. 2003. A new species of *Copidognathus* (Halacaridae: Acari) from India. *Korean Journal of Biological Science*, 7: 283–287.
- Chatterjee T. & Chang C.Y. 2004. Two new *Copidognathus* halacarids (Acari: Halacaridae) Mumbai coast of India (the Arabian Sea). *Italian Journal of Zoology*, 71: 265–269.
- Chatterjee T., Marshall D.J. & Pesic V. 2012. New records of *Copidognathus* mites (Acari: Halacaridae) from mangroves in Brunei Darussalam with descriptions of two new species. *Zootaxa*, 3269: 18–30.
- Chatterjee T. & Guru B.C. 2013. New records of halacarid mites (Acari, Halacaridae) from the Andaman and Nicobar Islands, India. *Acta Biologica*, 20: 5–15.
- Procheş Ş. 2002. New species of Copidognathinae (Acari: Halacaridae) from southern Africa. *Journal of Natural History*, 36: 999–1007.
- Procheş Ş. & Marshall D.J. 2002. Diversity and biogeography of southern African intertidal Acari. *Journal of Biogeography*, 29: 1201–1215.

Procheş Ş., Marshall D.J., Ugrashen K. & Ramacharan A. 2001. Mangrove pneumatophore arthropod assemblages and temporal patterns. *Journal of the Marine Biological Association of the U.K.*, 81: 545–552.

**OBSERWACJE *COPIDOGNATHUS BALAKRISHNANI* CHATTERJEE
PRZY POMOCY MIKROSKOPU SKANINGOWEGO Z UWAGAMI NA
TEMAT GATUNKU ZBIORCZEGO *COPIDOGNATHUS BALAKRISHNANI***

Streszczenie

Copidognathus balakrishnani Chatterjee, 2000, należy do grupy blisko spokrewnionych gatunków, określanych jako "grupa *balakrishnani*". *C. balakrishnani* został wcześniej opisany na podstawie okazów Cochin z wodód w Kerala w Indiach. Okazy wykazane w niniejszym badaniu zebrano w Goa (Indie) z porostu glonów w namorzynach. Jest to pierwsze odkrycie tego gatunku poza Kerala. W niniejszym opracowaniu zaprezentowano obserwacje mikroskopowe z użyciem mikroskopu skaningowego niektórych cech *C. balakrishnani* oraz innych osobników z grupy *balakrishnani*.

Słowa kluczowe: SEM, *Copidognathus balakrishnani*, grupa *balakrishnani*, rozmieszczenie

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