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Halacaridae (Acari) from the Great Meteor Seamount (Northeastern Atlantic): description of two new *Copidognathus* species

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(With 26 figures)

Abstract

Two *Copidognathus* species, *C. leptus* sp. n. and *C. procerus* sp. n., are described. The two species are slender, have elongate ocular plates, their posterior dorsal plates bear a pair of porose costae, but they distinctly differ in the ornamentation of the plates. *C. leptus* is similar to *C. lamellosus* whereas *C. procerus* resembles species of the *oculatus* group. The two *Copidognathus* species are from the Great Meteor Seamount, northeastern Atlantic.

Introduction

The genus *Copidognathus* contains about one-third of all marine halacarid species. This order of magnitude often is somewhat higher in warm-temperate and tropical waters, but lower in polar regions, the number of species is high in the littoral, from the edge of the high water line to that of the lower margin of the continental shelf, but low in the bathyal and abyssal. The samples from the Great Meteor Seamount, northeastern Atlantic, are from the plateau and terraces at a depth of 290-550 m. The halacarid genera recorded and the relevant number of species (in parentheses) are: *Acaromantis* (1), *Acanthohalacarus* (1), *Agauopsis* (2), *Arhodeoporus* (1), *Atelopsalis* (1), *Bradyagaue* (1), *Coloboceras* (1), *Copidognathus* (5), *Halacarus* (2), *Lohmannella* (1), *Scaptognathus* (3) (Bartsch 1973a, b, c, 1991, 2001a, b, in press). Included are the two new *Copidognathus* species, *C. leptus* sp. n. and *C. procerus* sp. n., described in this paper.

Area Investigated and Methods

The Great Meteor Seamount, at approximately 30°N and 28-29°W, lies almost 1700 km off the coast of Africa and 1000 km south of the Azores. From an almost even plateau of 1200 km², at a depth of 290-400 m, and terraces at 450 and 550 m, the slopes steeply fall to the seafloor at more than 4000 m (Pasenau 1971; Ulrich 1971). The sediment on the plateau is dominated by biogenic calcareous deposits and porose limestone (Schott *et al.* 1969).

Sediment from the plateau, collected with an epibenthic sledge, was fixed on-board with buffered 4% formalin (Martinez Arbizu & Schminke 2000). The meiofauna, held back by a 40 µm mesh sieve, was sorted in the laboratory in Oldenburg (University of Oldenburg) under supervision of Dr K. H. George. The halacarid mites were cleared in lactic acid and mounted in glycerine jelly. Holo- and paratypes are deposited in the Zoologisches Museum Hamburg (ZMH).

Abbreviations used in the descriptions are: *AD*, anterior dorsal plate; *AE*, anterior epimeral plate; *ds-1* to *ds-6*, first to sixth (pair of) dorsal idiosomatic seta(e); *GA*, genitoanal plate; *GO*, genital opening; *OC*, ocular plate(s); *P-2* to *P-4*, second to fourth palpal segment; *pas*, parambulacral seta(e); *PD*, posterior dorsal plate; *PE*, posterior epimeral plate(s); *pgs*, perigenital setae; *sgs*, subgenital setae. Legs numbered I to IV. The position of a seta is given in a decimal system, with reference to the length of a segment or plate.

Systematics

Copidognathus leptus sp. n. (Figs 1-14)

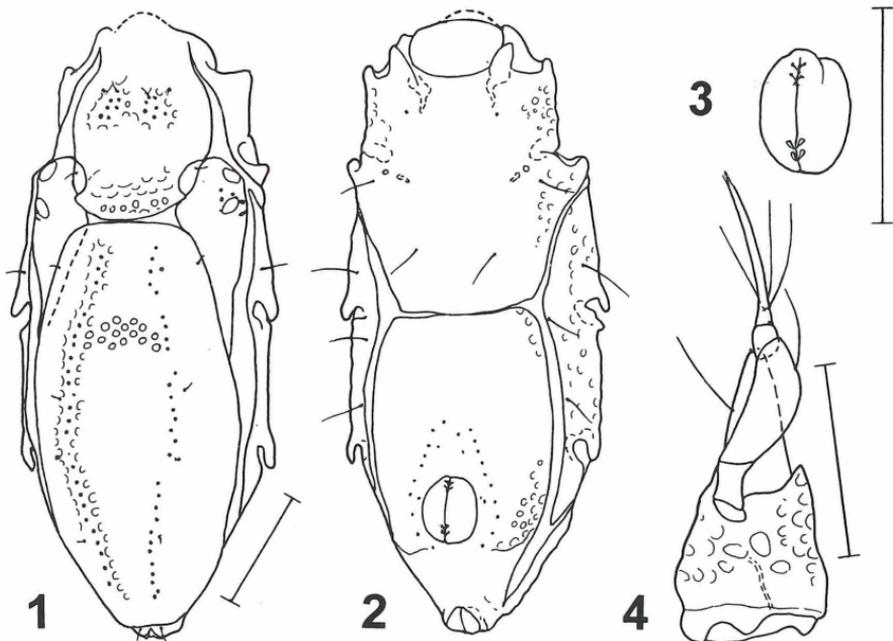
MATERIAL EXAMINED: Holotype male, ZMH A18/02, Northeastern Atlantic, Great Meteor Seamount, 29°48.6'N, 28°29.6 'W, R.V. Meteor, Cruise 42/3, Station No 515, 302 m depth, epibenthic sledge, 13 September 1998, coll. P. Martinez Arbizu and K. H. Schminke.

Paratype female, ZMH A18/02, collecting data same as above.

ETYMOLOGY: Derived from 'leptos' (Greek), thin.

DIAGNOSIS: Length 262-264 µm. *AD* with pair of small, rounded areolae with rosette pores. *OC* elongate. *PD* with single pair of narrow porose costae. Setae *ds-2* in membranous integument. Pair of gland pores on *AD* and *PD* close to porose areolae and costae, respectively. Lateral portions of ventral plates with foveae and scattered rosette pores, ventral portions almost smooth. Epimeral processes large. Rostrum slender, nearly extending to end of *P-2*. Legs slender. Telofemora longer than twice the height and with foveate sculpturing. Tibiae I to IV with 2, 2, 1, 0 bipectinate setae. Tarsi III and IV slender, with four and three dorsal setae, respectively.

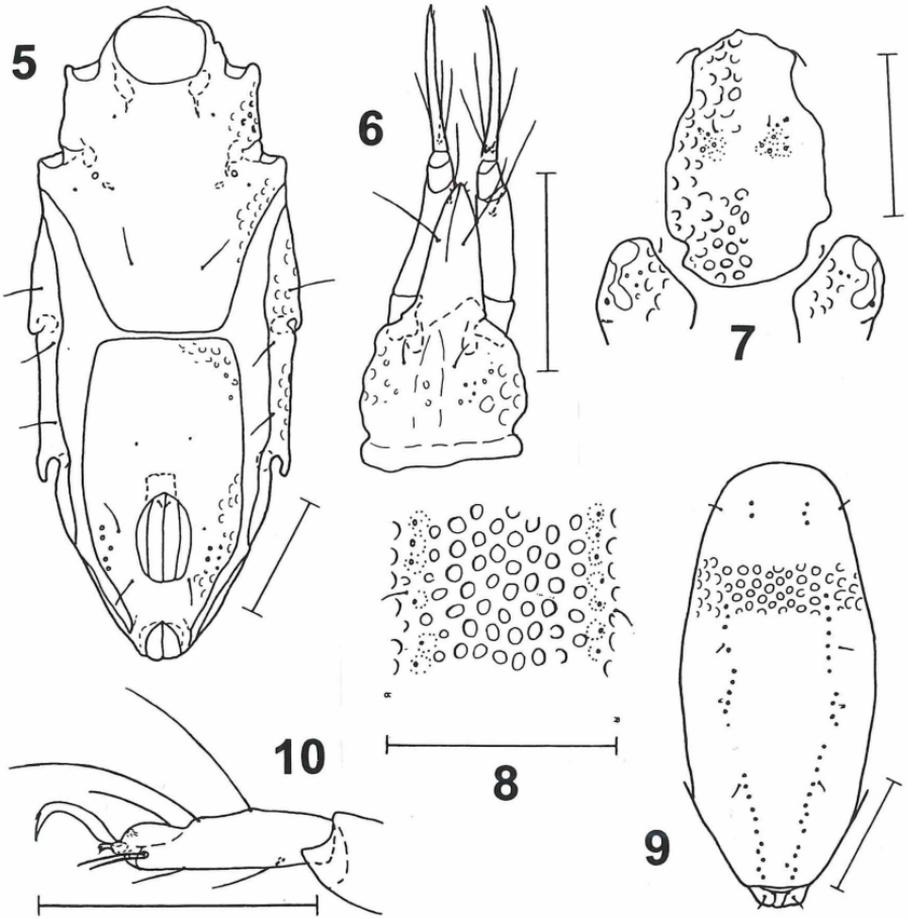
DESCRIPTION: Male. Length of holotype 262 µm, width 114 µm. Idiosoma slender. Raised areolae of dorsal plates with rosette pores, each pore with small ostium and 5-10 canaliculi. Remainder of plate foveate (Figs 1 and 8). Length of *AD* 85 µm, width 55 µm. Anterior margin with small, arched frontal lamella. Integument thick, raised in area of porose areolae and along posterior margin. Porose areolae small, circular, with six rosette pores each. *AD* abruptly narrowed near posterior margin of plate; then lateral margins of plate almost parallel-sided as illustrated in female (Fig. 7); plate seemingly divergent if *AD* not plane (Fig. 1). Pair of gland pores delicate, situated in anterolateral edge of raised areolae. *OC* elongate, extending beyond insertion of leg III; its length 87 µm. Raised areolae with two to three rosette pores and two corneae. Gland pore small, in anterolateral margin level with posterior cornea; pore canaliculus slightly posterior to



Figs 1-4. *Copidognathus leptus* sp. n.: 1 - idiosoma, dorsal, male; 2 - idiosoma, ventral, male; 3 - genital opening, male; 4 - gnathosoma, lateral, female. Scale = 50 μ m.

gland pore. Length of *PD* 167 μ m, width 90 μ m. Pair of costae extending almost to anterior margin. Costae mostly one-rosette pore wide, though in some parts interrupted or two rosette pores wide. Gland pores delicate, one pair immediately lateral to costae at about the level of insertion of leg IV. Dorsal setae delicate; first pair on *AD* immediately anterior to pair of porose areolae; *ds-2* in membranous integument between *AD* and *OC*, *ds-3* in anterolateral margin of *PD*, *ds-4* and *ds-5* immediately lateral to costae. Pair of *ds-6* on anal cone.

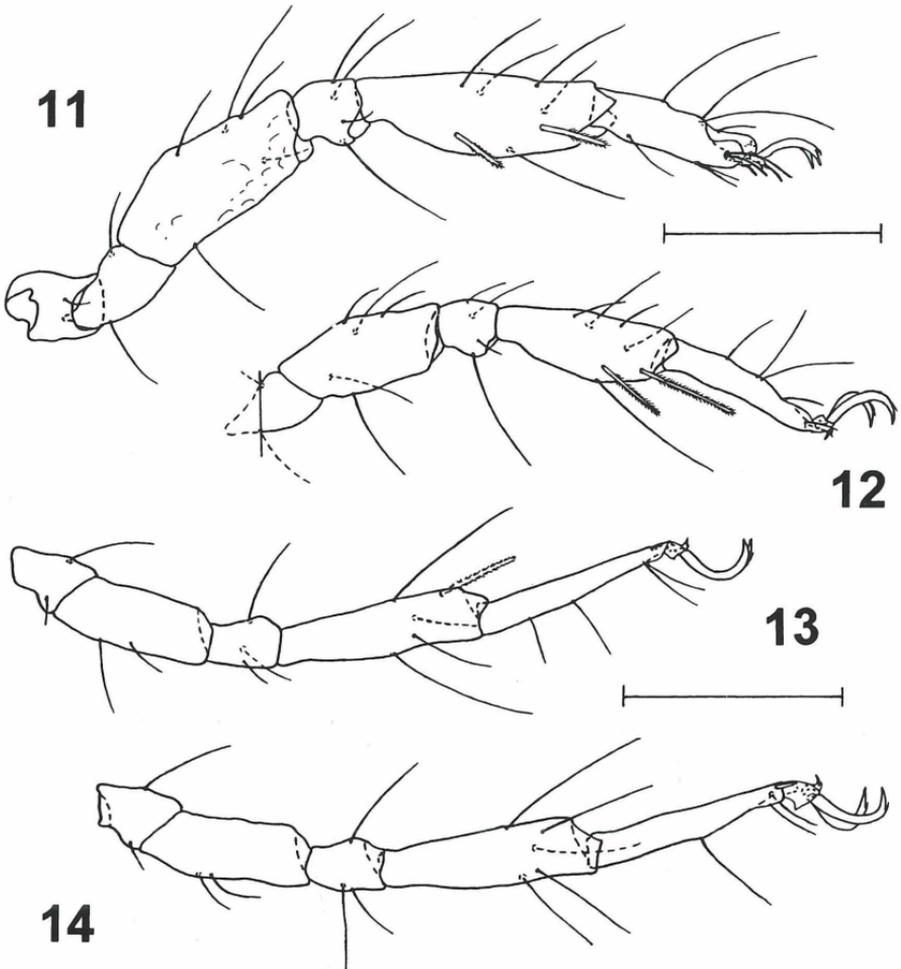
Length of *AE* 94 μ m, width 103 μ m. Plate marginally foveate and with scattered rosette pores; each rosette pore with deep ostium; surface of ventral parts almost smooth though faint polygonal ornamentation seen when focused on deeper integumental layers. Epimeral processes I large (Fig. 2), processes II small, lamellar. Posterior margin of *AE* truncate. Epimeral pores 2-3 μ m wide. *PE* elongate, length 152 μ m, anterior extending to the level of corneae of *OC*, posterior almost to the level of posterior margin of *GO*. Length of *GA* 133 μ m, width 76 μ m; anterior margin truncate. Area with *GO* raised above posterior portion of *GA*. Anterior and posterior portions of plate with foveae and either side of *GO* with rosette pores and deep foveae. *GO* small, length 30 μ m, width 22 μ m. Distance from *GO* to anterior truncate margin of *GA* equalling 2.25 times length of *GO*, distance



Figs 5-10. *Copidognathus leptus* sp. n.: **5** - idiosoma, ventral, female; **6** - gnathosoma, ventral, male; **7** - AD and anterior portion of OC, female; **8** - portion of PD level with *ds-4*, female; **9** - PD, female; **10** - tarsus and part of tibia I, lateral, male (medial setae and claw omitted). Scale = 50 μ m.

from posterior margin of GO to end of anus 1.25 times length of GO. Ring with perigenital setae extending beyond GO by length of GO. Holotype with 25 *pgs* and four pairs of small *sgs* (Figs 2 and 3). Spermatopositor extending beyond ring of *pgs*.

Gnathosoma slender, length 72 μ m, width 42 μ m. Rostrum almost half length of gnathosoma. Tectum triangular, short (cf. Fig. 4). Gnathosomal base with foveate sculpturing; foveae in ventrolateral portions with canaliculi. Rostrum not reaching end of *P-2*. Basalmost pair of maxillary setae slender, shorter than apical pair of setae (Fig. 6). Palps slender. *P-2* with dorsal seta; no seta on *P-3*; three slender setae in basal whorl of *P-4*.



Figs 11-14. *Copidognathus leptus* sp. n.: **11** - leg I, medial, male; **12** - basifemur to tarsus II, medial, male (setae on basifemur in holotype broken); **13** - basifemur to tarsus III, medial, male (bipectinate setae on tibia in holotype broken); **14** - basifemur to tarsus I, medial, male. Scale = 50 μ m.

Legs slender. Length of legs I, III and IV (without claws) about 0.6 of that of idiosoma. Trochanters III and IV each with short spiniform process. Telfemora, genua and tibiae with articular membranes; those of tibiae distinctly triangular and pointed (Figs 10-14). Fossa membranes present but small. Surface of telfemora, genua and tibiae I and II foveate. Length: height ratio of telfemora I to IV about 2.4, 2.2, 2.6, 2.8, respectively. Tibia of leg I somewhat longer than telfemur; tibia II almost as long as telfemur II; tibiae III and IV distinctly longer than these legs' telfemora. Tarsus IV about as long as tibia IV. Leg chaetotaxy (*pas* and *famulus* excluded): leg I, 1, 2, 5, 4, 7, 7; leg II, 1, 2, 5, 4, 7, 4; leg III, 1, 2, 2, 3, 5, 4; leg IV, 0, 2, 2, 3,

5, 3. Tibia I to IV with 2, 2, 1, 0 bipectinate and 1, 1, 1, 2 slender, tapering ventral setae. Basal bipectinate seta of tibia II shorter than corresponding apical seta. Tarsus I with pair of doubled *pas* (Fig. 10), solenidion setiform and famulus within fossa membrane. Tarsus II with pair of single *pas*; solenidion setiform and in dorsolateral position, same as on tarsus I. Medial *pas* on tarsus III setiform, eupathid, lateral *pas* short, spiniform. On tarsus IV both lateral and medial *pas* short, spiniform.

Claws on tarsi I to IV slender, with accessory process. Claw pectines not seen. Central sclerite with small, bidentate median claw.

F e m a l e. Length 264 μm , width 110 μm . On *PD* costae with rosette pores more frequently interrupted than in male *PD* (Fig. 9). *GA* more slender than in male, its anterior margin truncate; length of *GA* 132 μm , width 67 μm . *GO* in posterior half of plate; interval between anterior margin of *GO* and that of *GA* equalling 1.7 times length of *GO*. Ovipositor short, only slightly extending beyond *GO*. Three pairs of *pgs* as illustrated. Genital sclerites with pair of minute *sgs*.

REMARKS: Conspicuous characters of *Copidognathus leptus* are: elongate *AD* with pair of small, rounded porose areola, *OC* posteriorly tail-like, long *PD* with narrow costae, one rosette pore wide, ventral plates marginally foveate, in the median almost smooth. An ornamentation of the dorsal and ventral plates and arrangement of the *pgs* on the male *GA* similar to that of *C. leptus* is present in the species *C. hartwigi* Bartsch, 1978, *C. falcifer* Viets, 1940, *C. lamelloides* Bartsch, 2000, *C. lamellosus* (Lohmann, 1893), *C. tabellio* (Trouessart, 1894), all recorded from the Northeastern Atlantic Ocean and/or the Mediterranean and Black Sea (Viets 1940; Bartsch 2000, 2001c). The idiosoma of *C. leptus* is much more slender than it is in these other species, and the *OC* are elongate, their posterior tail-like portion extending beyond the level of insertion of leg III whereas in the other species the posteriorly pointed *OC* only slightly extend beyond the insertion of leg III.

Elongate *OC*, with a posterior 'tail' reaching distinctly beyond the insertion of leg III are present in all species of the *oculatus* group and in several species of the *gibbus* and the *ornatus* group (Bartsch 1977, 1997, 1999; Otto 2000, 2001). Species of the *oculatus* group have a transverse or arch-like porose areola on the *AD*, males have a postgenital papilla, three pairs of *sgs* and the *pgs* close around the *GO*, species of the *gibbus* group are characterized by large lamellae on the legs and species of the *ornatus* group by large glands, prominent porose areolae and four setae on genu IV, character combinations not present in *C. leptus*. Other species with elongate *OC* are *C. amalus* Bartsch, 1999, *C. caudatus* Newell, 1947, *C. festivus* Bartsch, 1984, *C. figeus* Bartsch, 1976, *C. keralensis* Chatterjee, 2000, *C. occultans* Bartsch, 1991, *C. pauciporus* Bartsch, 1977, and *C. tectirostris* Bartsch, 1979. The length of the *OC* is a reliable character in the diagnosis of a species but is, in general, not expressive when evaluating intraspecific relationship.

Copidognathus procerus sp. n.
(Figs 15-26)

MATERIAL EXAMINED: Holotype male, ZMH A19/02, Northeastern Atlantic, Great Meteor Seamount, 30°06.5'N, 28°23.3'W, R.V. Meteor, Cruise 42/3, Station No 521, 511 m depth, epibenthic sledge, 14 September 1998, coll. P. Martinez Arbizu and K.H. Schminke.

Paratype female, ZMH A19/02, collecting data same as above. Two paratype males, ZMH A19/02, collecting data same as above.

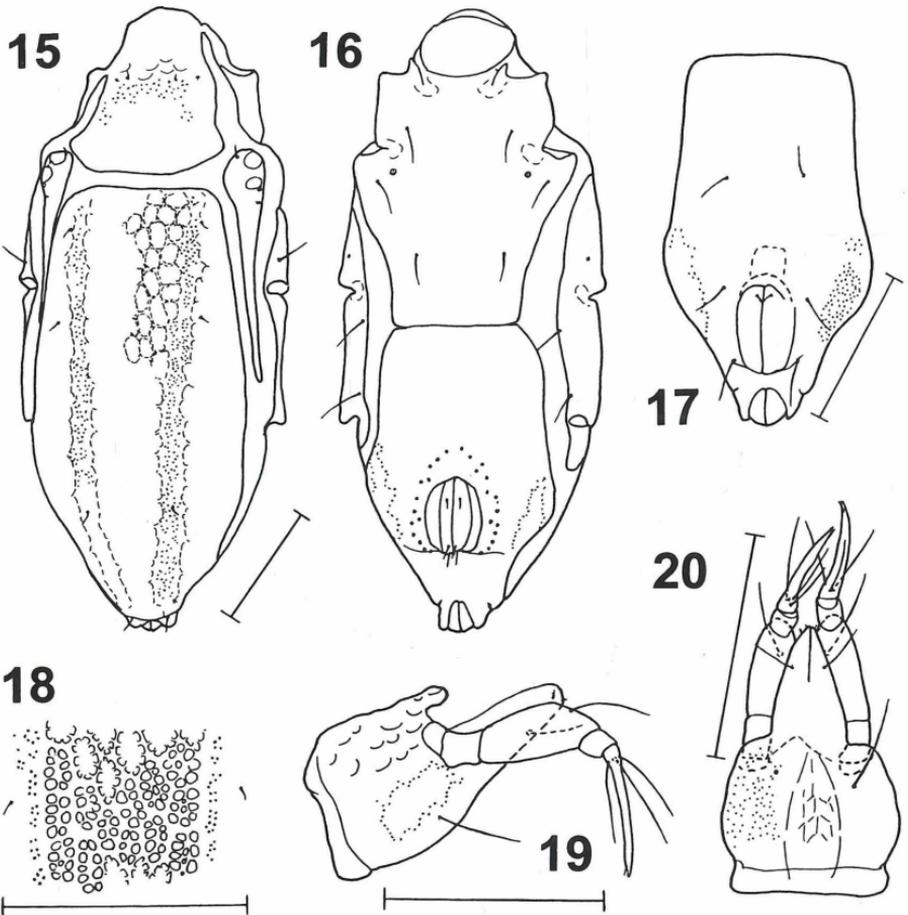
ETYMOLOGY: Derived from 'procerus' (Latin), slender

DIAGNOSIS: Length 250-261 μm . *AD* with arched porose areola; these with canaliculi. *OC* elongate. *PD* with single pair of narrow porose costae. Remainder of plate with polygons. Ventral plates marginally with reticulate sculpturing; ventral portion delicately pitted. Epimeral processes I present but small. Gnathosomal base with marginal porose areolae. Rostrum extending to level of seta on *P-2*. Telfemora almost twice as long as high. Articular membranes on telfemur, genu and tibia I small, on the other legs inconspicuous. Tibiae I to IV with 2, 2, 1, 1 bipectinate setae. Tarsi III and IV with four and three dorsal setae, respectively.

DESCRIPTION: Male. Length of idiosoma 252-261 μm ; length of holotype 252 μm , width about 110 μm . Idiosoma slender. Dorsal plates panelled; porose panels with numerous canaliculi. Length of *AD* 68 μm ; plate widest near posterior margin, then abruptly converging. Anterior margin of *AD* rounded; posterior margin in its median portion truncate. Porose areola of *AD* arch-like, area anterior to this porose areola foveate rather than panelled, area posterior to porose areola panelled. Gland pores small, first pair of pores between anterior edge of porose areola and lateral margin of *AD*. *OC* elongate, tail-like extended, reaching beyond the level of insertion of leg III. Length of *OC* 95 μm . Small anterior portion with two corneae, a gland pore and pore canaliculus. *PD* long, length 175 μm ; its anterior margin truncate. Plate with pair of porose costae. Costae in their anterior half one porose panel wide, in posterior half two porose panels wide (Fig. 15). Remainder of plate reticulate, each polygon of reticulum subdivided (cf. Fig. 18). Gland pores inconspicuous. Dorsal setae small. Pair of *ds-1* on *AD* at about the same level as pair of gland pores; *ds-2* in anteromedial margin of *OC*. Pairs of *ds-3* to *ds-5* on *PD*, *ds-3* and *ds-4* lateral to costae, *ds-5* within costae; *ds-3* and *ds-4* anterior and posterior to level with insertion of leg III, *ds-5* in posterior portion of *PD* far posterior to insertion of leg IV.

Marginal and lateral portions of ventral plates distinctly panelled; ventral portion of *AE* and *GA* with faint panelling, surface with delicate pits. Length of *AE* 102 μm ; posterior margin truncate. Epimeral processes I short, pointed; epimeral processes II lamelliform. Epimeral pores constricted by numerous tines. Three pairs of ventral setae as illustrated (Fig. 16); posterior pair of setae removed from posterior margin of plate. Length of *PE* 117 μm ,

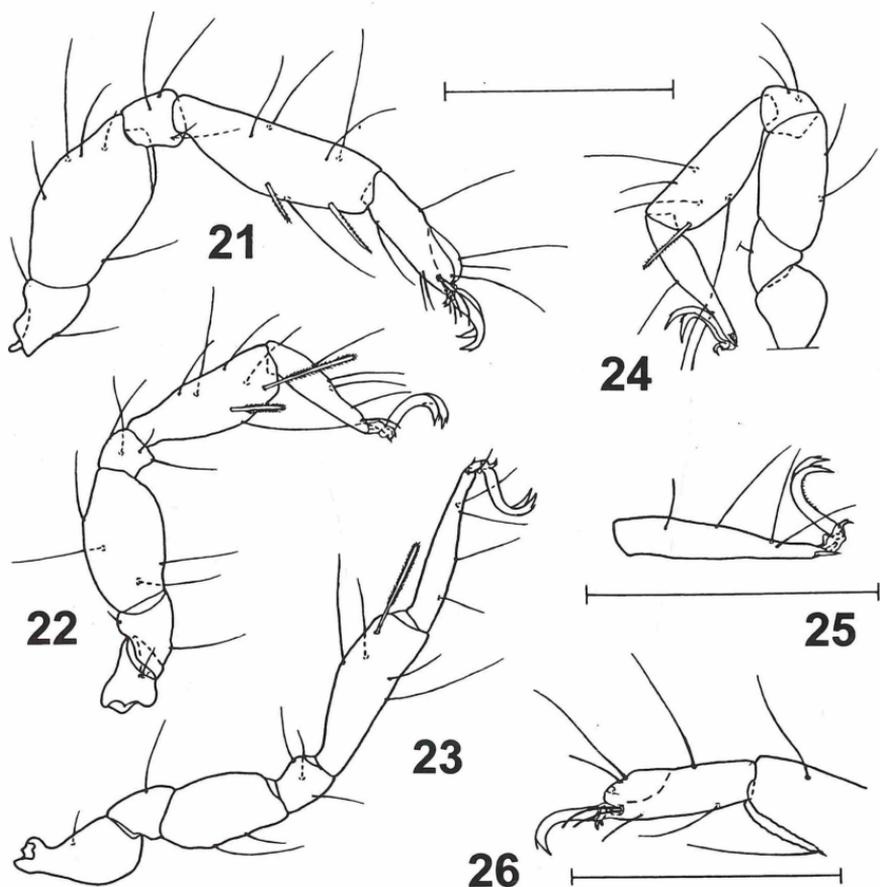
extending beyond insertion of leg IV. GA longer than AE, its length 125 μm ; anterior margin truncate. Spermatopositor surpassing GO by more than length of GO; its length 56 μm , width 37 μm . Length of GO 30 μm . Distance from anterior margin of GO to that of GA about twice length of GO, distance between GO and end of anal cone equalling length of GO. With 25-27 perigenital setae; anterior setae somewhat removed from GO, the others situated close to GO. Genital sclerites with one anterior pair and two posterior pairs of sgs; posterior ones unequal in length, posteriormost setae at least twice the length of preceding seta.



Figs 15-20. *Copidognathus procerus* sp. n.: **15** - idiosoma, dorsal, male; **16** - idiosoma, ventral, male; **17** - genitoanal plate, female; **18** - portion of PD level with ds-4, female; **19** - gnathosoma, lateral, male (punctate areola surrounded by stippled line); **20** - gnathosoma, ventral, male. Scale = 50 μm .

Length of gnathosoma 62 μm . Integument of gnathosomal base reticulate, lateral areas punctate (Fig. 19). Tectum with short, triangular process. One pair of maxillary setae on gnathosomal base, the other pair of setae on rostrum; basal pair longer than that on rostrum (Fig. 20). Apex of rostrum with two pairs of minute rostral setae. Rostrum extending to about the level of dorsal seta of *P*-2. *P*-4 slightly longer than *P*-2.

Legs. Telofemur I with coarse reticulate ornamentation, each mesh faintly pitted. Telofemora about twice as long as high (Figs 21-24). Telofemur I distinctly shorter than tibia I, telofemora II and IV slightly shorter than these legs' tibiae. Tarsus III about as long as tibia III. Trochanters III and IV apically rounded, without prominent lamellar processes. Telofemora lack



Figs 21-26. *Copidognathus procerus* sp. n.: **21** - basifemur to tarsus I, medial, male; **22** - leg II, medial, male; **23** - leg III, medial, male; **24** - leg IV, medial, male; **25** - tarsus III, lateral, male; **26** - basifemur to tarsus I, lateral, male (medial setae and claw omitted). Scale = 50 μm .

ventral lamellae. Articular membranes of telofemur and tibia I short, rounded; articular membranes of the other legs inconspicuous. Fossary membranes on tarsus I well developed (Fig. 26); on tarsi II to IV absent. Leg chaetotaxy (*pas* and *famulus* excluded): leg I, 1, 2, 5, 4, 7, 7; leg II, 1, 2, 4, 4, 7, 4; leg III, 1, 1, 2, 3, 5, 4; leg IV, 0, 1, 2, 3, 5, 3. Tibiae I to IV with 2, 2, 1, 1 bipectinate ventromedial setae and 1, 1, 1, 1 slender ventral setae. Tarsus I with long solenidium; *famulus* integrated in lateral fossa membrane. Tip of tarsus I with pair of doubled eupathid *pas*, tarsus II with a pair of single *pas*; tarsus III with one short lateral (Fig. 25) and one long medial *pas*, and tarsus IV with a pair of short, slightly widened *pas*.

Claws with accessory process and few very delicate tines (Fig. 25). Central sclerite extended into small, bidentate median claw.

F e m a l e. Length of idiosoma 250 μm , width 102 μm . Dorsal aspect same as that of male. Posterior portion of *AE* elongate; third pair of setae at 0.66 relative to length of *AE*. Length of *GA* 117 μm , width 67 μm . Anterior margin truncate; lateral areas punctate (Fig. 17). Length of *GO* 30 μm ; interval between anterior margin of *GO* and that of *GA* 2.3 times length of *GO*. Three pairs of *pgs*, the second pair about level with anterior margin of *GO*; anterior pair of *pgs* removed from *GO* by more than length of *GO*. Ovipositor extending only slightly beyond *GO*. Genital sclerites with pair of small *sgs*.

REMARKS: The most conspicuous characters of *Copidognathus procerus* are: porose areola on the *AD* arched; epimeral processes present though small; *OC* elongate, extending far beyond the level of insertion of leg III; *PD* truncate and with pair of porose costae; gland pores indistinct; opposing margins of *AE* and *GA* truncate; lamellae and articular membranes of legs small or inconspicuous. *C. procerus* resembles species of the *oculatus* group, as outlined by Bartsch (1999). In contrast to the other species, (1) the first pair of gland pores are removed from the lateral margin of the *AD* and situated in the lateral margin of the porose areola, and (2) the males lack a postgenital papilla and the anterior *pgs* are not as close to the *GO* as in other species. Three species of the *oculatus* group are recorded from the North Atlantic area, *C. latisetus* Viets, 1940, *C. oculatus* (sensu Lohmann 1889) and *C. setilatus* Bartsch, 2001 (Viets 1940; Bartsch 2001c). The porose areolae of *C. procerus* consist of polygons pierced by numerous canaliculi whereas the other three species have typical rosette pores, each with a distinct ostium which is surrounded by canaliculi, and the idiosoma is more slender than in *C. latisetus*, *C. oculatus* and *C. setilatus*. The four individuals of *C. procerus* have four setae on telofemur II, in the other species five setae are present. In the *oculatus* group, telofemur II of *C. rasilis* Bartsch, 1999 demonstrates an arrangement of setae similar to that of *C. procerus*. *C. rasilis* is recorded from Western Australia (Bartsch 1999).

Most of the *Copidognathus* species have two setae on the basifemora, one dorsal and one ventral seta. In contrast, in *C. procerus* no dorsal seta was recognized on the basifemora III and IV. Otto (2000) mentioned a similar reduced number of setae to be characteristic in species of the *gibbus* group collected in northeastern Australia.

Acknowledgement

Thanks are due to Dr K. H. George who forwarded the halacarid mites described in this paper.

Zusammenfassung

Die zwei *Copidognathus* Arten *C. leptus* n. sp. und *C. procerus* n. sp., gesammelt auf der im Nordostatlantik liegenden Großen Meteor Bank, werden beschrieben. Sie sind gekennzeichnet durch ihren schlanken Rumpf, die langgestreckten Okularplatten und das Paar der Poren-Rippen auf den Posterodorsalplatten. Sie unterscheiden sich durch die Skulpturierung der Panzerplatten. *C. procerus* ist Arten der *oculatus* Gruppe ähnlich, *C. leptus* denen der *C. lamellosus* Gruppe.

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