# 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 $\mathrm{sp} . \mathrm{n}$. and C. procerus $\mathrm{sp} . \mathrm{n}$. , 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 warmtemperate 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 $30^{\circ} \mathrm{N}$ and $28-29^{\circ} \mathrm{W}$, lies almost 1700 km off the coast of Africa and 1000 km south of the Azores. From an almost even plateau of $1200 \mathrm{~km}^{2}$, 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 onboard with buffered $4 \%$ formalin (Martinez Arbizu \& Schminke 2000). The meiofauna, held back by a $40 \mu \mathrm{~m}$ 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: $A D$, anterior dorsal plate; $A E$, anterior epimeral plate; $d s-1$ to $d s-6$, first to sixth (pair of) dorsal idiosomatic seta(e); $G A$, 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, $29^{\circ} 48.6^{\prime} \mathrm{N}, 28^{\circ} 29.6$ '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 $\mu \mathrm{m}$. AD with pair of small, rounded areolae with rosette pores. OC elongate. PD with single pair of narrow porose costae. Setae $d s-2$ in membraneous integument. Pair of gland pores on $A D$ and $P D$ 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 $262 \mu \mathrm{~m}$, width $114 \mu \mathrm{~m}$. 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 $A D 85 \mu \mathrm{~m}$, width $55 \mu \mathrm{~m}$. 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. $A D$ 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 $A D$ 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 $87 \mu \mathrm{~m}$. 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 $=50 \mu \mathrm{~m}$.
gland pore. Length of $P D 167 \mu \mathrm{~m}$, width $90 \mu \mathrm{~m}$. 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 $A D$ immediately anterior to pair of porose areolae; ds-2 in membraneous integument between $A D$ and $O C$, $d s-3$ in anterolateral margin of $P D, d s-4$ and $d s-5$ immediately lateral to costae. Pair of $d s-6$ on anal cone.

Length of $A E 94 \mu \mathrm{~m}$, width $103 \mu \mathrm{~m}$. 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 $A E$ truncate. Epimeral pores 2-3 $\mu \mathrm{m}$ wide. PE elongate, length $152 \mu \mathrm{~m}$, anteriad extending to the level of corneae of OC, posteriad almost to the level of posterior margin of GO. Length of GA $133 \mu \mathrm{~m}$, width $76 \mu \mathrm{~m}$; anterior margin truncate. Area with GO raised above posterior portion of GA. Anterior and posterior portions of plate with foveae and either side of $G O$ with rosette pores and deep foveae. GO small, length $30 \mu \mathrm{~m}$, width $22 \mu \mathrm{~m}$. Distance from GO to anterior truncate margin of GA equalling 2.25 times length of GO, diștance


Figs 5-10. Copidognathus leptus sp.: 5 - idiosoma, ventral, female; 6 - gnathosoma, ventral, male; $7-A D$ and anterior portion of OC, female; 8 - portion of $P D$ level with ds-4, female; 9 - PD, female; 10 - tarsus and part of tibia I, lateral, male (medial setae and claw omitted). Scale $=50 \mu \mathrm{~m}$.
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 $p g s$.

Gnathosoma slender, length $72 \mu \mathrm{~m}$, width $42 \mu \mathrm{~m}$. 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 $\mathrm{sp} . \mathrm{n} .: 11$ - 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 $=50 \mu \mathrm{~m}$.

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. Telofemora, genua and tibiae with articular membranes; those of tibiae distinctly triangular and pointed (Figs 10-14). Fossa membranes present but small. Surface of telofemora, genua and tibiae I and II foveate. Length: height ratio of telofemora I to IV about 2.4, 2.2, 2.6, 2.8, respectively. Tibia of leg I somewhat longer than telofemur; tibia II almost as long as telofemur II; tibiae III and IV distinctly longer than these legs' telofemora. 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.

Female. Length $264 \mu \mathrm{~m}$, width $110 \mu \mathrm{~m}$. On $P D$ costae with rosette pores more frequently interrupted than in male $P D$ (Fig. 9). GA more slender than in male, its anterior margin truncate; length of GA $132 \mu \mathrm{~m}$, width 67 $\mu \mathrm{m}$. 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 $A D$ with pair of small, rounded porose areola, OC posteriorly tail-like, long $P D$ 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 $O C$ 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 archlike 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, $30^{\circ} 06.5^{\prime} \mathrm{N}, 28^{\circ} 23.3^{\prime}$ 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 $\mu \mathrm{m}$. 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 $P-2$. Telofemora almost twice as long as high. Articular membranes on telofemur, 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: M a l e. Length of idiosoma 252-261 $\mu \mathrm{m}$; length of holotype $252 \mu \mathrm{~m}$, width about $110 \mu \mathrm{~m}$. Idiosoma slender. Dorsal plates panelled; porose panels with numerous canaliculi. Length of $A D 68 \mu \mathrm{~m}$; plate widest near posterior margin, then abruptly converging. Anterior margin of $A D$ rounded; posterior margin in its median portion truncate. Porose areola of $A D$ 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 $A D$. OC elongate, tail-like extended, reaching beyond the level of insertion of leg III. Length of OC $95 \mu \mathrm{~m}$. Small anterior portion with two corneae, a gland pore and pore canaliculus. $P D$ long, length $175 \mu \mathrm{~m}$; 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 $d s-1$ on $A D$ at about the same level as pair of gland pores; ds-2 in anteromedial margin of OC. Pairs of $d s-3$ to $d s-5$ on $P D, d s-3$ and $d s-4$ lateral to costae, $d s-5$ within costae; $d s-3$ and $d s-4$ 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 $A E$ and GA with faint panelling, surface with delicate pits. Length of $A E 102 \mu \mathrm{~m}$; 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 $117 \mu \mathrm{~m}$,
extending beyond insertion of leg IV. GA longer than $A E$, its length $125 \mu \mathrm{~m}$; anterior margin truncate. Spermatopositor surpassing GO by more than length of GO; its length $56 \mu \mathrm{~m}$, width $37 \mu \mathrm{~m}$. Length of GO $30 \mu \mathrm{~m}$. 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 $P D$ level with ds-4, female; 19 - gnathosoma, lateral, male (punctate areola surrounded by stippled line); 20 - gnathosoma, ventral, male. Scale $=50 \mu \mathrm{~m}$.

Length of gnathosoma $62 \mu \mathrm{~m}$. 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 $\mathrm{sp} . \mathrm{n} .: 21$ - 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 $=50 \mu \mathrm{~m}$.
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 solenidion; 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.

Female. Length of idiosoma $250 \mu \mathrm{~m}$, width $102 \mu \mathrm{~m}$. Dorsal aspect same as that of male. Posterior portion of $A E$ elongate; third pair of setae at 0.66 relative to length of $A E$. Length of $G A 117 \mu \mathrm{~m}$, width $67 \mu \mathrm{~m}$. Anterior margin truncate; lateral areas punctate (Fig. 17). Length of GO $30 \mu \mathrm{~m}$; interval between anterior margin of GO and that of GA 2.3 times length of GO. Three pairs of $p g s$, 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 $A D$ 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 $A E$ 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 $A D$ 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.

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## 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 langestreckten 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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