



## *Copidognathus nautilei* (Acari: Halacaridae), a new mite from a hydrothermal vent field in the Mid-Atlantic Ridge

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**Abstract:** Several specimens of *Copidognathus nautilei* sp. nov. were collected on the Mid-Atlantic Ridge from the 14°45'N area. The species is described. *C. nautilei* demonstrates an overall resemblance to *C. papillatus*, a species recorded from hydrothermal vent fields in the east Pacific.

**Résumé :** Plusieurs individus de *Copidognathus nautilei* sp. nov. ont été récoltés sur la dorsale médio-atlantique, sur la zone hydrothermale de 14°45'N. L'espèce est décrite ; elle est proche de *C. papillatus*, une espèce des régions hydrothermales du Pacifique oriental

**Keywords:** Mid-Atlantic Ridge, bathyal, Halacaridae (Acari), description.

### Introduction

The first halacarid mite described from a hydrothermal vent site was *Copidognathus papillatus* Krantz, a species found associated with mussels raked from the walls of a vent in the Galapagos Rift (1°N, 86°W) at a depth of about 2500 m (Krantz, 1982). *C. papillatus* was later recovered from hydrothermal vent areas along the East Pacific Ridge (13°N, 104°W, 2630 m, and 17°S, 113°W, 2580 m), the Lau Basin, Valu Fa Ridge (22°S, 177°W, 1900 m) and the North Fiji Basin (19°S, 173°W, 2750 m) (Bartsch, 1991, and unpublished data from the cruise NAUDUR, December 1993, at 17°25,85'S, 113°12,15'W).

In recent years, while surveying the fauna associated with vents in the Mid-Atlantic Ridge, the taxon Halacaridae was found to be represented by the genera (and species) *Copidognathus* (*C. alvinus* Bartsch), *Halacarellus* (*H. auzendei* (Bartsch), *H. alvinus* Bartsch), *Agaue*

(*A. plutonius* Bartsch), and *Halacarus* (*H. prolongatus* Bartsch). Now, at the more southerly 14°45'N area (site Irina 2), a new species, in general facies similar to *Copidognathus papillatus*, was found.

### Methods

During the MICROSMOKE cruise of the RV *Nadir* and the submersible *Nautile*, biological data were collected at the 14°45'N area (site Irina 2). The cruise was organized by CNRS/INSU, chief scientist Daniel Prieur. The biological samples were sorted at the Centre National de Tri d'Océanographie Biologique (IFREMER, Brest).

The mites were cleared in lactic acid and mounted in glycerine jelly. Drawings were prepared using a camera lucida.

Type specimens are deposited in the Muséum National d'Histoire Naturelle, Paris (MNHN), the Zoological Institute and Zoological Museum, Hamburg (ZMH) and the author's halacarid collection.

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From anterior to posterior, the legs are numbered I to IV and the dorsal idiosomal setae ds-1 to ds-6.

*Copidognathus nautilei* sp. nov.

(Figs 1-20)

*Material and collecting data* : Holotype. Female, MNHNP, Mid-Atlantic Ridge 14°45,10'N, 44°58,68'W, dive 20, 3049 m, 05 December 1995 (Microsmoke, PL20), observer D. Prieur.

Paratypes. One female, two males, two protonymphs, one larva, MNHNP; one male, one protonymph, ZMH; four females, three males, five protonymphs, one larva, author's collection. Collecting data as above.

*Description* : Female. Length of idiosoma 402-475  $\mu\text{m}$  (holotype 403  $\mu\text{m}$ ); width of holotype 250  $\mu\text{m}$ . Striae of membraneous integument between anterior dorsal plate, ocular plate and posterior dorsal plate with numerous minute, slightly raised connective bars (as in Fig. 15); marginal membraneous integument with parallel striae. Dorsal plates reticulated (Fig. 1). Anterior margin of anterior dorsal plate with irregularly dentate lamella. Plate, without lamella, 97  $\mu\text{m}$  long, 110  $\mu\text{m}$  wide. Ovate raised area with delicate canaliculi and superficial foveae, 2-3  $\mu\text{m}$  in diameter. Remainder of plate reticulate. Pair of gland pores within anterior margin of raised areola, setae ds-1 within this areola and somewhat posterior to the level of the gland pores (Fig. 2). Ocular plate 57  $\mu\text{m}$  long and 53  $\mu\text{m}$  wide; with broadly rounded angles. Gland pore separated from lateral margin by 4  $\mu\text{m}$ ; pore canaliculus within lateral margin. Setae ds-2 in striated integument between anterior dorsal plate and ocular plate. Posterior dorsal plate 250  $\mu\text{m}$  long, 167  $\mu\text{m}$  wide. Anterior margin rounded. Pair of medial and lateral longitudinal costae only slightly raised; costae extending to the level of insertion of leg III. Costae with ovate fovea-like ostia. At a level with insertion of leg IV, ostia of median costae surrounded by delicate canaliculi. Plate outside costae reticulated. Pair of gland pores immediately lateral to medial costae; anterior pair of pores slightly anterior to the level of insertion of leg IV, succeeding pair near distal margin of the posterior dorsal plate. Setae ds-3 in striated integument immediately anterior to posterior dorsal plate, setae ds-4 and ds-5 anterior and posterior to pair of gland pores in the middle of the plate. Adanal setae on anal plate.

Marginal areas of anterior and posterior epimeral plates and posteromarginal areas of genitoanal plate foveate, remainder of plates very delicately punctate (at low magnification plates almost smooth). Striae of membraneous integument between ventral plates parallel, more delicate than on dorsum. Trochanters I and II flanked by medial and lateral epimeral processes (Fig. 3). Medial epimeral processes rounded. Anterior epimeral plate

110  $\mu\text{m}$  long, 232  $\mu\text{m}$  wide; its posterior margin broadly excavated. Plate with three pairs of slender setae. Epimeral pores each with a cavity 5  $\mu\text{m}$  in diameter. Posterior epimeral plate with one dorsal and three ventral setae. Genitoanal plate 214  $\mu\text{m}$  long, 147  $\mu\text{m}$  wide. Genital opening large, 93  $\mu\text{m}$  long, 55  $\mu\text{m}$  wide. Distance between anterior margin of genital opening and genitoanal plate almost the same as length of genital opening. Three pairs of perigenital setae arranged as illustrated. Genital sclerites with pair of subgenital setae. Ovipositor extending beyond anterior margin of genital opening. Anal valves lamellar, extending slightly beyond anal sclerites.

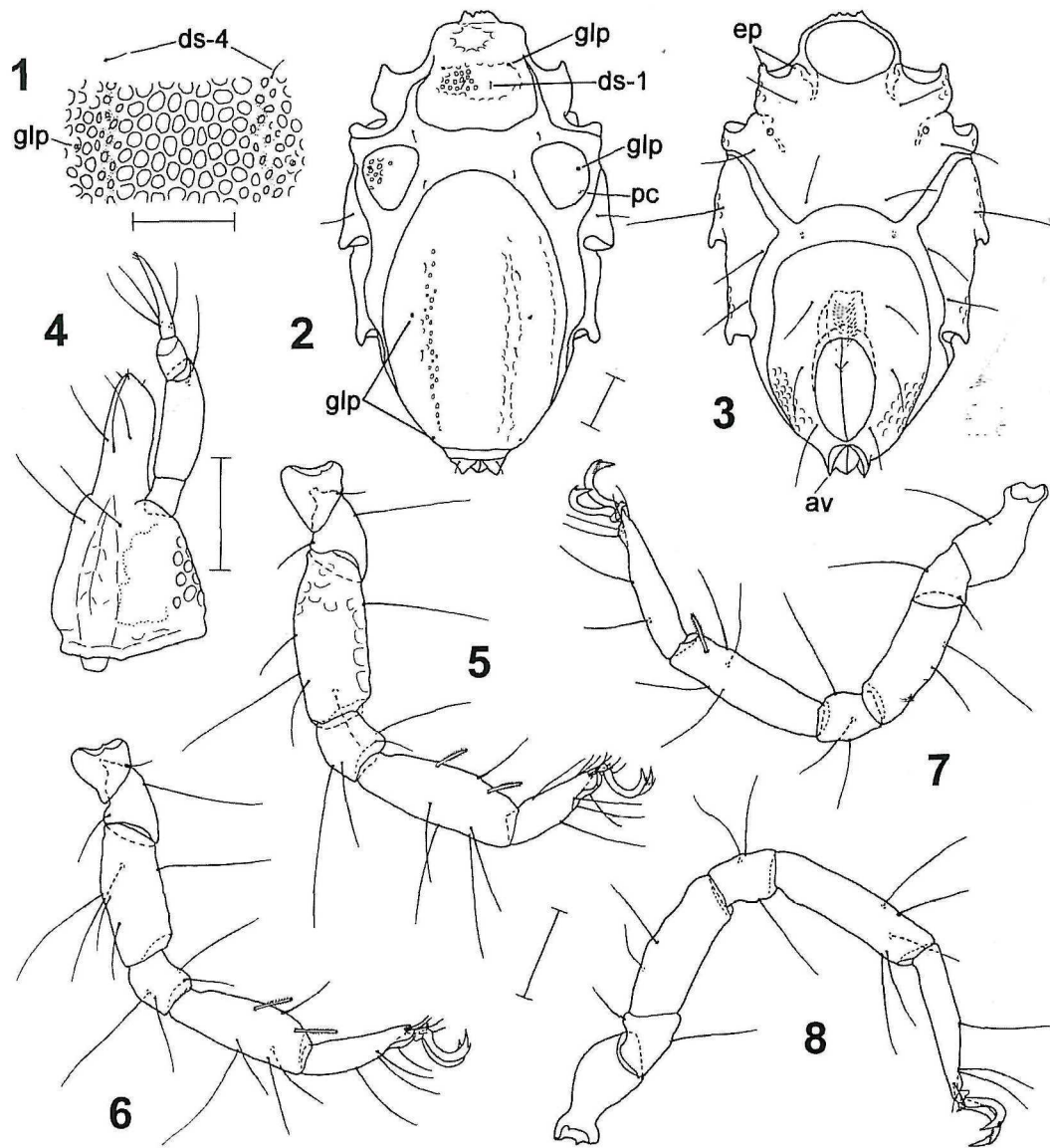
Gnathosoma 125  $\mu\text{m}$  long; rostrum triangular, 61  $\mu\text{m}$  long, extending to level with seta on second palpal segment. Tectum arch-shaped. Lateral portions of gnathosomal base coarsely foveate; ventral portions with delicate canaliculi (Fig. 4). One pair of maxillary setae on gnathosomal base, one pair on rostrum; rostral sulcus extending beyond the latter pair of setae. Tip of rostrum with two pairs of slender rostral setae.

Legs shorter than idiosoma. Telofemora coarsely reticulated; anterior portion of ventral margin of telofemora I (Fig. 9) and II delicately serrate. Telofemora, genua and tibiae with small articular membranes (Figs 5-8). Number of setae of trochanter to tarsus (solenidion and parambulacral setae included): leg I, 1, 2, 5, 4, 7, 11; leg II, 1, 2, 5, 4, 7, 8; leg III, 1, 2, 2, 3, 5, 6; leg IV, 0, 2, 2, 3, 5, 5. Exceptionally, only four setae on telofemur I. Two ventromedial setae on tibiae I and II and single ventromedial seta on tibia III bipectinate; ventral setae slender. Both ventral and ventromedial seta on tibia IV smooth and slender. Tarsi with small membranes of claw fossae. Tarsi I and II (Figs 10, 11) each with 22  $\mu\text{m}$ -long solenidion on the lateral membrane of claw fossa. Apex of tarsi I and II each with pair of doubled parambulacral setae; tarsus III (Fig. 12) medially with bluntly ending and laterally with tapering parambulacral seta, and tarsus IV (Fig. 13) with pair of slender, tapering setae.

Claws slender, with accessory process and delicate tines. Claw pecten present in posterior third of claws. Median claw small, bidentate.

Eggs 120-125  $\mu\text{m}$  in diameter. Egg membrane delicately porose.

Male. Length of idiosoma 421-452  $\mu\text{m}$ . Dorsal aspect same as that of female. In a 400  $\mu\text{m}$ -long male, genitoanal plate 212  $\mu\text{m}$  long, 175  $\mu\text{m}$  wide; genital opening 62  $\mu\text{m}$  long, 47  $\mu\text{m}$  wide. Distance between anterior margin of genital opening and genitoanal plate more than 1.5 times length of genital opening (Fig. 14). Spermatopositor large, 124  $\mu\text{m}$  long, 87  $\mu\text{m}$  wide, extending beyond genital opening by almost 1.5 times the latter's length. With 37-42 perigenital setae placed lateral and anterior to genital opening. Each genital sclerite with four or five subgenital setae.



**Figures 1-8.** *Copidognathus nauitlei* sp. nov., female.

1. Portion of posterior dorsal plate posterior to ds-4; 2. idiosoma, dorsal; 3. idiosoma, ventral; 4. gnathosoma, ventrolateral; 5. leg I, medial; 6. leg II, medial; 7. leg III, medial; 8. leg IV, medial. (av, anal valve; ds-1, ds-4, first and fourth dorsal seta; ep, epimeral process; glp, gland pore; pc, pore canaliculus) Scale = 50  $\mu$ m.

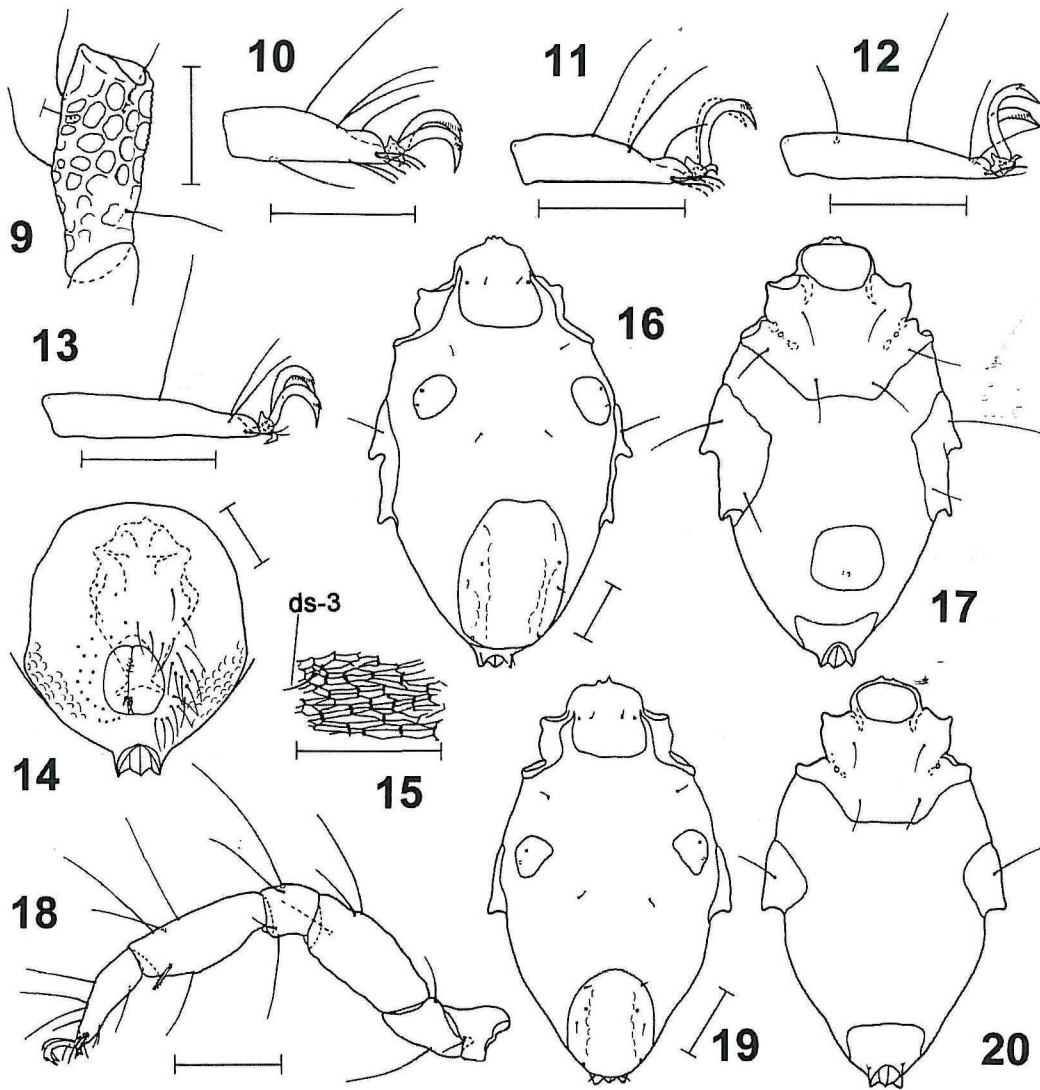
**Figures 1-8.** *Copidognathus nauitlei* sp. nov., femelle.

1. Détail de la plaque dorsale postérieure entre la quatrième soie dorsale et le pore de la glande ; 2. idiosome, vue dorsale ; 3. idiosome, vue ventrale ; 4. gnathosome, vue ventro-latérale ; 5. patte I, vue antérieure ; 6. patte II, vue antérieure ; 7. patte III, vue postérieure ; 8. patte IV, vue postérieure (av, valve anale ; ds-1, ds-4, première et quatrième soie dorsale ; ep, prolongement épiméral ; glp, pore de la glande ; pc, pore canaliculaire). Échelle = 50  $\mu$ m.

Protonymph. Idiosomal length 304-403  $\mu$ m. Dorsal plates distinctly smaller than in adults (Fig. 16). Striae of membranous integument with connective bars (Fig. 15). Anterior dorsal plate with coarsely serrate anterior lamella. Setae ds-1 level with pair of gland pores. Anterior margin of posterior dorsal plate truncate. Genital plate (Fig. 17) almost rectangular; with pair of minute internal genital acetabula. Anterior epimeral plate with three pairs of setae; posterior

epimeral plate with a dorsal and two slender ventral setae. Tibiae I (Fig. 18) to III each with a bipectinate ventromedial and a slender ventral seta; both setae on tibia IV smooth.

Larva. Idiosomal length 263-298  $\mu$ m. Dorsal and ventral plates (Figs 19, 20) smaller than in protonymphs. Anterior epimeral plate with two pairs of setae; posterior epimeral plate with a single ventral seta.



**Figures 9-20.** *Copidognathus nautiliei* sp. nov.,

9. Telofémur I, ventromédial, femelle; 10. tarsus I, latéral, femelle; 11. tarsus II, latéral, mâle (soies et griffe antérieures en ligne discontinue); 12. tarsus III, médial, femelle; 13. tarsus IV, médial, femelle; 14. génitoanal plate, mâle; 15. portion de membraneux intégrument médial à ds-3, protonymph; 16. idiosoma, dorsal, protonymph; 17. idiosoma, ventral, protonymph; 18. leg I, médial, protonymph; 19. idiosoma, dorsal, larva; 20. idiosoma, ventral, larva. (ds-3, troisième soie dorsale) Scale = 50  $\mu$ m.

**Figures 9-20.** *Copidognathus nautiliei* sp. nov.,

9. Téléfémur I, vue ventro-antérieure, femelle; 10. tarse I, vue postérieure, femelle; 11. tarse II, vue postérieure, mâle (soies et griffe antérieures en ligne discontinue); 12. tarse III, vue postérieure, femelle; 13. tarse IV, vue postérieure, femelle; 14. plaque génito-anale, mâle; 15. tégument membraneux près de la troisième soie dorsale; 16. idiosome, vue dorsale, protonymph; 17. idiosome, vue ventrale, protonymph; 19. idiosome, vue dorsale, larve; 20. idiosome, vue ventrale, larve (ds-3, troisième soie dorsale) Échelle = 50  $\mu$ m.

**Remarks :** Two species of *Copidognathus* are now known from the Mid-Atlantic Ridge, *C. alvinus*, collected from 37°N, 32°W, 1600-1700 m depth (Bartsch, 1994, 1996; Van Dover *et al.*, 1996) and *C. nautiliei*, from a more southerly and deeper vent site (15°N, 45°W, 3050 m). *C. nautiliei* is distinct from *C. alvinus*. The anterior dorsal plate of *C. nautiliei* has a transverse raised areola, oblong in outline; that area in

*C. alvinus* is like an inverted Y. The posterior dorsal plate of *C. nautiliei* is shorter than in *C. alvinus*, setae ds-3 are within the striated integument; in *C. alvinus* the ds-3 are on the posterior dorsal plate. The genital-anal plates of both females and males of *C. nautiliei* are distinctly shorter, and the distance from the anterior margin of the genital opening to the genital-anal plate is less than in *C. alvinus*.

*C. nautili* demonstrates a close similarity to *C. papillatus*, a species recorded from various hydrothermal vent fields in the east Pacific (Krantz, 1982; Bartsch, 1991). In both species, there is a transverse areola on the anterior dorsal plate with a similar arrangement of gland pores and dorsal setae; the ocular plates are short, rounded; the ornamentation of the posterior dorsal plate is similar, there is a pair of gland pores on a level with the insertion of leg IV, the ostia of the median costae are surrounded by very delicate canaliculi, and the areas outside the costae are reticulated; the striae of the membranous integument have connective bars; the ventral margins of the telofemora I and II are serrate; the ventral setae of tibia IV are smooth; in both species, tarsi III and IV have four and three dorsal setae respectively. *C. papillatus* is readily distinguished from *C. nautili* on the basis of the much longer anal valves and the much more aciculate ventral margin of the telofemora.

*Ecology:* *Copidognathus nautili* was recovered from washings of bivalves. Other taxa associated with these mussels are zoantharians, nematodes, bivalves, limpets, polychaetes, copepods, tanaidaceans, shrimps, crabs, and ophiurids.

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