Two new species of *Lophoturus* (Diplopoda, Penicillata, Lophoproctidae) from caves in Christmas Island, Australia, including the second troglomorph in Penicillata

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ABSTRACT
Two new species of the genus *Lophoturus* Brolemann, 1931 are described from three caves on Christmas Island. *Lophoturus speophilus* n. sp., from Jedda Cave and Jane up Cave, is the second species of Penicillata known with troglomorphic characters, having elongate antennae and legs, and the telotarsus bearing four sternal spiniform and lamellate processes on the claw, in addition to the two latero-dorsal denticles found in all Lophoproctidae. *Lophoturus humphreysi* n. sp. is described from material collected in 19th Hole cave and compared to other species of the genus. *Lophoturus obscurus catalai* Condé & Nguyen Duy-Jacquemin, 1977 and *Lophoturus obscurus tongae* Nguyen Duy-Jacquemin & Condé, 1982 are raised to species rank.

KEY WORDS
Myriapoda,
Diplopoda,
Polyxenida,
Lophoproctidae,
Christmas Island,
Australia,
new species,
new status,
cave.

RÉSUMÉ
Deux nouvelles espèces de Lophoturus *(Diplopoda, Penicillata, Lophoproctidae) de Christmas Island, Australie, dont la seconde espèce présumée troglomorphe chez les Pénicillates.*
Deux nouvelles espèces appartenant au genre *Lophoturus* Brolemann, 1931 récoltées dans trois grottes de Christmas Island, sont décrites. La première espèce, *Lophoturus speophilus* n. sp. de Jedda Cave et Jane up Cave, est la seconde espèce de Penicillata présentant des caractères troglomorphes décrite à ce jour : allongement des antennes et des pattes ; présence de quatre processus sternaux lamellaires et spiniformes du télotarse entourant la griffe, en plus des deux dents latéro-dorsales antérieures et postérieures de la famille des Lophoproctidae. La deuxième espèce *L. humphreysi* n. sp. est décrite de 19th Hole et comparée aux autres espèces du genre. *Lophoturus obscurus catalai* Condé & Nguyen Duy-Jacquemin, 1977 et *Lophoturus obscurus tongae* Nguyen Duy-Jacquemin & Condé, 1982 sont élevées au rang d'espèce.

MOTS CLÉS
Myriapoda,
Diplopoda,
Polyxenida,
Lophoproctidae,
Christmas Island,
Australie,
nouvelles espèces,
nouveaux statuts,
cavernicole.

INTRODUCTION

The first presumed troglomorphic species of Penicillata to be described was *Lophoproctus pagesi* Condé, 1982, from the Cueva de Genova, near Palma, Majorca, based on an adult female, of which only the head and anterior part of the trunk remained (Condé 1982). More recently, specimens similar to *L. pagesi* were mentioned from the "Gruta do Fumo", Parque Natural da Arrábida, Portugal, but with a few differences in the claws. These were referred to as *L.* cf. *pagesi* by Cardoso *et al.* (2008). In the slide-collection of the late Professor Bruno Condé is an adult male of *L. pagesi*, labelled by him but without information about the origin, which has allowed a comparison with *L.* cf. *pagesi*. The claws of *L.* cf. *pagesi* differ in having three dorsal denticles (the anterior one larger than the two others), as opposed to two in *L. pagesi*, and lacking the two sternal lamellate processes. The pubescent oval setae of the legs of *L*. cf. *pagesi* from Gruta do Fumo are different from those of the male of *L. pagesi*; they were not described in the holotype.

Here I describe two new species of the genus *Lophoturus* collected in three different caves in Christmas Island, Indian Ocean (Hymphreys & Eberhard 2001). One of these, from Jedda Cave, is the first troglomorphic species known for this genus and only the second to be described in the family Lophoproctidae.

MATERIAL AND METHODS

Abbreviations

Antenna

a	anterior sensillum basiconicum;
c	sensillum coeloconicum;
i	intermediate sensillum basiconicum;
p	posterior sensillum basiconicum.

Trichobothria

at	anterior trichobothria;
pet	postero-external trichobothria;
pit	postero-internal trichobothria.

Telotarsus

bd	basal denticle;
dd	dorsal denticle;
ld	little denticle;
ldd	latero-dorsal denticle;
lds	latero-dorsal scale;
sd	sternal denticle;
slp	sternal lamellate process;
smd	small denticle.

Institution

MNHN	Muséum national d'Histoire naturelle, Paris;
WAM	Western Australian Museum, Perth.

SYSTEMATICS

Order POLYXENIDA Lucas, 1840
Family Lophoproctidae Silvestri, 1897

Genus *Lophoturus* Brolemann, 1931

Remarks

Lophoturus, as reassessed by Condé & Nguyen Duy-Jacquemin (1977: 909-911), is a senior synonym of *Alloproctinus* Jeekel, 1963 (a replacement name for *Alloproctus* Silvestri, 1948). It is characterized by 0 to 4 pairs of linguiform processes on each side of median opening of labrum and antennal article VI with 3 thick sensilla, named anterior (a) intermediate (i) and posterior (p) (Ishii *et al.* 1999: 252, key).

Lophoturus speophilus n. sp.
(Figs 1, 2)

Type Material. — **Holotype:** adult male from Australia, Christmas Island, Jedda Cave located at – 10.488°, 105.645°: plateau cave, t° 25.2-26.1°C, humidity of 98-99%, BES-5849, 6.IV.1998, S. Eberhard coll., WAM. **Paratype:** adult female collected with the holotype, MNHN.

Other material examined. — One adult female, one subadult female (with 12 pairs of legs) and one larva with 6 pairs of legs, same locality as types, BES-5763, 29.III.1998, S. Eberhard coll., tree roots/wood, MNHN. One adult male and one adult female, Christmas Island Jane-up Cave, BES-5842, 6.IV.1988, S. Eberhard coll., WAM.

Etymology. — This species is named *speophilus* (from the Greek *speos*, cave, and *philos*, loving) with reference to its being found in a cave.

Diagnosis

Large size: 4.60 to 5.30 mm. Antennae elongate, particularly from articles VI onwards. Long and thin sensilla basiconica on article VI and VII. Labrum without ornamentation except for 2-3 linguiform processes on each side of its median opening. Trichomes of each tergite grouped into two, separate, oval clusters with an additional posterior row barely subdivided in its middle except on collum; distance between clusters much greater than length of each cluster. Legs elongate, tarsus II of 13th leg 350 µm long (holotype). Pubescent oval setae on leg articles except tibia and tarsus. Spine of tarsus II subequal to telotarsus. Telotarsus bearing 4 sternal spiniform and lamellate processes, in addition to the 2 laterodorsal denticles characteristic of Lophoproctidae.

Description of adults

Measurements

Body length (without caudal pencil): male holotype 5.30 mm; female paratype 5.10 mm; female BES-5763 4.60 mm. Tarsus II leg of 1st leg: 275 µm (holotype and female BES-5763), of 13th leg: 350 µm (holotype) (tarsus II of legs 9 to 13 lacking in female BES-5763).

Head

Anophthalmic. Vertex with a pair of posterior tufts, each arranged in 2 rows: anterior row with 23 and 24 trichomes in holotype and paratype (Fig. 1A), 28 in female BES-5763; posterior row with 3 and 4 trichomes in the 2 type specimens, 5 in female BES-5763. Distance between each tuft about half their length (Fig. 1A).

Length (Table 1) and diameter of antennal articles as shown in Fig. 1C; length/diameter ratio of article VI about 3.20-3.40 (Table 2). Article VI with 3 dorsal sensilla basiconica: the anterior (a) the shortest, the intermediate (i) slightly shorter than the posterior (p), one sensillum coeloconicum (c) near posterior sensillum (p), but slightly more distal (Fig. 1I). Antennal article VII with 2 dorsal sensilla basiconica, the anterior one thinner, shorter and more distal than the posterior; one sensillum coeloconicum (c) near the posterior sensillum, but more distal (Fig. 1H). Apex of third antennal article with well developed fan-shaped creasing of interarticular membrane (Fig. 1D).

Three trichobothria arranged triangularly (Fig. 1A), apex of anterior one slightly dilated and ending in a short spine-hair (at, Fig. 1B); the 2 other trichobothria very elongated (pet, Fig. 1B).

Labrum without cuticular setae; antero-median margin of labrum with 3+3 (holotype and female BES-5763) (Fig. 1G) or 2+2 (female paratype) linguiform processes. Clypeo-labrum of holotype with 14 short setae along the posterior margin (Fig. 1G).

Left palpus of gnathochilarium with 54 (Fig. 1E) and right with 52 sensilla in male holotype; 19+19 in female paratype (Fig. 1J); 25+25 in female BES-5763.

Trunk

Trichomes of each tergite grouped in two, separate, oval clusters with an additional posterior row barely subdivided in its middle (Fig. 2B) except on collum (Fig. 2A); distance between clusters much greater than length of each cluster. In holotype, collum with tufts of 95 trichomes each; lateral left protuberance of collum with 7 trichomes; right with 8 trichomes (Fig. 2A); right and left with 6 in female BES-5763. Each oval cluster of tergites II to X with 33 to 50 trichomes and posterior row with 34 (tergite II, Fig. 2B) and 39 (tergite IX).

Legs

Each leg article, except for tibia and tarsus, bearing pubescent oval setae and extended by an acute process (Fig. 2E); coxae with 3 to 12 in holotype, 3 to 8 setae in females; trochanters with 2 to 4 setae in holotype, 1 to 3 setae in females; prefemora with 1 to 4 setae in holotype (1 to 3 in females); femora with 2 setae in holotype, except leg I (1 seta in female); one small seta on tibia of leg I (Fig. 2D). Spine of tarsus II (Fig. 2F) subequal to telotarsus, sometimes slightly longer (ratio 1.05 to 1.11). Telotarsus (Fig. 2G, H) with 2 sternal lamellate processes (slp), about 2/3 length of claw, and 2 shorter denticles (sd); 2 latero-dorsal, subequal scales (lds) characteristic of Lophoproctidae, but broader.

Telson

Five or 6 trichomes a, of which 3 or 4 placed on internal side and 2 on external side of the group of trichomes b-c1-c3.

All trichomes of caudal penicil lost.

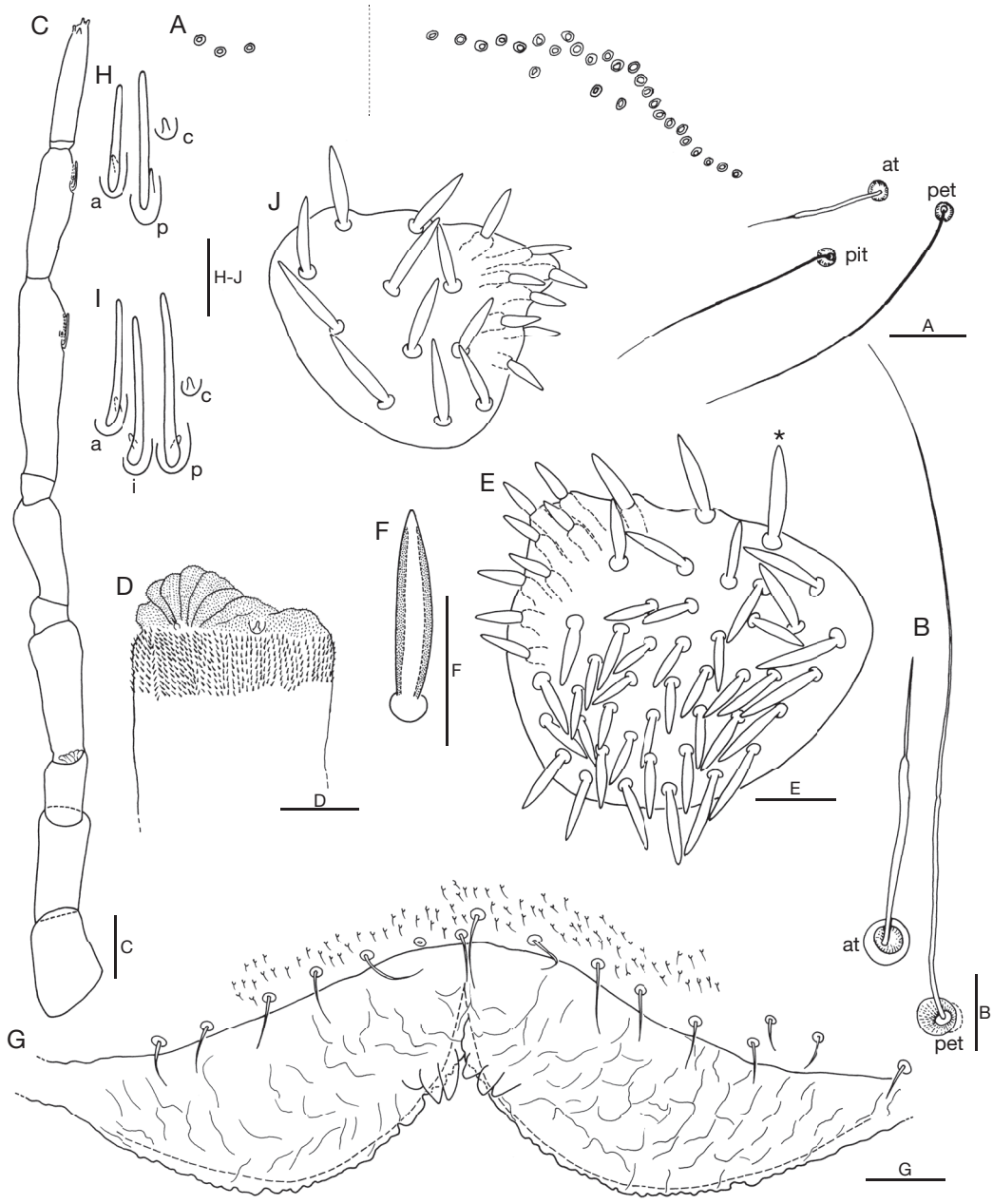

Fig. 1. — *Lophoturus speophilus* n. sp.: **A**-**G**, male holotype: **A**, insertions of trichomes of posterior tufts and right trichobothria on vertex; **B**, detail of anterior (**at**) and postero-external (**pet**) trichobothria; **C**, right antenna; **D**, distal end of left antennal article III, posterior face; **E**, left palpus of gnathochilarium; **F**, detail of sensillum indicated by asterisk in Fig. 1E; **G**, labrum; **H**-**J**, female paratype: **H**, detail of sensilla on article VII of right antenna; **I**, detail of sensilla on article VI of right antenna; **J**, right palpus. Abbreviations: see Material and methods. Symbol: *, detailed to Fig. 1F. Scale bars: A, 50 µm; B, D-J, 25 µm; C, 100 µm.

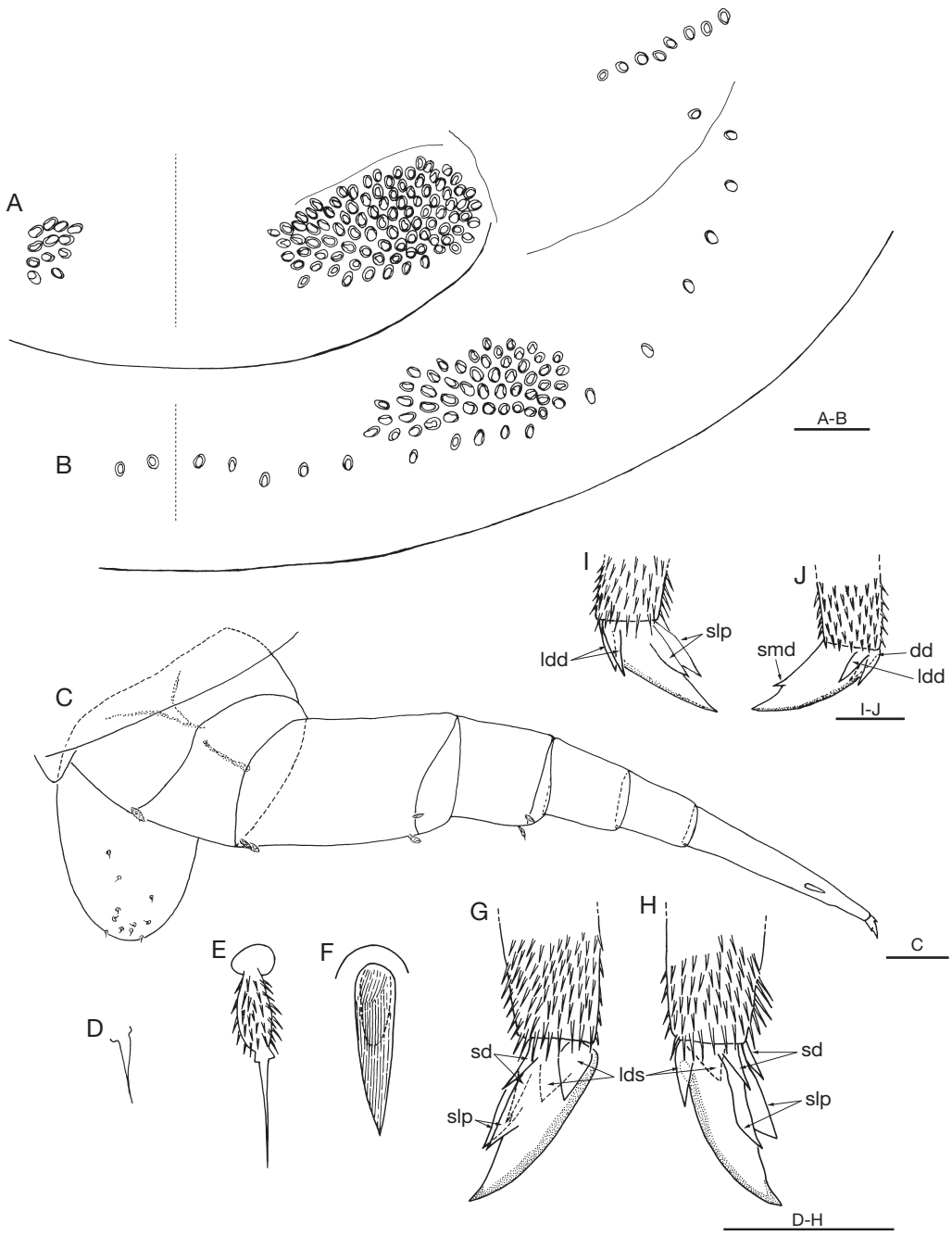

Fig. 2. — **A**-**H**, *Lophoturus speophilus* n. sp., male holotype: **A**, **B**, insertions of trichomes on right part of collum and tergite II; **C**, left leg II and penis; **D**, small tibial setae of leg I; **E**, prefemoral seta of left leg XI; **F**, spine of tarsus of left leg X; **G**, telotarsus of left leg X; **H**, telotarsus of right leg XIII; **I**, *Lophoproctus pagesi* Condé, 1982, adult male, telotarsus of right leg IV; **J**, *Lophoproctus* cf *pagesi* Cardodo *et al.*, 2008, Gruta do Fumo, male, telotarsus of left leg V. Abbreviations: see Material and methods. Scale bars: A, B, 50 µm; C, 100 µm; D-H, 25 µm; I, J, 10 µm.

TABLE 1. — Antennal article length (µm) in the species of *Lophoturus* Brolemann, 1931 and *Lophoproctus* Pocock, 1894. Symbol: *, Data after Condé (1982: 315).

Antennal article length	I	II	III	IV	V	VI	VII	VIII
Lophoturus speophilus n. sp. ♂ holotype	55	75	40	78	72	132	80	93
Lophoturus speophilus n. sp. ♀ paratype BES-5849	50	58	30	66	55	99	64	68
Lophoturus speophilus n. sp. ♀ BES-5763	54	68	36	75	55	135	83	88
Lophoturus humphreysi n. sp. ♂ holotype	42	44	25	45	35	67	29	50
Lophoproctus pagesi Condé, 1982 ♀ holotype, cueva de Genova. Majorca*	45	54	35	59	41	90	61	67.5
Lophoproctus pagesi ♂	31	34	20	40	28	74	47	50
Lophoproctus cf. *pagesi* Cardoso *et al.* (2008) ♂ Gruta do Fumo	45	38	26	40	34	68	50	54
Lophoproctus jeanneli (Brölemann, 1910) ♂ Esporlas Majorca*	30	31	24	40	26	60	32	47

FEMALE WITH 12 PAIRS OF LEGS

Measurements

Body length (without caudal penicil) 3.90 mm. Tarsus II length of 1st leg 225 µm, of 12th leg 260 µm.

Head

Antennal article VI with 3 basiconic sensilla and one posterior sensillum coeloconicum, article VII with 2 basiconic sensilla and one posterior sensillum coeloconicum. Surface of labrum without cuticular setae; 2+2 linguiform processes on anterior margin; 10 short setae along the posterior margin. Palpus of gnathochilarium with 18 sensilla. Trichobothria as in adults.

Trunk

Collum with left tuft of 70 trichomes and right of 67. Lateral protuberances of tergite I with 6 barbate trichomes. Oval clusters of tergites II with 35 and 36 trichomes, posterior row with 35.

Legs

Coxae with 2 to 5 setae; trochanters with 2 setae (except 5 with only 1); prefemur with one seta, rarely two; femora with 1 seta. Tibia of leg I with one small seta tapered apically. Telotarsus as the adults: with 2 sternal lamellate processes and 2 shorter denticles; 2 latero-dorsal subequal scales.

Telson

Seven trichomes a, of which 4 placed on internal side and 3 on external side of the group of trichomes b-c1-c3.

LARVA WITH 6 PAIRS OF LEGS

Measurements

Body length (without caudal penicil) 2.20 mm. Tarsus II length of 1st leg 135 µm, of 6th leg 165 µm.

Head

Vertex with a pair of posterior tufts: anterior row of 9 trichomes and only 1 posterior trichome. Antennal article VI with 3 basiconic sensilla and one posterior coeloconicum sensillum. Antennal article VII with 2 basiconic sensilla and one posterior coeloconicum sensillum. Trichobothria as in adults. Surface of labrum as in adult females, 2 + 2 linguiform processes on anterior margin; clypeo–labrum with 9 setae along the posterior margin. Outer palp of gnathochilarium with 18 sensilla.

Trunk

Collum with left tuft of 26 trichomes and right of 27. Lateral protuberance of tergite I with 3 barbate trichomes. Telotarsus as adults.

TABLE 2. — Antennal article ratios (L/d) in the species of *Lophoturus* Brolemann, 1931 and *Lophoproctus* Pocock, 1894. Symbol: *, Data after Condé (1982: 315).

Antennal article	I	II	III	IV	V	VI	VII	VIII
Lophoturus speophilus n. sp. ♂ holotype	1.00	1.70	1.05	1.80	1.60	3.40	2.40	4.60
Lophoturus speophilus n. sp. ♀ paratype BES-5849	1.10	1.80	1.05	1.90	1.60	3.20	2.40	4.30
Lophoturus speophilus n. sp. ♀ BES-5763	1.10	1.80	1.10	2.20	1.60	4.50	2.80	4.60
Lophoturus humphreysi n. sp. ♂ holotype	0.90	1.10	0.80	1.30	1.30	1.90	1.65	2.50
Lophoproctus pagesi Condé, 1982 ♀ holotype, cueva de Genova. Majorca*	1.00	1.38	1.20	2.14	1.40	3.10	2.44	4.00
Lophoproctus pagesi ♂	1.24	1.50	1.00	2.00	1.35	3.10	2.40	3.60
Lophoproctus cf. *pagesi* Cardoso *et al.* (2008) ♂ Gruta do Fumo	1.40	1.50	1.20	1.60	1.60	2.70	2.10	3.60
Lophoproctus jeanneli (Brölemann, 1910) ♂ Esporlas, Majorca*	1.07	1.27	1.09	1.60	1.00	2.00	1.40	3.03

Telson

Left side with 7 trichomes a, of which 4 placed on external side of group of trichomes b-c1-c3; right with six, of which 3 external.

REMARKS

Lophoturus speophilus n. sp. was collected in two different caves that are nearby located in the center of Chrismas Island (Grimes 2001: 43, fig. 2).

Lophoturus humphreysi n. sp.
(Figs 3, 4)

TYPE MATERIAL. — Holotype: adult male from Australia, Christmas Island, 19th Hole cave, located at – 10.425°, 105.701°: anchialine cave, t° 27-27.4°, humidity 98-99 %, BES-5921, 30.III.1998, W. F. Humphreys coll., WAM.

ETYMOLOGY. — This species is named after its collector, Dr W. F. Humphreys (Senior Curator, Western Australian Museum).

DIAGNOSIS

Anterior sensilla basiconica of antennal articles VI and VII shorter and slightly thinner than others. Labrum clothed with small cuticular setae and 2+3 lamellar processes on anteromedian margin. Trichomes of each tergite grouped into two, separate, oval clusters with an additional posterior row barely subdivided in its middle, except on collum and tergite X; distance between clusters much greater than length of each cluster. Pubescent oval setae on leg articles, except tibia and tarsus. Spine of tarsus II subequal in length to the telotarsus on posterior legs. Claw with one small sternal denticle. Apical part of tarsus II with 2 rows of cuticular setae that are longer and more spaced than the other setae.

DESCRIPTION OF ADULT MALE

Measurements

Body length (without caudal pencil): 3.60 mm. Length of caudal penicil 0.60 mm. Tarsus II length of 1st leg 180 µm, of 13th leg 240 µm.

Head

Anophthalmic. Vertex with a pair of posterior tufts, each arranged in 2 rows, anterior right row of 23 and left of 22 trichomes; posterior right row of 2 and left of 3 trichomes. Distance between each tuft about equal to their length (Fig. 3F).

Length and diameter of the antennal articles as represented in Fig. 3A; length/diameter ratio of article VI about 1.90 (Table 2). Article VI with 3 sensilla basiconica (Fig. 3C, D), the an-

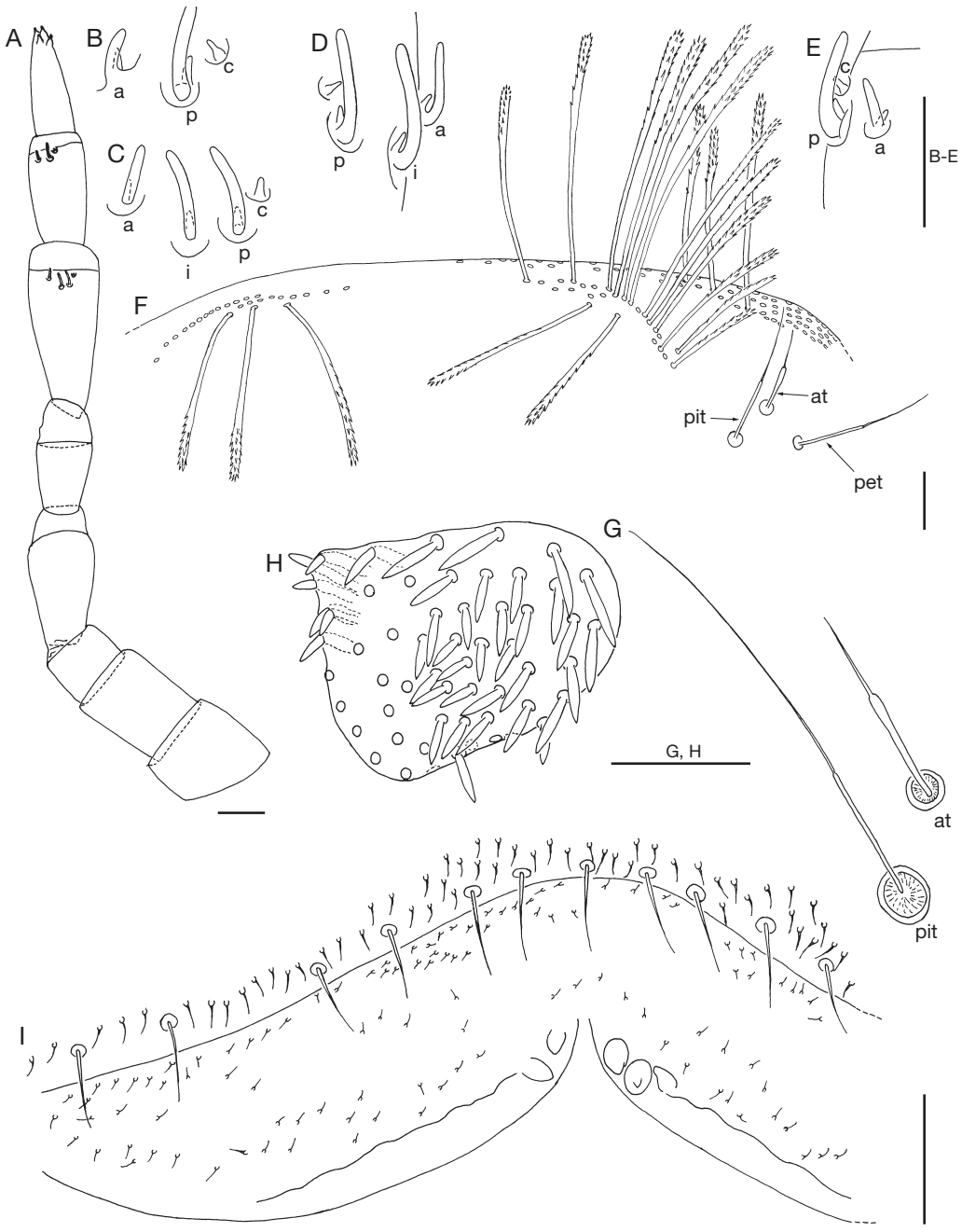

Fig. 3. — *Lophoturus humphreysi* n. sp., male holotype: **A**, right antenna; **B**, detail of sensilla on article VII of right antenna; **C**, detail of sensilla on article VI of right antenna; **D**, detail of sensilla on article VII of left antenna; **E**, detail of sensilla on article VI of left antenna; **F**, trichomes of posterior tufts and right trichobothria on vertex; **G**, detail of right anterior (**at**) and postero-internal (**pit**) trichobothria; **H**, left palpus of gnathochilarium; **I**, labrum, left side only partially drawn. Abbreviations: see Material and methods. Scale bars: A, F-H, 50 µm; B-E, I, 25 µm.

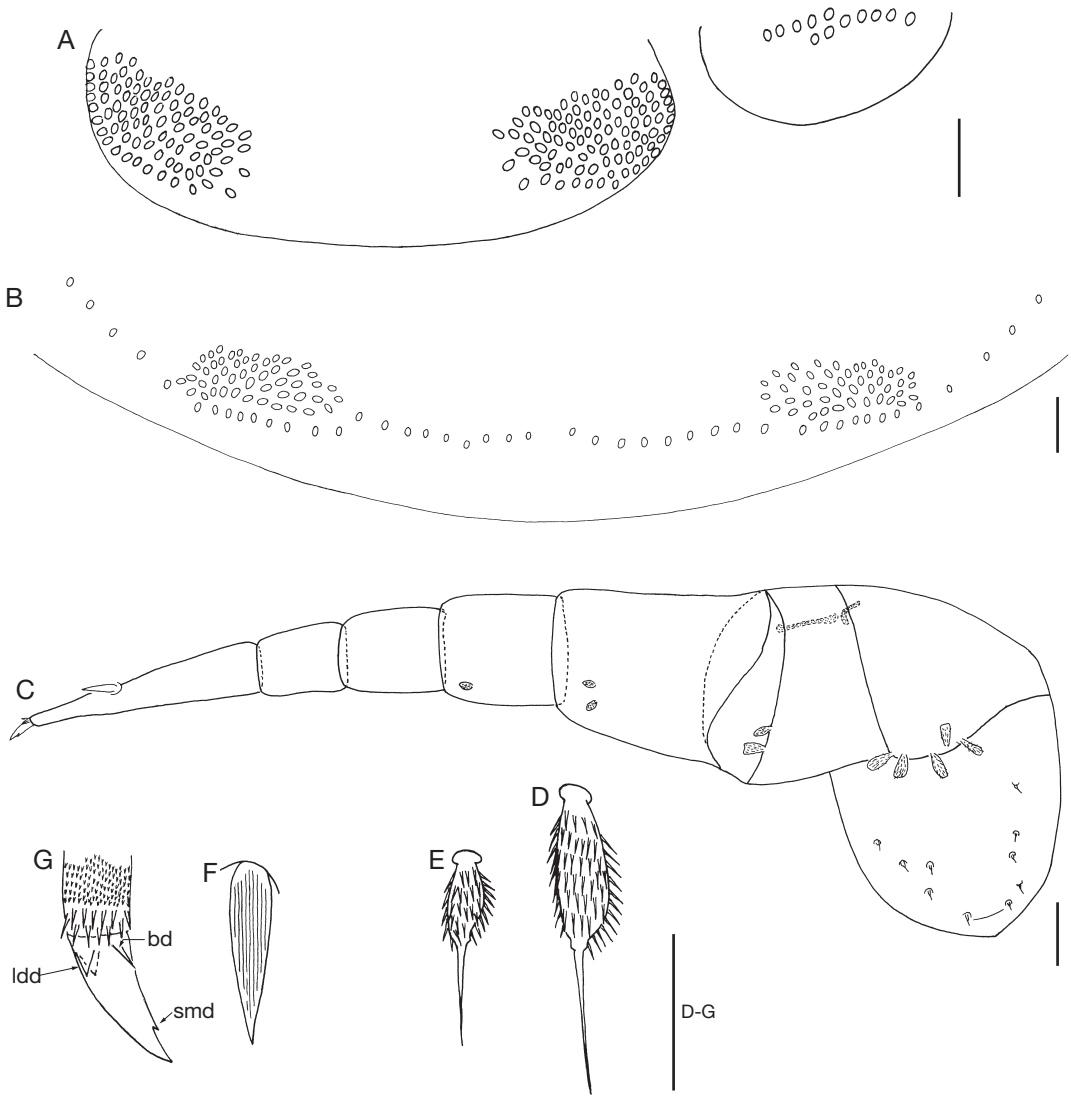

FIG. 4. — *Lophoturus humphreysi* n. sp., male holotype: **A**, insertions of trichomes on collum and right lateral protuberance; **B**, insertions of trichomes on tergite IV; **C**, right leg II and penis; **D**, coxal seta of right leg I; **E**, seta of trochanter of right leg I; **F**, tarsal spine of right leg VII; **G**, telotarsus of right leg VII. Abbreviations: see Material and methods. Scale bars: A-C, 50 µm; D-G, 25 µm.

terior (a) more distal, shorter and slightly thinner than the 2 others, intermediate (i) slightly longer than the posterior (p); one sensillum coeloconicum (c) near the posterior sensillum (p), but more distal. Antennal article VII with 2 dorsal sensilla basiconica, the anterior sensillum, more distal slightly thinner and shorter (1/2) than the posterior; sensillum coeloconicum (c) near the posterior sensillum (p), but more distal (Fig. 3B, E).

Three trichobothria arranged triangularly, apex of anterior one slightly dilated and ending in a

short spine-hair (Fig. 3 [at]); the other 2 are very elongated (Fig. 3 [pit]).

Labrum clothed with some small cuticular setae and 2+3 lamellar processes on antero-median margin (Fig. 3I); clypeo-labrum with fourteen short setae along the posterior margin.

Left palpus of gnathochilarium with 59 (Fig. 3H) and right with 56 sensilla.

Trunk

Trichomes of each tergite grouped into two, separate, oval clusters with an additional posterior row barely subdivided in its middle (Fig. 4B), except on collum (Fig. 4A) and tergite X; distance between clusters much greater than the length of each cluster. Collum with left tuft of 85 trichomes and right tuft of 89 trichomes; lateral left protuberance of collum with 11 trichomes and right with 12 trichomes (Fig. 4A). Each oval cluster of tergites II to VI with 43 to 54 trichomes and VII to IX with 36 to 41 trichomes; posterior row with 41 to 55 trichomes. Oval clusters of tergite X with 56 trichomes each (no posterior row).

Legs

Each leg article, except for tibia and tarsus, bearing pubescent oval setae extended by an acute process (Fig. 4E, D); coxae II to XIII bearing 4 to 6 setae (Fig. 4C, D), coxae I with 3 setae; trochanters with 2 setae (Fig. 4C-E) (except 1 seta on trochanters of legs I and V); prefemora with 2 setae (except 1 seta on leg I and III, 3 setae on right legs VII and X and left legs X and XIII); femora with 1 seta, very rarely 2 (on VIII femora); 1 small seta only on tibia of leg I. Telotarsus with 2 latero-dorsal, subequal denticles (ldd); a small, frayed, basal denticle (bd) is visible ventrally (Fig. 4G), as in all Lophoproctidae. Claw with one small sternal denticle (smd). Apical part of tarsus II with 2 rows of cuticular setae that are longer and more spaced than other setae (Fig. 4G).

Telson

Seven and 8 trichomes a, of which 6 and 7 placed on internal side and 2 on external side of the group of trichomes b-c1-c3. Trichomes of caudal pencil generally with 3 hooks.

DISCUSSION

Lophoturus is a widespread genus in tropical and subtropical areas around the world. The differences between species tend to be relatively slight. Ishii (1988) redescribed *L. obscurus okinawai* Nguyen Duy-Jacquemin & Condé, 1982 (from Ry Ky, Okinawa) and elevated it to species rank. The same rank is here proposed for *L. catalai* Condé & Nguyen Duy-Jacquemin, 1977 n. stat. (from New Caledonia) and *L. tongae* Nguyen Duy-Jacquemin & Condé, 1982 n. stat. (from Tonga Archipelago). *L. obscurus catalai* is maintly different from *L. obscurus* by the disposition, in V shape, of the sensilla basiconica on antennal article V, and by the tighter and more elongated claws. *L. obscurus tongae* is different from *L. obscurus* by the presence of 1+1 (instead of 2+2) linguiform processes in the antero-median margin of the labrum and does not have 2 rows of longer cutilar setae on apical part of tarsus II. On the other hand, the elevation of *L. obscurus kurchevae* Nguyen Duy-Jacquemin & Condé, 1982 (from Manus Island, Bismark Archipelago) to species rank is, at present, not realistic because it is very similar to *L. catalai* (described after a larva stadium V): same disposition of sensilla basiconica on antennal article VI; two rows of cuticular setae longer and more spaced on apical part of tarsus II.

The position of the antennal sensilla of articles VI and VII of *L. humphreysi* n. sp. is the same as in *L. okinawai*, but the posterior sensillum basiconica is shorter. The small cuticular setae on the labrum are absent in the adult male of *L. okinawai* (Ishii 1990: 17, 19, fig. 56), but are present in a male with 10 pairs of legs from Ry Ky (Nguyen Duy-Jacquemin & Condé 1982: 98-99, fig. 5). The clypeo-labrum of *L. humphreysi* n. sp. is edged with short setae along the posterior margin, as in *L. okinawai*. However, the claw, with a sternal denticle, and the apical part of tarsus II, are different to those of *L. okinawai*, which lacks the two rows of longer and more spaced cuticular setae. These rows are also present in *L. catalai* and *L. O. kurchevae* as mentioned previouly.

L. speophilus n. sp. is principally distinguishable from the other species of *Lophoturus* by the elongation of antennae and legs, and by the addition of four sternal processes (two lamellar and two spines) on the claw. The two lamellar processes resemble

those of *Lophoproctus pagesi* Condé, 1982 (Fig. 2I), whereas they are absent in *L.* cf *pagesi* from Gruta do Fumo (Fig. 2J), which has an additional dorsal denticle (Fig. 2J [dd]). The length of each antennal article was measured in the two troglomorphic species, *Lophoturus speophilus* n. sp. and *Lophoprotus pagesi*, each belonging to a different genus (Table 1). One male and two females of *L. speophilus* n. sp. were compared to one male of *L. humphreysi* n. sp., all collected from different caves in Christmas Island. The antennal articles of the latter are distinctly shorter. Similarly, the lengths of the antennal articles of *L. pagesi* and of the male of *L.* cf. *pagesi* are greater than those of *L. jeanneli* (Brölemann, 1910).

Because the differences in length could be due to a difference in the size of the species (*L. speophilus* n. sp. being larger than *L. humphresi* n. sp. and *L. pagesi*), the length/diameter ratios, which provide a better indication of the degree of elongation, were compared (Table 2). *L. speophilus* n. sp. shows higher ratios than *L. humphreysi* n. sp. for all the articles and *L. pagesi* has higher ratios than *L. jeanneli*, particularly from article VI onwards.

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