

# The genus *Tuberillo* Schultz 1982 (Crustacea Oniscidea Armadillidae) with descriptions of four new species

S. TAITI<sup>1</sup> and G.A. GRUBER

Istituto per lo Studio degli Ecosistemi, Consiglio Nazionale delle Ricerche, Via  
Madonna del Piano 10, I-50019 Sesto Fiorentino (Firenze), Italy

Received 11 August 2010, accepted 10 December 2010

Six species of *Tuberillo* Schultz 1982 have been examined and a new diagnosis of the genus is given. The type specimens of *T. sarawakensis* Schultz 1982 and *T. jubatus* Herold 1931 are illustrated and four species are described as new: *T. schawalleri* from Leyte, Philippines; *T. cebuensis* from Cebu Island, Philippines; *T. borneanus* from Sabah, Malaysia; and *T. riedeli* from Sulawesi, Indonesia.

KEY WORDS: Crustacea, Isopoda, Oniscidea, Armadillidae, *Tuberillo*, new species, Oriental Region.

---

Introduction .....	205
Abbreviations .....	206
Taxonomic account .....	206
Family Armadillidae Brandt 1831 .....	206
Genus <i>Tuberillo</i> Schultz 1982 .....	206
<i>Tuberillo sarawakensis</i> Schultz 1982 .....	206
<i>Tuberillo jubatus</i> (Herold 1931) .....	208
<i>Tuberillo celebensis</i> Taiti, Ferrara & Kwon 1992 .....	208
<i>Tuberillo schawalleri</i> n. sp. ....	208
<i>Tuberillo cebuensis</i> n. sp. ....	214
<i>Tuberillo borneanus</i> n. sp. ....	218
<i>Tuberillo riedeli</i> n. sp. ....	222
Key to the species of <i>Tuberillo</i> .....	228
Acknowledgements .....	228
References .....	229

## INTRODUCTION

The genus *Tuberillo* was erected by SCHULTZ (1982) for the new species *T. sarawakensis* from Sarawak, Borneo, Malaysia. TAITI et al. (1992) described a further new species (*T. celebensis*) from the Togian Islands, Sulawesi, Indonesia, and

---

<sup>1</sup> Corresponding author: Dr Stefano Taiti (E-mail: stefano.taiti@ise.cnr.it).

transferred *Hybodillo jubatus* Herold 1931 from Sabang Island, Sumatra, Indonesia, to this genus. In this paper, four new species of *Tuberillo* from the Oriental Region are described and two of the previously described species (*T. sarawakensis* and *T. jubatus*) are illustrated after re-examination of their type specimens.

#### ABBREVIATIONS

BMNH = Natural History Museum, London; MZUF = Museo di Storia Naturale dell'Università, Sezione di Zoologia "La Specola", Florence; MHNG = Muséum d'Histoire Naturelle, Geneva; SMNS = Staatliches Museum für Naturkunde, Stuttgart; ZMB = Zoologisches Museum, Berlin.

#### TAXONOMIC ACCOUNT

Family Armadillidae Brandt 1831

Genus *Tuberillo* Schultz 1982

Type species: *Tuberillo sarawakensis* Schultz 1982 by original designation and monotypy.

*Diagnosis.* Animals able to roll up into a perfect ball (endoantennal conglobation), with epimera of pereionites and pleonites slightly curved outwards. Dorsal surface covered by distinct tubercles. One line of *noduli laterales* per side on the pereionites, all *noduli* inserted on the dorsal tubercles and at the same distance from the lateral margin of the segments. Cephalon with a large frontal shield distinctly protruding above the vertex. Pereionite 1 with a schisma at posterolateral corner, with inner lobe reaching or surpassing outer lobe. Epimeron of pereionite 2 with a large ventral lobe obliquely directed. Telson hour-glass-shaped or with a quadrangular distal part. Antenna short and stout. Pleopods 1-5 or 2-5 exopods with uncovered lungs. Uropods with a tiny exopod.

*Remarks.* The genus *Tuberillo* appears morphologically similar to the Neotropical and Afrotropical genus *Ctenorillo* Verhoeff 1942 of which *Tuberdillo* Schmalzfuss & Ferrara 1983 and *Vandelillo* Arcangeli 1957 are junior synonyms (see TAITI et al. 1998: 299). It differs from *Ctenorillo* in having pleopods with uncovered lungs instead of monospiracular covered lungs. As in most of the species of Armadillidae with a distinct dorsal ornamentation, the number and disposition of tubercles is the best character to distinguish the species.

*Tuberillo sarawakensis* Schultz 1982 (Fig. 1)

*Tuberillo sarawakensis* SCHULTZ 1982: 116, figs 12, 13; TAITI et al. 1992: 833, 834; TAITI et al. 1998: 298; SCHMALFUSS 2003: 321.

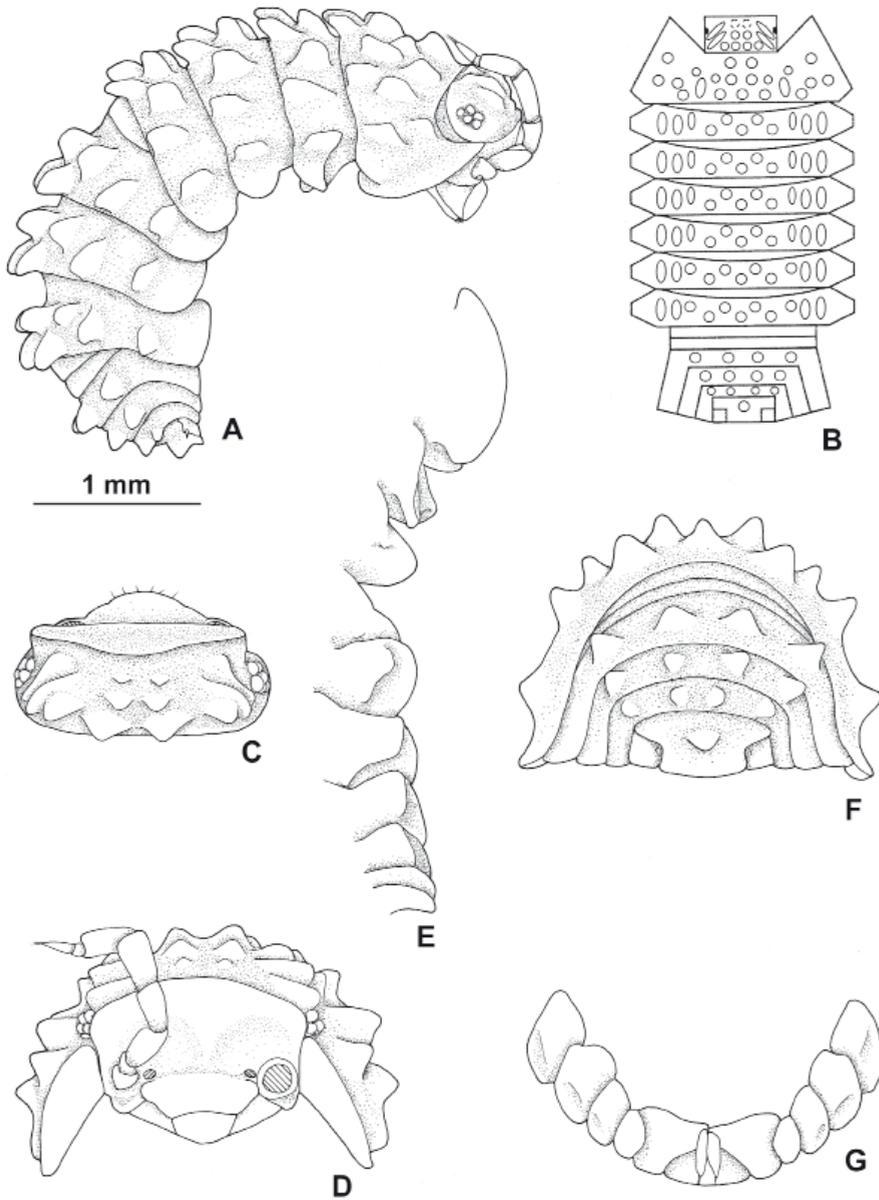


Fig. 1. — *Tuberillo sarawakensis* Schultz 1982, allotype ♀: A, animal in lateral view; B, disposition of dorsal tubercles; C, cephalon, dorsal; D, cephalon, frontal; E, epimera of pereionites 1-7 and pleonites 3-5, ventral; F, pereionite 7, pleon, telson and uropods, dorsal; G, pereionite 7, pleon, telson and uropods, ventral.

*Type material re-examined.* Malaysia: ♂ Holotype, Sarawak, Gunong Mulu National Park, 4th District, Lubang Sungei Payau (Deer Water Cave), III-V.1978, leg. P. Chapman (Royal Geographic Expedition), BMNH 1981:343:1; ♀ Allotype, same data as holotype, BMNH 1981:344:1.

*Remarks.* Re-examination of the type specimens permits the addition of some details to the original description of the species given by SCHULTZ (1982), in particular the disposition of the dorsal tubercles (Fig. 1A-D, F), the interlocking structures on the ventral side of the epimera of the pereionites (Fig. 1E), and the uropod with basal part of the protopod enlarged and protruding laterally (Fig. 1G).

*Distribution.* Sarawak, Borneo, Malaysia.

***Tuberillo jubatus*** (Herold 1931) (Fig. 2)

*Hybodillo jubatus* HEROLD 1931: 330, figs 40-43.

*Tuberillo jubatus*; TAITI et al. 1992: 834; SCHMALFUSS 2003: 321.

*Type material re-examined.* Indonesia: ♀ Holotype, Sabang, Sumatra, II.1927, leg. Rensch, ZMB 22986.

*Remarks.* This species was described and partly illustrated by HEROLD (1931) in the genus *Hybodillo*. TAITI et al. (1992) included the species in the genus *Tuberillo*. Re-examination of the single type specimen deposited in ZMB, even if without cephalon, confirms the ascription of this species to *Tuberillo*. Additional characters to HEROLD's description are: the disposition of the dorsal tubercles on the pereion and pleon (Fig. 2A-C, E); the large triangular inner lobe of the schisma on pereionite 1 and the triangular ventral lobe on the epimeron of the pereionite 2 which are distinctly protruding backwards (Fig. 2D); the uropod with the basal part of the protopod slightly enlarged (Fig. 2F) and a short but distinct exopod (Fig. 2G), not figured by HEROLD (1931).

*Distribution.* Sabang Island, Sumatra, Indonesia.

***Tuberillo celebensis*** Taiti, Ferrara & Kwon 1992

*Tuberillo celebensis* TAITI et al. 1992: 834, figs 30-32; SCHMALFUSS 2003: 321.

*Distribution.* Togian Islands, Sulawesi, Indonesia.

***Tuberillo schawalleri*** n. sp. (Figs 3-6)

*Material examined.* Philippines: ♂ Holotype, Leyte, Lake Danao, forest edge, 500 m, leg. W. Schawaller, 9.III.1991, SMNS. 3 ♂♂, 3 ♀♀, 4 juvs Paratypes, same data as holotype, SMNS; 3 ♂♂, 4 ♀♀ Paratypes, same data as holotype, MZUF.

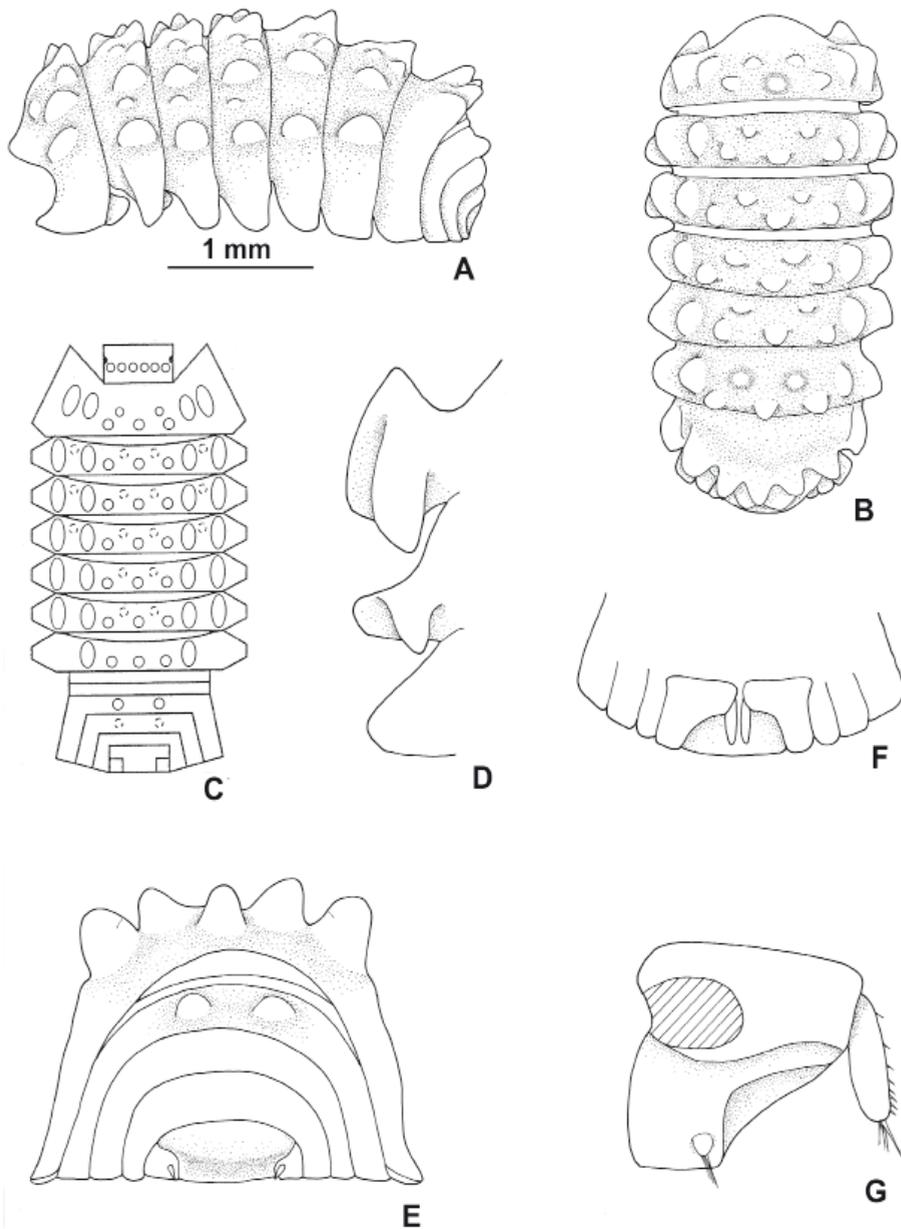


Fig. 2. — *Tuberillo jubatus* (Herold 1931), holotype ♀: A, animal without cephalon in lateral view; B, pereionite, dorsal; C, disposition of dorsal tubercles; D, epimera of pereionites 1-3, ventral; E, pereionite 7, pleon, telson and uropods, dorsal; F, pereionites 1-3, telson and uropods, ventral; G, uropod.

*Description.* Maximum length: ♂, 2.5 mm; ♀, 2.2 mm. Colour (after preservation in alcohol) pale with some sparse irregular dots of grey-brown pigment. Dorsum covered with large single and bifid tubercles (Figs 3A, 4D, 5A): cephalon with one row of six tubercles near the rear margin of vertex; pereonite 1 with eight tubercles, with the one near the base of epimeron bifid; pereonites 2-6 with six tubercles, with the outer one bifid; pereonite 7 with same number

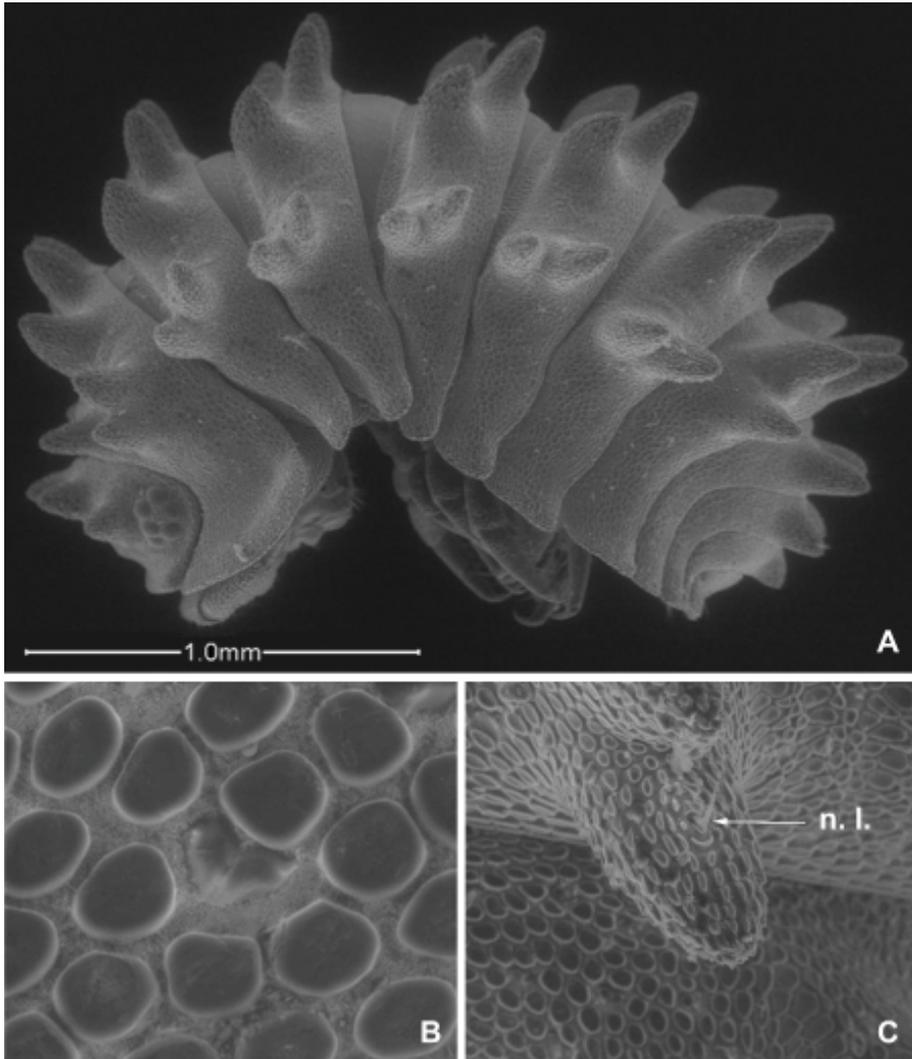


Fig. 3. — *Tuberillo schawalleri* n. sp., paratype ♀: A, animal in lateral view; B, cuticular structure and scale-seta; C, lateral tubercles of pereonite 6 with *nodulus lateralis* (n.l.) (SEM).

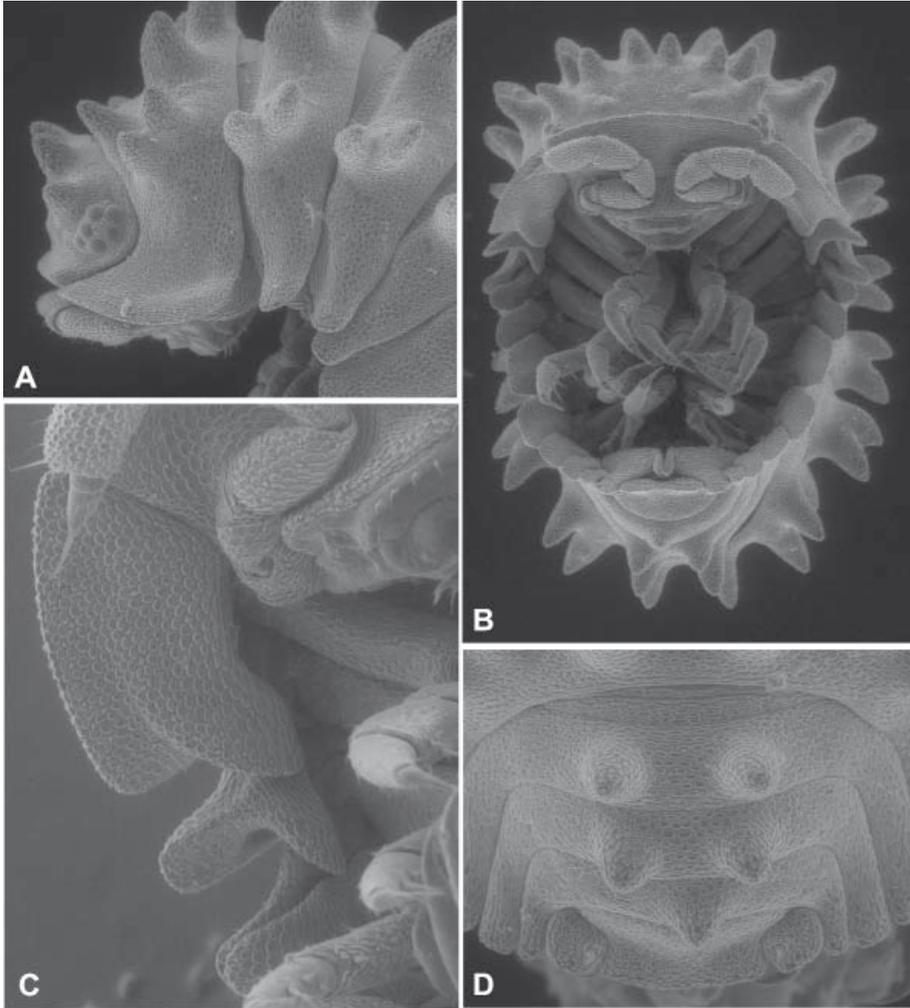


Fig. 4. — *Tuberillo schawalleri* n. sp., paratype ♀: A, pereionites 1-4, lateral; B, animal in ventral view; C, pereionites 1 and 2, ventral; D, pleon, telson and uropods, dorsal (SEM).

and disposition of tubercles as previous pereionites but with the outer tubercle simple; pleonites 3-4 with two paramedian tubercles; pleonite 5 with a single medial tubercle. Dorsal cuticle with verruca-like prominences and triangular scale-setae (Fig. 3B). Pereionites 1-7 bearing one *nodulus lateralis* per side (Fig. 3C): on pereionites 1-6, it is located on the frontal face of the posterior tip of the outer bifid tubercle; on pereionite 7, it is on the caudal face of the second tubercle from the lateral margin. Eye consisting of six large ommatidia (Fig. 4A). Cephalon with frontal shield clearly protruding above vertex, slightly concave in the middle;

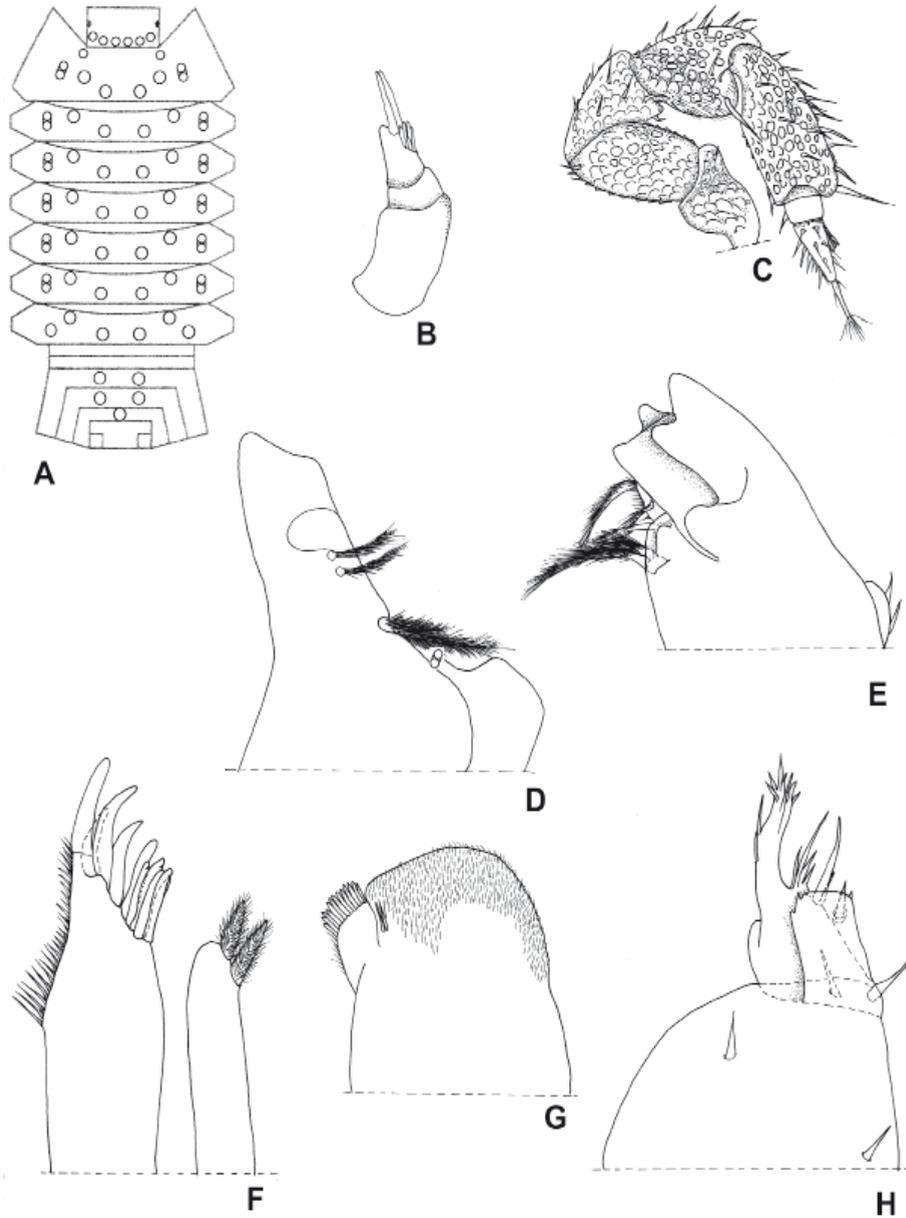


Fig. 5. — *Tuberillo schawalleri* n. sp., paratype ♂: A, disposition of dorsal tubercles; B, antennule; C, antenna; D, right mandible; E, left mandible; F, maxillule; G, maxilla; H, maxilliped.

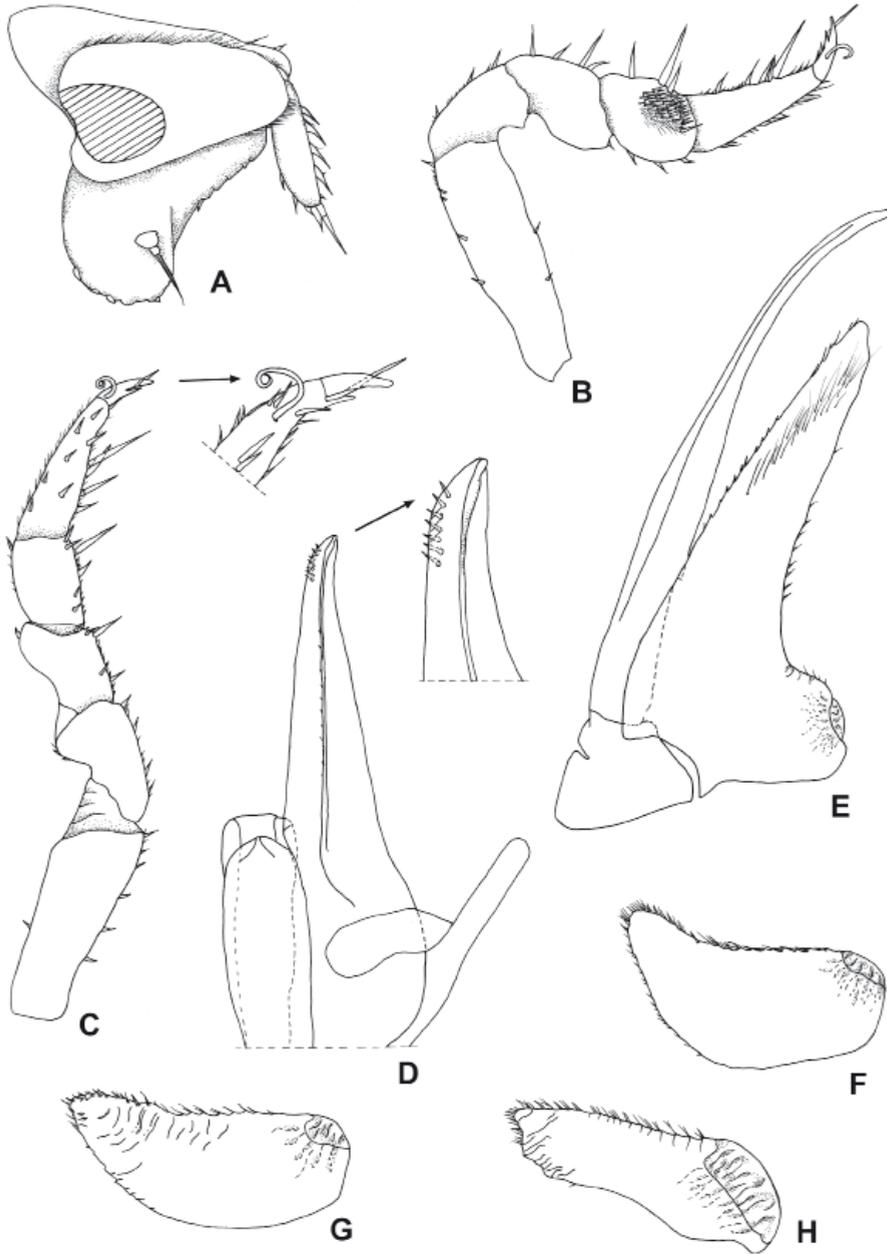


Fig. 6. — *Tuberillo schawalleri* n. sp., paratype ♂: A, uropod; B, pereopod 1; C, pereopod 7; D, pleopod 1 and genital papilla; E, pleopod 2; F, pleopod 3 exopod; G, pleopod 4 exopod; H, pleopod 5 exopod.

profrons with deep antennal sockets receiving antennae when the animal rolls up (Fig. 4B). Pereonite 1 with inner lobe of schisma subtriangular with rounded apex, distinctly extending beyond posterior margin of outer lobe (Fig. 4C). Pereonite 2 with a subquadrangular ventral lobe distinctly extending beyond posterior margin of the epimeron (Fig. 4C). Telson hourglass-shaped, about three times as broad as long, with convex basal part and distal part slightly bent outwards (Fig. 4D). Antennule of three articles with two long apical aesthetascs and a tuft of short subapical aesthetascs on the distal article (Fig. 5B). Antenna short and stout, slightly surpassing rear margin of cephalon, second article of flagellum about three times as long as the first, bearing few aesthetascs (Fig. 5C). Mandibles with molar penicil consisting of two plumose setae (Fig. 5D, E); right mandible with 1+1 and left mandible with 2+1 free penicils. Maxillule with outer branch bearing 4+6 (some slightly cleft) teeth; inner branch with two slender penicils (Fig. 5F). Maxilla distally bilobate, with inner lobe distinctly narrower than outer lobe (Fig. 5G). Maxilliped endite with a subapical large seta and three triangular setae on the apical margin; palp 2-jointed with two setae on the basal article (Fig. 5H). Uropodal protopod with enlarged basal part distinctly protruding laterally; exopod very short, inserted dorsally near the medial margin of the protopod (Fig. 6A).

*Male.* Pereiopods without particular modifications (Fig. 6B-C). Pleopod 1 exopod bean-shaped, very small, about three times as broad as long, no visible respiratory structures; endopod with triangular distal part slightly bent outwards, bearing one row of small setae on the caudal face near the medial margin (Fig. 6D). Pleopod 2 endopod distinctly longer than exopod (Fig. 6E). Pleopods 3-5 exopods as in Fig. 6F-H.

*Etymology.* The new species is named for Dr Wolfgang Schawaller, SMNS, who collected the specimens.

*Remarks.* This new species has the smallest number of dorsal tubercles in the whole genus. Its closest morphological affinities are with *T. jubatus*. The cephalon with only one row of six tubercles is similar to that of *T. jubatus* while all other species are provided with two or more rows. Two paramedian tubercles are present on the pleonites 3 and 4 as in *T. jubatus*, while all the other species are provided with four or more tubercles. Pleonite 5 has only one medial tubercle while five are present in *T. celebensis*, four in *T. sarawakensis*, three in *T. borneanus* n. sp., *T. cebuensis* n. sp. and *T. riedeli* n. sp., and none in *T. jubatus*. The telson has no dorsal tubercles as in *T. jubatus* while a central one is present in all other species. The enlarged and protruding basal part of uropodal protopod is similar to that found in *T. cebuensis* n. sp.

### ***Tuberillo cebuensis* n. sp. (Figs 7-9)**

*Material examined.* Philippines: ♂ Holotype, Cebu Island, Camp 7, 700 m, leg. V. Cottarelli, 31.I.1980, MZUF. 1 ♀ Paratype, same data as holotype, MZUF.

*Description.* Maximum length: ♂, 2.3 mm; ♀, 2.8 mm. Pale colour (after preservation in alcohol). Dorsal tubercles are low and disposed as follows (Fig. 7A-

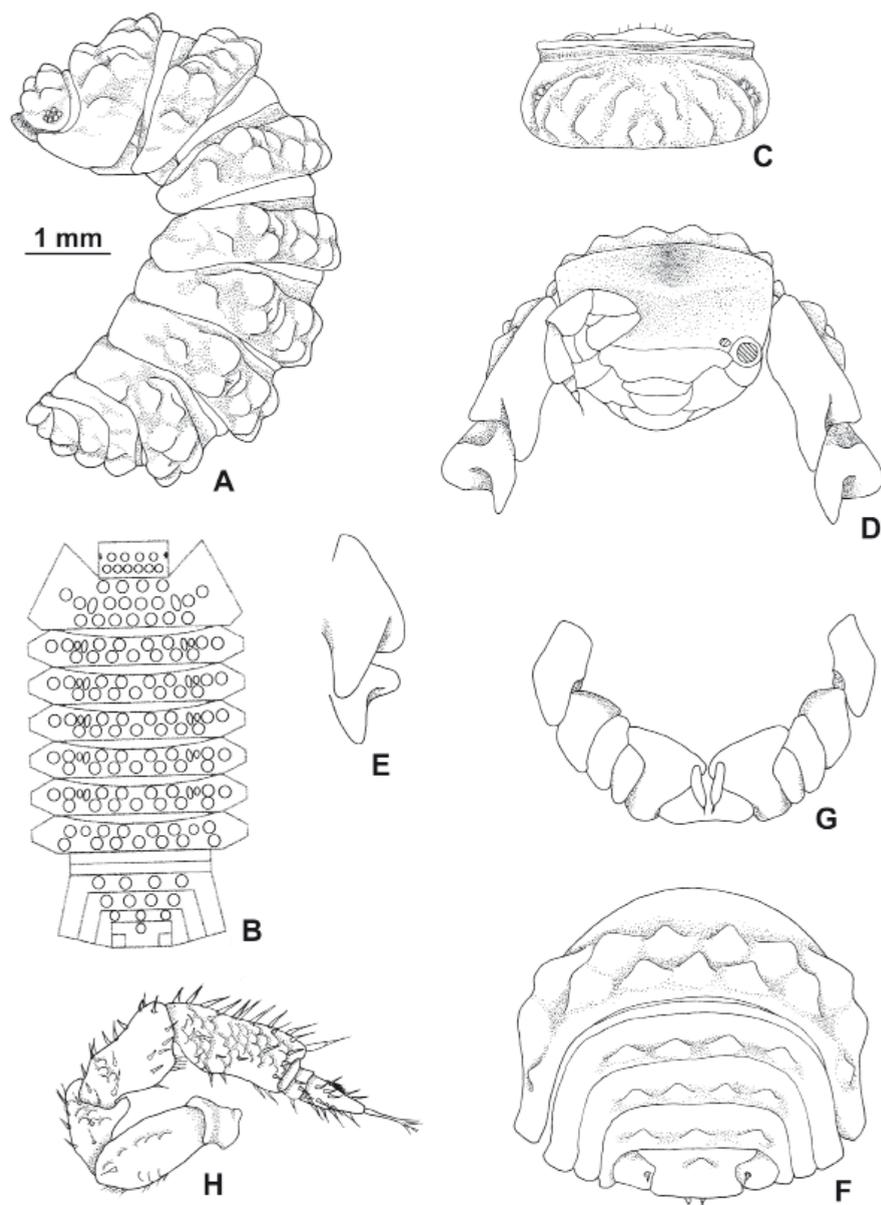


Fig. 7. — *Tuberillo cebuensis* n. sp., paratype ♀: A, animal in lateral view; B, disposition of dorsal tubercles; C, cephalon, dorsal; D, cephalon, frontal; E, epimera of pereionites 1 and 2, ventral; F, pereionite 7, pleon, telson and uropods, dorsal; G, pereionite 7, pleon, telson and uropods, ventral; H, antenna.

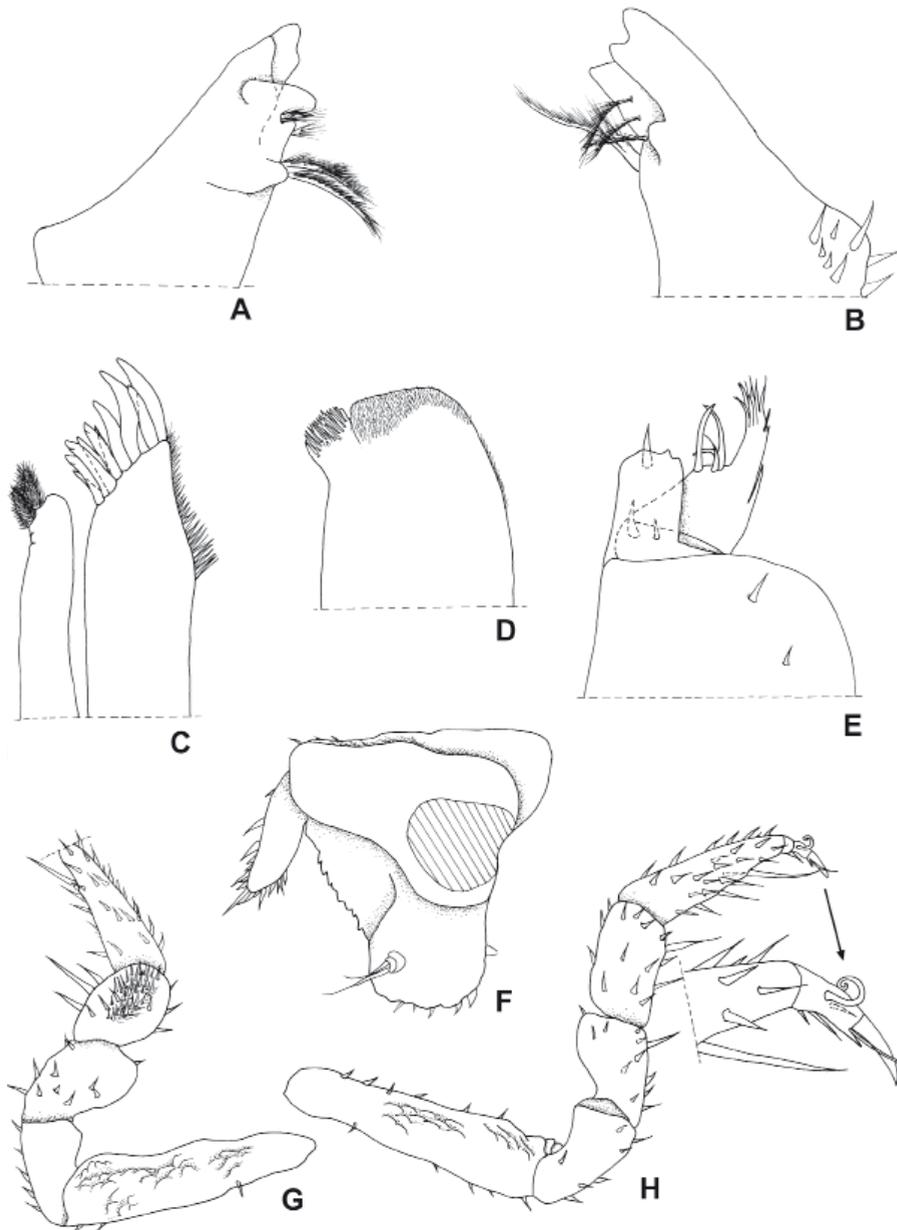


Fig. 8. — *Tuberillo cebuensis* n. sp., paratype ♀: A, right mandible; B, left mandible; C, maxillule; D, maxilla; E, maxilliped; F, uropod. Paratype ♂: G, pereiopod 1; H, pereiopod 7.

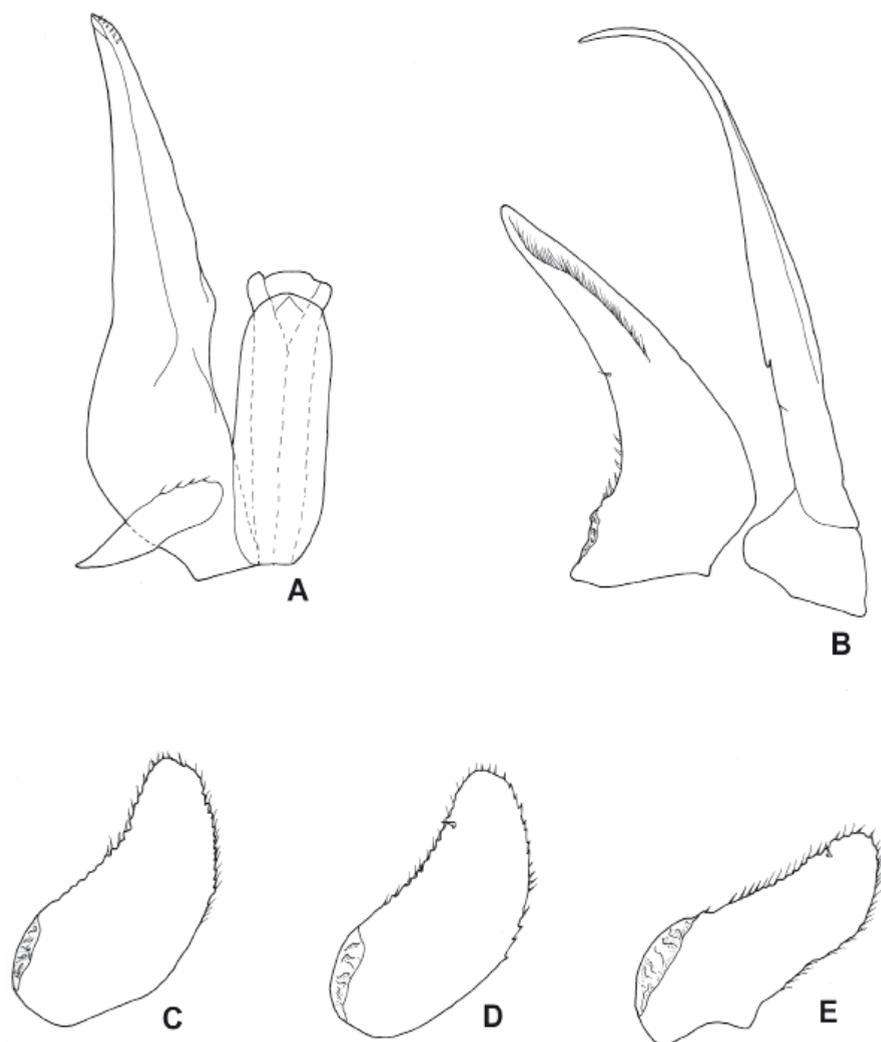


Fig. 9. — *Tuberillo cebuensis* n. sp., holotype ♂: A, pleopod 1 and genital papilla; B, pleopod 2; C, pleopod 3 exopod; D, pleopod 4 exopod; E, pleopod 5 exopod.

B): cephalon with two rows, an anterior one of four tubercles and a posterior one of six; pereionite 1 with three rows of four, 10 and seven tubercles; pereionites 2-6 with two rows of 12 and seven tubercles; pereionite 7 with two rows of eight and seven tubercles; pleonites 3 and 4 with four tubercles each; pleonite 5 with three tubercles; telson with one tubercle in the middle of the basal part. Dorsal cuticle as in the preceding species. Pereionites 1-7 bearing one *nodulus lateralis* per side: on pereionites 1-6, it is located on the frontal face of the first tubercle from the lateral margin of the posterior row; on pereionite 7, it is on the caudal face of the third tubercle of the anterior row. Eye consisting of six large ommatidia. Cephalon with frontal shield distinctly protruding above vertex and slightly concave in the middle (Fig. 7C-D). Pereionite 1 with inner lobe of schisma triangular and distinctly protruding beyond posterior margin of outer lobe; pereionite 2 with a triangular ventral tooth distinctly protruding beyond posterior margin of epimeron (Fig. 7E). Telson hourglass-shaped, three times as broad as long with distal part slightly narrower than the basal part (Fig. 7F). Antenna short and stout with second article of flagellum about four times as long as first, bearing one tuft of some aesthetascs (Fig. 7H). Buccal pieces (Fig. 8A-E) as in the preceding species. Uropodal protopod with basal part very much enlarged; exopod very short, inserted dorsally near the medial margin of the protopod (Figs 7G, 8F).

*Male.* Pereiopods (Fig. 8G-H) without special modifications. Pleopod 1 exopod minute, about four times as long as wide, no visible respiratory structures; endopod with triangular distal part slightly bent outwards, bearing one row of small setae on the caudal surface near the medial margin (Fig. 9A). Pleopod 2 endopod distinctly longer than exopod (Fig. 9B). Pleopods 3-5 exopods as in Fig. 9C-E.

*Etymology.* The name of the new species refers to Cebu Island, Philippines, where the specimens were collected.

*Remarks.* The new species is readily distinguishable from all the other species in the genus by the number and disposition of the dorsal tubercles. In having four tubercles on the pleonites 3 and 4, three on the pleonite 5 and one on the telson, *T. cebuensis* is similar to *T. borneanus* n. sp. and *T. riedeli* n. sp. (see below). It differs from both in the more numerous number of tubercles on the pereionites and the male pleopod 1 exopod with no visible respiratory structures.

### ***Tuberillo borneanus* n. sp. (Figs 10-12)**

*Tuberillo* n. sp.; HASSALL et al. 2006: 202.

*Material examined.* Malaysia: ♂ Holotype, Sabah, Lahad Datu, Danum, 4°58.025'N 117°47.319'E, primary forest, 8.X.2000, leg. Z. Latipi, MZUF. 1 ♀ Paratype: same data as holotype, MZUF; 1 ♀ Paratype, Sabah, 24 km W of Sandakan, Kabili-Sepilok Forest Reserve, forest near "Pond, sifting leaf litter and rotten wood in secondary lowland forest, 23.IV.1982, leg. B. Hauser, MHNG; 1 ♂ Paratype, same locality, 30 m, forest near "Orang-Utan Rehabilitation Station", sifting leaf litter and rotten wood in lowland dipterocarp forest, 3.V.1982, leg. B. Hauser, MHNG.

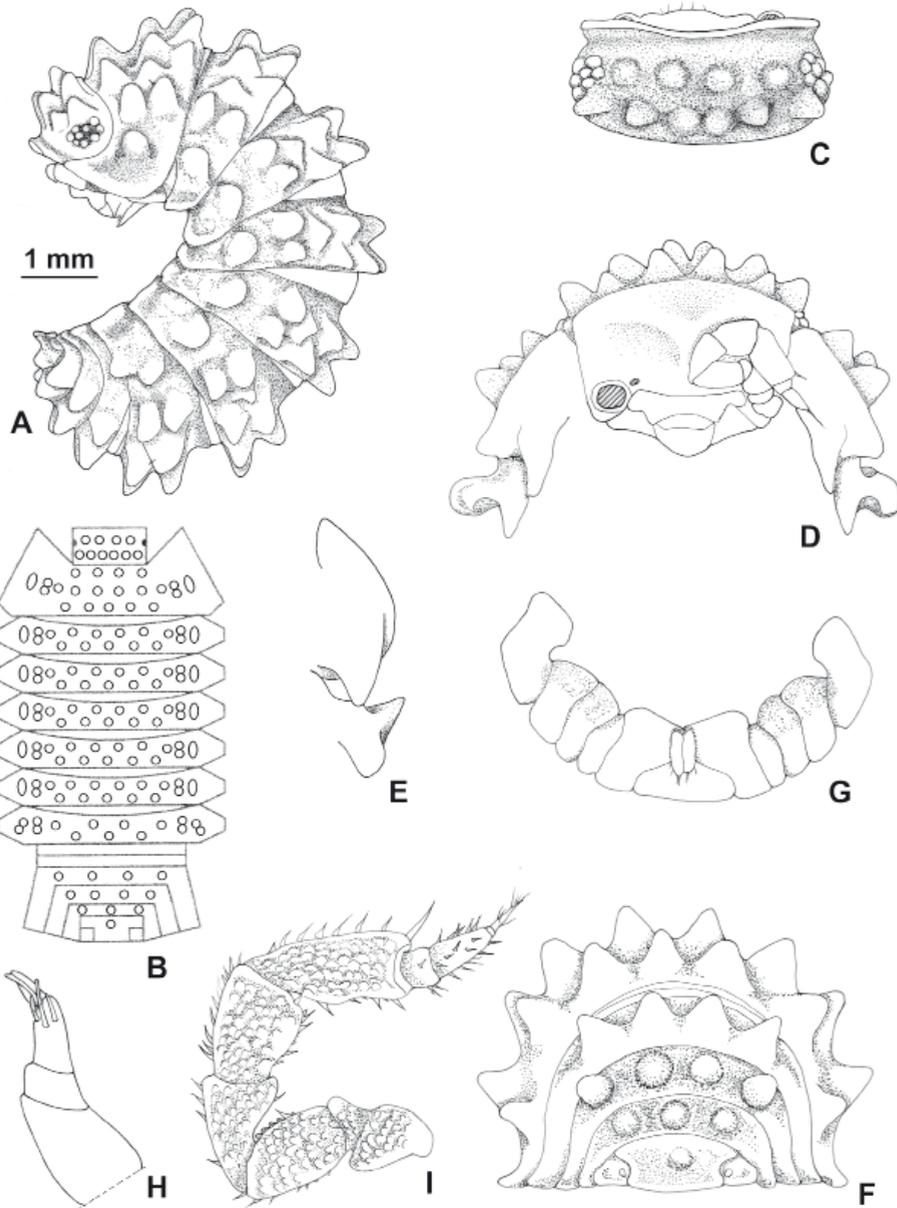


Fig. 10. — *Tuberillo borneanus* n. sp., paratype ♀: A, animal in lateral view; B, disposition of dorsal tubercles; C, cephalon, dorsal; D, cephalon, frontal; E, epimera of pereonites 1 and 2, ventral; F, pereonite 7, pleon, telson and uropods, dorsal; G, pereonite 7, pleon, telson and uropods, ventral; H, antennule; I, antenna.

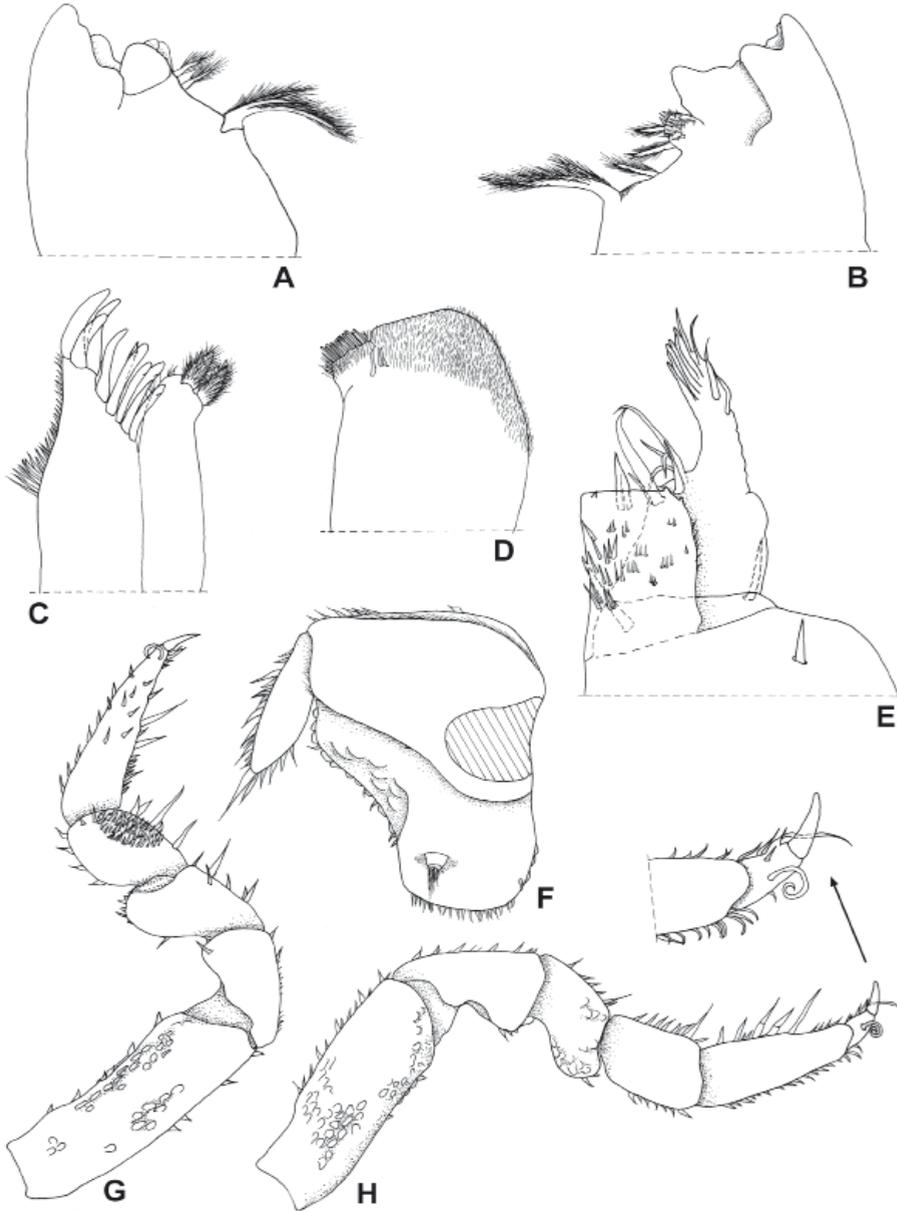


Fig. 11. — *Tuberillo borneanus* n. sp., holotype ♂: A, right mandible; B, left mandible; C, maxillule; D, maxilla; E, maxilliped; F, uropod; G, pereiopod 1; H, pereiopod 7.

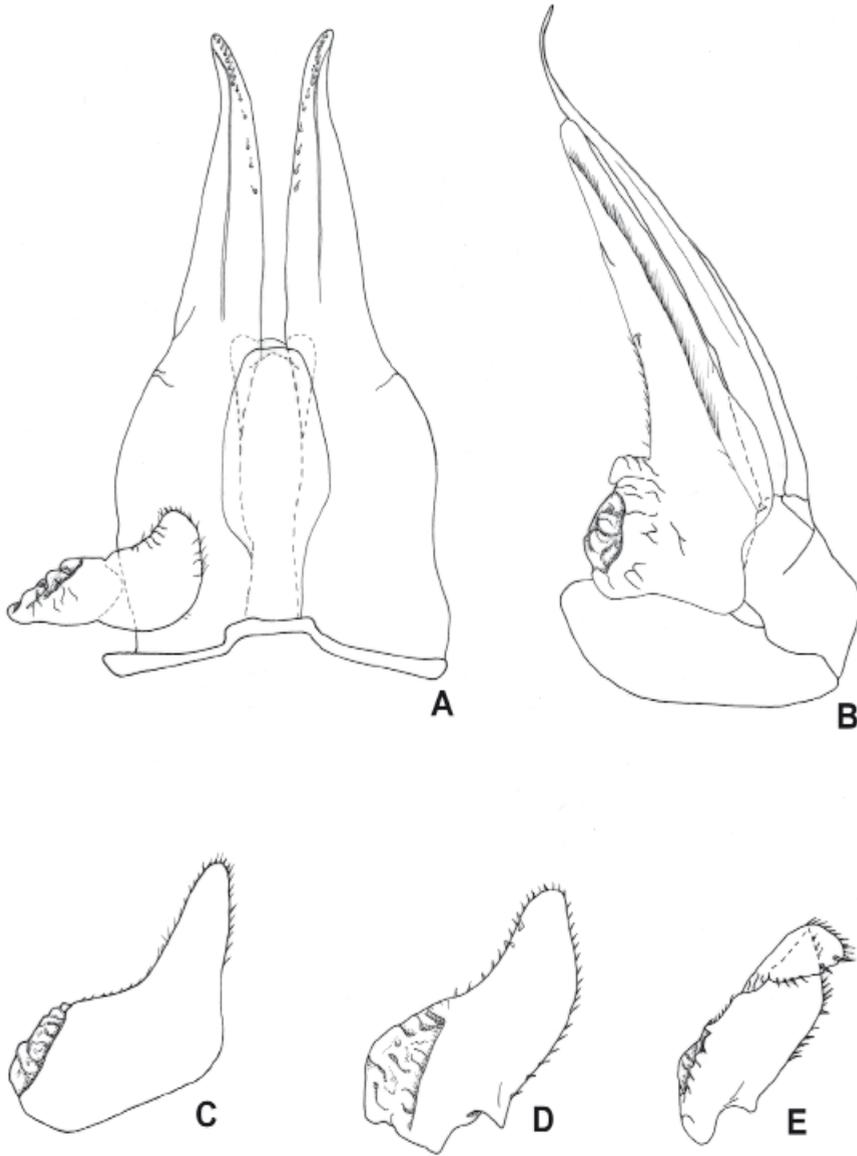


Fig. 12. — *Tuberillo borneanus* n. sp., holotype ♂: A, pleopod 1 and genital papilla; B, pleopod 2; C, pleopod 3 exopod; D, pleopod 4 exopod; E, pleopod 5 exopod.

*Description.* Maximum length: ♂ and ♀, 4 mm. Pale colour (after preservation in alcohol). Dorsum covered with numerous large tubercles (Fig. 10A-B): cephalon with an anterior row of four tubercles and a posterior one of six tubercles; pereionite 1 with three rows of four, 10 and seven tubercles; pereionites 2-6 with two rows of 10 and seven tubercles; pereionite 7 with two rows of eight and seven tubercles; pleonites 3-4 with four tubercles each; pleonite 5 with three tubercles; telson with one tubercle. Dorsal cuticle as in *T. schawalleri*. Pereionites 1-7 bearing one *nodulus lateralis* per side: on pereionites 1-6, it is located on the frontal face of the first tubercle from lateral margin of posterior row; on pereionite 7, it is on the caudal face of the third tubercle of the anterior row. Eye consisting of 8-9 large ommatidia. Cephalon with frontal shield distinctly protruding above vertex and slightly concave in the middle; profrons with antennal sockets receiving antennae when the animal rolls up (Fig. 10C-D). Pereionite 1 with inner lobe of schisma triangular, distinctly protruding beyond posterior margin of outer lobe; pereionite 2 with subquadrangular ventral lobe extending beyond posterior margin of epimeron (Fig. 10E). Telson hourglass-shaped, about twice as broad as long, with distal part slightly bent outwards (Fig. 10F). Antennule of three articles, with two long apical and few subapical aesthetascs on the distal article (Fig. 10H). Antenna short and stout with second article of flagellum about twice as long as first, bearing two aesthetascs (Fig. 10I). Mandibles with molar pencil consisting of 3-4 plumose setae arising from a common stem; right mandible with 1+1 and left mandible with 2+1 free penicils (Fig. 11A-B). Maxillule (Fig. 11C), maxilla (Fig. 11D) and maxilliped (Fig. 11E) as in *T. schawalleri*. All pleopodal exopods with uncovered lungs. Uropodal protopod with basal part not enlarged; exopod very small, inserted dorsally near the medial margin of the protopod (Figs 10G, 11F).

*Male.* Pereiopods with no particular modifications (Fig. 11G-H). Pleopod 1 exopod small, twice as broad as long, with a short rounded posterior point; endopod with distal part slightly bent outwards, bearing one row of small setae on the caudal surface near the medial margin (Fig. 12A). Pleopod 2 endopod distinctly longer than exopod (Fig. 12B). Pleopods 3-5 exopods as in Fig. 12C-E.

*Etymology.* The name refers to Borneo, where the new species occurs.

*Remarks.* *Tuberillo borneanus* is characterized by an eye consisting of 8-9 ommatidia, while all the other species in the genus have between 5 and 7 ommatidia, and by the number and disposition of the dorsal tubercles. Moreover, it differs from *T. sarawakensis*, *T. schawalleri* and *T. cebuensis* in the uropodal protopod not enlarged and protruding laterally, and from *T. riedeli* n. sp. in the male pleopod 1 exopod with a distinct posterior point.

***Tuberillo riedeli* n. sp.** (Figs 13-17)

*Material examined.* Indonesia: ♂ Holotype, North Sulawesi, Tomohan, Rukuran, Gunung Mohawn, 1200 m, leg. A. Riedel, 30.XI.1999, SMNS. 1 ♂, 4 ♀♀ Paratypes, same data as holotype, MZUF; 1 ♂, 15 ♀♀ Paratypes, same data as holotype, SMNS; 1 ♂ Paratype, North Sulawesi, Kotamubagu, Matalibaru, Gunung Tonggara, 800-900 m, leg. A. Riedel, 5-10.XII.1999, SMNS.

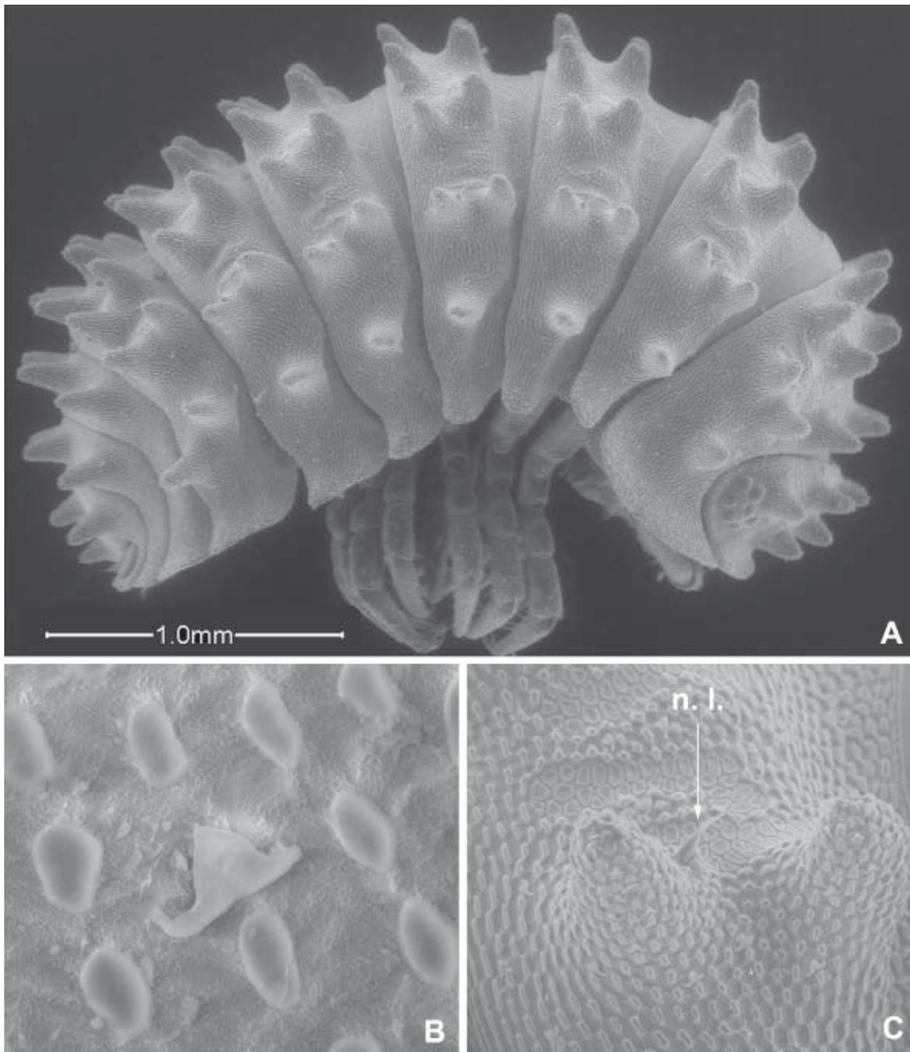


Fig. 13. — *Tuberillo riedeli* n. sp., paratype ♀: A, animal in lateral view; B, cuticular structure and scale-seta; C, tubercles of pereionite 4 with *nodulus lateralis* (n.l.) (SEM).

*Description.* Maximum length: ♂ and ♀, 3.5 mm. Colour dark brown-grey. Dorsum covered with numerous conical tubercles (Figs 13A, 16A) disposed as follows: cephalon with an anterior row of four tubercles and a posterior row of six tubercles; pereionite 1 with three rows of four, eight and seven tubercles; pereionites 2-6 with two rows of eight and seven tubercles; pereionite 7 with two rows of eight and nine tubercles; pleonites 3 and 4 with four tubercles each;

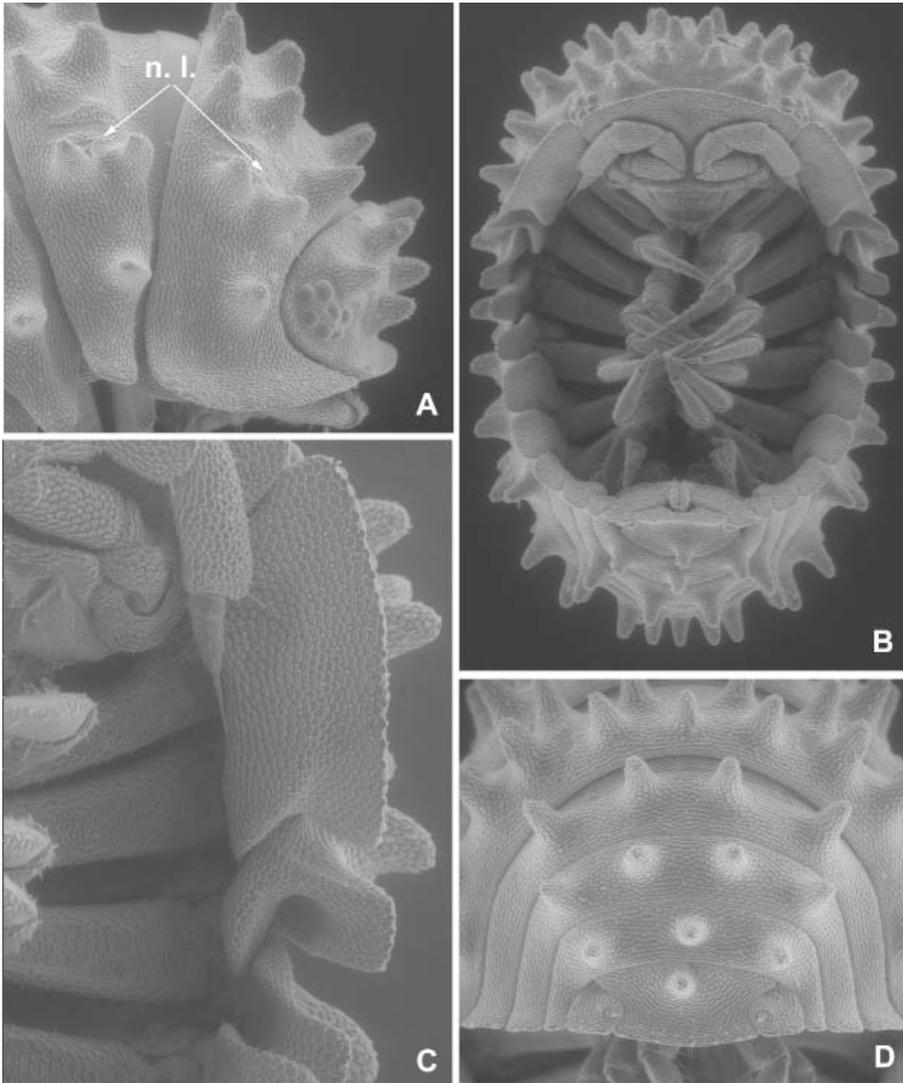


Fig. 14. — *Tuberillo riedeli* n. sp., paratype ♀: A, pereionites 1 and 2, lateral; B, animal in ventral view; C, pereionites 1 and 2, ventral; D, pleon, telson and uropods, dorsal (SEM).

pleonite 5 with three tubercles; telson with one tubercle in the middle of the basal part. Dorsal cuticle with oval verruca-like prominences and numerous tiny triangular scale-setae (Fig. 13B). Pereionites 1-7 bearing one *nodulus lateralis* per side (Fig. 13C): on pereionites 1-6, it is located on the frontal face of the first tubercle of the posterior row; on pereionite 7, it is on the caudal face of the third tubercle of the posterior row. Eye consisting of seven large ommatidia (Fig. 14A). Cephalon with frontal shield clearly protruding above vertex and slightly concave

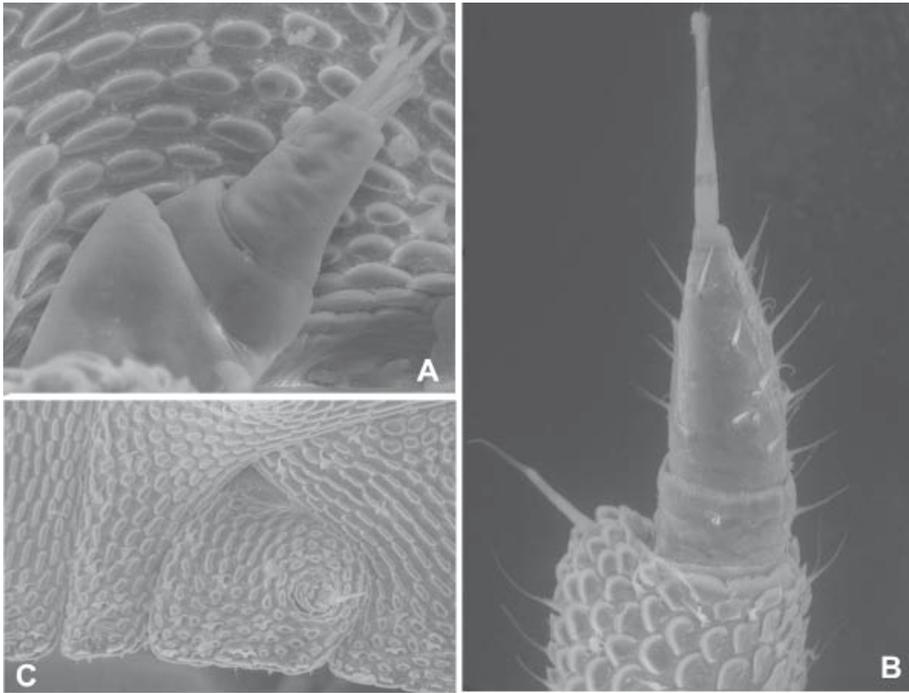


Fig. 15. — *Tuberillo riedeli* n. sp., paratype ♀: A, antennule; B, antennal flagellum; C, left uropod (SEM).

in the middle; profrons with very deep antennal sockets receiving antennae when the animal rolls up (Fig. 14B). Pereionite 1 with inner lobe of schisma rounded and slightly protruding beyond posterior margin of outer lobe; pereionite 2 with triangular ventral lobe clearly protruding beyond the caudal margin of the epimeron (Fig. 14A, C). Telson hour-glass shaped, about twice as broad as long, with distal part slightly bent outwards (Fig. 14D). Antennule of three articles with a tuft of aesthetascs at the apex (Fig. 15A). Antenna with second article of flagellum about three times as long as the first, bearing one row of three aesthetascs (Figs 15B, 16B). Mandibles with molar penicil consisting of four plumose setae; right mandible with 1+1 and left mandible with 2+1 free penicils (Fig. 16C-D). Maxillule outer branch with 4+5 teeth; inner branch with two penicils (Fig. 16E). Maxilla distally bilobate, with inner lobe distinctly narrower than outer lobe (Fig. 16F). Maxilliped endite with a large subapical seta and two triangular spines on the apical margin; palp 2-jointed, with the basal article bearing 2 large setae (Fig. 16G). Uropodal protopod not enlarged; exopod very short, inserted dorsally near the medial margin of the protopod (Figs 15C, 17A).

*Male.* Pereiopods with no particular modifications (Fig. 17B, C). Pleopod 1 exopod very small, about twice as broad as long, with subquadrangular medial part; endopod with distal part slightly bent outwards, bearing one row of small setae on the caudal surface near the medial margin (Fig. 17D). Pleopod 2 endopod longer than exopod (Fig. 17E). Pleopods 3-5 exopods as in Fig. 17F-H.

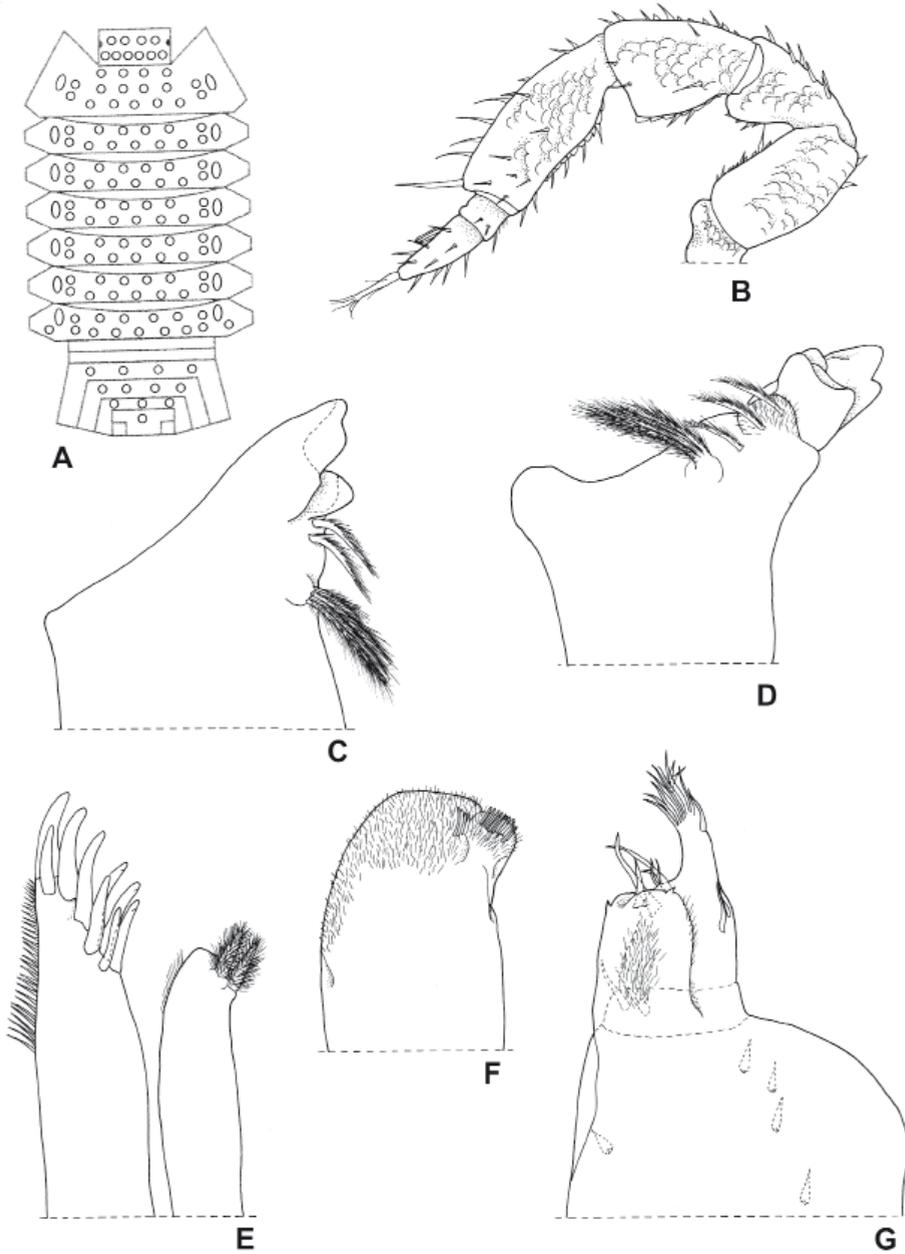


Fig. 16. — *Tuberillo riedeli* n. sp., paratype ♂: A, disposition of dorsal tubercles; B, antenna; C, right mandible; D, left mandible; E, maxillule; F, maxilla; G, maxilliped.

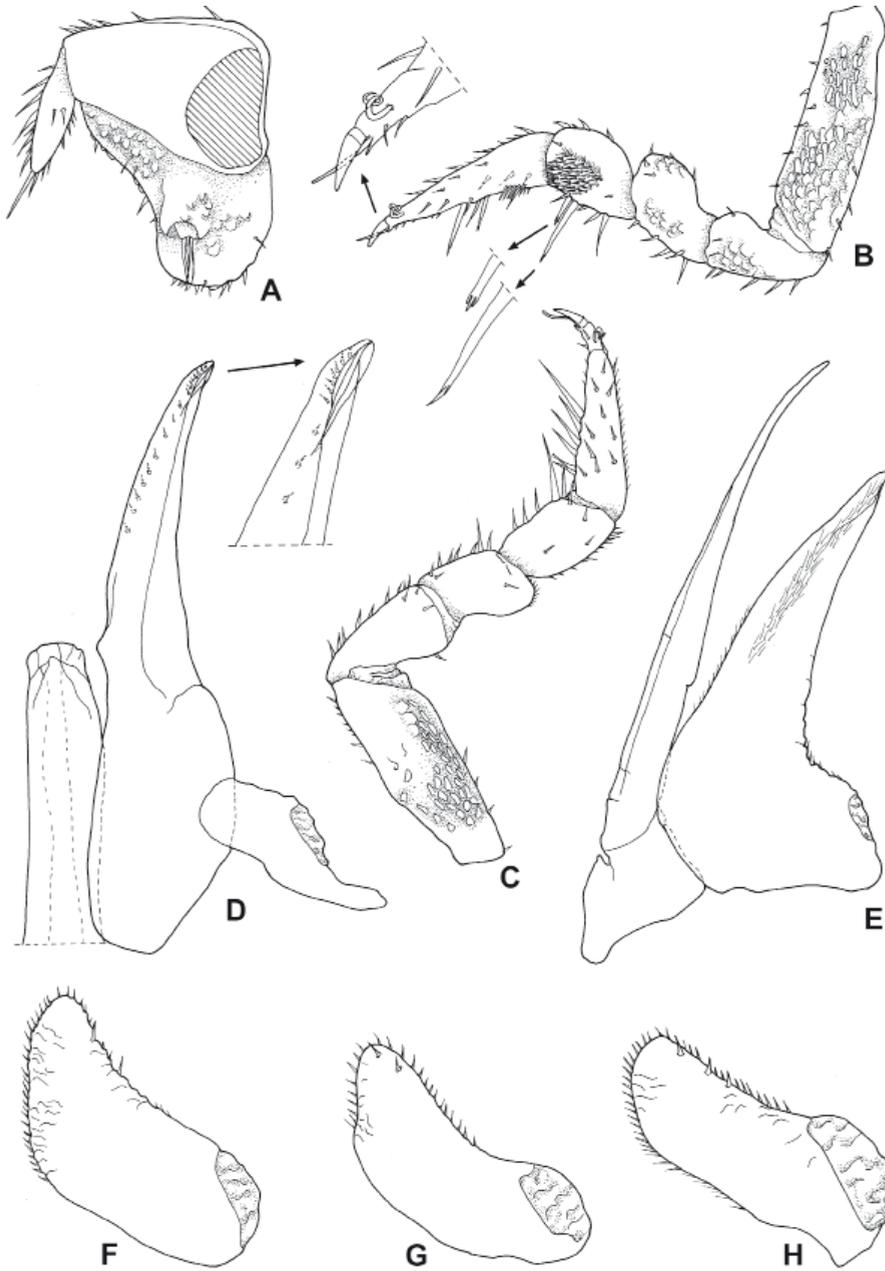


Fig. 17. — *Tuberillo riedeli* n. sp., paratype ♂: A, uropod; B, pereiopod 1; C, pereiopod 7; D, pleopod 1 and genital papilla; E, pleopod 2; F, pleopod 3 exopod; G, pleopod 4 exopod; H, pleopod 5 exopod.

*Etymology.* The new species is named for Dr Alexander Riedel, Karlsruhe, who collected the specimens.

*Remarks.* *Tuberillo riedeli* differs from all the other species by the dark pigmentation and the number and disposition of the dorsal tubercles. In the disposition of tubercles on the cephalon and pleon, it is similar to *T. borneanus* from which it differs in having two tubercles less on each pereionite.

KEY TO THE SPECIES OF *TUBERILLO*

1	Pleonite 3 with two tubercles (Figs 2C, E; 4D) .....	2
—	Pleonite 3 with four or more tubercles (Fig. 1B).....	3
2	Pereionites 1-6 with the outer tubercles bifid (Figs 3A, 5A).....	
	..... <i>T. schawalleri</i>	
—	Pereionites 1-6 with the outer tubercles not bifid (Fig. 2A, C) .....	
	..... <i>T. jubatus</i>	
3	Cephalon with two rows of tubercles, an anterior one of four and a posterior one of six tubercles (Figs 7B-C, 10B-C, 16A); pleonite 5 with three tubercles (Figs 7B, F; 10B, F; 14D; 16A) .....	4
—	Cephalon with a different arrangement of tubercles (Fig. 1B-C; fig. 30b in TAITI et al. 1992); pleonite 5 with four or more tubercles (fig. 30g in TAITI et al. 1992) .....	6
4	Pereionites 2-6 with 19 tubercles (Fig. 7B); uropodal protopod with basal part enlarged (Fig. 8F) .....	
—	Pereionites 2-6 with 17 or 15 tubercles (Figs 10B, 16A); uropodal protopod with basal part not enlarged (Figs 11F, 17A) .....	5
5	Pereionites 2-6 with 17 tubercles (Fig. 10B); eye consisting of eight ommatidia; male pleopod 1 exopod with a distinct posterior point (Fig. 12A).....	
—	Pereionites 2-6 with 15 tubercles (Fig. 16A); eye consisting of seven ommatidia; male pleopod 1 exopod with no posterior point (Fig. 17D) .....	
	..... <i>T. borneanus</i>	
6	Eye consisting of five ommatidia; male pleopod 1 exopod with a triangular posterior point (fig. 13H in SCHULTZ 1982) .....	
—	Eye consisting of seven ommatidia; male pleopod 1 exopod without triangular posterior point (fig. 32d in TAITI et al. 1992) .....	
	..... <i>T. sarawakensis</i>	
	..... <i>T. celebensis</i>	

ACKNOWLEDGEMENTS

We wish to thank the following people for the loan of the materials and facilities provided during visits to their institutions: Dr H. Schmalfuss (SMNS), Ms M. Lowe (BMNH), Dr C.O. Coleman (ZMB), and Dr B. Hauser (MHNG). We thank also Mr Z. Latipi and the Tropical Biology and Conservation Institute, University of Malaysia Sabah for the material collected in the Danum Valley. Dr C. Giordano (CeME-CNR, Florence) and Dr I. Checcucci (ISE-CNR, Florence) are

particularly acknowledged for helping us with SEM and drawings, respectively. A visit by S. Taiti to the ZMB in 2005 was made possible by an European Union grant under the SYNTHESYS Project.

## REFERENCES

- HASSALL M., JONES D.T., TAITI S., LATIPI Z., SUTTON S.L. & MOHAMMED M. 2006. Biodiversity and abundance of terrestrial isopods along a gradient of disturbance in Sabah, East Malaysia. *European Journal of Soil Biology* 42 (Supplement): 197-207.
- HEROLD W. 1931. Land-Isopoden von den Sunda-Inseln. Ausbeuten der Deutschen Limnologischen Expedition und der Sunda-Expedition Rensch. *Archiv für Hydrobiologie, Supplement* 9: 306-393.
- SCHMALFUSS H. 2003. World catalog of terrestrial isopods (Isopoda: Oniscidea). *Stuttgarter Beiträge zur Naturkunde (A)* 654: 1-341.
- SCHULTZ G. 1982. Terrestrial isopod crustaceans (Oniscoidea) from Mulu Caves, Sarawak, Borneo. *Journal of Natural History* 16: 101-117.
- TAITI S., FERRARA F. & KWON D. 1992. Terrestrial Isopoda from the Togian Islands, Sulawesi, Indonesia. *Invertebrate Taxonomy* 6: 787-842.
- TAITI S., PAOLI P. & FERRARA F. 1998. Morphology, biogeography, and ecology of the family Armadillidae (Crustacea, Oniscidea). *Israel Journal of Zoology* 44: 291-301.

