MARQUESAN TERRESTRIAL ISOPODA *

By

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INTRODUCTION

The collection of terrestrial isopods made by the Pacific Entomological Survey so far examined by me is of particular interest, as, up to the present, no species of woodlouse has been recorded from the Marquesas or Society Islands. Exploration of the Polynesian groups cannot be said to have more than commenced, although certain areas relevant to the present investigation have received some attention. One would particularly mention the important monograph by Verhoeff [1] on forms from New Caledonia and the Loyalty Islands. Stebbing [2] has reported on a collection from New Britain, New Guinea, and the Loyalty Islands; I have studied a small collection from the Samoan Islands [3]; and there are sporadic records by Dana [4] and Budde-Lund [5] from other localities.

Further afield, but still of interest regarding the fauna of these islands, is the work of Wahrberg [6] on Australia, Chilton on New Zealand and the Kermadec Islands, and numerous authors on the Dutch East Indies and Malay Peninsula.

The present collection from the Marquesas and Society Islands contains the following species, all, of course, new records for the locality, and five of them new: *Ligia vitiensis* Dana, *Philoscia (Setaphora) truncata* Dollfus, *Philoscia (Setaphora) fasciata,* new species, *Alloniscus oahuensis* Budde-Lund, *Porcellionides pruinosus* (Brandt), *Porcellio (Mesoporcellio) laevis* Latreille, *Porcellio (Heminagara) tahitiensis,* new subgenus, new species, *Spherillo (Spherillo) montivagus* Budde-Lund, *Spherillo (Spherillo) testudinalis* Budde-Lund, *Spherillo (Spherillo) pygmaeus* Verhoeff, *Spherillo (Xestodillo) marquesarum,* new species, *Cubaris murinus* Brandt, *Echinodillo montanum,* new genus, new species, and *Tridentodillo squamosus,* new genus, new species.

All of the above were collected in the Marquesas, with the single excep-

[1] Verhoeff, K. W., Isopoda terrestria von Neukaledonien und den Loyalty-inseln: Sarasin und Roux, Nova Caled. Zool., vol. 4, pt. 2, 1926.

[2] Stebbing, T. R. R., Crustacea: Willey's Zool. Results, pt. 5, 1900.

[3] Jackson, H. G., Isopoda Terrestria: Insects of Samoa, pt. 8, fasc, 1, 1927.

[4] Dana, J. D., Crustacea, U. S. Expl. Exp., vol. 13, pt. 2, 1852.

[5] Budde-Lund, G., Crustacea Isopoda Terrestria, Copenhagen, 1885; Isopoda von Madagaskar und Ostafrika . . . : Voeltzkow, Reise in Ostafrika in den Jahren 1903-1905, Bd. 2, 1908.

[6] Wahrberg, R., Terrestrische Isopoden aus Australien: Arkiv. f. Zool., Bd. 15, no. 1, 1922.

* Pacific Entomological Survey Publication 7, article 10. Issued September 15, 1933.

tion of *Porcellio (Heminagara) tahitiensis,* which was found only in Tahiti. The Tahitian collection, which will form the subject of a separate report, contained five species: *Spherillo montivagus, S. marquesarum, Cubaris murinus, Porcellio tahitiensis,* and *Philoscia fasciata.*

I would like to express my appreciation of the kindness of Mr. E. P. Mumford, the Director of the Pacific Entomological Survey, in allowing me to report on this most interesting collection, and to Mr. R. B. Brook-Greaves for his most able assistance in the preparation of the figures illustrating this paper.

DISTRIBUTION

The specimens recorded above occurred among the Marquesas Islands as is shown in the following table. The known distribution of the species is given after the name. Of these species, four are new: *Tridentodillo squamosus, Philoscia (Setaphora) fasciata, Echinodillo montanum* and *Spherillo marquesarum.*

Eiao	
Ligia vitiensis	Fiji, British New Guinea
Cubaris murinus	Pacific
Porcellionides pruinosus	Cosmopolitan
Nukuhiva	
Spherillo testudinalis	Asiatic and Australian Islands, Samoa
Spherillo pygmaeus	New Caledonia
Cubaris murinus	Pacific, etc.
Tridentodillo squamosus	Marquesas
Porcellio laevis	Cosmopolitan
Porcellionides pruinosus	Cosmopolitan
Philoscia (Setaphora) fasciata	Marquesas and Society Islands
Philoscia (Setaphora) truncata	Celebes, Formosa, Hongkong, Japan, New Britain, Shanghai, Sunda Islands
Uahuka	
Spherillo montivagus	Australia, Samoa
Cubaris murinus	Pacific
Echinodillo montanum	Marquesas
Alloniscus oahuensis	"Indes," Comoro Island, Samoa
Philoscia (Setaphora) fasciata	Marquesas and Society Islands
Uapou	
Cubaris murinus	Pacific
Spherillo montivagus	Australia, Samoa
Spherillo marquesarum	Marquesas and Society Islands
Philoscia (Setaphora) truncata	Celebes, Formosa, Hongkong, Japan, New Britain, Shanghai, Sunda Islands
Hivaoa	
Spherillo montivagus	Australia, Samoa
Cubaris murinus	Pacific
Porcellionides pruinosus	Cosmopolitan
Alloniscus oahuensis	"Indes," Comoro Island, Samoa
Philoscia (Setaphora) fasciata	Marquesas and Society Islands

Tahuata	
Philoscia (Setaphora) fasciata	Marquesas and Society Islands
Mohotani	
Cubaris murinus	Pacific
Porcellionides pruinosus	Cosmopolitan
Alloniscus oahuensis	"Indes," Comoro Island, Samoa
Fatuhiva	
Philoscia (Setaphora) truncata	Celebes, Formosa, Hongkong, Japan, New Britain, Shanghai, Sunda Islands
Philoscia (Setaphora) fasciata	Marquesas and Society Islands
Cubaris murinus	Pacific
Fatuuku	
Porcellionides pruinosus	Cosmopolitan

It will be noted that such forms as are not peculiar to the Marquesas Islands or of universal distribution are related to the islands lying to the west of this group; no one is also found in the Hawaiian Islands. The species recorded vary greatly in abundance. In the nine islands on which collections were taken, *Cubaris murinus* occurred in 7 islands, *Philoscia fasciata* in 5 islands, *Spherillo montivagus* in 3 islands, *Porcellionides pruinosus* in 5 islands, *Alloniscus oahuensis* in 3 islands, *Spherillo marquesarum* in 1 island, *Philoscia truncata* in 3 islands, the remainder in one island each.

The ubiquitous *Porcellionides pruinosus* is thus the only non-Pacific form to be generally distributed; the remainder of the commoner forms are peculiar to Polynesia. *Cubaris murinus,* a common form in tropical countries, was in number of individuals and wideness of distribution by far the most common, although the endemic *Philoscia fasciata* runs it close.

The distribution in height is of interest, as woodlice have been rarely recorded from such high altitudes. Of the four endemic species of the Marquesas, *Tridentodillo squamosus* occurred at 3800-4000 feet, *Echinodillo montanum* at 2900 feet, *Spherillo marquesarum* at 1800-2700 feet, and the only species which was found at low altitudes and throughout the whole range was *Philoscia fasciata* which began at 100 feet and extended to 3800 feet.

The greatest height reached by species of wide distribution was 1600 feet by *Porcellionides pruniosus*; *Cubaris murinus* also stopped at the same altitude.

Spherillo pygmaeus and *Spherillo testudinalis,* the former recently described from New Caledonia, the latter of wide tropical distribution, were found at the considerable elevation of 4000 feet, but not intermedially. It seems likely that this is a mere freak of collecting without significance, but it is also open to the interpretation that these species are moving towards extinction in the islands.

It is of interest to note that, with the exception of *Philoscia fasciata,* all

specimens collected above 1600 feet belong to the armadillid type of organization, and that the two grotesque spiny forms were only found at the great heights of 2900-4000 feet. Are the latter gerontic forms which have found a last refuge on the heights of these inaccessible islands?

NOMENCLATURE

The large number of woodlice with highly developed powers of conglobation related to the "Spherillo-Armadillo" complex which occur in any collection from the Pacific make it desirable to define the attitude an investigator of such a collection takes to the tangled nomenclature. I propose to follow Budde-Lund, Dollfus, Verhoeff, and most of the more voluminous writers on the group in using the name *Armadillo* as the generic name of the group of species whose type is *A. officinalis* Duméril and Armadillinae for the subfamily containing it.

The question of the validity of this generic name was discussed fully, but not exhaustively, by Stebbing,[7] and it is unnecessary to recapitulate his arguments as there can be no doubt that, by all rules of nomenclature, the name is invalid several times over. Even if Stebbing is right in his contention that it is pre-occupied by a mammal (which is more than doubtful) it was undoubtedly first clearly proposed by Cuvier in 1792 for species of millipedes which Latreille in 1802 transferred to *Glomeris,* a genus of his own creating. It has priority, therefore, as the name of a genus of millipedes and not of Crustacea, and Latreille, who sinned in renaming it, did so yet again when in 1804 he employed the name *Armadillo* for a genus of terrestrial isopods.

However, he was not allowed to keep the name in the sense in which he proposed it, as Brandt in 1833 in the first critical work of real systematic value on the Oniscoidea, created *Armadillidium,* which he defined in terms which include Latreille's *Armadillo,* and used the name *Armadillo* for a species which had first received perfunctory mention under the style *Armadillo officinalis* in a dictionary by Duméril, published in 1804, the same year as Latreille's contribution to Buffon. He seems unaware of Latreille's two species of *Armadillo* which were included by Milne Edwards in 1840 under *Armadillidium* Brandt. In the sense in which it was used by Brandt, *Armadillo* has stubbornly retained its place, in spite of the overwhelming case against it.

If we seek for a substitute we at once encounter difficulties.

Brandt set up a section Cubaridea in opposition to Armadillidea (containing *Armadillidium*) and included in it the genera *Cubaris* (type *murinus*), *Armadillo* (type-*officinarum* = *officinalis* Duméril) and *Diploexochus* (type-*echinatus*). All these are perfectly good genera today, and it seems a retro-

[7] Stebbing, T. R. R., Crustacea: A. Willey's Zool. Results . . . 1895, 1896, 1897, pt. 5, p. 650. 1900.

grade step to replace *Armadillo* by *Cubaris,* as some authors have done, when the two genera are indubitably distinct. If a sacrifice must be offered to priority it would be better to follow Barnard's suggestion [8] and use Koch's *Pentheus* (1840) for the *"officinalis"* section.[9]

It would be better still if the whole matter were allowed to rest and the perfectly understood genus *Armadillo* were whitewashed of its past by the international commission and its use were to be continued in the sense in which it has been used since Brandt by all the more important writers on the group. There was no confusion in the nomenclature until some modern authors began to use *Cubaris* as a synonym for *Armadillo,* which it is not, and only further confusion would be caused by resurrecting the still-born *Pentheus* and attempting to substitute it for *Armadillo.*

In this paper I have made use of the genera proposed by Verhoeff in 1926, but I am not satisfied that these are entirely satisfactory or will stand detailed scrutiny. Barnard is probably right in considering that the articulating lappets, on which the system is primarily founded, do not constitute a real guide to affinity; but it is a convenient character and easy to follow. Most of these genera seem to be carved out of Budde-Lund's composite genus *Spherillo,* but one at least falls under the *Armadillo* group with slender penicilli on the maxilla. I have below identified *Nesodillo medius* Verhoeff with *Cubaris murinus* Brandt so that *Nesodillo* must be abandoned in favor of *Cubaris.* It should also be noted that *Sphaerillo* Verhoeff = *Spherillo* Dana and Dana's spelling of the genus must take precedence.

Family LIGIIDAE

Ligia vitiensis Dana (fig. 1).

Lygia vitiensis, Dana, Crustacea, U. S. Expl. Exp. vol. 13, pt. 2, p. 741, 1853.

Ligia vitiensis, Budde-Lund, Crustacea Isopoda Terrestria, p. 271, 1885; Stebbing, Crustacea, A. Willey's Zool. Results, pt. 5, p. 646, 1900.

Ligia hawaiensis, Jackson, Zool. Soc. London, Proc., p. 696, 1922.

A number of well-preserved specimens of both sexes of a species of *Ligia* were collected by A. M. Adamson at Vaituha, Eiao, from "wet rocks at base of waterfall, 200 feet," which had a general resemblance to *Ligia hawaiensis.* In 1922 I decided, on the specimens at my disposal, that *L. vitiensis* Dana was a synonym of *L. hawaiensis* Dana, but on examining these specimens I am inclined to lay more stress on the points of difference than formerly and conclude that Dana was right in placing his incomplete specimen from the "Feejees" as a separate species. I withdraw, therefore, my synomym

[8] Barnard, K. H., Terrestrial Isopoda: South African Museum, Ann., 30, pt. 2, 1932.

[9] Since the above was set up I have received from Prof. Alceste Arcangeli (Bull. di Zool. III, 3, p. 123, 1932) a detailed discussion of the question of the validity of *Armadillo* which supports the plea for the retention of the name which I have put forward here.

and reconstitute the species *L. vitiensis* as a good one. The points of difference Dana mentions are well marked in these specimens and may be tabulated, with others, as follows:

LIGIA VITIENSIS	LIGIA HAWAIENSIS
Surface quite smooth.	Surface minutely granular.
Antennal flagellum (male) reaching to hind border of last thoracic tergite; 28 moderately stout segments.	Reaching to hind border of third abdominal tergite; 30 long segments.
Coxal plates (male) very faintly marked on all segments; (female) deep and well marked on all segments.	Coxal plates (male) scarcely if at all separate; (female) deep on second and third somites, but exceedingly faint on others.
Abdomen not contracted; postero-lateral angles drawn back sharply.	Abdomen abruptly contracted; postero-lateral angles little produced.
Telson fully twice as broad as long; postero-lateral processes acute and moderately long, reaching nearly to level of accessory processes.	Telson not twice as broad as long; postero-lateral processes acute but short, not nearly approaching in length level of accessory processes.
Uropod propos with tooth on outer distal border; endopod with long horny terminal spine.	Uropod propos without tooth; endopod without horny spine.
Distribution: Fiji, New Guinea, Marquesas.	Distribution: Hawaii.

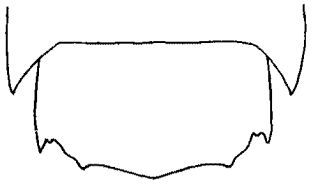

FIGURE 1. Telson of *Ligia vitiensis*.

It is of interest to note that Stebbing's specimens from British New Guinea were obtained "from face of cliff with fresh water species, far above tide mark," which agrees well with the habitat of these specimens from Vaituha, Eiao.

FAMILY ONISCIDAE

SUBFAMILY ONISCINAE

Philoscia (Setaphora) truncata Dollfus.

Fatuhiva: Hanavave Valley; Ihiota, altitude 410 and 450 feet, September 10, 1930; Teaotu, altitudes 100 and 1000 feet, September 9, 1930; Punahitahi, altitude 650 feet, August 18, 1930; Ahuava, altitude 1840 feet, August 19, 1930, LeBronnec.

Nukuhiva: Vaiotekea, altitude 2700 feet, 1200 feet, August 6, 1931, LeBronnec and Tauraa.

Uapou: Vaikokoo, Paaumea Valley, in log of *Hibiscus tiliaceus,* altitude 1850 feet, October 20, 1931, LeBronnec.

This species has been widely recorded from the Malay Peninsula and it is not surprising that it should be found on the islands of the Pacific. The specimens here recorded approach *S. notabilis* Herold [10] in the shape of the first pleopod of the male and the form of the telson, but I prefer to retain Dollfus' name as I am not satisfied that the differences are not due to the variability of the species, which was expressly remarked on by the author of the species. Herold's figure of *S. truncata baliensis* does not agree with Dollfus' original figures of his own species and the first pleopod of the male figured by Arcangeli [11] as belonging to *S. truncata* is intermediate between that figured by Herold for *S. truncata* and *S. notabilis.* Dollfus' dsecription lacks many of the characters which a modern systematist would rely on, and in the circumstances I feel that the matter cannot be finally settled without a new critical examination of Dollfus' type specimens.

Philoscia (Setaphora?) fasciata, new species (fig. 2, *a-j*).

Length, male 4.5 mm., female 5.5 mm.; breadth, male 1.5 mm., female 2 mm.

Shape, elongate-oval. Surface, very smooth and shining.

Head discrete; eyes prominent but not large, 16 ocelli. Supra-antennal line well marked, sinuate between antennal sockets, probably confluent with marginal lines. Postfrons slightly convex but without tubercle. Lateral processes of clypeus narrow and long. The head is in general form typical of the genus.

Thorax. Tergites I to IV nearly transverse hind margins, remainder slightly concave. Posterolateral angles of VII nearly rectangular, not produced and scarcely exceeding second abdominal somite. Glands very weak or absent.

Abdomen. Epimera somewhat adpressed. Posterolateral angles visible from above but very weakly developed. Very abruptly contracted. Telson almost arcuate, median angle broadly rounded, sides slightly notched at base of uropod, sides free from last somite. About ⅓ length of thorax.

Appendages. Antenna very slender; flagellal segments equal, or third slightly longer, about equalling in length fifth segment, reaching to hinder border of tergite of V thoracic tergite in both male and female. Mandibles: right penicilli 1 + 1; left penicilli 1 + 2. Inferior seta slender. Maxillula: outer endite, 4 + 6 (1, 3, 4, 6 bifurcate, 2, 5 simple and slender), inner endite, minute spine, two long and bushy penicilli. Maxilla: outer lobe lamellate, bordered with exceedingly fine setae; inner lobe abrupt, moderately setose; three stout bristles between the two. Maxillipede: endite with two thornlike sessile spines on outer side of distal margin, one small spine on face, margin very minutely and sparsely setose; outer lobe of base with groups of minute setae set in rows. Pleopoda: distal border of first exopod of male slightly curved, endopod with row of small spines on outer side of point. Uropod: protopod massive and greatly exceeding telson, very shallow canal on outer border; exopod lanceolate, deeply caniculate externally, about twice length of protopod; endopod set behind exopod, laterally compressed, reaches about halfway up exopod, but its entire length is about ¾ exopod.

Color (in spirit). Hind border of each tergite of thorax and coxal plates dark purple brown, front of tergite yellow; above each coxal plate prominent longitudinal

[10] Herold, Werner, Land-Isopoden von den Sunda-Inseln: Arch. für Hydrobiologie, Suppl. Bd. ix, Bd. II, 1931.

[11] Arcangeli, A., Isopodi terrestri raccolti nell' Estremo Oriente: Lab. di Zool. gen. agr., Boll., vol. 20, 1927.

yellow stripe; posterolateral corners of each thoracic tergite white; first tergite of abdomen dark, second and third yellow except for narrow border of pigment; except for an incomplete median and lateral yellow stripes the remainder of the abdomen is dark. Head mottled on vertex; profrons and clypeus dark; antennae dark. Lower surface of body yellow, brown patches on ischios of each leg, pleopods brown. The general impression, to the eye, of the entire animal is that of strong zebra-like brown and yellow striping. The coloring given above applies particularly to the male and young female, the older females becoming more uniformly pigmented.

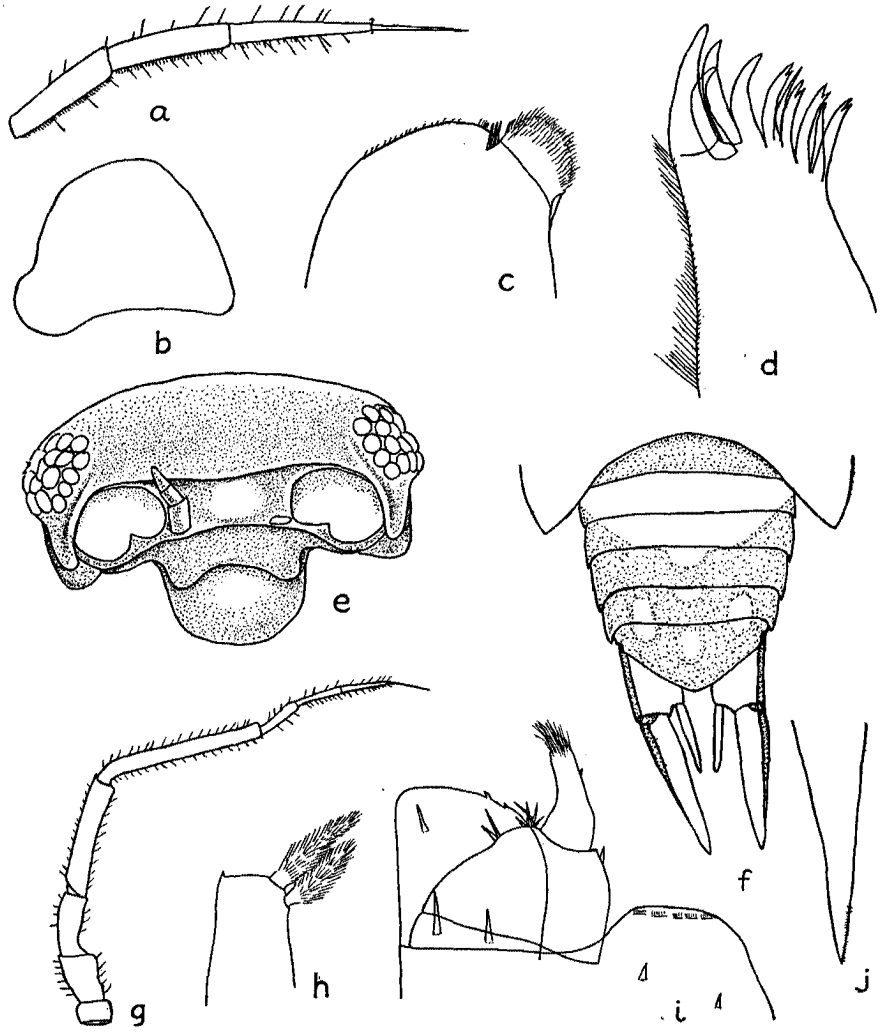

FIGURE 2. *Philoscia fasciata* new species: *a*, flagellum of antenna; *b*, 1st pleopod, male, exopod; *c*, maxilla; *d*, maxillula, outer endite; *e*, head from front; *f*, abdomen and uropods; *g*, antenna; *h*, maxillula, inner endite; *i*, maxillipede; *j*, 1st pleopod, male, tip of endopod.

Tahuata: Hanamiai Valley, altitude 1000 to 1200 feet, May 28, 1930, and June 4, 1930, LeBronnec and Tauraa.

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, on ground, October 27, 1929; Ooumu, altitude 3800 to 4000 feet, November 13, 1929, Mumford and Adamson.

Hivaoa: Mounaofefe, altitude 2010 feet, "Dead petioles of *Angiopteris*," September 14, 1929; Matauuna, altitude 3760 feet, "under dead leaves," August 1 and 27, 1929; Vaiepoepo, altitude 2430 feet, June 3, 1929; Tapeata, altitude 2250 feet, May 25, 1929; Tehueto Valley, altitude 500 feet, March 8, 1929; Mount Ootua, altitude 3032 feet, February 13, 1930; Mumford and Adamson. Temetiu Ridge, altitude 2900 feet, January 14, 1932; Mount Temetiu, altitude 3900 feet, January 20, 1932; Kaava [Kaara] Ridge, altitude 2720 feet, January 6, 1932, LeBronnec.

Fatuhiva: Teaotu, altitude 100 feet, September 9, 1930, LeBronnec.

Uahuka: Tauheeputa, altitude 1770 feet, April 25, 1931; Penau Ridge, altitude 2000 feet, "in moss," March 5, 1931; Penau, Hane Valley, altitude 1820 feet, "under dead leaves," February 27, 1931; Hitikau summit, altitude 2910 feet, "in dead stipes of tree fern (*Cyathea* species)," March 4, 1931; LeBronnec and H. Tauraa. North Range, September 24, 1929, Adamson.

Very widely distributed in the Marquesas, especially at high altitudes. Only two records are below 1000 feet, and the majority were taken over 2000 feet.

Specimens were collected also on Tahiti, at altitudes of 350 to 1800 feet.

I assign this species to *Setaphora* with hesitation. It satisfies Budde-Lund's diagnosis [12] in all but one respect—the structure of the endite of the maxillipede, which is defined by him, "apice levites hirsuta, spina mediocri et oculeis 3 parvis munita." Here there are two thorn-like sessile teeth on the outer side (as in *Plymophiloscia* Wahrberg), and the setae clothing the distal margin are so fine and sparse as almost to escape notice. Some species of the genus are described as possessing a bushy penicillium in addition to the three spines. In spite of the exceedingly fine line between some of the subgenera of *Philoscia* which have been set up, this difference does not seem weighty enough to justify a further subgenus in view of the close agreement of all the other characters with *Setaphora*.

Alloniscus oahuensis Budde-Lund.

Alloniscus oahuensis Budde-Lund, Prospectus generium specierumque Crustaceorum Isopodum terrestrium, p. 1, 1879; Crustacea Isopoda Terrestria, p. 225, 1885.

[12] Budde-Lund, G., Isopoda von Madagaskar und Ostafrika . . . : Voeltzkow, Reise in Ostafrika in den Jahren 1903-1905, Bd. 2, 1908.

Alloniscus brevis, Budde-Lund, Crustacea Isopoda Terrestria, p. 226, 1885, in Voeltzkow, Reise in Ostafrica in den Jahren 1903-1905, Bd. II, p. 298, 1908; Jackson, Insects of Samoa, pt. 8, fasc. 1, p. 6, 1927.

Hivaoa: Atuona Village, July 7, 1929, Mumford and Adamson.

Mohotani: February 2 and 3, 1931, LeBronnec and H. Tauraa.

Uahuka: Haahue Valley, March 20, 1931, LeBronnec and H. Tauraa.

The material upon which the above identification is based consists of 50 specimens from three localities. The relationship between the two species in the synonymy is of some complexity, but the number of specimens makes possible a statistical study which goes some way to clear up the difficulties. The material roughly divides itself up into very broad, intermediate, and narrow forms, of which 17 are male with a length-breadth ratio between 1.5 and 2.077 and 33 are females with a ratio between 1.632 and 2.167. A further analysis shows that 10 males and 1 female lie above 1.685 and that only three males and 26 females lie below 1.833. Below 1.875 there are but one male and 22 females. The three narrow males have a length of 7.0 mm. (2) and 6.75 mm., and all males but one above the 1.833 mark are longer than 7 mm.

If the specimens are arranged in order of length, they fall into groups with the following constitutions: 9.00 m., 1 male; 8.50 mm., 3 males, 1 female; 8.00 mm., 3 males, 4 females; 7.75 mm., 1 male, 3 females; 7.50 mm., 4 males, 4 females; 7.25 mm., 1 male, 3 females; 7.00 mm., 2 males, 6 females. Of the remainder, all but two are females.

In each of these groups up to 7.00 mm., the males are broader than the females of the same group.

The following conclusions may be drawn from these facts:

1. The mature male is consistently broader than the mature female of the same age.

2. The males attain maturity at a length of about 6.75 to 7.00 mm., when the length-breadth ratio decreases rapidly and suggests heterogonic growth.

3. The females attain maturity at a smaller size than the male; the smallest with fully developed oöstegites (but no eggs) measured 5.5 by 3.00 mm.

4. Evidence as to the existence of breeding and non-breeding phases in the female is inconclusive. Twenty-one females were ovigerous or provided with well-developed oöstegites; twelve were not ovigerous. Every length group had ovigerous and the majority had also non-ovigerous females. Of the specimens collected in February and March on Mohotani and Uahuka, 15 were ovigerous and only 2 non-ovigerous. Of the specimens collected on Hivaoa in July, 6 were ovigerous and 11 non-ovigerous. These figures suggest

that the active breeding season is in February and March, and that in July breeding is either ceasing or recommencing for an autumn brood. From the haphazard variation in length and breadth of ovigerous and non-ovigerous females it is possible that alternative phases are passed through as in some other isopods.

5. As regards the identification of the species, the broad forms exactly correspond with Budde-Lund's (1885) and my (1921) descriptions of *Alloniscus brevis* Budde-Lund; the narrower ones are more variable but the majority represent Budde-Lund's description of *Alloniscus oahuensis* Budde-Lund (1885). The original descriptions were each drawn upon a single specimen of unnamed sex. I expressed doubt in 1921 of the separate identity of these two species, but it was not possible without the wealth of material here available to perceive the true relationship between them, which is that the males at any breeding stage are consistently broader than the females and that both belong to the same species.

As the name *Alloniscus oahuensis* Budde-Lund dates from 1879, it must replace *Alloniscus brevis* Budde-Lund.

Subfamily PORCELLIONIINAE

Porcellio (Mesoporcellio) laevis Latreille.

Nukuhiva: Taiohae, November, 1929, Mumford and Adamson.

A species which is found wherever civilization has penetrated.

Porcellio (Porcellionides) pruinosus Brandt.

Hivaoa: Atuona Village, July 7, 1929, Mumford and Adamson.

Mohotani: altitude 700 feet, February 2 and 3, 1931, LeBronnec and H. Tauraa.

Eiao: altitude 1665 feet, "under dung of cattle," September 28, 1929, Adamson.

Fatuuku: altitude 990 feet, November 19, 1931.

Nukuhiva: Taiohae, November 23, 1929, Mumford and Adamson.

Of world-wide distribution.

Subfamily ARMADILLINAE

Spherillo (Spherillo) montivagus Budde-Lund.

Hivaoa: Mount Ootua, altitude 3032 feet, "at base of *Asplenium nidus*," February 13, 1930; Kopaafaa, altitude 2900 feet, February 26, 1930, Mumford and Adamson.

Uahuka: Hitikau Ridge, altitude 2900 feet, "under dead leaves," March 3, 1931, LeBronnec and H. Tauraa; North Range, altitude 2350 feet, September 24, 1929, Adamson.

Uapou: Hakahetau Valley, altitude 2800 feet, "from dead fern stipes," December 6, 1929, Adamson, altitude 3000 feet, November 19, 1931, Le-Bronnec.

Taken also on Tahiti at 750 feet. Recorded from Samoa and Tonga.

Spherillo (Spherillo) testudinalis Budde-Lund.

Nukuhiva: Oomu, altitude 4050 feet, "in wet humus," November 12, 1929, Mumford and Adamson.

Widely distributed in the islands of the Pacific and Indian Oceans.

Spherillo (Spherillo) pygmaeus Verhoeff.

Nukuhiva: Oomu, November 12, 1929; Taiohae, November 23, 1929, Mumford and Adamson.

First recorded by Verhoeff in 1926 from New Caledonia.

Spherillo (Xestodillo?) marquesarum, new species (fig. 3, *a-f*).

Length, male 4.75 mm., female 5.5 mm.; breadth, male 2 mm., female 2.5 mm.

Shape, oblong-oval. Surface smooth, minutely scaly, shining.

Head. Eyes small, 12-13 ocelli. Shield turned back on vertex, but margin slightly raised from it; rather tumid laterally and in middle of face, recessed behind antennae; marginal line passing well to lateral side of eyes and projecting over genae, passing upwards on shield and nearly confluent with frontal line. Lateral processes of clypeus heavy and bluntly triangular.

Thorax. Tergite I very slightly sinuate, lateral margin tumid, posterolateral angle deeply cleft, cleft continued forwards on margin, but lost further forward; inner lamella thick and tumid, outer lamellate, exceeding inner posteriorly, but shorter than it laterally. II well formed blunt inner lamella. Posterior margins of all nearly transverse and only slightly sinuate at sides; posterolateral angles of IV-VII nearly rectangular. Pronotum broad, about ¼-breadth of segment.

Abdomen. Postero-lateral angles nearly rectangular; posterior border of V very slightly diverging at each side. Telson markedly coarctate, hind margin slightly curved. 1½ times longer than broad.

Appendages. Antenna slender; flagellum shorter than fifth segment, or with terminal brush of setae equal to it, second segment of flagellum three times longer than first. Mandibles: right penicilli 1 + 1; left penicilli 1 + 2. Maxillula: outer endite, 4 + 5, all simple; inner, 2 short bushy penicilli. Maxilla: typical of the genus. Maxillipede: endite with blunt spine on inner edge, near to it a trangular thorn-like spine; outer edge small sharp slender spine, near to it a long sharp spine; on face a very long sharp spine greatly exceeding the longest of the border spines. Uropod: protopod longer than telson, rectangular on inner posterior border and only slightly rounded on outer; exopod small, conical, set at proximal end of base towards medial border; length about 1/6 outer border in female, about ¼ in male; endopod reaching nearly to hind border of telson.

Color in spirit irregularly mottled on yellow ground. Color of pigment of different specimens varies from delicate light violet to purplish brown. Female from Pepehitoua markedly rufous over epimera and on epistomial shield.

Uapou: Hakahetau Valley, altitude 2000 feet, "petioles of *Angiopteris*," December 6, 1929; Pepehitoua Valley, altitude 2700 feet, "ex dead petioles of *Cyathea* species," December 8, 1929, Adamson; Kohepu summit, altitude

3200 feet, November 28, 1931; Teavaituhai, altitude 3000 feet, November 20, 1931, Teavanui, altitude 2900 feet, December 27, 1931; Vaihakaatiki, altitude 3000 feet, November 18, 1931, LeBronnec.

Taken also in Tahiti at 1800 feet, Adamson.

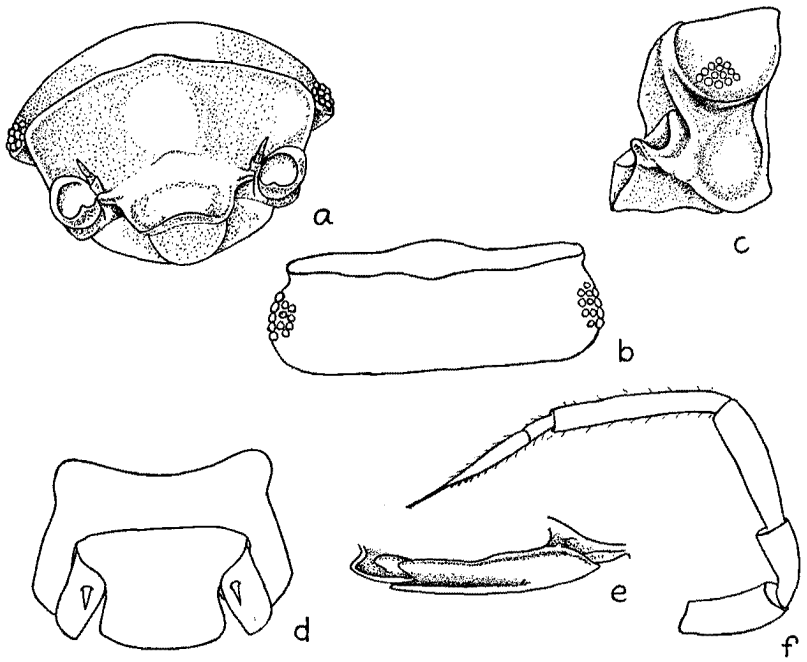

FIGURE 3. *Spherillo marquesarum* new species: *a*, head, from front; *b*, head, from above; *c*, head, from side; *d*, telson and uropods; *e*, lateral margin of 1st and 2nd thoracic tergites from below; *f*, antenna.

Cubaris murinus Brandt.

Nesodillo medius Verhoeff, Sarasin and Roux, Nova Caledonia, Zool., vol. 4, L. 2, p. 287, 1926.

Nukuhiva: Taiohae, November, 1929, Mumford and Adamson.

Hivaoa: Anatuakina, altitude 1525 feet, "under dead bark," May 1, 1929, Mumford and Adamson; Mounaofefe, altitude 2010 feet, "dead petioles of *Angiopteris*," September 14, 1929, Adamson.

Fatuhiva: Teaotu, altitude 100 feet, September 9, 1930; Otomahe, Omoa [Oomoa] Valley, altitude 280 feet, August 20, 1930, LeBronnec.

Uahuka: Hanatea Valley, altitude 100 feet, "under stones," March 11, 1931; Haahue Valley, altitude 260 feet, "under bark of *Sapindus saponaria*," March 20, 1931, and altitude 90 feet, "in dead log of *Sapindus saponaria*," March 20, 1931; Teavamataiki, altitude 730 feet, March 19, 1931, LeBronnec and H. Tauraa.

Uapou: Teepotaootetoiki, Hakahetau [Hakapetau] Valley, altitude 120 feet, November 23, 1931, LeBronnec.

Mohotani: altitude 700 feet, "dead wood of *Cordia subcordata,*" January 31, 1931; altitude 700 feet, February 2 and 3, 1931; altitude 200 feet, "under stones," February 4, 1931, LeBronnec and H. Tauraa.

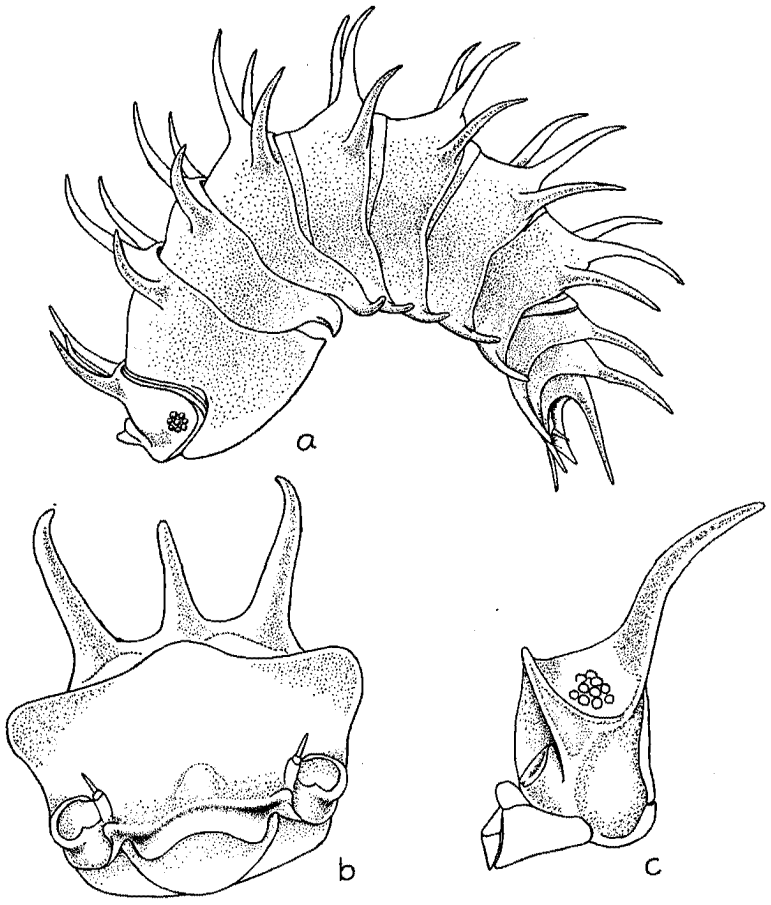

FIGURE 4. *Echinodillo montanum* new species: *a*, whole specimen, from side, excluding appendages; *b*, head, from front; *c*, head, from side.

Eiao: altitude 1665 feet, "under dung of cattle," September 28, 1929, Adamson; altitude 1600 feet, under bark of *Thespesia populnea,* March 21, 1931; altitude 1600 feet, under dead bark of *Pisonia* species, March 16, 1931; altitude 1800 feet, March 22, 1931, LeBronnec and Tauraa.

This species proved to be the characteristic armadillid of the collection. It was found in most of the islands, and I identified it, at first, with Ver-

hoeff's recently described *Nesodillo medius* from New Caledonia, as it satisfied his description in every detail. However, comparison of the specimens with examples of *Cubaris murinus* (which is nowhere well described) from numerous localities in the Budde-Lund collection in the British Museum (Natural History) proved it to be identical with that species. The genus *Nesodillo* must therefore be abandoned in favor of *Cubaris* Brandt. Figures of *C. murinus* may be found in Budde-Lund [13] (mouthparts), Barnard [14] (head and articulating lappets) and Verhoeff [15] (telson, uropoda, and pleopoda). Verhoeff gives a full description under *Nesodillo medius*, and the distribution is dealt with by Budde-Lund.

Genus ECHINODILLO, new genus

Frontal shield raised prominently from vertex, slightly produced in median line of margin. Coxal plates of all free somites but first of thorax and abdomen drawn out laterally into long recurved spines; anterior and posterior lateral angles absent. Head and each thoracic somite with 1 median and 2 lateral dorsal long recurved spines on hind borders. Median spines on third, fourth, and fifth segments of abdomen. Hind border of telson drawn out into long median spine, coarctate, narrow. Border of first thoracic tergite thin and concave, not split; small articulating lappets placed well back from border of first and second thoracic tergites.

Echinodillo montanum, new species (fig. 4, *a-c;* fig. 5, *a-h*).

Length: male, 7 mm.; female, 8 mm. Breadth: male, 4 mm.; female, 4.5 mm.

Shape, oblong-oval. Surface smooth but scaly, especially on spines.

Head. Eyes small, about 10 ocelli, placed well within marginal line. Shield prominent, lateral lobes slightly projecting and rounded, median bluntly rounded lobe; vertex with 3 long spines on posterior border, recurved, 2 lateral longer than median; marginal line confluent with frontal line on side of shield. Lateral processes of clypeus massive, somewhat conical, but not prominent.

Thorax. All tergites more or less sinuate on each side, 3 long recurved spines (2 lateral, 1 median) on hind border. Posterolateral angle of I drawn out into sharp spine, border thin and concave, articulating process set back from lateral border and not exceeding hind border, small and rounded. Articulating process of II sharp and tooth-like, not exceeding hind border. Lateral borders of all but I produced to form sharp curved spines, no angles, but anterolateral angle is faintly indicated on V, VI and VII. Pronotum broad, rather more than ¼ tergite.

Abdomen: I hidden under VII of thorax; III, IV, V with long median spines, lateral borders produced as in thorax, anterolateral angles faintly indicated. Telson markedly coarctate, long and narrow, hind border broadly rounded and continuous with lateral borders; median posterior spine more than ½ length of telson.

Appendages: antennula, basal segments large and tubular, terminal segment slender.

[13] Budde-Lund, G., A Revision of "Crustacea Isopoda Terrestria"; 2 Spherilloninae. 3 Armadillo, Copenhagen, 1904.

[14] Barnard, K. H., Terrestrial Isopoda: South African Mus., Ann., vol. 30, pt. 2, 1932.

[15] Verhoeff, K. W., Isopoda terrestria von Neukaledonien und den Loyalty-inseln: Sarasin und Roux, Nova Caled., Zool., vol. 4, L. 2, 1926.

Antenna slender, flagellum shorter than fifth segment, proximal segment ⅓ length of flagellum. Mandibles: right penicilli 1 + 1; left penicilli 1 + 2 (?). Maxillula: outer endite, 4 + 5 all simple, the 5 inner spines long and slender; inner endite, 2 very short bushy penicilli, no spine.

Maxilla similar to *Spherillo*. Maxillipede: endite with thornlike tooth and two stout spines on distal border, small tooth to outer side; outer margin of endite crenulate. Inner bristle groups on inner side of endopod small, each bearing one very long spine, nearly attaining to height of endopod. Pleopoda all bearing tracheae. First pleopod of male small and of tracheal part only; of female vestigial. First endopod of male bearing tuft of setae on outer side of tip. Uropod: protopod shorter than telson, inner

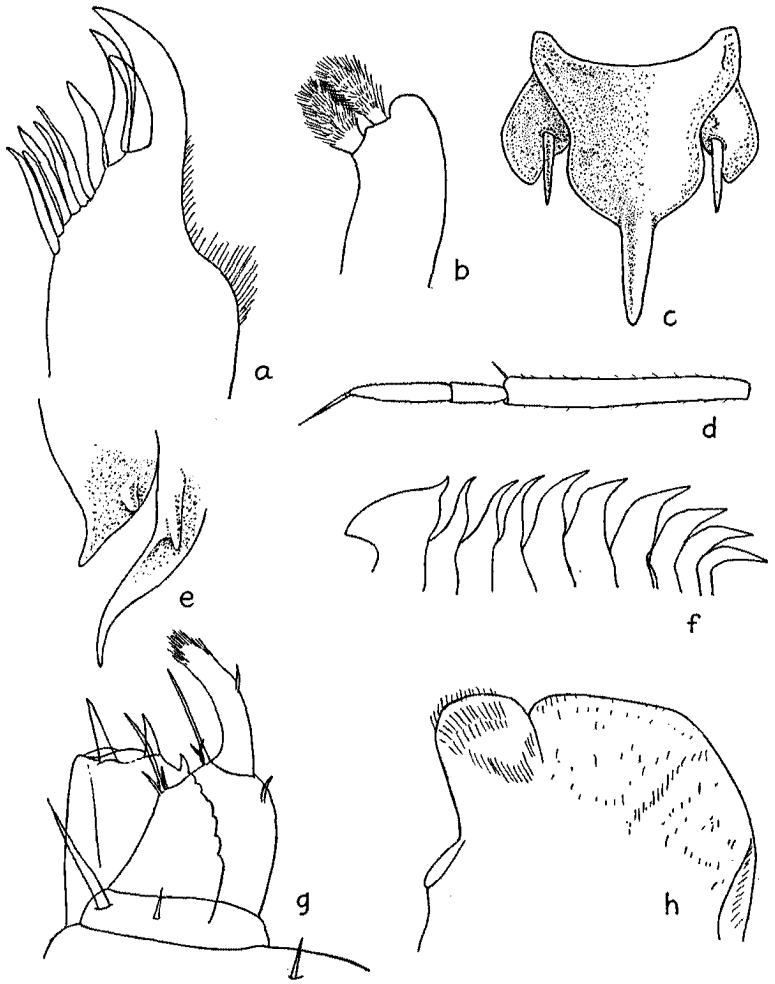

FIGURE 5. *Echinodillo montanum* new species: *a*, maxillula, outer endite; *b*, maxillula, inner endite; *c*, telson and uropods; *d*, antenna, 5th segment and flagellum; *e*, lateral margin of 1st and 2nd tergites from below, *f*, lateral margin of tergites of thorax and abdomen from above; *g*, maxillipede; *h*, maxilla.

angle more or less rectangular, outer and distal margins broadly rounded; exopod, long, slender and conical, greatly exceeding base and arising from its inner and upper angle, base plane at point of insertion, not forming investing roll or channel; endopod little shorter than base, much shorter than telson.

Color (in spirit) very uniformly mottled with grey brown pigment. Epimera rather lighter in color than back.

Uahuka: Hitikau Ridge, altitude 2900 feet, 1 male, 1 female, March 3, 1931; altitude 2900 feet, "under moss," 2 males, 1 female, March 4, 1931; LeBronnec and H. Tauraa.

Except for the great development of spines, this grotesque creature is in fundamental structure a *"Spherillo."*

Genus TRIDENTODILLO, new genus

Edge of frontal shield laminate and strongly raised from thorax, broadly triangular in middle. Lateral border of first somite thin and not split; on under side, distant from lateral margin, a long deep fold extending length of somite, drawn out posteriorly into strong semi-circular lappet. Articulating lappet on second somite caniniform, greatly exceeding hind margin of tergite. Antero- and posterolateral angles of first three coxal plates deleted so that lateral margin of plate is acute; margins of remaining free thoracic and abdominal somites sub-quadrangular, not produced. Head and each thoracic tergite bearing three very long slender curved spines on hind margin. Abdomen without spines.

Tridentodillo squamosus, new species (fig. 6, *a-d*).

Length, 7.5 mm.; breadth, 3.5 mm. Shape, oblong-oval.

Surface smooth and without rugosities, but very scaly.

Head. Eyes small, compact and very convex, but not deflecting marginal line or projecting over genae; 12 ocelli. Shield margin carried vertically above face, not at all depressed on to vertex, lateral lobes sharp, median lobe scarcely indicated by blunt triangular form of frontal line. Marginal line projecting over genae and confluent with frontal line. Profrons slightly tumid in middle and excavated at each side for antennae. Lateral processes of clypeus, blunt and somewhat triangular.

Thorax. Hind border of all tergites very slightly sinuate on each side, 3 very long slender spines (2 lateral and 1 median) on hind borders, length of each spine about ⅓ of whole body. Posterolateral angle of I rounded, lateral border thin and slightly concave, not split; articulating lappets and coxal plates as described under genus. Pronotum not broad, about 1/5 tergite.

Abdomen as described under genus. Telson pronouncedly coarctate, hind margin slightly rounded, slightly broader than long in the proportion 4.3.

Appendages: antennula minute, terminal segment slender; antenna slender, setose, flagellum shorter than fifth segment, distal segment nearly 3 times proximal, terminal brush of setae; maxillula and maxilla similar to *Echinodillo;* maxillipede absent in this specimen. Uropod: protopod slightly longer than telson, truncate, rectangular; exopod minute, inserted on distal inner border of base; endopod much shorter than telson.

Color (in spirit): irregular mottling with light brown pigment; epimera lighter and almost devoid of dark pigment; telson dark.

Nukuhiva: Ooumu, altitude 3800-4000 feet, "among wet herbage," November 13, 1929, 1 female, Mumford and Adamson; altitude 3890 feet, July 20, 30, 1931, LeBronnec and Tauraa.

Nearly related to, but very markedly distinct from the foregoing genus.

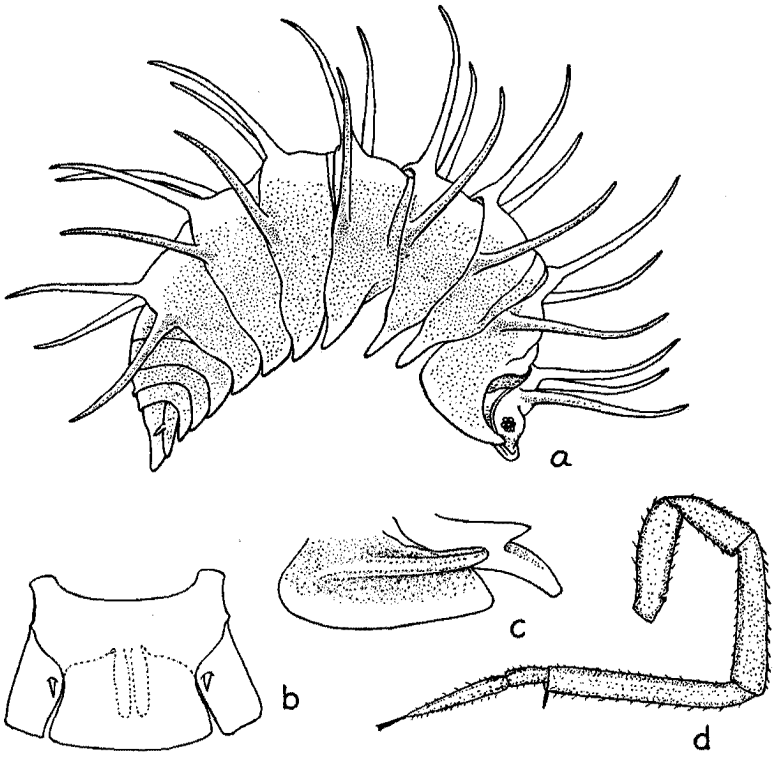

FIGURE 6. *Tridentodillo squamosus* new species: *a*, whole specimen, from side, excluding appendages; *b*, telson and uropods; *c*, lateral margin of 1st and 2nd tergites from below; *d*, antenna.