

AMERICAN MUSEUM NOVITATES

Number 206

Published by
THE AMERICAN MUSEUM OF NATURAL HISTORY
New York City

January 21, 1926

59.53,72(728)

FOREST ISOPODS FROM BARRO COLORADO ISLAND, PANAMA CANAL ZONE

BY WILLARD G. VAN NAME

In the spring of 1924 the writer had the privilege of spending several weeks at the Barro Colorado Island Biological Station in the Panama Canal Zone, and the small collection of land isopods described in the following pages was made at that time. The specimens were obtained between March 30 and the middle of April, just at the end of the dry season, when the ground even in the densest forest was extremely dry, and practically no rain fell during the period. Such conditions are not favorable for finding land isopods, and it seems likely that collecting at some other season would give a larger yield both of species and individuals. Yet it is hardly to be expected that very many species of land isopods occur on the island, as the uniformly densely forested condition of the whole area naturally limits its fauna to species adapted for life in that environment.

But, since Barro Colorado Island is likely to become an important center of zoological, botanical and ecological research in the near future, it seems desirable to make any facts learned about its fauna available as soon as possible and therefore to report on this collection without awaiting the time when more material may be available. Moreover, the present collection, small as it is, is interesting not only because most of the species are new to science but because it is composed entirely of native forest-living species, unmixed with any introduced forms. Among the species obtained, five in number, there is not a single one of the more or less cosmopolitan forms that have followed civilized man over so much of the world, being accidentally introduced on the roots of plants brought in for cultivation or carried among lumber or other merchandise. The absence of such species confirms the existence of purely natural ecological conditions on the island.

The majority of the specimens were collected in the old-growth forest, because the deeply shaded localities and the fallen and decaying logs there are favorite places of concealment for the isopods and other terrestrial invertebrates that were sought. The second-growth jungle is,

however, so high and dense as to afford in some places an environment almost as favorable. Most of the collecting was done in parts of the island not far removed from the Station, as at that time trails through the forest were few and most of the distant parts of the island could be reached only by expenditure of time and labor that would seriously curtail the actual collecting.

I wish to express my appreciation of the opportunities and privileges that the Barro Colorado Biological Station afforded me, and my thanks to Doctor James Zetek of the United States Department of Agriculture, the Resident Custodian, and his assistant, Doctor Ignacio Molino, for many favors. To Professor J. Chester Bradley of Cornell University, who was also at the Station, I am indebted for some of the specimens and for assistance in many ways.

While a considerable number of land and fresh-water isopods are credited with a distribution indicating their probable or possible occurrence in the Canal Zone or Republic of Panama, the list of those actually recorded in literature from those regions is very short, comprising so far as I have discovered only the following species, four of them having been described as new species from Panama localities.

Cubaris flavobrunneus (Dollfus), 1896. (New species.)

Armadillo flavo-brunneus DOLLFUS, 1896, p. 1, Figs. 1-3; BUDDE LUND, 1904, p. 120, "Punta de Sabana, Darien."

Cubaris longispinis Richardson, 1912. (New species.)

Cubaris longispinis RICHARDSON, 1912a, p. 477, Figs. 1, 2. Porto Bello, Republic of Panama.

Ligyda baudiniana (Milne Edwards), 1840.

Ligia baudiniana JACKSON, 1922, p. 698. "Progriso, Colon." Widely distributed in the West Indian region. See RICHARDSON, 1905, p. 678, Figs. 719-723.

Ligyda exotica (Roux) 1828.

Ligyda exotica RICHARDSON, 1905, p. 676, Figs. 716-718. "Panama." Very widely distributed in warm regions.

Palægyge meeki Richardson, 1912. (New species.)

Palægyge meeki RICHARDSON, 1912b, p. 521, Figs. 1-4. Various localities in Canal Zone and vicinity, parasitic on shrimps of genus *Macrobrachium*.

Philoscia variegata Dollfus, 1893.

Philoscia variegata DOLLFUS, 1896, p. 2. "Rio Lara, Darien." (Recorded also from localities in Venezuela, DOLLFUS, 1893, p. 343. Pl. x, figs. 10a-10d, and Colombia, RICHARDSON, 1914.)

Probopyrus panamensis Richardson, 1912. (New species.)

Probopyrus panamensis RICHARDSON, 1912b, p. 523, Figs. 5-8. "Pariso, Canal Zone" (parasitic on shrimp *Macrobrachium acanthurum*). See also VAN NAME, 1925, p. 483

Porcellionides pruinosus (Brandt), 1833.

Metoponorthus pruinosus DOLLFUS, 1896, p. 2. Darien. (An almost cosmopolitan species. See RICHARDSON, 1905, p. 627, Fig. 674.)

Sphæroniscus sp. undetermined.

DOLLFUS, 1896, p. 2. Darien.

The species obtained at Barro Colorado Island and here described include only one (*Philoscia variegata*) of the previously recorded forms. They are as follows:

Leptotrichus isthmicus, new species
Calycuoniscus barbouri, new species
Scleropactes zeteki, new species
Philoscia variegata, Dollfus, 1893.
Philoscia gatumensis, new species

According to the classification of Budde-Lund (1904, 1912), these all belong to the family Oniscidæ, *Leptotrichus* and *Philoscia* being of the subfamily Oniscinæ, and *Scleropactes* of the subfamily Sphérilloninæ. All these genera have other representatives in tropical and South America. *Scleropactes* being confined to those regions. *Calycuoniscus* is a more recently established genus of the subfamily Oniscinæ.

***Leptotrichus isthmicus*, new species**

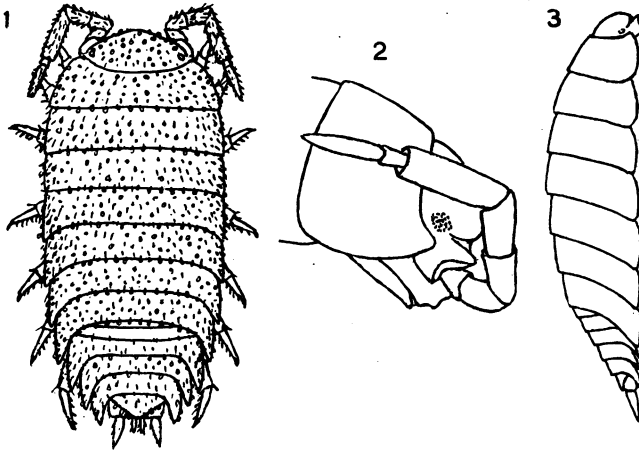
Figures 1 to 3

The collection contains only one specimen of this species (a male), which, if it could be fully straightened out, would measure hardly more than 2.5 mm. long. It is quite closely allied to a form occurring in British Guiana that I have regarded as identical with *L. pittieri* Pearse, 1921, and redescribed and figured under that name in my report on the isopods of Kartabo (Zoologica, VI, p. 486, Figs. 37-42). The present specimen from Barro Colorado may not have reached its full size, but I observed no indication of immaturity, and the species is probably a very small one.

The body is rather wide, with the back fairly well arched, the outline seen from above being somewhat ovate, with the greatest width toward the front end. The abdomen is short but wide anteriorly, where it continues the general outline of the body without any very abrupt contraction. Color yellowish white.

The body surface is fairly even but is rather thickly provided with short thick glandular hairs, some of which, as in *L. pittieri*, are swollen at the end, forming minute capitate or club-shaped processes easily rubbed off. These are especially developed along the posterior margins of the segments, including the telson, but many are scattered also on various parts of the dorsal surface of the segments of the head and body. Scattered among them are many short hairs which are not so modified. It was not possible to demonstrate that these club-shaped or capitate modified hairs were arranged in definite transverse rows as in the case of the British Guiana form, except along the posterior margins of the segments. Perhaps, however, their distribution would appear more regular had not so many of them been rubbed off.

The head is wide and short, its median portion obtusely prominent. Below each eye a wide somewhat square, broadly truncated lobe extends obliquely outward, and sloping somewhat downward forms with its concave lower surface a projecting arch over the base of the second antenna. These lobes are one of the best marked characters of the species, being much more developed, as well as different in shape, from the very much less prominent ones present in the above-mentioned British Guiana form. The upper border of the epistome forms a distinct but scarcely prominent line, nearly horizontal though somewhat lower in the middle. In the present species the eyes are reduced and unpigmented, nevertheless they are not vestigial to such an extreme extent as in that species, a few more or less developed ocelli being apparently present. The second antennæ are larger and stouter than in the British Guiana



Figs. 1 to 3. *Leptotrichus isthmicus*, new species. Fig. 1. Dorsal view of male. $\times 20$. Fig. 2. Side view of head and antennæ of same. $\times 50$. Fig. 3. Side view of body. \times about 20.

species, with a longer and thicker flagellum of two articles, of which the basal one is very short. The antennæ would probably reach about to the front of the third thoracic segment if they could be fully drawn back. The thoracic segments have the lateral ends cut off in curves of rather large radius, and all except the first have the posterior lateral angle more or less extended backwards. The first segment has that angle considerably rounded; in the second it is more sharply rounded and in succeeding ones it becomes successively sharper, though not very acute even in the posterior ones. The legs are stout and of moderate length with well-developed spines, and are somewhat pubescent. The third, fourth and fifth abdominal segments have the lateral angles sharp, and considerably longer and extended farther backwards than in the species from British Guiana. The telson also differs, being shorter and more rounded at the tip in the present species. The branches of the uropoda are short, the outer ones rather broad at the base; the inner ones are much smaller and shorter and are compressed from side to side.

The type and only specimen was found under a log in old-growth forest near the Biological Station.

This species and that of Pearse mentioned above appear to be near to the genera *Trichorhina* and *Gedania* of Budde-Lund, and should perhaps be placed in one of them, but to avoid changes until their disposition can be more definitely determined I am leaving them in the genus that Pearse adopted.

***Calycuoniscus barbouri*, new species**

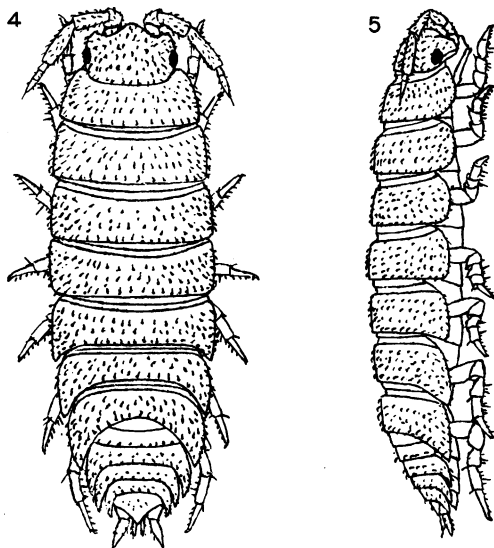
Figures 4 and 5

The only specimen of this species that I found is a female, which, though it has a marsupium containing several embryos, is scarcely 3 mm. long. The body is elongate oval, with a moderately large and wide head and a small, short abdomen whose large epimera continue evenly the curvature of the outline of the thorax. Body surface unusually granular (like fine sandpaper under high magnification) when dry, but appearing smooth when wet. It bears numerous, short, glandular hairs which are present also on the antennæ, uropoda, etc. These hairs are more or less thickened and enlarged at the end, or club-shaped, as in *Leptotrichus pittieri*, but are smaller; they show a tendency to arrangement in transverse rows. Though somewhat erect at its origin, each hair bends backward like a little hook. Color purplish brown above, with small oval light markings on the dorso-lateral regions. Under parts and legs very little pigmented.

Head moderately set back into the thorax, its front outline prominent in the middle and with distinct but obtuse lateral lobes. In a side view these lobes appear large and somewhat square (though narrower toward the lower end), descending far down in front of the eyes. Eyes of moderate size, somewhat bulging and well pigmented, but with few ocelli. Second antennæ quite short, not reaching far along the second thoracic segment when drawn back as far as possible. Their flagellum has two articles and a very short terminal bristle. The first article is much the shortest. On the antenna of the left side, what appears to be a slightly marked articulation is discernible about the middle of the long second article. I could not demonstrate it on the right antenna.

The thoracic segments have the epimeral parts large and well developed and cut off in a more or less curved outline at the lateral ends, the posterior angle being rounded off in all except the seventh, though somewhat acute also in the sixth segment. Only the last three have the posterior lateral angle appreciably extended back. These segments have the exposed part considerably elevated above the portion that slides under the segment next in front, and a distinct though shallow transverse groove separates these two parts of the segment. The legs are rather short and not very spiny, though fairly stout.

The abdominal segments 3, 4, and 5 have the epimeral parts much extended and tapering to a sharp backwardly curving point. The telson is triangular with somewhat concave sides. The basal joints of the uropoda scarcely reach the end of the telson; their branches are short, the outer one fairly wide at the base, tapering to a point; the inner is narrow and somewhat compressed laterally.



Figs. 4 and 5. *Calycuoniscus barbouri*, new species. Dorsal and lateral views of female. $\times 22.5$.

The only specimen was taken by sifting leaves in old-growth forest near the Biological Station, April 4, 1924. The species is named after Doctor Thomas Barbour, to whose efforts and generosity the establishment of the Station is largely due.

I have referred this species to *Calycuoniscus* Collinge, 1915, in consideration of its general resemblance to that form, though the setae on the body surface have undergone a much lesser degree of modification. Aside from my objections to the multiplication of slightly distinguished genera, more material for study would be necessary for establishing one, as the minute and delicate type is not in condition to stand more handling.

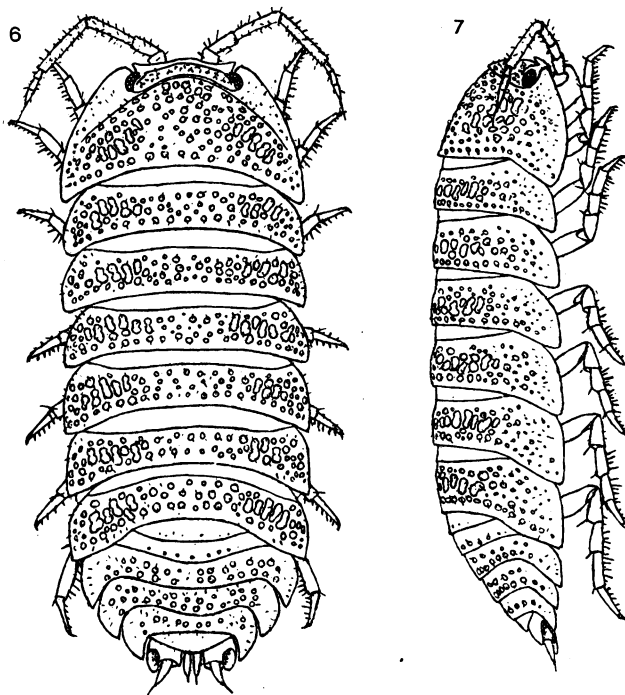
***Scleropactes zeteki*, new species**

Figures 6 to 13

The body when seen from above is oblong, parallel-sided and broadly rounded before and behind; it is highly arched, the general form suggesting that which prevails in the genus *Cubaris*, and as in the members of that genus, the body can be rolled up compactly. The articulation is, however, considerably looser than usual in *Cubaris*.

Body surface covered with minute slightly elevated tubercles arranged in indistinct transverse rows; on the dorso-lateral regions of the thorax the tubercles are larger and often more or less confluent. In many cases the tubercle bears a very short, stiff setose hair on its summit. These hairs are also scattered elsewhere. The color is a dull slaty gray above with the usual small yellowish markings, and larger yellowish

spots on the segments at the junction of the epimeral with the main parts of the segments, and in the median region of the back. The epimera are also lighter colored, giving the appearance of a broad light border around the body. The legs and lower parts are yellowish (unpigmented). The terminal half of the fifth joint of the antennæ is abruptly light colored. Length of the largest individuals (females) about 15 mm.

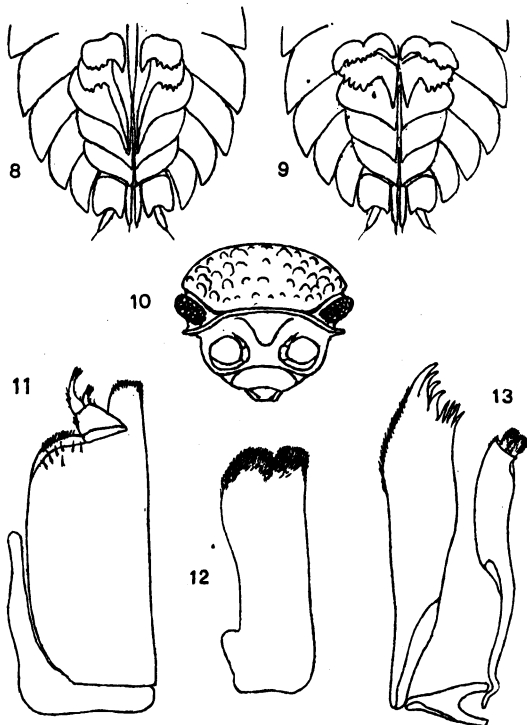


Figs. 6 and 7. *Scleropactes zeteki*, new species. Dorsal and lateral views of female. $\times 5.5$.

Front outline of head transverse and slightly sinuous when seen from above, with well-marked lateral angles. The upper border of the epistome is somewhat unevenly arched when seen from in front and is upturned to form a projecting border to the front of the head, producing a very deep, narrow furrow between itself and the base of the forehead. This furrow, however, does not extend the whole width of the front, but curves upward on the forehead along the inner border of each eye.

Eyes oval, oblique, of medium size with fairly numerous ocelli. Their surface is very convex and prominent. Second antennæ short (not reaching the third segment when drawn back) and weak, somewhat hairy and provided with a flagellum of three articles, the first being rather short, and the articulation between the last two being rather indistinct and probably not movable. The last article is tipped with a rather short bristle.

Thoracic segments with the lateral ends rounded-truncate, and the posterior lateral angles more or less produced backward (especially those of segment I) but not very acute. They have a wide, smooth anterior portion that fits under the segment next in front and is separated from the slightly but not abruptly elevated tuberculated portion by a distinct line of demarkation. Legs rather weak and slender, with fairly long sharp and slender spines.



Figs. 8 to 13. *Scleropactes zeteki*, new species. Fig. 8. Under side of abdomen and pleopoda of male. $\times 5.4$. Fig. 9. Same of female. $\times 5$. Fig. 10. Front view of head. $\times 8$. Fig. 11. Maxilliped. $\times 25$. Fig. 12. Second maxilla. $\times 25$. Fig. 13. First maxilla. $\times 25$.

Third, fourth and fifth abdominal segments with the ends bent backward and ending in rather acute angles. Telson having the form of an exceedingly wide, short triangle much rounded at the tip. Basal joints of the uropoda wide and extending much beyond the telson; their dorsal surface has a large, sharply defined excavation on the posterior lateral part; the outer branch is short, curved and tapering and arises from a conspicuous excavation in the thick terminal margin of the basal joint; the inner branch arises far forward on the ventral aspect of that joint close to the median line. It is straight and long and projects nearly half its length beyond the end of the telson, lying close alongside its fellow of the opposite side in the gap between the

somewhat widely separated basal joints. The first and second pleopoda of both sexes have the rear margin more or less irregularly and conspicuously dentate, as shown in Figs. 8 and 9.

This was one of the common isopods and was collected from near the lake shore to altitudes of over 200 feet at several points, especially under dead logs on the ground in old-growth forest. It is rather slow in its movements, as its comparatively weak legs and bulky body would lead one to expect. I have named the species for Doctor James Zetek, Resident Custodian of the Barro Colorado Biological Station. A large female has been selected as the type.

It seems to be most closely related to the type of *Scleropactes* (*S. concinnus* Budde-Lund, 1885, from Peru; see also Budde-Lund, 1904, 'Rev. Crust. Isop. Terr.,' part 2, p. 47, Pl. VII, figs. 1-10), but that species is at once distinguishable from the present one by the smooth body surface, as well as by other minor differences.

***Philoscia variegata* Dollfus**

Figures 14 to 20

Philoscia variegata DOLLFUS, 1893, Ann. Soc. Entom. France, LXII, p. 343, Pl. x, figs. 10-10d; 1896, Boll. Mus. Zool. Anat. Univ. Torino, XI, No. 228, p. 2. RICHARDSON, 1914, Mém. Soc. Neuchatel. Sci. Nat., V, p. 30.

General outline of the body in a dorsal view widely elliptical, or more or less ovate. The thorax comprises by far the greater part of it; the head appears short and not much set back into the thorax in a dorsal view, though when seen from one side the anterior angles of the first thoracic segment are seen to extend forward a little under the eyes. Front outline of head gently curved, without lobes at the lateral corners; abdomen small, not much over one-fifth of the whole body length. Length of largest specimens (females) but little over 10 mm.

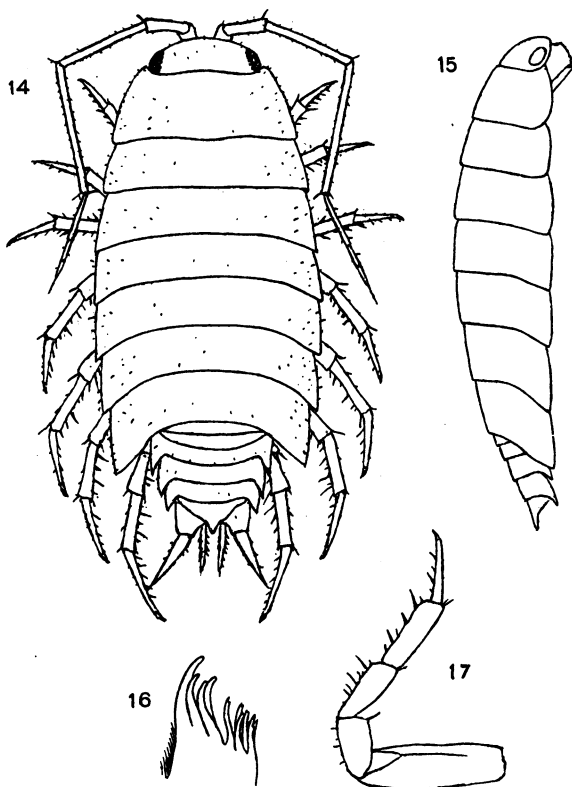
Coloring quite conspicuous. Ground color of upper parts dark brown with a purplish shade, deepening to nearly black toward the sides. Outside this darker part there is a broad light band or border (unpigmented except for scattered, stellate pigment dots of brown) occupying the whole epimeral part of each thoracic segment. On the abdominal segments the epimera are less conspicuously lighter. The usual small irregular light-colored bars and spots are present on the dorso-lateral regions. Below the body and legs are practically unpigmented except for scattered stellate brown pigment dots.

Body surface very smooth and shining, though when wet a few short stiff hairs scattered over the surface become visible. Articulation moderately firm and compact. First pair of legs short and small, but proceeding backward the legs become much longer and stouter, the seventh legs being especially large and long. The legs have slender but fairly numerous spines.

Epistome forming a distinct but only slightly raised line across the head between the lower anterior part of the eyes. The latter are oval, fairly large and prominent, with about 28 ocelli arranged in four rows. Second antennæ long and slender, reaching when well drawn back along the sixth (in some individuals to the seventh) thoracic segment, but there is considerable individual variation, as well as variation with age and probably with sex, the antennæ in old males appearing to average longer. The

flagellum is shorter than the last segment of the peduncle, which is itself very long and slender in many specimens. The first article of the flagellum is considerably the longest; the terminal article, which bears a bristle of no great length, is the shortest.

The posterior lateral corners of the first thoracic segment form about a right angle rounded off at the apex in the arc of a very small circle; the inferior lateral borders of the segment are gently curved. The second segment also has the inferior (lateral)

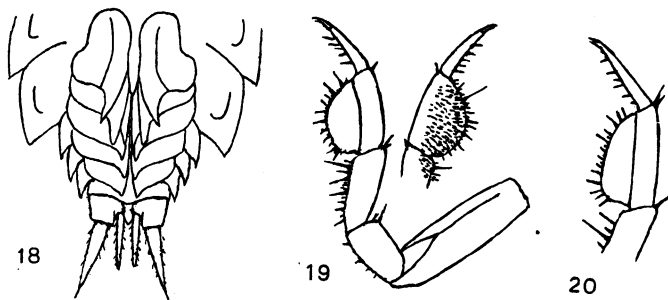


Figs. 14 to 17. *Philoscia variegata* Dollfus, 1893. Female. Fig. 14. Dorsal view, $\times 7$. Fig. 15. Lateral view of body. $\times 7$. Fig. 16. Tip of outer division of first maxilla. $\times 84$. Fig. 17. Second leg. $\times 14$.

border slightly curved and the posterior angle rounded off at the extreme apex. The third has that angle almost sharp, and succeeding segments have the inferior or lateral borders straight and the posterior angle more or less acute. Proceeding backwards from the first, successive segments have their lateral posterior angle more and more extended backwards so that the angle becomes more acute in the posterior ones, except that the seventh segment, owing to a curvature in the posterior margin of the epimeron, has that angle less acute than the sixth.

The posterior lateral angles of the third, fourth and fifth abdominal segments are bent directly backward, and extended into quite prominent triangular projections. Telson triangular, broader than long, its apex moderately sharp and its lateral borders sinuously concave. The basal segments of the uropoda slightly exceed the tip of the telson. Their branches are rather long, the inner being slender and laterally compressed, and the outer somewhat widened from side to side and sharply tapering. Both the basal segment and the outer branches have a furrow along the external aspect.

Aside from the usual sexual differences in the pleopoda, the males have the carpus of the first three pairs of thoracic legs widened into a broad flat expanse whose inner or anterior face is covered with short stiff hairs; the corresponding surface of the merus is similarly covered with short hairs, though not expanded. This expansion



Figs. 18 to 20. *Philoscia variegata* Dollfus, 1893. Male. Fig. 18. Under side of abdomen and pleopoda. $\times 9$. Fig. 19. Second leg. $\times 13.5$. Fig. 20. Terminal joints of third leg. $\times 13.5$.

of the carpus is most developed on adult males, where it may be almost semicircular in the first pair of legs, though somewhat narrower on the second, and still more so on the third. On young males it is always more or less narrow; on females it is entirely wanting, the anterior legs being similar in form and spination (except for being shorter) to those of the posterior segments.

The specimens were obtained at various points on the island varying in altitude from close to the lake to 200 feet above it, under logs and among decaying leaves on the ground. The animals are exceedingly active, not only running rapidly, but having considerable power of leaping.

The modification of the anterior pairs of legs in the male shows it to be a close ally of *P. muscorum* Scopoli, a well-known European species, the type of *Philoscia*; hence in any subdivision of the genus this will remain in the typical subgenus. *P. muscorum* is reported by Richardson (1913, Proc. U. S. Nat. Mus., XLIV, p. 339) from Costa Rica and from Woods Hole, Massachusetts; and it will probably be found to have established itself in other New World localities.

P. muscorum seems to be distinguished from the present species by the narrower head more set back in the thorax, somewhat shorter second antennæ and legs, and the shorter terminal bristle on the antennæ; the less squarely truncated thoracic epimera, and by having the posterior corners of the first four instead of only the first two thoracic segments noticeably rounded off. Apparently the males of *P. muscorum* have the widening of the carpus of the anterior legs less developed than in the present form, but this is probably more or less subject to individual and age variation (See Richardson, *loc. cit.*, p. 339).

The species to which I refer these specimens was described by Dollfus (1893) from various localities in Venezuela (Caracas, Corozal, Petare, Cumbre de Valencia and Colonie Tovar), also (1896) Rio Lara, Darien, and recorded by Richardson (1914) from localities in Colombia in altitudes varying from 1200 to 3700 meters. Dollfus' (1893) description shows an inexplicable discrepancy, as in describing the head he mentions "lobes latéraux tres développés, se recombent en avant des yeux," but the excellent figures on his plate show no such structures, and would represent well the specimens in the present collection. None of these, however, reach as large size as that given by Dollfus (14 mm. long).

***Philoscia gatunensis*, new species**

Figures 21 and 22

This small and slender form may easily be distinguished from all the other similar American species with which I am familiar by the lateral lobes of the head that extend down below the eyes, these being of unusually large size, although they do not project forward or outward much, and are not very prominent in a dorsal view of the head unless the latter is considerably tilted up. But in a side view they appear large and of squarish outline, with the lower anterior corner rounded off and the lower posterior corner a little produced.

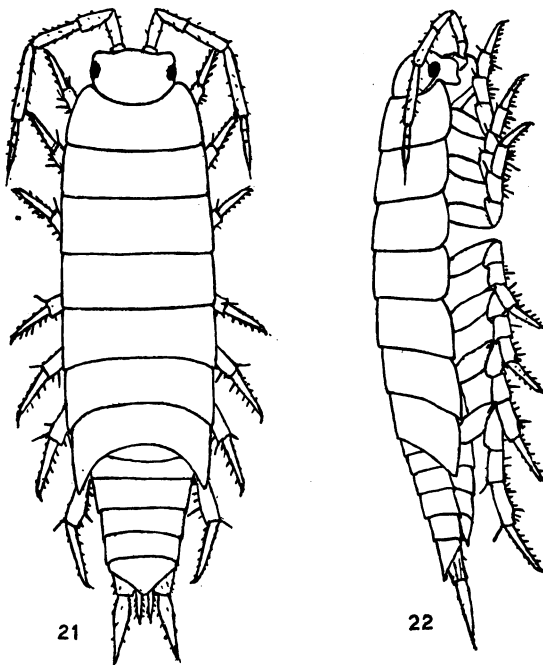
Length of the largest individual in the collection (a female with marsupium), 3.75 mm.

In other respects the species present little that is unusual in members of this genus; in addition to its very small size it is characterized by its narrow, elongate body, whose segments, being rather loosely articulated, permit of considerable additional elongation of the body when the intersegmental muscles are relaxed. The back is not greatly arched; the body surface is very smooth and even and practically free from pubescence, though the antennæ and to a less extent the uropoda bear some short hairs; the color is the usual purplish brown above, with small light-colored markings on the head and dorso-lateral regions of the back; the legs and under parts are practically unpigmented.

The head is fairly large and rounded, though not wide, and is somewhat set back into the thorax. Its large but rather closely appressed lateral lobes have already been

described; the median part of the forehead is slightly prominent. Eyes wide apart, rather small; ocelli few, apparently not over 10 or 12. Second antennæ of moderate length and stoutness, reaching nearly or quite to the fourth thoracic segment when laid back. Flagellum considerably shorter than the last segment of the peduncle; its terminal article the longest and tipped with a rather short terminal bristle.

The first four thoracic segments have the posterior lateral corners rounded off and not produced backwards. The last three have the corresponding corners sharp and more or less produced backward. All have the lateral ends cut off with a some-



Figs. 21 and 22. *Philoscia gatunensis*, new species. Dorsal and lateral views of female. $\times 19$.

what curved outline which, however, is more squarely truncate in the case of the last three or four segments than in the anterior ones. Legs moderately long for the size of the animal. No sexual differences in the legs were noted.

Abdomen rather long and of smoothly tapering outline when seen from above. The posterior lateral corners of segments 3, 4, and 5 are appressed and scarcely at all produced into points, and do not break the smooth, straight outline of the sides of the abdomen in a dorsal view of the same. Telson triangular, wider than long, but not greatly so; its apex fairly acute. Inner branches of uropoda rather narrow and laterally compressed, the outer ones slightly flattened, of sharply tapering outline as seen from above or below.

Only nine specimens were collected, all obtained in old-growth forest not far from the Biological Station by sifting dead leaves and mould. The species is, however, probably relatively more abundant than the material obtained would indicate, as its minute size and considerable activity in escaping make it unlikely to be collected by any other method than sifting. A female has been designated as the type.

LITERATURE

- BRANDT, J. F.
1833. 'Conspectus Monographiæ Crustaceorum Oniscodorum Latreillei.' Bull. Soc. Imp. Nat. Moscou, VI, pp. 171-193.
- BUDDE-LUND, G.
1885. 'Crustacea Isopoda Terrestria per familias et genera et species descripta.' Hauniæ, pp. 1-319.
1904. 'A revision of Crustacea Isopoda Terrestria, with additions and illustrations, Part II, Spherilloninæ; Part III, Armadillo.' Copenhagen, pp. 33-144, Pls. VI-X.
- COLLINGE, W. E.
1915. 'Description of a new Genus and Species of terrestrial Isopod from British Guiana.' Journ. Linn. Soc. London, Zoöl., XXXII, pp. 509-511, Pl. L.
- DOLLFUS, A.
1893. 'Voyage de M. E. Simon au Venezuela (Decembre 1887- Avril 1888). 25^e Mémoire, Isopodes Terrestres.' Ann. Soc. Ent. France, LXII, pp. 339-346, Pls. IX, X, 1 text-fig.
1896. 'Isopodes terrestres recueillis dans le Darien par M. le Dr E. Festa.' Boll. Mus. Zool. Anat. Comp. Univ. Torino, XI, No. 228, pp. 1, 2, Figs. 1-3.
- JACKSON, H. G.
1922. 'A Revision of the Isopod Genus *Ligia* (Fabricius).' Proc. Zoöl. Soc. London, pp. 683-702, Pls. I, II.
- MILNE, EDWARDS, A.
1840. 'Histoire Naturelle des Crustacés.' Isopods in Vol. III, pp. 115-283, Pls. XXXI-XXXIII. Paris.
- PEARSE, A. S.
1921. 'Crustacea from Lake Valencia, Venezuela.' Proc. U. S. Nat. Mus., LIX, pp. 459-462, Figs. 1-2.
- RICHARDSON, H.
1905. 'A Monograph on the Isopods of North America.' Bull. No. 54, U. S. Nat. Mus., pp. i-liii, 1-727, Figs. 1-740.
1912a. 'Description of a New Terrestrial Isopod Belonging to the Genus *Cubaris* from Panama.' Proc. U. S. Nat. Mus., XLII, pp. 477-479, Figs. 1, 2.
1912b. 'Description of Two New Parasitic Isopods Belonging to the Genera *Palægyge* and *Probopyrus* from Panama.' Proc. U. S. Nat. Mus., XLII, pp. 521-524, Figs. 1-8.

1913. 'Terrestrial Isopods Collected in Costa Rica by Mr. Picado, with the Description of a New Genus and Species.' *Proc. U. S. Nat. Mus.*, XLIV, pp. 337-340, Figs. 1-5.
1914. 'Terrestrial Isopoda of Colombia.' *Mém. Soc. Neuchâteloise Sci. Nat.*, V, pp. 29-32.

ROUX, J. L. F.

1828. 'Crustacés de la Méditerranée et de son Littoral.' Paris et Marseilles.

VAN NAME, W. G.

1925. 'The Isopods of Kartabo, Bartica District, British Guiana.' *Zoologica*, VI, pp. 461-503, Figs. 1-77.

