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Acarina from Southeastern Polynesia—II (Oribatidae)[1]

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This is the second report on Acarina, or mites, collected by the Mangarevan Expedition which was sent by Bishop Museum to explore islands of southeastern Polynesia in 1934. The first report, covering the Mesostigmata, was published by Ivar Trägårdh in 1951 (29).[2] The Trägårdh report includes 14 species and 13 genera, of which 7 genera and 11 species are described as new to science. To this may now be added the 31 species of Oribatidae which are reported upon in this paper.

My report is based upon 324 specimens of Oribatidae collected by the Mangarevan Expedition and includes 26 species and five varieties in 21 genera. Of these, 14 species and one variety are described as new to science. In addition, *Humerobates humeralis perkinsi* Jacot is raised to specific status.

For a detailed survey of the mite fauna of any locality, it is necessary that a careful and extensive use of the Berlese funnel be made. By the use of this funnel, the acarologist can obtain thousands of mites from a suitable biotope, but much time must be spent making such collections. There was no acarologist on the Mangarevan Expedition, and the mites collected were taken as incidental collections by the entomologist, the botanists, and the malacologists. In fact, a number of specimens were obtained from the empty shells of land mollusks when they were cleaned in the laboratory after the expedition. However, despite the lack of time and of facilities for specialized mite collecting techniques, the results obtained are a good addition to our knowledge

[1] Mangarevan Expedition publication 43.
[2] Numbers in parentheses refer to Bibliography p. 151.

of the acarid fauna of the Pacific islands. No oribatids had been previously known from the islands represented by the collections reported upon here.

In addition to the Oribatidae, two species belonging to other suborders were found in the material studied. One of these belongs to the Bdellidae, but the mount is so badly preserved that it is impossible to determine the specimen. The other species is a bird mite, which Dr. Charles D. Radford of Manchester, England, was kind enough to identify as *Alloptes crassipes* (Canestrini), 1878.

Only two larger papers on the oribatid mites from Pacific islands have been published, both by Jacot (13, 14). I have discovered several of the species listed by Jacot in the Mangarevan Expedition collection.

Dr. Elwood C. Zimmerman, the entomologist on the Mangarevan Expedition, assisted me in translating my original manuscript from German into English and revised the manuscript. I am also indebted to Dr. G. O. Evans of the British Museum (Natural History) for his help.

All collections reported here were made by the Mangarevan Expedition in 1934, and the types of the new species are deposited in Bishop Museum. Oribatidae were collected on the islands of Tahiti, Moorea, Huahine, Raiatea, Tahaa, Borabora, Rapa, Marotiri, Raivavae, Tubuai, Rurutu, Rimatara, Maria, and Flint. It is of interest that the expedition evidently found no oribatids on the several atoll islands of the Tuamotus which they visited. No specimens were found on Pitcairn or nearby Henderson Island, although they probably occur there.

Family CAMISIIDAE Sellnick, 1929

Genus **Nothrus** C. L. Koch, 1836

Type *Nothrus palustris* C. L. Koch, 1839.

1. Nothrus oceanicus, new species (fig. 1).

Propodosoma a cone with a small constriction above leg I on each side and a little round projection between legs I and II. The blunt, rounded rostrum has in its center the notch characteristic of species of *Nothrus*. Rostral hairs narrow, leaflike, their points of insertion united by a low, curved ridge. A short distance behind rostral hairs, and somewhat more separated than those, lamellar hairs are inserted on low apophyses, and they are broader than rostral hairs. The two apophyses are united by a poorly developed keel. At a distance from posterior border of propodosoma and from its lateral border is placed the strongly chitinized bothridium, which is triangular in outline, outward-directed side of triangle longest, posterior side, parallel to posterior border of propodosoma, shortest.

Sensillus, directed outward and a little upward, is a bristle tapering gradually to its distal end, somewhat longer than one-half width of propodosoma, and with a few fine cilia on distal part. Interlamellar hair, at a level with sensillus, is 32 μ distant from bothridium. This hair is broken off, but it may be of same size as lamellar hairs. Behind bothridium and between it and anterior border of hysterosoma is a sickle-shaped chitinization, the arc opened inward. Except part behind

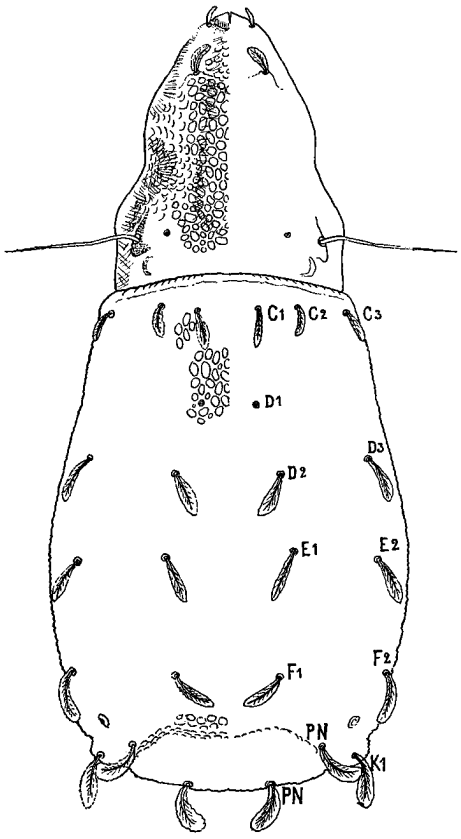

FIGURE 1.—*Nothrus oceanicus,* dorsal side.

bothridium, whole surface of propodosoma covered with pits, diameter 12-16 μ; bottoms of pits appear finely granulated, spaces between pits form a network of ridges. There is a regular longitudinal depression between and in front of bothridiae.

Width of anterior border of hysterosoma 288 μ. Body widest behind middle. Anterior border projects slightly, and is slightly longitudinally sulcate. Whole surface covered with distinct, but not perfectly equal, pits, delimited by a net of

more strongly chitinized ridges. Close to inner side of marginal hairs is a longitudinal stripe of smaller and considerably less distinct pits, situated where margin of dorsal shield is bent upward. Flat knobs touch each other on margin. Posterior border of body slightly convex. Outer corners of posterior border well marked by low indentations in front and behind last marginal hair (F2). Whole posterior part of dorsal plate between outer corners a trapezium, sloping backward. Anterior side of trapezium shorter than posterior border of body.

Hairs of dorsal shield leaflike, each with a longitudinal rib from which small lateral ribs project obliquely forward. Margins of these leaves smooth or provided with little notches.

Marginal row of hairs on each side of dorsal shield has bristles C3, D3, E2, and F2. Distance from C3 to D3 is much greater than distances from D3 to E2 and from E2 to F2. There are two median rows: C1, D1, D2, E1, and F1. The distances from C1 to D1 and from E1 to F1 are greater than from D1 to D2 and D2 to E1. The distances from C1 to C1 and from D1 to D1 are equal; from D2 to D2 and from E1 to E1 are greater. The space between F1 and F1 equals that between D2 and D2. Between C1 and C3, hair C2, a little smaller than the others, is nearer to C1 than to C3. At outer posterior corner of body is hair K1. On posterior margin is hair PN1; and somewhat higher on dorsal surface, nearer to K1 than to PN1, PN2 is inserted. Under posterior rounded corner of body is hair PN3, which is smaller than hairs on dorsal shield. All other hairs on ventral side simple, short bristles. Epimera I to IV on each side of venter fused. Also, epimera I and II of one side fused with those of other side. Between epimera III and IV of one side and III and IV of other side is a deep notch.

Tarsi with three distinct claws, middle one much stronger than lateral ones, which resemble curved hairs. Most segments with low pits and narrow leaflike hairs. Many hairs on tarsi simple and smooth.

Holotype, slide 001.

Raivavae: Ahuoivi Point, on dead leaves, Aug. 9, one specimen, Cooke, Kondo, and D. Anderson. Type locality.

This new species resembles *Nothrus biciliatus* C. L. Koch, but several characters separate it from the German species. *N. oceanicus* (a female) is 765 μ long and 405 μ broad. *N. biciliatus* is 924 μ long and 450 μ broad.

Genus **Phyllonothrus,** new genus

This genus is similar to the genus *Camisia,* but lacks any real bothridium. The hairs on the dorsal shield are all pick-shaped; on the legs, mostly small blades. A single nymph composes the collection.

Type *Phyllonothrus runcifer,* new species.

2. Phyllonothrus runcifer, new species (fig. 2).

Length 505 μ, width 200 μ. Whitish yellow in color.

Propodosoma posteriorly smaller than anterior edge of hysterosoma, sides somewhat converging toward top, with low indentations over leg I, but with rostrum truncate. Rostral hairs simple, short, curved. Behind rostral hairs, at border of rostrum, are low apophyses for lamellar hairs, which are formed like

a double pickax (pointed at both ends and provided with a short handle in the middle) and each inserted at top of apophysis. There seems to be a fold in the surface of the propodosoma between the lamellar apophyses, thus forming a kind of translamella.

At a level with the middle of coxa I are insertions of interlamellar hairs, separated from each other as are lamellar hairs. (The hairs are broken off, but I believe that they were of the size of the lamellar hairs, considering their large points of insertion.) Behind and inside interlamellar hairs are two elongated trapeziform areas, flat indentations, which do not reach anterior border of hysterosoma.

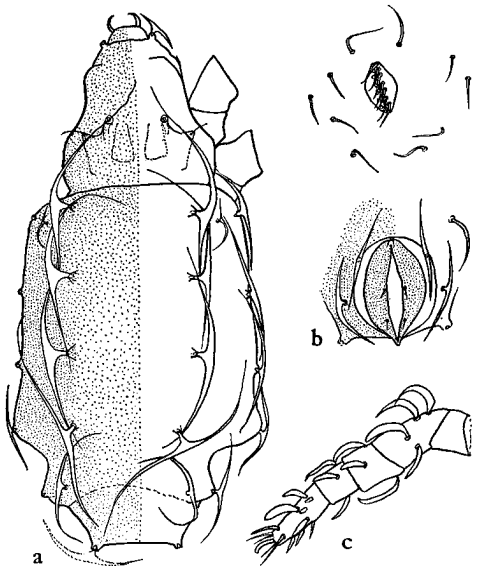

FIGURE 2.—*Phyllonothrus runcifer:* **a**, dorsal side; **b**, part of ventral side; **c**, leg II.

Outside interlamellar hairs a sharp angle is directed outward, limited anteriorly by a concave chitinous line, beginning at interlamellar hair, and an almost straight lateral line which is directed backward and a little inward. Corner of the angle does not reach side of propodosoma. At its apex is inserted a simple, short, fine hair which I believe to be the sensillus. I see no bothridium.

Dorsum of hysterosoma almost parallel-sided in basal three-fourths of its length, enlarging a little posteriorly; body constricted, forming a short part with right angles, and finally body narrowed again, forming a trapezium with a straight posterior border with blunt corners. This trapezoidal part seems to lie on a lower level than rest of dorsum.

There is a marginal row of six of above-described double pickax hairs, four equidistant from each other on first three-fourths of border, one at corner of

narrowed part, and one on blunt corner of trapezoidal one. Each blade of picklike hairs long enough to reach basal "handle" of following hair. There is a submarginal row of four hairs of the same length, but these are somewhat broader. Distal ends of picklike hairs, especially of anteriormost ones, very fine and extremely long. Long apex of each anterior hair extends beyond insertion of interlamellar hair. A fifth hair is close to fifth hair of marginal row. A much smaller hair is inserted between first hair of marginal and that of submarginal one. These three hairs correspond to hairs C1, C2, and C3 in all Camisiidae.

Ventral side (fig. 2, *b*). Small nymphal genital fissure limited by two narrow shields, outlines of which form a bow. Seven short, simple hairs inserted on each border of the fissure. Surrounding genital fissure, and at a distance from it, are 10 larger, simple hairs, arranged roughly on each side as follows: one in front, two at sides, and two laterally behind fissure.

Anal opening touches posterior border of body. On each side is a sickle-shaped shield. In posterior half and near inner border are inserted two very small hairs. The two shields are situated in a nearly circular-shaped area of venter. On margin of chitinous part of circular area, in anterior half, is inserted a picklike hair, and a second hair of same shape is somewhat removed from border. A little in front and laterad of opening is a larger but simple hair. All other hairs on ventral surface simple.

Legs with one claw. Except for some simple hairs at distal end of tarsi, all hairs more or less leaflike, but narrow (fig. 2, *c*).

Holotype, slide 002.

Rurutu, type locality, bluff north of Moerai, under stones, Aug. 25, Cooke.

Genus **Acronothrus** Berlese, 1916

Type *Nothrus cophinarus* Michael, 1908 (New Zealand).

3. Acronothrus nukuhivae Jacot, B. P. Bishop Mus., Bull. **114**: 218, 1934 (1935).

Rapa: Mt. Ororangi, southeast valley, 600-700 ft., July 3, Zimmerman. Mangaoa Peak, 900-1,200 ft., July 4, five specimens, Zimmerman. Pake Bay, July 6, one specimen, Kondo. Mt. Perahu, east ridge, 1,000-1,200 ft., July 13, one specimen, Zimmerman. Mt. Tepiahu, south slope, 400-600 ft., July 16, one specimen, Zimmerman. Near Morongota, gathered from ground with land shells, July 16, two specimens, Cooke, Kondo, W. Anderson. Mt. Tepiahu, south side, under stones, July 23, one specimen, Cooke and Kondo. Mangaoa Peak, northeast ridge, 1,000-1,200 ft., July 25, four specimens, Zimmerman. Mt. Tanga, north slope, 300-700 ft., July 31, under dead leaves, one specimen, D. Anderson.

Raivavae: Mt. Muanui, south slope, 400-700 ft., Aug. 6, four specimens, and east slope, 500-800 ft., Aug. 8, one specimen, Zimmerman.

Tubuai: Mt. Taitaa [mapped Taita], northwest ridge, 1,200 ft., Aug. 21, one specimen, and southwest ridge, 1,200 ft., Aug. 23, two specimens, Zimmerman.

Rurutu: Mt. Teape, southwest slope, 1,000 ft., Sept. 2, one specimen, Zimmerman.

This species has been known heretofore only from the Marquesas Islands.

Family NEOLIODIDAE Willmann, 1931

Genus **Liodes** von Heyden, 1826

Several present-day acarologists do not realize that the genus *Neoliodes* Berlese must be called *Liodes* von Heyden. Berlese was of the opinion that *Liodes* was preoccupied by Latreille, 1796, for a genus of Coleoptera. But Latreille called his genus *Leiodes*. If this name is later changed to *Liodes* by coleopterologists, it is an unauthorized change which must be withdrawn. *Liodes* is the name of a genus of Oribatidae, with *Notaspis theleproctus* Hermann, 1804, as type. Jacot established in 1929 (9) the genus *Udetaliodes* with *Liodes concentricus* Banks as type. I stated my opinion regarding this in 1930 (25), and I have not changed it. Grandjean, 1936 (6), collecting in the neighborhood of Strassburg, rediscovered Hermann's species, but he does not mention Jacot's new genus. Graf Vitzthum, in 1943 (30), considered the name *Udetaliodes* to be identical with *Neoliodes* Berlese. The short diagnosis of the genus, as well as the figures, in Jacot's paper (9, p. 31), demonstrates that his species belong to the genus *Liodes* and that the new name was superfluous.

There are three different species of *Liodes* in the Mangarevan Expedition collection: *Liodes bataviensis* (Sellnick), 1925, *Liodes hawaiiensis* (Jacot), 1929, and *Liodes zimmermani,* new species.

In Jacot's key to the species of *Liodes* found in the Pacific islands (9), he divides them into two groups: species which have one longitudinal keel in the middle of the anterior part of the dorsal shield and species which have three, five, or seven parallel keels in the same place. The nymphal exuviae which always remain on the dorsum also have these lines. The species *Liodes zimmermani* has no keel. If we wish to put the species into Jacot's key, we must establish a third group. The anterior part of the dorsal shield of *Liodes zimmermani* is densely covered with low knobs which nearly touch each other, and the intervals between the knobs form a kind of polygonal reticulation.

Figure 3, *b* (*hawaiiensis*), 3, *e* (*zimmermani*), and 3, *h* (*bataviensis*) show an opening (of a gland?) on the dorsal shield near its lateral border. I mentioned this opening in 1925 (22, p. 463). Apparently Jacot, who has described many new species, has paid no attention to such foramina. In studies made of specimens *in toto,* the openings are not visible, or they are very difficult to find. It is necessary to dissect the animals to see them. (See figures 3, *b, e,* and *h.*)

There are very distinct differences between femur I in the various species, as is noted in the following descriptions.

4. Liodes hawaiiensis (Jacot). (Figure 3, *a-c.*)

Udetaliodes hawaiiensis Jacot, Am. Microscopical Soc., Trans. **48**: 31, 1929 (with figures).

Only distal half or a little more of surface of femur I is covered with pits. Pits relatively distinct, but network of lines between them less developed. Anterior dorsal hairs straight, inclined a little forward. Posterior dorsal hair inserted in middle of dorsal edge, inclined forward, and bowed. Only one short, erect, straight hair about middle of lower edge of femur. Lateral hair inserted in front of femur and near ventral edge.

Slides 007-012.

Rapa: Mt. Ororangi, southeast valley, 600-700 ft., July 3, two specimens, Zimmerman. Mangaoa Peak, northeast ridge, 1,000-1,200 ft., July 25, one specimen, Zimmerman.

Tubuai: Mt. Taita, northwest ridge, 1,200 ft., Aug. 21, 33 specimens, Zimmerman.

Tahiti: Mt. Aorai Trail, 3,500-4,500 ft., on *Metrosideros,* Sept. 13, one specimen, Zimmerman.

Previously known only from the Hawaiian Islands.

5. Liodes zimmermani, new species (fig. 3, *d-f*).

Femur I is larger than on other species. Only part of anterior half of the segment pitted, but pits not so distinctly limited as in the other two species. Surface of proximal half with more or less distinct transverse ridges covering it. Anterior dorsal hair curved; posterior one, situated at middle of dorsal edge, rather straight and nearly appressed. Lower edge of femur with two short, straight hairs, posterior one of which is inserted in middle. Both are inclined a little forward. Lateral hair, inserted in a line with anterior one on lower edge, is straight and a little longer than lower hairs.

Largest specimen 1,530 μ long and 990 μ broad.

Type, slides 003 a-g., paratypes, slides 004-006.

Marotiri: Southeast Islet (type locality), July 22, 12 specimens, Zimmerman and Fosberg.

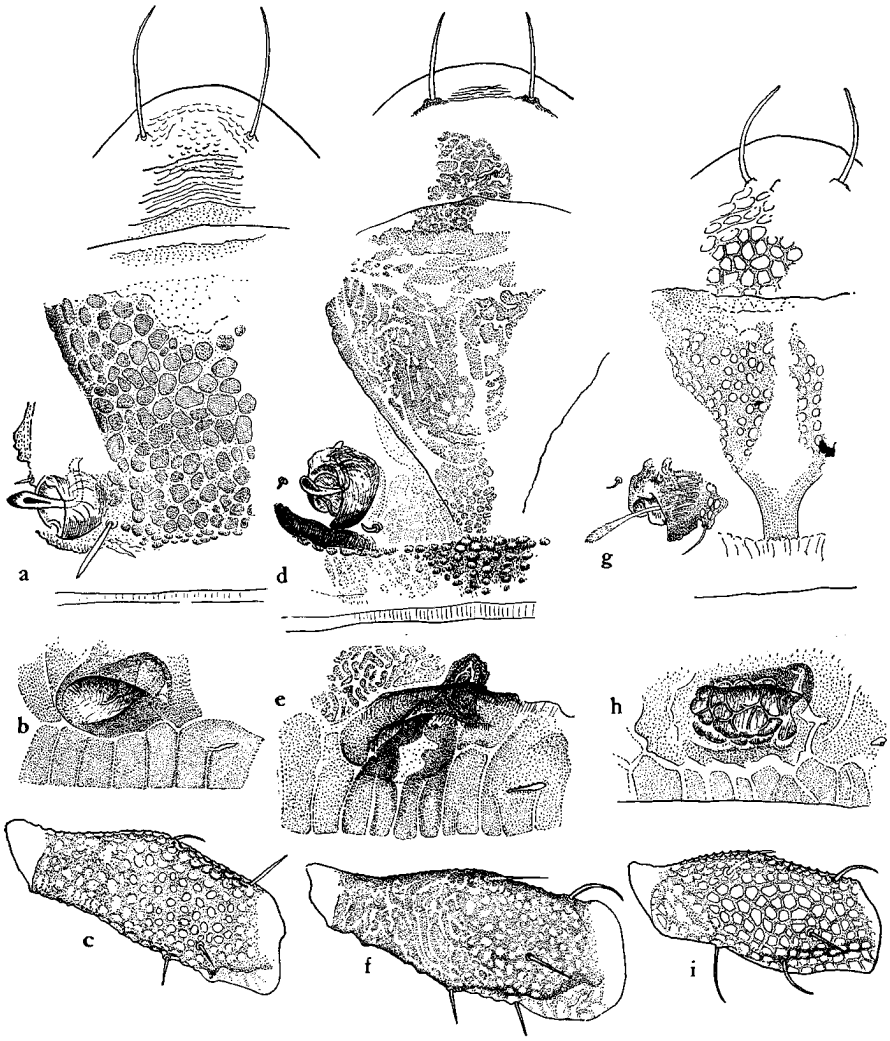

FIGURE 3.—**a-c,** *Liodes hawaiiensis: a,* part of propodosoma with bothridium and sensillus; *b,* opening at side of dorsal shield; *c,* femur I. **d-f,** *L. zimmermani: d,* part of propodosoma with bothridium and sensillus; *e,* opening at side of dorsal shield; *f,* femur I. **g-i,** *L. bataviensis: g,* part of propodosoma with bothridium and sensillus; *h,* opening at side of dorsal shield; *i,* femur I.

6. Liodes bataviensis (Sellnick). (Figure 3, *g-i.*)

Neoliodes bataviensis Sellnick, Treubia **6**: 463, 1925 (with figures).

Three-fourths of outside of femur I covered with well-defined pits. In a preparation, shows a distinct network of chitinous ridges which surround light spots. Posterior dorsal hair inserted rather far back, and not on dorsal edge, but distinctly removed inward from edge, nearly appressed and curved. Anterior hair inclined and curved. Posterior ventral hair in line with posterior dorsal hair; that is, inserted in proximal third of segment. Anterior of ventral hairs inserted somewhat in front of middle of femur. Both hairs curved forward a little. Lateral hair inserted on line between anterior dorsal and anterior ventral hair, not quite in middle of lateral surface.

Slides 013-015.

Mangareva.: Taravai, northeast side, June 1, five specimens, Zimmerman.

Flint: Oct. 16, 44 specimens, Zimmerman.

Not known heretofore outside of Java.

Family CARABODIDAE Willmann, 1931

Genus **Carabodes** C. L. Koch, 1836

Type *Carabodes coriaceus* C. L. Koch, 1836.

7. Carabodes granosus, new species (fig. 4, *a*).

A female, length 504 μ, width 234 μ. Color yellow brown.

Posterior part of propodosoma narrower than anterior border of hysterosoma, forming an elongated trapezium, which tapers to rostrum; anterior border of rostrum truncated.

Lamellae apparently flat, almost horizontal, ridges without distinct sculpture, outer border forming lateral border of propodosoma. They reach tip of propodosoma, forming there a rounded edge upon which is inserted the lamellar bristle which is a perfectly smooth hair. These hairs are bent toward each other. Rostral hairs inserted under lamellar hairs also smooth, and almost appressed to rostrum, crossing each other at their apices.

Whole surface between lamellae rough with densely placed, raised spots. On level with insertion points of lamellar hairs, there is apparently a low indentation indicated by a transverse row of dots. In front of this row is a triangular, light-colored spot.

Interlamellar hairs situated half way between anterior and posterior border of propodosoma. They are shorter than lamellar hairs, straight, ensiform, directed outward, forward, and upward, but not reaching lateral border of lamellae.

Bothridium is a cup lying in posterior angle of lamella. Sensillus, directed somewhat backward, with thin peduncle which increases gradually to a dark-brown, claviform head. Right one shows a longitudinal furrow at one side.

Furrow between propodosoma and hysterosoma well-marked, but without cavity (*Halshöhle*) beneath posterior dorsal part of propodosoma. Anterior border of hysterosoma almost straight. Antero-lateral angles form prominent shoulders, lateral border continuing into rounded hind margin.

A depression, somewhat remote from lateral and posterior borders and parallel to them, marks a distinct marginal part of dorsal shield. Whole shield rough with raised dots, as on propodosoma, in addition a very fine granulation or punctuation on dots and on narrow spaces between them.

Hairs on median part of dorsal shield formed almost like interlamellar hairs, perhaps a little more rod-shaped, and curved. Two median, longitudinal rows of five hairs; the distance between rows nearly the same as between a hair and lateral border. Two hairs on each side nearer to margin, and on margin three somewhat claviform hairs on each side in posterior third of hysterosoma. Having only three hairs on posterior border is unusual in *Carabodes*. Most species have four pairs of bristles on hind margin.

Ventral side: Gnathosoma and genital covers lack sculpture. Some pits at outer part of anal covers. Rest of ventral surface, particularly part behind genital opening, with dots of similar form to those of dorsal shield, but lower. Hairs at lateral and posterior sides of anal covers stout, but smaller than those of dorsal shield.

Femora I and II with low pits.

An egg in body was relatively large: 208 μ long and 130 μ broad.

Type, slide 016.

Raivavae: Ahuoivi Point (type locality), on dead leaves, Aug. 9, one specimen, Cooke, Kondo, and D. Anderson.

8. Carabodes imperfecta, new species (fig. 4, *b*).

A female, 630 μ long, 360 μ broad. Color yellow brown.

There is a deep notch between propodosoma and hysterosoma, but no cavity (*Halshöhle*) under posterior border of propodosoma.

Propodosoma rather flat; that is, surface of lamellae and surface of propodosoma between them horizontal, therefore on same level with each other. Only a shallow depression between disk and lamellae which form margins of propodosoma.

Outer border of lamellae a sharp keel and both borders somewhat convergent. Anterior end of lamella rounded, without a special cusp. Rostrum between ends of lamellae blunt. Inner borders of lamellae (the furrows) very convergent anteriorly in proximal parts, but then almost parallel. Upon rounded end of lamella is inserted lamellar hair, which is thick and rough and nearly appressed to anterior, rounded end of lamellae. There is a kind of translamella, made wavy by shallow pits, between anterior ends of lamellae. In front of this, on little knobs, are inserted the two rostral hairs which are almost straight, very narrowly leaflike and each with a fine longitudinal rib. Part in front of translamella distinctly pitted; behind it mostly indistinct, rounded, flat knobs scattered on surface.

Somewhat behind mid-length of propodosoma are inserted interlamellar hairs, 55 μ long, separated from each other as much as from margin of lamellae, erect, a little diverging, each like a narrow leaf with a distinct rib, the inner border of leaf supplied with little teeth.

Bothridium is a cup, included in the posterior part of the lamella, as is usual in *Carabodes,* and the opening is thus directed outward. Sensillus is at first directed outward, but then bends upward. This organ is proximally rather strong, then tapers to a pointed distal end which, on its outside, has many fine little barbs directed toward point of bristle. Sensillus almost as long as interlamellar hair.

Anterior border of hysterosoma projects a little in the center, and like inner edge of lamellae, is a very well chitinized line. Anterior edge of hysterosoma a flat, sharply bordered blade which does not, however, project distinctly over outer border of hysterosoma. A low indentation seems to mark a marginal part of dorsal plate, as in most species of *Carabodes*. But posterior part of dorsal plate is lacking, hence I can say nothing about course of marginal indentation. However, margins of body nearly parallel and posterior margin bluntly and broadly rounded.

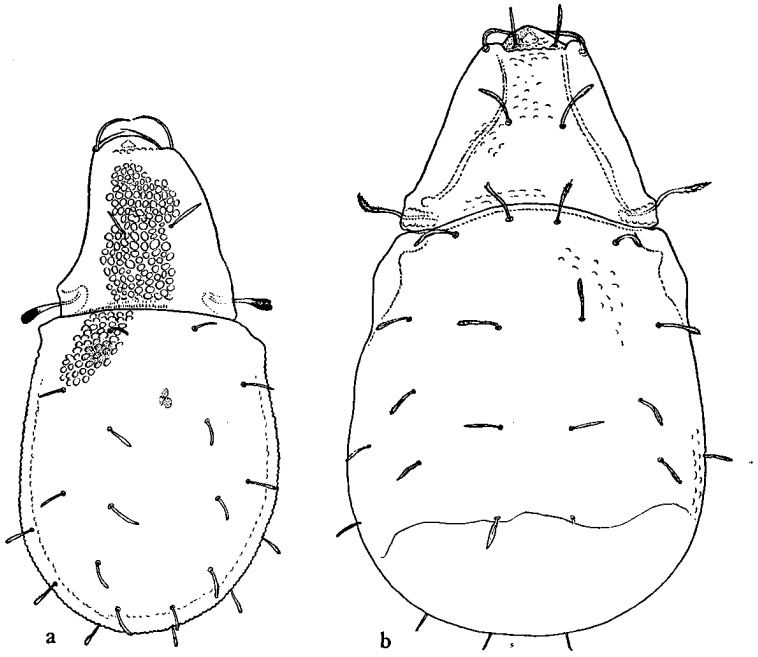

FIGURE 4.—**a,** *Carabodes granosus,* dorsal side; **b,** *C. imperfecta,* dorsal side.

Surface of hysterosoma not perfectly smooth, but lacks both knobs and pits. Hairs on fragment of dorsum proximally cylindrical, then gradually a little enlarged, resembling a narrow leaf, with several diverging ribs projecting from cylindrical part, 44 μ long. Most bristles erect and bowed backward somewhat. Hairs on posterior border of dorsal plates short, straight, radiate, narrow, but with ribs. Number of hairs inserted on posterior border not known, as part of posterior border is lacking. From position of remaining hairs there seem to be more than the usual four on each side of body.

Ventral side: Gnathosoma developed as usual and smooth; apodemata rather distinct, as is sternal beam, which reaches to genital aperture and is united with apodemata.

Genital opening is 76 μ long and 68 μ broad, anteriorly broader than posteriorly, with rounded corners. On each cover are inserted four equally spaced

hairs in a longitudinal row nearer genital fissure than outer border. Hairs relatively long, 38 μ.

Anal aperture 88 μ long, broadest part of equal width; broader posteriorly than anteriorly. Two hairs on each cover, stouter than those of genital covers and inserted near anal fissure, anterior one a little in front of middle, posterior one approaching posterior margin. At sides of anal opening are inserted the following bristles: the first a little in front of cover, and 28 μ from it; second at a level with half the length of cover, 28 μ from it; third behind posterior third of opening and close to it. All hairs stouter than those of ventral side, but not as stout as those of posterior margin of body.

Genital opening 96 μ from anal opening, space between them covered with low knobs which can only be seen in lateral aspect. Pair of hairs near genital opening fine and fully as long as those on genital covers. Distance between these hairs as great as that of anterior pair of anal covers, 100 μ.

Only one claw on tarsus. At outside of genu I and II is inserted a swordlike hair which is 33 μ long and has a distinct longitudinal rib. No pits on femora I and II.

Type, slide 017.

Rurutu: Mato Naa (type locality), Aug. 30, one specimen, Fosberg.

This species is related to the European *Carabodes marginatus* (Michael). The sensillus has nearly the same form. But the sculpture of the dorsal surface is not the same, and the rostral and dorsal hairs of each species are individually distinct.

Family HERMANNIELLIDAE Grandjean, 1934

Genus **Hermanniella** Berlese, 1908

Type *Hermannia granulata* Nicolet, 1855.

9. Hermanniella punctulata columbiana Berlese, Redia **6**: 362, 1910.

Rimatara: northwest of Aurau, Sept. 5, one specimen, D. Anderson and Y. Kondo.

Heretofore recorded from British Columbia.

Family ZETORCHESTIDAE Michael, 1898

Genus **Zetorchestes** Berlese, 1888

Type *Carabodes micronychus* Berlese, 1883.

10. Zetorchestes micronychus pacificus, new subspecies.

Female, 468 μ long and 360 μ wide.

This new subspecies has the same somewhat globular body as typical species. Border between propodosoma and hysterosoma a mere punctuated line. Lamellae

flat, nearly horizontal, narrow blades, a little remote from outline of propodosoma, projecting rather far forward, tapering to distal end, and this end is bent outward at a blunt angle. At top of lamella, which has no cusp, is inserted lamellar hair of medium length, curved inward. Lamella covered with rather deep pits. Viewed laterally, border of lamella therefore appears to be wavy, as in *Z. falzonii* Coggi.

Between blunt angles of both lamellae is a faint transverse line, apparently a low folding of surface, an indication of translamella.

Between insertions of lamellar hairs are two little apophyses, or knobs, containing rostral hairs. Lamellae and knobs subequally spaced. Rostral hairs of equal width throughout, but distal end forked, inner prong a little longer than outer one, both prongs short, diverging.

Interlamellar hairs very fine, scarcely discernible, shorter than lamellar hairs, directed toward each other.

Bothridium an ear-shaped, outwardly projecting cup at proximal part of lamella. Sensillus with a thin peduncle which widens gradually to a head of clavate outline which is, however, a flat leaf. On surface of leaf lie, nearly appressed, longitudinally disposed, short rods. Sensillus directed outward and obliquely upward and apparently a little smaller than that of the European form.

In dorsal view may be seen a distinct cone at anterior corner of dorsal shield, a little outside bothridium. Apparently, the European form does not have the cone, for I did not draw it in my figure (24, fig. 51).

In the European form, the hairs on the dorsal surface are easily discernible. In the new subspecies, I see only the insertion points of very fine hairs. There is a long fissure near border of dorsal shield behind middle. In the European form, these fissures are also present, but they are nearer together in the new subspecies.

Genital and anal openings close, only a narrow chitinous rim between them. There is a remarkable low, but sharp, keel which begins at insertion of leg III, then takes a backward course to level of anterior border of genital opening, then bends at a blunt angle inward and goes toward last quarter of genital opening.

Leg IV has almost same shape as that of *Z. micronychus* Berlese and *Z. falzonii* Coggi, but they seem to differ somewhat.

Rurutu: Mato Arei, under dead leaves, Aug. 26, one specimen, D. Anderson.

All the differences combined are not sufficient to justify establishing a new species, hence I consider this form to be a new subspecies.

Berlese established his species in 1883 (1, pt. 4) on the inner side of the wrapper as *Carabodes micronychus*. In 1888 (1, pt. 63) he gave a better description of the species. No details can be distinguished on his figure of the entire animal, but leg IV seems to be drawn correctly. Comparing Berlese's figure with that which Coggi gives of *Zetorchestes falzonii* (4, fig. 5), I am of the opinion that the differences are so slight that the two species are identical.

Berlese's species is 450 μ long; and my specimens (24) are 440 μ long. Coggi's *Z. falzonii* is 500 μ long and 350 μ broad. The Pacific subspecies thus stands between *Z. micronychus* and *Z. falzonii*.

FAMILY EREMAEIDAE WILLMANN, 1931

Genus **Oppia** C. L. Koch, 1836

Type *Oppia nitens* C. L. Koch 1836.

11. Oppia ultraciliata (Jacot)?

Dameosoma ultraciliata Jacot, B. P. Bishop Mus., Bull. **121**: 19, 1934.

Rapa: Above Area, 400 ft., under stones, July 24, one specimen, D. Anderson.

Heretofore known only from Hawaii.

FAMILY CERATOZETIDAE JACOT, 1925

Genus **Humerobates** Sellnick, 1929

In 1929 (24), I established the genus *Humerobates,* with *Notaspis humeralis* Hermann as the type species. With this name I associated the species considered by Berlese and other acarologists as identical with Hermann's species, but Grandjean, in 1936 (6), pointed out that Berlese's species is not the same as that of Hermann. New collections made by Grandjean in localities around Strassburg, where Hermann found his species, led Grandjean to conclude that *Notaspis humeralis* Hermann is identical with *Sphaerozetes (Trichoribates) numerosus* Sellnick, 1924 (20). According to the rules of nomenclature, the generic name *Humerobates* must stand, but the name of the type species must be changed. Grandjean calls it *rostrolamellatus.* Having taken the new generic name *Diapterobates* for the rediscovered *Notaspis humeralis* Hermann, we have to use the names as follows:

Diapterobates Grandjean, Ent. Soc. France, Ann. **105**: 79, 1936 (type species *Notaspis humeralis* Hermann, Mém. Apt., 92, 1804).

Humerobates Sellnick, Tierwelt Mitteleur. **3** (9): 11, 1929 [type species *Humerobates rostrolamellatus* Grandjean (misidentified as *Notaspis humeralis* by Sellnick), Soc. Ent. France, Ann. **105**: 77, 1936].

There are three described forms of *Humerobates:* (1) *H. rostrolamellatus* Grandjean (fig. 5, *a, b*), widespread in Europe; (2) *H. humeralis arborea* (Banks) (*Oribata arborea*), Am. Ent. Soc., Trans. 22: 7, 1895, of the United States; (3) *H. humeralis perkinsi* Jacot, B. P. Bishop Mus., Bull. **121**: 67, 1934, of the Hawaiian Islands.

I am of the opinion that the two subspecies are good species. Although Jacot confirms that he knows the type species (14, p. 67), he considers the specimens found in the Hawaiian Islands only a variety, *perkinsi.*

I have collected *H. rostrolamellatus* several times in Germany, the last time on July 17, 1948, on *Calluna vulgaris* near Ganderkesee in Oldenburg. After studying these specimens and comparing them with

FIGURE 5.—**a, b,** *Humerobates rostrolamellatus: a,* pteromorpha; *b,* propodosoma, oblique lateral view. **c-i,** *H. perkinsi: c,* pteromorpha; *d,* propodosoma, oblique lateral view; *e,* palp; *f,* gnathosoma; *g,* mandible; *h,* leg I; *i,* leg IV.

the specimens of the Mangarevan Expedition which I believe to be *H. perkinsi,* I have no doubt that *H. perkinsi* is a species and not a subspecies. Jacot gave only a very short note on this species, for which I have completed the description as follows.

12. Humerobates perkinsi (Jacot), new status, new combination (fig. 5, *c-i*).

Humerobates humeralis perkinsi Jacot, B. P. Bishop Mus., Bull. 121: 67, 1934.

Length 1,020 μ, width 800 μ, a few specimens a little smaller. Color brown or dark brown.

Surface of integument smooth and somewhat shining. Under high magnification, surface dulled by very fine cover of cerotegument.

Body pyriform, acuminate in front, and rounded behind. Lateral border from rostrum to pteromorphae almost a straight line, both sides forming a pointed angle; top of rostrum rounded, but with notch on each side which is not visible in whole mount. Lateral to indentation is a pointed gena, much appressed to rostrum; top of gena is in front of tectopedia I. Chitin behind rostrum somewhat lighter, as is usual in the Pterogasterinae.

Lamellae are low ridges, which are 108 μ long in one specimen, propodosoma of which is 306 μ long. Their posterior ends, bothridiae, 230 μ, tops of lamellae 100 μ apart. Cusp of each lamella very short, only 20 μ long, and only a little broader at anterior end than lamellar hair inserted there which is somewhat longer than lamella, tapering to its end and very fine and sparsely ciliated.

In *H. rostrolamellatus,* which is smaller than *H. perkinsi,* distance between sensilli is 225 μ and that of apices of lamellae is 84 μ. Apex of the lamella of *H. rostrolamellatus* a little broader than lamellar hair, which is stouter than that of *H. perkinsi,* as long as lamella, and more ciliated.

A very faint translamella in *H. perkinsi* is a prolongation of inner border of cusps of lamellae and runs as a scarcely curved line from one cusp to the other, conspicuous only in dissected specimens. Translamella more distinctly marked in *H. rostrolamellatus,* but far from being a ridge or blade.

Interlamellar hairs similar to lamellar hairs, 270 μ long in *H. perkinsi,* fine and finely ciliated; 190 μ long in *H. rostrolamellatus,* stouter and more ciliated, as in other species. Distances of insertion points of interlamellar hairs from anterior border of hysterosoma, which overlaps a little the real border between hysterosoma and propodosoma, only 12 μ, distance to sensillus 80 μ. Small groove from which interlamellar hair projects is in outer half covered by small chitinous ridge so that proximal part of hair is directed inward, and at first, after extending beyond ridge, the hair has a vertical direction (in both species). Ridges, which run from anterior edges of lamellae to little indentations at border of rostrum, are characteristic of genus, rather distinct and parallel in *H. rostrolamellatus;* weaker and converging in *H. perkinsi,* in which they are visible only in lateral view.

There is considerable difference in shape of tectopedia I, delineated in figures 5, *b* and 5, *d*. In *H. rostrolamellatus* (fig. 5, *b*), upper border of tectopedia I has a sharp point, and this upper border is nearly as long as lower border. In *H. perkinsi,* upper border of tectopedia I forms an angle of 120 degrees to 140 degrees with anterior border of blade. Upper border of tectopedia I shorter than

lower border. In *H. arborea,* as indicated by figure given by Jacot, anterior edge of tectopedia I resembles that of *H. rostrolamellatus,* but also differs.

Upper edge of tectopedia appears to be formed by single very narrow arched rodlets, obliquely placed on top of one another. As rodlets are not of equal length, they terminate at upper edge unevenly. In *H. rostrolamellatus* (fig. 5, *b*), terminations are pointed, sharp, and more numerous than *H. perkinsi* (fig. 5, *d*), where three to four blunt or truncate corners are visible.

In front of lower border of tectopedia is inserted a rostral hair, which is somewhat more ciliated in *H. perkinsi* and reaches beyond rostrum.

Bothridium an elongated open cup at proximal end of lamella and close to border of hysterosoma, at beginning of inner anterior border of pteromorpha. Sensillus with short, clavate head on short peduncle; interior of head granulated, but outside without markings.

Beyond anterior border of pteromorpha begins the large, spoon-shaped tectopedia II, upper border of which is slightly curved. At proximal end of tectopedia II is situated insertion point of exobothridial bristle, which is a stout, rough hair, 80 μ long (65 μ in *H. rostrolamellatus*), directed anteriorly, parallel to upper border of tectopedia II. There is a light spot, an area porosa, between bothridium and tectopedia I.

Dorsal shield of hysterosoma arched but not forming a real globe, for its highest elevation lies behind middle so that anterior part slopes down more gently than posterior one. Anterior border of shield slightly convex forward, overlapping as a narrow band (12 μ broad) posterior border of propodosoma, and covering short area porosa anterior situated behind middle of distance between interlamellar hair and bothridium. Anterior border of hysterosoma continues to anterior border of pteromorphae. Pteromorphae movably attached to dorsal shield, but fine slit between pteromorphae and dorsal shield does not continue perfectly to anterior border, so that there is a narrow chitinous bridge between anterior border of dorsal shield and pteromorphae. Outer border of pteromorphae well rounded; posterior edge of pteromorpha continues along border of hysterosoma and bends down to venter for a short distance (fig. 5, *c*). In *H. rostrolamellatus,* outer border of pteromorpha also rounded, but somewhat pointed, and prolongation of posterior edge does not bend downward at its end (fig. 5, *a*). Surface of pteromorphae in both species is finely striated, but striation does not reach outer border of plates.

At anterior border of dorsal shield is a light spot which is as broad as distance between the two areae porosae anteriores, converging posteriad and as long as broad.

Four areae porosae on each side of dorsal shield (in addition to areae porosae anteriores). Area porosa adalaris is the largest, 60 μ long, 32 μ broad, a little more distant from inner border of pteromorpha than its own width, oval or elliptical in outline. The two areae porosae mesonoticae not half length of area porosa adalaris. Areae porosae posteriores a little farther from each other than from neighboring area porosa mesonotica.

Dorsal shield with many insertion points of hairs, but hairs not discernible.

Ventral side: No chitinous bridge between chitinized posterior border of camerostome and genital aperture, but a curved line runs from outer edge of aperture to coxa IV, and part behind this line is somewhat darker than anterior part of ventral side.

Apodemata are dark bars, I and II of almost equal length; III perhaps half as long as I or II.

Genital opening a rounded trapezium, anterior border broader than posterior one, with seven fine hairs on each cover.

Anal opening, twice length of genital opening, much larger, broadly oval, anterior part more pointed, with usual two hairs widely separated.

Hairs on ventral plate of moderate length (50 μ), slender on sternal part, stouter behind anal opening.

There is an area porosa postanalis close to posterior border of ventral plate which is discernible only if posterior part is seen from behind. This area is 16 μ long and 100 μ broad, as broad as one of the covers of anal opening. *H. rostrolamellatus* has this area too. Thus, it seems to be a generic character. In 1923 (19), I discovered this area in the Galumninae. It exists, as far as I know, in a number of Galumninae, but not in *Neoribates* and *Stictozetes*. It is extraordinary that *Humerobates* and *Trihumerozetes,* new genus, also have this area.

Tarsi terminated by trihomohamate ungues, outer hooks longer and less bent at distal half than inner one. The three species have some differences as to armature of legs, especially in leg IV. Distal end of tibia IV with four bristles. Hair on dorsal side of segment not exactly length of segment, very fine, and lacks ciliation. Two ciliated bristles on ventral side. In *H. arborea,* Jacot draws both bristles as equal in length; in *H. rostrolamellatus,* distal of these two bristles is one and one-half times as long as the other; in *H. perkinsi,* distal bristle is three times as long as the other. On ventral side of tarsus are numerous barbed bristles, and there are also differences between these bristles in the three forms.

Figure 5, *e* shows the palp; 5, *f,* the gnathosoma; and 5, *g,* the mandible of *H. perkinsi.*

Slides 018-020.

Rapa: Mt. Ororangi, southeast valley, 600-700 ft., July 3, one specimen, Zimmerman. Mangaoa Peak, 900-1,200 ft., July 4, two specimens, Zimmerman.

Marotiri: Southeast Islet, July 22, 72 specimens, Zimmerman and Fosberg.

Tahiti: Mt. Aorai Trail, 3,500-4,500 ft., on *Metrosideros,* Sept. 13, one specimen, Zimmerman.

Heretofore known only from the Hawaiian Islands.

Genus **Trihumerozetes,** new genus

This new genus resembles *Humerobates* and *Trichoribates. Humerobates* has a ridge from the anterior end of the lamella to the anterior border of the rostrum. In *Trihumerozetes,* this ridge begins in front of the anterior end of each lamella (that is, remote from it), and runs to the rostrum. *Trichoribates* has no such ridge.

The genera *Humerobates* and *Trichoribates* have a gnathosoma, the anterior border of its hypostome being an almost straight, or only slightly convex, line.

In *Trihumerozetes,* the anterior border of the hypostome has on each anterior corner a remarkable projection, similar to a knob, or horn (fig. 6, *f*). I know of no genus of Oribatidae with a hypostome formed in such a manner.

Type *Trihumerozetes cornutus,* new species.

13. Trihumerozetes cornutus, new species (fig. 6).

Length 790 *μ*, width 560 *μ*. Color of unmounted animal black; pteromorphae brown.

Dorsal side of body very highly arched.

Propodosoma makes up nearly a third of body. Rostrum bluntly rounded, and with a little impression on each side at anterior edge. A longitudinal carina

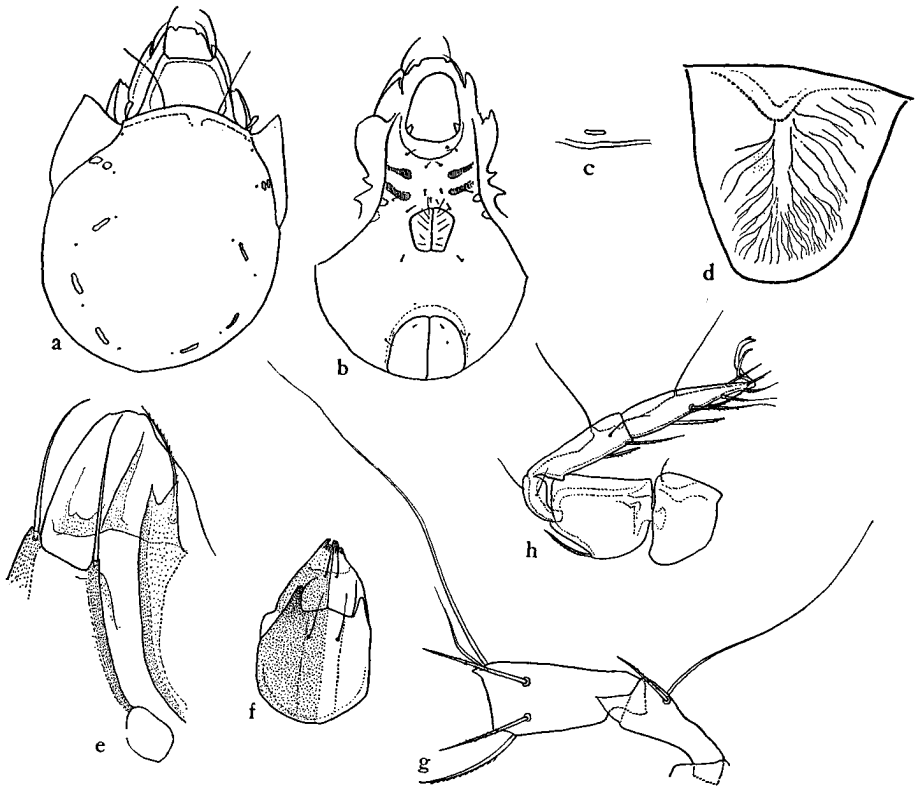

FIGURE 6.—*Trihumerozetes cornutus:* **a**, dorsal side; **b**, ventral side; **c**, area porosa postanalis; **d**, pteromorpha; **e**, propodosoma; **f**, gnathosoma; **g**, genu and tibia I; **h**, leg IV.

begins a little in front of anterior edge of lamella, but does not reach anterior border of rostrum (fig. 6, *e*). This carina, as seen from outer side, is a keel. Between keels, is a flat longitudinal impression, the hind margin of which has a little nose-like projection in its middle.

Lamellae are narrow keels which reach from bothridiae to half the length of propodosoma, converging toward each other, of almost equal width throughout, with a short cusp which is only a little broader at its top than lamellar hair at its insertion. Lamellar hair arises from the somewhat oblique tip of cusp, is not as long as lamella, and is sparsely ciliated. A narrow ridge from the lower inner edge of one cusp to that of the other marks a translamella.

Tectopedia I (fig. 6, *e*) a chitinous blade, broader than lamella and one and one-half times its length, hence lamella is remarkably overtopped by it. Its upper and lower borders are bent downward at beginning in front of bothridium; thereafter, blade is nearly straight and enlarges toward its anterior end. Upper border somewhat longer than lower; blade thus with a fairly long, free cusp, which is deeply notched at its anterior end and forms two points, upper of which is shorter and narrower than lower. Notch is a pointed angle, base of which is, rounded. At inner side of lower point is inserted rostral hair, outer border of which is more strongly barbed than all other hairs of propodosoma.

Tectopedia II broad and spoon-shaped (fig. 6, *a*, *b*), not reaching as far in front as tectopedia I. Its anterior border is somewhat wavy, and it begins under pteromorpha.

Interlamellar hairs long and sparsely and finely barbed, arising beneath anterior border of hysterosoma, which slightly overlaps posterior border of propodosoma. Hairs nearly perpendicular, only distally bent a little backward.

Bothridium rather large, oviform in outline, but flat on dorsal side, and orifice rather small. Sensillus short, clavate, without barbs, and not sculptured.

Dorsum of hysterosoma oviform in outline, well-rounded behind and broader than in front, anteriorly truncated and bent forward only a little at middle. Movable adhering pteromorphae as long as broad (fig. 6, *d*), their anterior and posterior borders converging toward outer border, which is rounded. From a somewhat lighter and broad area in middle of pteromorpha arise fine channels directed toward outer borders of blade, like roots of a tree. In addition, the pteromorpha very finely dotted with fine points.

Dorsal plate with distinct areae porosae, which can be seen only when dorsal and ventral plates are separated. Most species of related genera have one area porosa adalaris on each side of dorsal shield, but *T. cornutus* has two (fig. 6, *a*). Outer area is 18 μ distant from outer border of dorsal plate and is as great in diameter. Inner one is 55 μ from inner border of outer one and is a little smaller. Distance to area porosa mesonotica anterior is 125 μ. Area porosa mesonotica anterior, area porosa mesonotica posterior, and area porosa posterior are situated in their usual places and all are much longer than broad.

I could see no hairs on the dorsal plate; but there are insertion points at the usual places, and several gland spots.

Ventral side (fig. 6, *b*): Camerostome oviform in outline and somewhat broader behind, and hind margin only slightly convex. Gnathosome is remarkable, as large undivided hypostome, which borders the two maxillae in a nearly straight line, has on each outer edge a toothlike corner, or knob, which projects forward. A pair of fine, long hairs is in anterior third of hypostome. Hairs on each maxilla, one behind anterior border of projection of gnathosome, the other near border of darker chitinized posterior part; both hairs rather close together.

A real sternal beam is lacking, but there are two rather clear apodemata on both sides. Hairs on sternal part shown in figure 6, *b*.

Genital aperture has rounded trapezoidal aspect frequently found in Oribatidae, broader in front than behind, each cover with six hairs, anterior ones longer than posterior.

Anal aperture large, its own length distant from genital aperture, not the same distance from hind margin of ventral plate, which cannot be seen from below, because this part is almost perpendicular. Each anal cover has usual two hairs, the hair in front small, near anterior border, and in middle of plate, posterior one longer and near anal fissure. Behind each posterior edge of aperture are two hairs, as long as posterior bristles of anal covers.

A special character of the species is an area porosa postanalis, which is found in only a few genera of Oribatidae, which is close to posterior border of ventral plate behind anal aperture and can only be seen if specimen is dissected (fig. 6, *c*).

Tarsi of all legs have three claws, middle one thicker than outer ones. There is a very long hair on dorsal side of genu and tibia I and II (fig. 6, *g*). On lower part of front edge of each genu of both legs is a sharp chitinous point or a blade directed toward tibia and overlapping posterior end of this segment. Femur IV dilated on ventral edge into a flat keel, anterior corner of which is rounded, posterior corner rectangular. Even ventral edge of coxa IV is a keel (fig. 6, *h*). On the other hand, dorsal edge of tibia and tarsus IV is a very sharply flattened border. Hairs of legs have fine, sharp points.

Slides of the dissected holotype 021, a-f.

Rapa: Mt. Perahu (type locality), east ridge, 1,400-1,700 ft., one specimen. There was no collector or date mentioned on the label in the tube, but in comparison with other labels, it is probable that the date is July 28 and the collector Zimmerman.

Family GALUMNIDAE Grandjean, 1936

Genus **Notogalumna,** new genus

No border between propodosoma and hysterosoma. Hind margin of hysterosoma a straight line, and posterior lateral margins of body straight to pteromorphae. Posterior margin and posterior lateral margin form an angle of more than 90 degrees; corner of angle rounded.

Areae porosae adalares exceedingly remote from pteromorphae. One large area porosa mesonotica and one area porosa posterior on each side.

Type *Notogalumna praetiosa,* new species.

14. Notogalumna praetiosa, new species (fig. 7).

Length 720 μ, width behind pteromorphae 490 μ. Color dark brown, pteromorphae light brown. Surface shining.

Disregarding pteromorphae, body is pentagonal in outline.

Rostrum nearly rectangular, but its top rounded. Rostral hairs almost appressed to rostrum.

Lamellae narrow, low ridges; their cusps seen as small points at outline of propodosoma. Lamellar hairs inserted on inner edge of lamellar ridge, 60 μ long, nearly erect, somewhat longer than rostral hairs.

Interlamellar hairs finer than lamellar hairs, and inserted near inner border of beginning of lamellar ridges, 40 μ long, bent downward and almost appressed to surface of propodosoma.

Bothridium a short cup. Sensillus a slender hair, tapering and pointing toward its distal end, directed backward and a little outward, 100 μ long.

A narrow, short ridge running parallel to lamellar ridge outside of lamella toward insertion of leg I is half as long as lamella. I believe that this ridge must be tectopedia I.

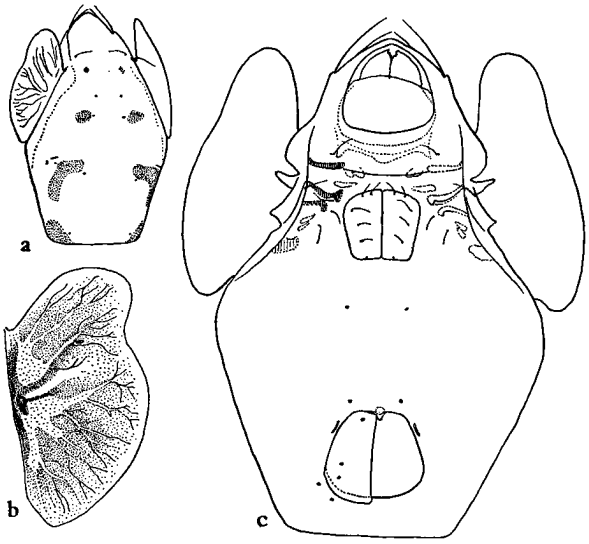

FIGURE 7.—*Notogalumna praetiosa:* **a**, dorsal side; **b**, pteromorpha; **c**, ventral side.

There is no border between propodosoma and hysterosoma. But there seems to be a very short slit near the inside of bothridium; perhaps this is the indication of a front margin on hysterosoma. In front of this slit is the very narrow and short area porosa anterior. Both slit and area can be seen only under high magnification in dissected specimens. This area must not be confused with the two dark spots behind interlamellar hairs, which apparently are thickened chitinous parts in interior of body (attachment area of mandibular retractor?). (See figure 7, *a*.)

Areae porosae adalares short, elliptical, 40 μ in diameter, but form not constant. Some specimens have one area rounded, the other with corners. Distance of the area from inner edge of pteromorpha is 120 μ, three times the diameter of area. This position, far from the pteromorphae, is remarkable and strange in the Pterogasterinae. Distance between the two areae is 128 μ, the same distance between areae porosae adalares and area porosa mesonotica. There is only one area porosa mesonotica, which is very large, 162 μ in total length, and formed

like a little sock, the foot part of which is anterior, the heel directed outward. Area porosa posterior covers posterior corner of body, is triangular in shape, and is almost as long as area porosa mesonotica. Outward from latter are several fissures. There are a number of insertion points of hairs, but I could not discern any hairs.

Pteromorphae movable, attached to edge of dorsal shield. Their shape is similar to that of *Zetes*. A very fine venation issues from light spots in pteromorphae (fig. 7, *b*).

Ventral side (fig. 7, *c*) shows the parallel edges of real sternal plate; in line with genital opening, edges bend outward and end at posterior corner of pteromorphae.

First apodema a narrow bar, almost horizontal; both of these apodemata united by a distinct transverse line. Apodema II as long as I; it is at first directed obliquely backward, then bends toward anterior corner of genital opening, but does not reach it. Apodema III a little more than half as long as II, horizontal at first, then bent backward, ending in a small thickening. Several light spots on sternal part and behind apodema III.

Genital opening is far forward and a little broader in front than behind, rounded, laterally straight, posterior border straight. Two hairs inserted parallel to and near anterior border of each cover, and three hairs longitudinally inserted, parallel to side and placed more toward outer border of cover. A point near posterior border of each cover may be insertion point of a hair.

Anal opening is, as usual, anteriorly narrower than posteriorly, of equal length and width, twice its own length from genital opening, half its length from posterior border of body. Apparently three hairs on each cover, one near anterior border, two longitudinally inserted near posterior end of cover.

Following hairs discernible on ventral side of body: one in front of center of apodema I; a second behind outer corner of apodema II and outside brim at margin of ventral plate; a third between knob on apodema III and genital opening; a fourth behind knob and somewhat outward; a fifth behind genital opening (as far from each other and from opening as width of latter); in front of outer corner of anal opening is sixth hair and behind posterior corner of opening and obliquely inserted are seventh and eighth bristles. At outside of anterior quarter of anal opening and close to it is a longer fissure.

No area porosa postanalis behind anal opening, but a number of light, small spots, perhaps muscle scars.

Tarsi with three claws of almost equal size. On ventral side of tarsi two bristles, slightly toothed on ventral face.

Slides of allotype 022, a-d; slide of paratype 023.

Raivavae: Mt. Turivao (type locality), south slope, Aug. 11, two specimens, W. Anderson.

Raiatea: Toahiva Valley, Oct. 7, one specimen, D. Anderson.

15. Zetes bryani marquesi Jacot, B. P. Bishop Mus., Bull. **114**: 231, 1934 (1935).

Slides 024, a-d.

Rapa: Mt. Tepiahu, south slope, 400-600 ft., July 20, eight specimens, Zimmerman. Teutu, on dead leaves, July 27, two specimens,

Kondo. Mt. Tanga, north slope, 300-700 ft., July 31, one specimen, D. Anderson.

Flint: Oct. 16, 10 specimens, Kondo and D. Anderson.

Known elsewhere only from the Marquesas.

16. Galumna hawaiiensis Jacot, B. P. Bishop Mus., Bull. **121**: 77, 1934.

Slides 025, a-b.

Rapa: Near Ahurei cemetery, under stones, July 28, two specimens, W. Anderson. Mt. Tanga, north slope, July 31, 300-700 ft., under dead leaves, one specimen, D. Anderson.

Tahiti: Mt. Aorai Trail, 3,500 ft., Sept. 12, one specimen, Zimmerman.

Known heretofore from the Hawaiian Islands.

17. Galumna hawaiiensis marquesana Jacot, B. P. Bishop Mus., Bull. **114**: 232, 1934 (1935).

Slides 026, a-b.

Rapa: Mt. Tepiahu, south slope, 400-600 ft., July 20, one specimen, Zimmerman.

Family ORIPODIDAE Jacot, 1925

Genus **Anoripoda,** new genus

Very similar to *Oripoda* Banks and Pergande, 1904, because pteromorphae are formed as in that genus. Bothridium entirely covered by anterior border of pteromorphae, and sensillus partially covered. In *Oripoda,* anterior border of rostrum is gently and broadly rounded; in *Anoripoda* center of rostrum projects like a narrow but rounded nose, and on each side of this projection is a protuberance of equal length, but narrower, at head of which is inserted rostral hair.

Type *Anoripoda nasalis,* new species.

18. Anoripoda nasalis, new species (fig. 8).

Female, 358 μ long, 198 μ broad. Color light brown. Surface smooth and shining.

Propodosoma from anterior border of hysterosoma to tip of rostrum 100 μ long; thus more than half as long as hysterosoma. Upper edge of propodosoma an almost straight line; that is, does not slope down toward nose. As figure 8, *a* shows, tectopediae II are well developed and much projected laterally. In front of leg I propodosoma contracts, and there is a slight emargination. Whereas the rostrum of related species has a more or less rounded border, *A. nasalis* has a rounded projection resembling a nose in middle of anterior border, but at each side of this nose is a rather strong peg projecting to level of anterior point of nose. Between nose and peg is a well rounded bay. At top of these most unsual pegs is inserted rostral hair, which is directed upward or gently inward, proximal

part stout, very finely pointed distad. Upper edge of peg a sharp ridge, which goes back nearly to lamellar hair. Ridge corresponds to edge seen in true *Scheloribates.* Lamella (fig. 8, *b*) also resembles that of *Scheloribates.* It is somewhat longer than half of propodosoma and, as in *Scheloribates,* is formed by two ridges. Upper one projects from anterior border of pteromorpha and is rather strong. Origin of lower one under and in front of bothridium. Both are fused to a ridge or a ledge about midway between interlamellar and lamellar hair. Lamella has no cusp. Lamellar hair resembles rostral hair and is inserted at top of lamella. Interlamellar hair, of equal distance from lamella and anterior border of hysterosoma, is an erect bristle almost twice length of lamellar hair and slightly inclined

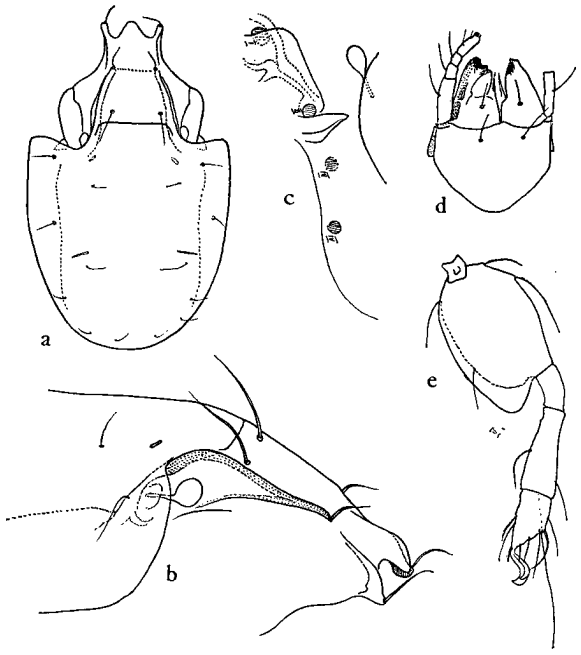

FIGURE 8.—*Anoripoda nasalis:* **a,** dorsal side; **b,** part of propodosoma, oblique view; **c,** part of body, from side; **d,** gnathosoma; **e,** leg II.

backward. All the hairs of propodosoma smooth. Bothridium completely hidden by anterior border of pteromorpha. Sensillus with a pear-shaped head on a thin peduncle. Seen from above (fig. 8, *a*), peduncle and part of head of sensillus concealed under pteromorpha. Surface of head seems to have extremely minute, scarcely discernible punctures. A suggestion (a very fine line) of a translamella between insertion of lamellar hairs. Outside and near origin of lower ridge of lamella is a short line which may be tectopedia I. Tectopedia II a triangular blade reaching from insertion of leg I to leg II (fig. 8, *c*), broad in front, narrow behind, with rounded corner. Tectopedia III an erect pointed blade behind insertion of leg II (fig. 8, *c*).

Suture between propodosoma and hysterosoma very distinct, perfectly straight, and bent posteriorly only at outer ends. Suture crosses surface of body well separated from anterior border of pteromorphae. Edge of lamellae and anterior edge of pteromorpha form a rounded excavation, leaving head of sensillus visible. Pteromorphae drawn like a narrow chitinous band around posterior part of body; similar to those of *Oripoda,* but still more distinct. No suture between dorsal shield and pteromorphae. Dorsal shield appears to reach to outer border of pteromorphae; but through integument, one can see real border of body.

Hairs on dorsal shield thin but distinctly discernible, a lateral row of four hairs and a mesal one of three. Near excavation behind sensillus is an area porosa, and in front of second hair of inner row, a long transverse fissure. Possibly there are more areae, but I could not discover them.

Nose of rostrum forms a tectal plate for anterior ends of mandibles. Lower border of nose is anterior border of camerostome. Gnathosoma has common form in Oribatidae. Plate covers posterior part of camerostome, maxillae foremost. Palpus with five segments, if we consider a very narrow chitinous piece as palpcoxa. There are three short, stout, little thorns in one row on the border of palptarsus and over them a short, thick bristle (fig. 8, *d*).

Mandibles normal; the movable segment with five stout dark teeth; fixed segment with four teeth.

A few chitinous lines directed obliquely backward could be called apodemata. Apodema II goes to anterior border of genital aperture, III goes to the posterior border, and IV is very short and almost horizontal.

Genital opening situated a little in front of middle of ventral side of body; it is small, anteriorly a little narrower than posteriorly, corners rounded. Anal aperture lies at posterior margin of ventral side, is twice as long as broad, and one and one-half times its own length distant from genital opening. Rather long hairs on each anal cover, and two others close to aperture on venter.

Tarsi trihomohamate. Tarsus of all legs rather short. Femur I without blade on ventral edge. Femur II with a not very broad but distinct blade, with rounded anterior corner. Femora III and IV with a kind of keel, but no blade.

Holotype, slides 027, a-d.

Raiatea: Tetaro Islet (type locality), Oct. 4, one specimen, Cooke and Kondo.

Family ORIBATULIDAE Jacot, 1929

Genus **Scheloribates** Berlese, 1908

Type: *Zetes latipes* C. L. Koch, 1841.

19. Scheloribates tubuaiensis, new species (fig. 9).

Female: length 810 μ, width 590 μ. One specimen 745 μ long and 560 μ broad probably a male.

Propodosoma nearly half as long as hysterosoma. Rostrum acute (70 degrees), but apex rounded. Lamellae half as long as propodosoma, tapering to distal end, without cusp. Lamellar hair inserted at point where lamellar ridge continues within ridge which runs to rostral hair and somewhat beyond it, but does not reach outer border of rostrum (fig. 9, *a*). A chitinous ridge which goes from lamellar hair to outer border of bothridium, not always reaching it, has

been called tectopedia I by several acarologists. A short line at inside of tip of lamella marks beginning of a translamella.

Interlamellar hair is longer than lamellar hair, erect, sometimes bent backward. All hairs of propodosoma simple, not barbed.

Orifice of bothridium a chitinous ring with a pointed angle directed outward, and a blade-like chitinous scale which partly overlaps opening. Scale plainly visible in dorsal view. Sensillus with penduncle bent in S-form, shorter than claviform head; head bent upward or somewhat backward beyond anterior border of pteromorpha; it has no hairs or aciculation.

Tectopedia II a spoon-shaped blade.

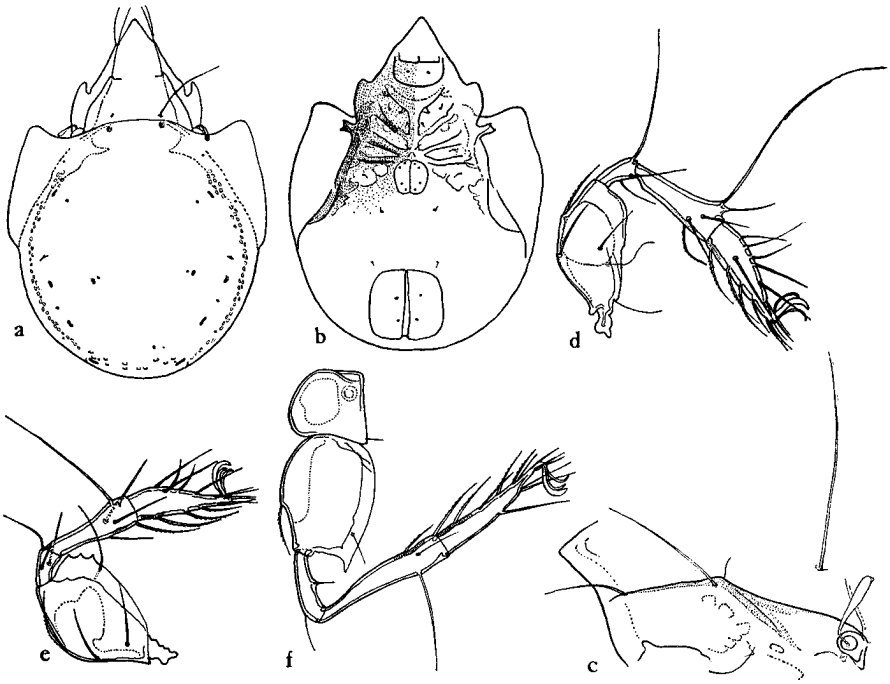

FIGURE 9.—*Scheloribates tubuaiensis:* **a,** dorsal side; **b,** ventral side; **c,** part of propodosoma, laterally; **d,** leg I; **e,** leg II; **f,** leg IV.

Anterior margin of hysterosoma slightly convex. Dorsal plate polished. No real areae porosae. Along border of shield, and somewhat remote from it, are one or two rows of small muscle scars. Close to these rows, and on inner side of them, are on each side of dorsal shield four elongated spots which may be called fissures, which are longitudinal slits; behind them, in inner part of chitinization, is an indistinct cavity. Position of fissures corresponds to those of areae porosae in other Pterogasterinae. A similarly formed fissure lies on a level with anterior mesonotical one, as far or nearly as far from it as anterior mesonotical fissure

is from second mesonotical fissure. In chitinization of dorsal shield are two other, transverse, slits, one in front of anterior mesonotica, the second close outside posterior fissure.

I saw seven pairs of insertion points of hairs on hysterosoma, each with nerve channel into interior of dorsal shield, but could see no hairs.

Figure 9, *b* shows ventral side of body, legs, and mouthparts omitted. A very distinct medial sternal rib extends from posterior border of genital opening. Apodemata, which are more or less distinct, are united with sternal rib. Hairs on sternal part minute.

Genital opening very small compared with anal opening. Distance between the two openings a little greater than length of anal opening. On each cover of genital opening are four setae, each anal opening cover with two hairs.

Femur II (fig. 9, *e*) with distinct broad blade on ventral edge, this blade with two excavations in front of usual hair. Thus three teeth are formed on edge of blade; however, one specimen has only two teeth. On femur IV is a very distinctly projecting acute tooth at distal edge of ventral blade (fig. 9, *f*).

Holotype, slides 028, a-f; specimens from Rurutu, slides 029, a-e.

Tubuai: Tapapatauai Islet, under trash, Aug. 19, one specimen, Kondo. Mt. Taita (type locality), under dead leaves, Aug. 20, one specimen, D. Anderson. North of Araua, under dead *Pandanus* leaves, Aug. 22, one specimen, W. Anderson.

Rurutu: north of Avera, near shore, Aug. 31, one specimen, Kondo and D. Anderson.

Only two species of the genus *Scheloribates* have the dimensions of *tubuaiensis*. In *S. decumanus* Berlese (2) from South America, the lamellae run close to the sides of the propodosoma and are scarcely visible. The other species, *Protoribates* (*Scheloribates*) *longilamellatus* Berlese (3), has a sensillus "very long, very narrow, scarcely thickened towards distal end, outer edge barbed." That species has been discovered in Africa and Java. These details easily distinguish the new species from the two Berlese species.

20. Scheloribates praeincisus Berlese, Redia **6**: 384, 1910.

Slide 031.

Rurutu: west of Moerai, Aug. 24, one specimen, Cooke.

Borabora: Vaitape Village, 100-200 ft., Oct. 3, one specimen, Zimmerman, Kondo, and D. Anderson.

Known heretofore from Java and Sumatra.

21. Scheloribates praeincisus interruptus Berlese, Redia **12**: 315, 1916.

Rurutu: Mato Naa, on dead banana leaf, Aug. 24, one specimen, D. Anderson.

Recorded heretofore from Java and Sumatra.

22. Scheloribates indica (Oudemans).

Murcia indica Oudemans, Ent. Berichten Nederl. **4**: 192-200, 1915. Slide 030.

Meetia: south slope, May 12, one specimen, Cooke and D. Anderson.

23. Scheloribates muiri Jacot, B. P. Bishop Mus., Bull. **121**: 53, 1934.

Tubuai: Taita, northeast ridge, on decayed leaves, Aug. 20, one specimen, Kondo and D. Anderson. North of Araua, Aug. 22, one specimen, W. Anderson.

Tahiti: Arihiri, Pare, Mar. 16, three specimens, Zimmerman.

Previously known in the Hawaiian Islands.

24. Scheloribates fimbriatus Sig Thor, Zool. Anzeiger **88**: 196, 1930.

Raivavae: north of Ahuoivi, under trash, Aug. 9, one specimen, Cooke, Kondo, and D. Anderson.

Known previously from Turkestan, but subspecies recorded in the Hawaiian Islands.

Genus **Styloribates** Jacot, 1934

Type *Styloribates pectinatus* Jacot, 1934.

25. Styloribates pacificus, new species (fig. 10).

Length 810 μ, width 600 μ. One specimen 990 μ long and 790 μ broad.

Remarkable because of the triangular pteromorphae directed exactly laterally and reaching beyond outline of broadest part of body. Remarkable, too, because of strange form of lamellae.

Venter absolutely plain. In lateral view, dorsal lines of propodosoma and hysterosoma together form a regularly curved but not quite semicircular line.

Outlines of propodosoma form acute angle anteriorly. Rostrum however, somewhat rounded or truncated and bent down, slightly resembling a nose. Seen from above, a small projection on each side of rostrum. Projections are profiles of ridges running from insertions of rostral hairs to anterior border of propodosoma (fig. 10, *c*). At inside of each ridge a narrow furrow in surface of propodosoma. Length of ridge 48 μ; of the rostral hairs 132 μ, which are nearly straight, finely barbed, inclined to surface of propodosoma, forming an extremely sharp angle with ridge (about 30 degrees). Both hairs somewhat inclined toward each other.

Insertion of lamellar hair lies almost in prolongation of rostral ridge, 100 μ distant from insertion of rostral hair. Insertion of lamellar hair begins the very strange lamella (fig. 10, *c*). No lamellar cusp. Lamella forms a chitinous ridge of moderate width in its distal part running toward bothridium but only reaching half way (64 μ long). Usually lamella reaches bothridium in the Pterogasterinae. In *Scheloribates* and related genera, lamella bifurcates at half its length, outer branch going from lamellar hair to lower border of bothridium, inner branch to inner border. In *Styloribates pacificus,* lamella bifurcates, but outer branch does not reach outer border of bothridium, and inner branch forms a blunt angle, runs

as a more or less sharp ridge to insertion of interlamellar hair, and beyond this to anterior border of hysterosoma to a conspicuous knob of chitin. This direction toward inner branch of lamella quite unusual in the Pterogasterinae.

There is no translamella.

Lamellar hair 200 μ long, very fine in its distal half, sparsely ciliated and inclined toward surface (at about 40 degrees).

Interlamellar hair, 240 μ long, erect and sometimes bent a little backward. Interlamellar hairs 152 μ apart.

Bothridium with elliptical opening, surrounded by a chitinous ring which is posteriorly somewhat broader than at inner side. Sensillus with a clubbed head on a curved peduncle. Head rounded at top and without hairs or other markings on surface.

A small area porosa outside point of bifurcation of lamella, and in front of area some spots surrounded by darker chitin. No true tectopedia I.

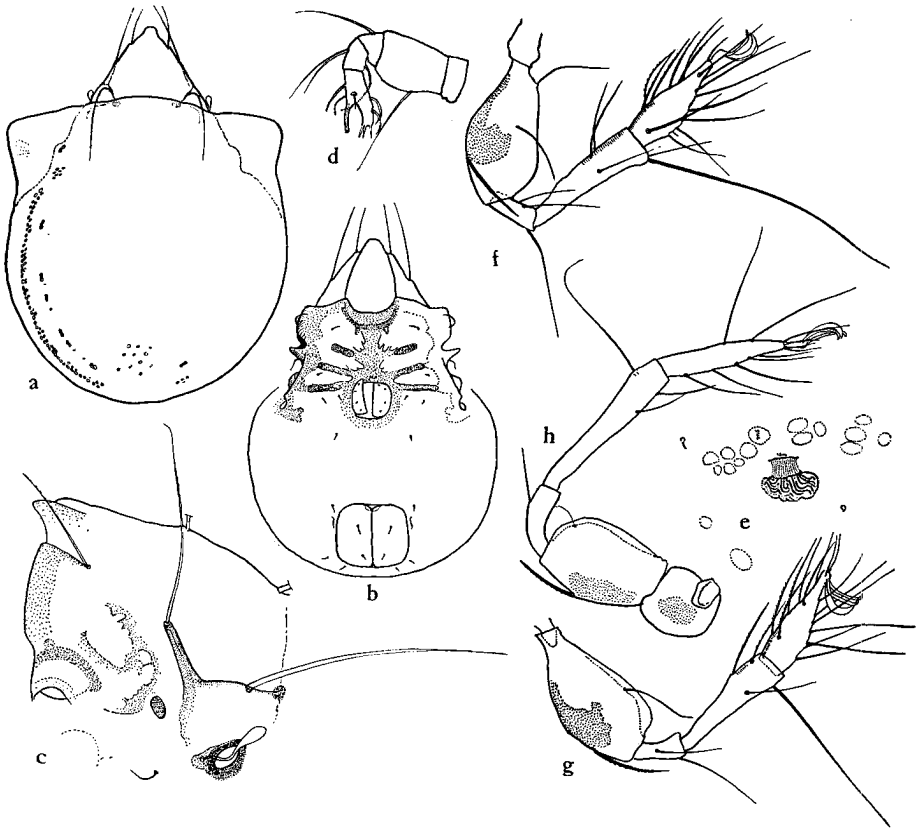

FIGURE 10.—*Styloribates pacificus:* **a,** dorsal side; **b,** ventral side; **c,** propodosoma, oblique lateral view; **d,** palp; **e,** gland of dorsal side; **f,** leg I; **g,** leg II; **h,** leg IV.

A very fine exobothridial hair is inserted between bothridium and insertion of leg II.

Anterior border of hysterosoma nearly straight, more or less distinctly marked. Border continues to anterior margin of pteromorphae. Pteromorphae triangular, outer edge rounded, directed exactly laterally, and without a separation between them and dorsal plate of hysterosoma; often a slight radial striation on their surfaces.

Notogaster has no true areae porosae. One or two rows of small, clear spots run parallel to outer border of dorsal shield from one pteromorpha to other around body; these spots are places of affixation of muscles. Somewhat higher is a row of dark elongate chitinizations, the first at a level with middle of pteromorpha, five or six behind it. As far as visible, there is a short and very fine slit in cuticle of dorsal shield (fig. 10, *e*), from which a number of fine parallel channels run into body to a cavity which is surrounded by wrinkled chitin and may be a gland. Between some chitinizations are fine punctures, apparently insertion points of hairs, but even under high magnification, I saw no hairs.

Ventral side of body (fig. 10, *b*) with camerostome oval in outline. Its concave hind margin continues with a ridge to outer edge of body, and this part somewhat prolonged beyond outline of propodosoma. In front of ridge is a rounded, deep furrow. Prolonged part of propodosoma, which may be called tectopedia II, rounded on outside and with single curved hair in middle. Behind tectopedia II is a sharply pointed projection, tectopedia III. On posterior side is a bristle.

A chitinous bridge extends between chitinized hind border of camerostome and genital opening, which is surrounded by chitinization. (See apodemata and ventral hairs in figure 10, *b*.) Genital opening small and rounded in outline. Four fine hairs on each cover. Anal opening quadrangular in outline with rounded edges, four times as large as genital opening. Distance between openings more than twice length of genital opening.

Terminal segment of palp formed as in species described by Jacot in 1934 (14, pl. 10, fig. 101), *Styloribates pectinatus,* but it seems as if style on upper short projection of the new species is double and that on the lower and longer projection are three spines instead of two hairs (fig. 10, *d*).

Legs illustrated in figure 10, *f-h,* shown from inside, disclose porose spots on segments. Tarsi triheterodactyle, middle claw the strongest.

Holotype, slides 032, a-f; paratypes, slides 033, a-e.

Rapa: near Morongota (type locality), July 16, 18 specimens gathered from ground with land shells, Cooke, Kondo, and D. Anderson.

Family HAPLOZETIDAE Grandjean, 1936

Genus **Protoribates** Berlese, 1908

Type *Oribates monodactylus* Haller, 1884.

26. Protoribates boraboraensis, new species (fig. 11, *a*).

Length 450-468 μ, width 324-342 μ. Color light brown. Surface smooth.

Propodosoma pointed in front, but rostrum blunt. A remarkable character of this species is absence of a suture between propodosoma and hysterosoma.

Anterior end of pteromorpha, at level of bothridium, bends obliquely inward and forward and ends behind insertion of interlamellar hair. In other species of related genera, this line confluent with suture between propodosoma and hysterosoma behind interlamellar hair. Interlamellar hair long, strongly developed proximally, tapering toward distal end. A poorly developed ridge runs from interlamellar hair to insertion of lamellar hair, not quite reaching it. Lamellar hair inserted in anterior end of a distinct keel, shorter than interlamellar hair. Very fine keel goes from insertion of lamellar hair to rostral hair, which is shorter than lamellar hair and is bent inward. Only this hair is barbed on its outer side. No translamella present. Sensillus a clavigerous bristle, only club of which projects beyond border of pteromorphae. Behind interlamellar hair is a faint area porosa.

Hysterosoma posteriorly well rounded, with usual areae porosae, adalares of which are a little larger than the others; also very fine hairs found on dorsal surface.

Pteromorphae of medium size; their anterior and lateral borders nearly forming a right angle.

Apodemata strongly developed. Sternum present, but not so distinct as apodemata.

Genital and anal openings far apart, nearly as distant as length of both apertures combined.

Tarsi with one claw.

Holotype, slide 035; paratypes, slides 036-038.

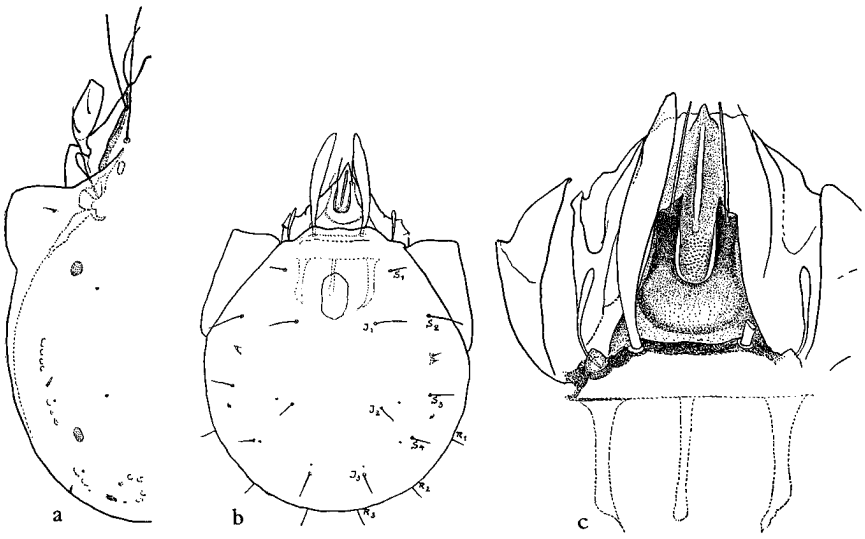

FIGURE 11.—**a,** *Protoribates boraboraensis,* half of dorsal side. **b, c,** *Phenopelops rapaensis: b,* dorsal side; *c,* propodosoma.

Raivavae: near Ahuoivi Point, under trash, Aug. 9, one specimen, Cooke, Kondo, Zimmerman, and D. Anderson.

Borabora: Vaitape Village, 100-200 ft., 17 specimens, Kondo, Zimmerman, and D. Anderson. Cliff back of Vaitape (type locality), 350 ft., Oct. 13, one specimen, D. Anderson.

Tahaa: Haamene Valley, north ridge, 400-1,100 ft., under stones and dead leaves, Oct. 10, two specimens, Zimmerman.

Family PELOPIDAE Ewing, 1917

Genus **Phenopelops** Petrunkevitch, 1955

The name *Pelops* (C. L. Koch, 1836) is preoccupied by *Pelops* Gistl, 1834, a genus of *Coleoptera*. Petrunkevitch (27) has proposed calling this oribatid genus *Phenopelops* on the same type species, *Pelops hirsutus* C. L. Koch, 1844 (16, pt. 38).

A new species of the genus in the Mangarevan Expedition collection follows:

27. Phenopelops rapaensis, new species (fig. 11, *b, c*).

Length 792 μ, width 630 μ. Color black. Integument dark brown in preparations, dorsal spot yellow. No visible layer of secretion on surface.

Propodosoma sharply pointed (fig. 11, *b*). A long, narrow, pale longitudinal furrow behind rostrum goes back almost to center of propodosoma, between anterior ends of lamellae. Lamellae, beginning near bothridium, are horizontal keels and project beyond middle of propodosoma, converging a little. Anterior half of each is leaflike, not quite as broad as distance separating them. End of lamella obliquely cut off in such a manner that inner corner is longer than outer one. Thus inner corner has a pointed angle, outer corner is a blunt angle. Inner borders of lamellae run backward together in a semicircular line. A narrow chitinous border parallels this line in front of beam which bears leaflike interlamellar hairs. Whole chitinous bridge between line and border may be considered translamella, but surface of propodosoma of species of *Phenopelops* is so different from other Pterogasterinae that it is very difficult to apply the same terms. The part here called translamella seems to be a flat, hollow-like depression. Part between ends of the lamellae has a depression, too, borders of which are distinctly marked; it is a little narrower than the space between the lamellar cusps and is covered with minute but distinct pits. Depression must not be confused with longitudinal furrow behind rostrum (fig. 11, *c*).

Lamellar hair projects from beneath anterior end of lamellar cusps, a little behind center of obliquely cut-off end. Hair rough and projecting to rostrum.

Interlamellar hair inserted, as stated above, on a beam lying under projection of anterior border of hysterosoma. Hair is, as usual in *Phenopelops,* a broad, leaflike, pale hair, reaching beyond anterior border of propodosoma.

Bothridium attached on a lateral prolongation of above-mentioned beam, which bends a little backward outside interlamellar hair. Bothridium rather small. Sensillus is a hair which gradually thickens to a fairly clavate head, directed anteriorly and slightly upward, peduncle with a slight bend inward.

Tectopedia I has a sharp point which projects nearly to anterior border of propodosoma, and rostral hair seems to be inserted at inner end of it. Tectopedia II a broad, spoonlike leaf with an impression at outer side, behind which is a kind of transverse ridge. Surface of this tectopedia distinctly pitted.

Outline of hysterosoma oviform, posterior border bluntly rounded, anterior end with converging sides, bluntly pointed, and, as in all species of *Phenopelops,* with a median projection which overhangs beam containing insertions of interlamellar hairs (fig. 11, *b*).

Pteromorphae of normal shape; that is, their anterior border straight, lower one rounded. They are movably attached at dorsal shield. At a level with center is a long, elliptical yellow spot on dorsal shield.

Inner row of dorsal hairs almost straight, but not equally spaced: J3 to J3 a little smaller than J2 to J2; J2 to J3 a little less than J2 to J1; J1 inserted behind border of yellow spot. S1 and S2 are, as usual, inserted near pteromorphae, and S2 in a line with J1. J3 and S4 not convergent. Hairs of row on posterior border of body, R1 to R3, of medium length, radiately projecting backward. All hairs of dorsal surface simple, not thick and not covered with secretions; hair S2 longest.

Areae porosae barely points. In addition to areae porosae, are two light area-like spots, placed close together, on right side of dorsal shield. On left side, only one larger light spot with only one point directed outward. As there is only one specimen in the collection, it is impossible to decide which is the normal area. A small, indistinct spot between S3 and S4.

Ventral surface without any remarkable characters.

Tibia II with toothed spine on dorsal side.

Holotype, slides 039, a-e.

Rapa: Teutu (type locality), on dead leaves, July 27, one specimen, Kondo.

This is the first species of *Phenopelops* reported from the Pacific islands. There is no species in the countries surrounding the ocean which agrees with *A. rapaensis.*

Family PHTHIRACARIDAE Perty, 1841

Subfamily EUPHTHIRACARINAE Jacot, 1930

The subfamily Euphthiracarinae was established in 1930 by Jacot (10). In his opinion, the genera *Oribotritia* Jacot, *Indotritia* Jacot, *Pseudotritia* Willmann, and *Euphthiracarus* Ewing belong to this subfamily. Toward the end of his paper, Jacot gives a key to the genera of the subfamily. *Oribotritia* and *Indotritia* have, along the ventral chitinization, a pair of genital shields, or plates, and behind them a pair of anal shields. At each side of these usually long and narrow shields is a shield as long as the two together. The part near the genital shield is called the adgenital shield, the part near the anal plate, the adanal shield. In *Pseudotritia* and *Euphthiracarus* all four shields are

fused and form a single plate on each side of the anogenital fissure.

The first two genera differ as follows: In *Oribotritia,* the fissure between the genital and adgenital shields is complete; that is, it goes from the outer corner of the chitinous fold between the genital and anal shields to the anterior border of the ventral plate. In *Indotritia,* the fissure is incomplete. It goes from the outer corner of the chitinous fold only to three-fifths the length of the genital shield; that is, the genital and adgenital shields are fused in their anterior two-fifths.

One character common to all the species of the genus *Oribotritia* was, perhaps, formerly overlooked. From the outer corner of the chitinous fold between genital and anal shields in all specimens an indentation is directed outward and a little forward. This is an indication of a division between adgenital and adanal shields. The indentation is extremely long in *Indotritia lebronneci* and in *I. bryani* Jacot which has led Jacot to place the two species in the genus *Indotritia,* the type species of which is *Tritia krakatauensis* Sellnick 1924 (21), thinking that this long emargination represents the above-mentioned fissure of the genital-adgenital plate. Unfortunately, I have no specimens of *Indotritia krakatauensis* (Sellnick) to re-examine, but my illustration (21, fig. 3) shows clearly that, besides the incomplete fissure between genital and adgenital shields, there is a little indentation issuing from the outer corner of the fold between genital and anal shields. Jacot's two species do not belong to the genus *Indotritia.*

There is a third species in the collection of the Mangarevan Expedition which shows the characters of Jacot's *Indotritia lebronneci* and *I. bryani.* I establish for these three species the following genus.

Genus **Austrotritia,** new genus

This genus is a member of the subfamily Euphthiracarinae Jacot. Genital shields and adgenital shields fused without suture. There is a very long, deep indentation between adgenital and adanal shields, directed outward and forward, but not reaching the outer border of these shields.

Type *Austrotritia quadricarinata,* new species.

28. Austrotritia quadricarinata, new species (fig. 12).

Length 1,504 μ, height 1,350 μ, length of aspis 684 μ, width of aspis 570 μ. Color yellow; anterior border of notogaster, genital shields, posterior border of aspis, scale above sensillus, and anterior half of apsis more or less brown. Surface of notogaster smooth. Upper dorsal line much arched. Bristles on

notogaster strong, bent forward, 270 μ long, finely ciliated at their distal ends.

Anogenital area (partly drawn in fig. 12, *c*) shows character mentioned in generic diagnosis. From outer corner of fold between genital and anal shields, or from outer corner of latter, a narrow indentation is directed forward and outward; that is, obliquely forward. It is 160 μ long, reaching almost outer border of adgenital shield.

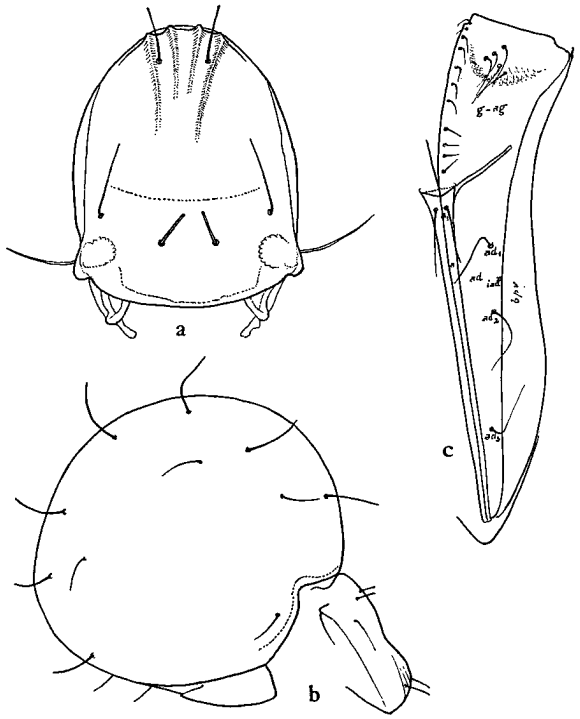

FIGURE 12.—*Austrotritia quadricarinata:* **a**, aspis; **b**, lateral view; **c**, anogenitale.

Inner border of genital shield bears 11 hairs near genital fissure. Distance between fourth and fifth hairs, counted from behind, greater than those between other hairs. This species separated by following characters: anterior third of genital shield deepened to resemble a rounded bowl, and in hollow are five rather long, fine hairs inserted rather close to each other and surpassing posterior border of hollow. The two other species have only two hairs in this position.

Anal cover has only one hair near anterior end. It is as long or almost as long as three hairs on adanal shield. Insertions as in figure 12, *c*. Near outer border of shield, between hairs 1 and 2, is adanal pore "iad."

Form of aspis of *A. quadricarinata* differs from that of other species (fig. 12, *a*); transverse furrow in middle of aspis is well developed and deeper than

in *Indotritia bryani*. Seen from above, part behind middle is light yellow, except posterior border, which is darkly chitinized. Anterior part of aspis, however, brown. This part, which strongly slopes down forward, has four longitudinal ridges, outer ridges longer than inner ones. At inner side of outer ridge is inserted rostral hair, 120 μ long, directed forward and a little upward and parallel. Upper hairs, inserted in a line with bothridium, broken but, judging from remaining stumps, must have been long. Distance between hairs less than distance from them to an outer bristle, which is inserted in front of upper hairs. Outer bristle appressed to surface of aspis, 180 μ long, and directed forward. Posterior border of aspis somewhat convex. From its outer posterior corner projects a scale, a squamose chitinous projection, which is situated above bothridium. Sensillus a simple bristle, tapering distally, 200 μ long and directed outward. Bothridium has usual snail-shell form. Distinct line extends from scale to lower border of aspis near anterior border. A chitinous peg, a projection from each corner of posterior border of aspis, may be a place for contractyle muscles to move aspis.

Gnathosoma resembles that of *Oribotritia*.

Three claws on tarsi, central one stronger than others.

Holotype, slides 040, a-e.

Rapa: Mt. Perahu (type locality), 1,900 ft., July 21, one specimen, Fosberg.

Revised key to genera of Euphthiracarinae

1. On each side of anogenital fissure is only one shield which reaches from anterior border to posterior border of venter. At point where genital fissure continues to anal one, about middle of length of ventral shield, is a dark chitinous triangle, sharp point of which is directed backward. A longitudinal serpentlike fissure goes through this triangle which is a mechanism to lock anogenital fissure 2

   On each side of anogenital fissure posteriorly is a narrow anal shield and on its outer side an adanal shield. Genital shield either completely separated from adgenital, or partially or completely fused with it. At point where genital fissure continues to anal fissure, somewhat in front of middle of length of ventral shield, is a narrow, triangular, transverse fold of posterior part of genital shield which overhangs anterior border of anal plates. Outside outer corners of this fold is a more or less deep indentation toward adgenital-adanal shield..... 3

2(1). Surface of notogaster only very finely dotted, nearly smooth. Aspis slightly flattened in front. Central rib from posterior border of aspis short.....**Pseudotritia** Willmann, 1920 [type: *Tritia* (*Pseudotritia*) *monodactyla* Willmann, 1920]

   Surface of notogaster extremely distinctly sculptured, mostly with pits. Aspis large, arched in anterior part. Central rib from posterior border of aspis reaches nearly to middle of aspis..... **Euphthiracarus** Ewing 1917 [type: *Phthiracarus flavus* Ewing, 1908]

3(1). Indentation from outer corner of fold between genital and anal shields very long, going obliquely forward nearly to outer border

of adgenital-adanal shield; genital shield fused with adgenital shield and without a suture.....**Austrotritia** Sellnick, 1959 [type: *Austrotritia quadricarinata* Sellnick, 1959]

Indentation from outer corner of fold between genital and anal shield short and often only indicated..... 4

4(3). Longitudinal fissure between genitale and adgenitale goes from outer corner of fold between genital and anal shields to anterior border of ventral area. Both shields completely separated..... **Oribotritia** Jacot, 1924 [type: *Hoplophora decumana* C. L. Koch, 1836]

Longitudinal fissure between genital and adgenital shield goes forward to three-fifths of length of genital shield, parallel to genital fissure. Anterior two-fifths of shields fused and without a suture .....**Indotritia** Jacot, 1928 [type: *Tritia krakatauensis* Sellnick, 1923]

In addition to *Austrotritia quadricarinata,* the following Euphthiracarinae are in the collection of the Mangarevan Expedition.

29. Austrotritia lebronneci (Jacot).

Indotritia lebronneci Jacot, B. P. Bishop Mus., Bull. **114**: 234, 1934 (1935).

Slides 041, a-c; 042; 043, a-b.

Rapa: Maitua, July 2, one specimen, Cooke and D. Anderson. Teutu, on dead leaves, July 27, one specimen, Kondo. Mt. Tanga, north slope, 300-700 ft., under dead leaves, July 31, one specimen, D. Anderson. Kopenaena Valley, July 24, one specimen, Kondo.

Raivavae: Ahuoivi Point, on dead leaves, Aug. 9, three specimens, Cooke, Kondo, and D. Anderson. Hoauatua Islet, Aug. 11, one specimen, Cooke, Zimmerman, Sam Wight, and Ernest Lyons. Mt. Turivao, south slope, Aug. 11, one specimen, W. Anderson.

Tubuai: Tapapatauai Islet, under trash, Aug. 19, one specimen, Kondo. Near Araua, under dead *Pandanus* leaves, Aug. 22, one specimen, W. Anderson. North of Araua, Aug. 22, one specimen, W. Anderson.

Rurutu: Mato Arei, under trash on ground, Aug. 27, two specimens, D. Anderson and Kondo. Mato Naa, Aug. 30, one specimen, Fosberg. North of Avera, near shore, Aug. 31, one specimen, Kondo and D. Anderson. Northwest of Avera, Sept. 1, one specimen, Kondo and D. Anderson. Mato Arapia, under stones, Sept. 2, Cooke, Kondo, and D. Anderson. Mato Arapia, south of Avera, Sept. 2, five specimens, Cooke, Kondo, and D. Anderson.

Maria: northeast islet, 5 ft., Sept. 6, one specimen, Zimmerman.

Tahiti: Arihiri, Pare, Mar. 16, one specimen, Zimmerman.

Raiatea: Tetaro Islet, Oct. 4, one specimen, Zimmerman, Kondo, and Cooke. Toahiva Valley, in trash on ground, Oct. 7, one specimen, C. Gessler.

Flint: 5-8 ft., Oct. 16, one specimen, D. Anderson.

It is of interest that almost all of these specimens were collected incidental to the collection of terrestrial mollusks.

Known previously from the Marquesas.

30. Pseudotritia loricata (Rathke) Entomologiske Jagttagelser, IN Skrivter af Naturhandl. Selskabet **5** (1): 191-200, 1799.

Trombidium loricatus Rathke, 1799.

Rurutu: north of Avera, near shore, Aug. 31, one specimen, Kondo and D. Anderson.

Tahiti: Arihiri, Pare, Mar. 16, three specimens, Zimmerman.

Widespread over Europe and Canada.

Genus **Hoplophorella** Berlese, 1923

Type *Hoploderma cucullatum* Ewing, 1909.

There are always five bristles on the anal plates of the Phthiracarini. Jacot, 1933 (12), believes the concentration of these bristles along the median edge to be a definite trend in the subfamily. In *Hoplophthiracarus* there are only two bristles along the median edge. *Phthiracarus* and *Hoplophorella* have three bristles. *Steganacarus, Tropacarus,* and *Atropacarus* have four bristles. In *Hoplophorella,* the three bristles are close together on the median edge; therefore, the species represented by the present collection belongs to this genus.

31. Hoplophorella singularis, new species (fig. 13).

Length of hysterosoma 630 μ, width 360 μ, height 360 μ. Length of aspis 295 μ, width 198 μ. Color yellow, except for collar of notogaster and posterior border of aspis which are light brown. Surface of notogaster evenly covered with shallow pits; without distinct borders.

Body rather long, as broad as high, well rounded posteriorly.

On each side of notogaster 15 stout bristles distinctly barbed, or with fine, sharp points, in their distal half. Part of hair within chitinized skin strangely formed (fig. 13, *e*).

Anal plates high, rounded, sculptured, but not so regularly as notogaster. Three long, smooth hairs close to inner edge of each plate, equally spaced. (I believe that the excrement slips out of the anal opening along these elastic hairs.) At a level with space between anteriormost and following bristles, a smooth bristle, which is longer than those on inner edge, is inserted near middle of cover (fig. 13, *f*). Farther in front of these hairs, at an equal distance from edges of cover, is a shorter stout and barbed bristle similar to those on notogaster.

Aspis truncated behind and rounded in front. Posterior border well chitinized, 20 μ broad; from middle of hind margin a chitinous bar extends forward, but it does not reach level of vertical bristles of aspis. Length of bar 60 μ. Some hardly visible keels run obliquely from inner toward outer side between bar and sensillar cup. Rest of surface provided with shallow pits similar to those of notogaster; no carina. Opening of shell-like sensillar cup lies below a narrow scale. Sensillus projects outward and somewhat forward and upward and thickens gradually to rounded knoblike head. In a line with bothridiae, are two pairs of

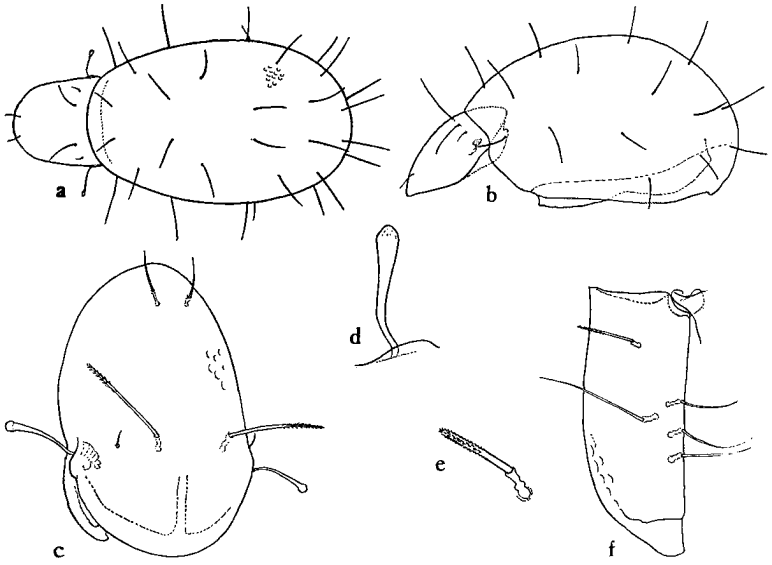

FIGURE 13.—*Hoplophorella singularis:* **a,** dorsal side; **b,** side view; **c,** aspis; **d,** sensillus; **e,** dorsal hair; **f,** anal shield.

bristles on aspis. Pair in middle of surface, vertical bristles, as far from each other as from bothridiae, similar to notogastral bristles and apparently erect (one of them appressed to aspis). Outer bristles very short, 16 μ long, whereas vertical bristles are 112 μ long. These outer bristles nearer to vertical ones than to bothridiae and directed forward and nearly appressed to aspis. Rostral hairs 40 μ long, directed somewhat upward and then bent down. Distance between them less than their length.

Holotype, slides 044, a-c.

Flint: type locality, under trash, Oct. 16, one specimen, Kondo and D. Anderson.

BIBLIOGRAPHY

1. Berlese, Antonio, Acari, Myriapoda, et Scorpiones hucusque in Italia reperta, pts. 1-101, Padova, 1882-1903.
2. Berlese, Antonio, Elenco di genera e specie nuove di Acari: Redia **5,** 1908.
3. Berlese, Antonio, Centuria terza di Acari nuovi: Redia **12,** 1916.
4. Coggi, A., Descrizione di specie nuove di Oribatidi italiani . . .: Soc. Ent. Ital., Boll. **30,** 1898.
5. Grandjean, F. A., Observations sur les Oribates: Mus. Hist. Nat. Paris, Bull. II, **5** (6), 1933.
6. Grandjean, F. A., Les Oribates de Jean-Frédéric Hermann et de son père: Soc. Ent. France, Ann. **105,** 1936.
7. Heyden, C. H. G. von, Versuch einer systematischen Einteilung der Acariden: Isis (von Oken) **18,** 1826.
8. Jacot, A. P., New oribatoid mites: Psyche **35,** 1928.
9. Jacot, A. P., Concerning the genus Neoliodes (Oribatoidea-Acarina): Am. Microscopical Soc., Trans. **48,** 1929.
10. Jacot, A. P., Oribatid mites of the subfamily Phthiracarinae of the northeastern United States: Boston Soc. Nat. Hist., Proc. **39,** 1930.
11. Jacot, A. P., A common arboreal moss mite, Humerobates humeralis: Boston Soc. Nat. Hist., Occ. Papers **5,** 1931.
12. Jacot, A. P., Phthiracarid mites of Florida: Elisha Mitchell Sci. Soc., Jour. **48,** 1933.
13. Jacot, A. P., Some Tyroglyphina (Sarcoptiformes) of the Marquesas Islands: B. P. Bishop Mus., Bull. **114,** article 17, 1934 (1935).
14. Jacot, A. P., Some Hawaiian Oribatoidea (Acarina): B. P. Bishop Mus., Bull. **121,** 1934.
15. Jacot, A. P., Some new western North Carolina moss mites: Ent. Soc. Washington, Proc. **40,** 1938.
16. Koch, C. L., Deutschlands Crustaceen, Myriapoden und Arachniden, Regensburg, 1836-1844.
17. Oudemans, A. C., Notizen über Acari, 25 Reihe: Archiv Naturgesch. A, Jahrg. 82, **6,** 1917.
18. Sellnick, Max, Die mir bekannten Arten der Gattung Tritia: Acari **3,** 1923.
19. Sellnick, Max, Oribatideos brasileiros: Arch. Mus. Rio de Janeiro **24,** 1923.
20. Sellnick, Max, Zur Kenntnis der estländischen Moorfauna, Oribatiden: Naturf.-Gesell. Dorpat, S. Ber. **33,** 1924.
21. Sellnick, Max, Oribatiden der Insel Krakatau: Treubia **5,** 1924.
22. Sellnick, Max, Javanische Oribatiden: Treubia **6,** 1925.
23. Sellnick, Max, Fauna sumatrensis: Suppl. Ent. **11,** 1925.

24. SELLNICK, MAX, Oribatei: Tierwelt Mitteleur. **3** (9), 1929.

25. SELLNICK, MAX, Eine neue brasilianische Neoliodes-Art und Bemerkungen über die Gattung Neoliodes: Zool. Anzeiger **89,** 1930.

26. SELLNICK, MAX, Oribatiden aus dem Karst.: Zool. Jahrb. Syst. **63,** 1932.

27. STÖRMER, L., PETRUNKEVITCH, A., and HEDGEPETH, I. W., Treatise on invertebrate paleontology, directed and edited by R. C. Moore, Arthropoda (P) : 98, 1955. (Published by the Geological Society of America and University of Kansas Press.)

28. THOR, SIG, Einige Acarina, besonders Hydracarina aus Turkestan: Zool. Anzeiger **88,** 1930.

29. TRÄGÅRDH, IVAR, Acarina collected by the Mangarevan Expedition to South Eastern Polynesia in 1934 . . .: Arkiv för Zoologi II, **4** (1): 45-90, 1951 (1952).

30. VITZTHUM, H. GRAF, Acarina, in Bronn's Kl. und Ord. des Tierreichs **5** (4), 1940-1943.