

SOME TYROGLYPHINA (SARCOPTIFORMES) OF THE  
MARQUESAS ISLANDS \*

By

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INTRODUCTION

GENOTYPES

A genus does not become valid until it is assigned a type. Thus the date of a genus is the date when it is assigned a type; previous to that it is a concept. The type makes the genus an individual.

Pierre André Latreille alone is responsible for the fixation of the types of all the earliest genera of mites. Oudemans<sup>1</sup> thinks that Latreille's use of the words "example" or "type" was dominated by "style" or "variety." I can not accept this idea, because Latreille did not use the word "type" or even "example" in his earlier publication,<sup>2</sup> and because a careful study of his three publications reveals that the type idea was a growing and developing concept in Latreille's mind. For example, in the earlier publication<sup>2</sup> he used no example whatever for two of his new genera (*Argas* and *Siro*); the rest of the time he used neither "example" nor "type." In the next work<sup>3</sup> he used the term "example" quite consistently. In the 1810 treatise we find the term "type" as well as the variety of designations pointed out by Oudemans. Finally, Latreille ended his work with a table in which a "type" is assigned to each genus. Nothing could be more complete or final, as far as type designation is concerned, and this is therefore fittingly the work from which we should derive the fixation of types (except the monotypes).

No type was assigned to the genus *Acarus* until 1810.<sup>4</sup> The first genus of mites definitely fixed by a type is *Atomus*.<sup>5</sup> Thus *Atomus* becomes type genus of the order of mites and should be used instead of *Acarus*.

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<sup>1</sup> Oudemans, A. C., Kritisch historisch overzicht der Acarologie, pt. 2: Tijd. voor Ent., vol. 72, suppl., pp. 33, 34, 1929.

<sup>2</sup> Latreille, P. A., Précis des caractères génériques des insectes, disposés dans un ordre naturel, 201 pp., Paris, 1796.

<sup>3</sup> Latreille, P. A., Histoire naturelle, générale, et particulière des crustacés et des insectes, vol. 3, Paris, 1802.

<sup>4</sup> Latreille, P. A., Considérations générales sur l'ordre naturel des (animaux composant les classes des) crustacés, des arachnides, et des insectes, p. 430, Paris, 1810.

<sup>5</sup> Latreille, P. A., Observations sur la variété des organes de la bouche des Tiques, et distribution méthodique des insectes de cette famille d'après les caractères, établis sur la conformation de ces organes: in Millin, Noel, et Warens, Magasin Encyclopédique, vol. 4, p. 18, 1795.

\* Pacific Entomological Survey Publication 7, article 17. Issued May 12, 1934.

## ABDOMINO-CEPHALOPROTHORACIC SUTURE

In earlier papers I have referred to the anterior edge of the notogaster or its indistinct remnant as the abdomino-cephaloprothoracic suture. For various reasons I no longer regard the anterior edge of the notogaster as the anterior edge of the abdomen. In brief, reference to such genera as *Belba* and *Oppia* show distinctly that this region is a midthoracic constriction passing between the second and third pairs of legs. This midthoracic constriction has developed in the mites as a result of the functional orientation of the legs: the anterior two pairs are directed forward and act as pullers; the hind two pairs are directed backward and act as pushers. This reverse motion of these double pairs has caused a reversal in the direction of the muscles attached to the epimera or apodemata so that the muscles of legs II and III become attached to the fused apodemata II and III. In the earlier stages of evolution in this group, this midthoracic fusion and concentration caused a considerable constriction which, in the higher Oribatidae, becomes almost entirely obliterated. I shall therefore refer to this area as the "midthoracic constriction," and to the anterior edge of the notogaster (which is the fused thoracic tergites III and IV and abdominal tergites) as the "midthoracic suture."

## THE UNGUIS

Probably because so many specialists on mites have had to work on highly specialized forms in parasitic or plant-injuring groups, a morphological character of some practical value in dividing the great order of mites with its 167 "families" seems to have been overlooked. This cleavage plane separates two strikingly different groups:

1. Mites with rather long, well-developed, cursorial legs having tarsi provided with two claws, usually accompanied by an arolium.
2. Mites with rather short, ambulatory legs having tarsi provided with one claw, often developed from a shaft and called the "unguis."

In both these groups there are, of course, many exceptions. The Opilioacaridae, Holothyridae, Mesostigmata, and Ixodoidea are typical of the first group. In most of these the legs are fairly long and the segments are more or less constricted at the ends. In the almost parasitic Uropodoidea the legs are shorter and the segments cylindrical. The Tarsonemoidea have two claws to tarsi II and III (the two conservative legs), and two to tarsi I in the immatures. Among free-living genera, *Labidostoma* has tarsus I with two claws, though other tarsi have three claws and *Caenonychus* has but a single claw. Throughout the mites, legs II and III are more conservative than legs I or IV. In the protostigmatal scaphbasket one finds a preponderance of two-clawed species, though these two claws are often masked by various modifications. For instance, in the Tetranychidae the arolium may be split into 2,

4, or even 6 hooks, and the claws may be similarly split into knob-tipped styles of a corresponding number or variously frayed at the base. All these modifications are reducible to three elements, a single ventral (typically an arolium) and two dorsal.

Among the ambulatorial mites (Sarcoptiformes) the nail also goes through many modifications, the commonest being to split on two sides to form three hooks. Although these three hooks are the regular thing in the highest Oribatoidea, the immatures and primitive genera have but a single hook. In one species both conditions occur. Irrespective of the number of hooks, there is only one basal (proximal) unit. The various modifications to be found in the parasitic forms are of no interest in this connection as being specializations away from the primitive condition. Legs I and IV, especially IV, are most susceptible to changes. That is, legs II and III are the most stable. It will be recalled that in both *Limulus* and the eurypterids the fourth leg is strikingly different from legs I to III.

#### NONSYSTEMATIC UNITS

A striking feature of the system of classification of the order as used in northern Europe is the use of such group names as cohorts (sub- and super-) and phalanx (sub- and super-), and the lack of such familiar divisions as subfamilies and superfamilies. Also the use of odd group names originally used to designate a certain category, but now used for entirely different categories. Rather than to retain this heterogeneous and additional assortment of terms, I will follow the simpler practice of using standard terminations of standard groups (tribes, subfamilies, superfamilies, and suborders) based on the oldest valid genus.

Among the Oribatoidea the various terms Diagastres, Syngastres, Macropylina, Brachypylina, Circummarginatae, Immarginatae, Pterogasterinae, Apterogasterinae, Ptyctima, Aptyctima, are interesting expressions of the presence or absence of certain structural characters, but have no rank in systematic nomenclature and only serve to clutter up classification.

The grouping of 37 subfamilies under 1 or 2 families is not an ideal mathematical arrangement, but it must be remembered that our knowledge of the evolution of this order is still almost a void.

Finally, it is easier to change terminations like -ini, -inae, -idae, -oidea, -ina, of standard well-known genera, than to sprinkle the group with foreign terms. After all, it requires no great mental effort to think of the Camisiinae instead of the Camisiidae, or to think of the one as including a few more (peripheral) genera than the other.

As knowledge of the fundamental lines of evolution develops, more valid families will be recognized. In the meanwhile it may be found more desirable

to sink many of the subfamilies into tribes, so that Camisiinae and Camisiini will also convey a greater or smaller number of genera. Such a system is a far more convenient sliding scale than one in which exotic terms are interpolated at frequent intervals. The day may dawn, 200 years hence, when a superman will demonstrate that the tribe is another term for supergenus.

Systematic units higher than the genus, based on the oldest valid genus, do not need author citations. As we are not interested in the definition of the group, it is of no importance who first used the term or when. The type genus stands for the definition. The type species bears the characters. The characters deemed of tribal or family importance will vary with each generation of specialists, though they will always be present in the type species. Thus the terms of higher category become purely mechanical contrivances.

#### SUBORDER TYROGLYPHINA (SARCOPTIFORMES)

Characters: unguis formed of a single unit as proximal end, terminating in a claw, distal end variously modified in parasitic species.

In 1796 Latreille instituted the genus *Tyroglyphus*<sup>6</sup> referring only *Acarus siro* Linné to it. Thus *Acarus siro* is monotype of *Tyroglyphus*. It was not until 1810<sup>7</sup> that a type was assigned to the genus *Acarus*. This type is *Acarus siro* Fabricius. As Fabricius was a compiler, his *A. siro* is *Acarus siro* of Linné (Fabricius' first bibliographic reference). Thus *Acarus* is a synonym of *Tyroglyphus*.

*Acarus siro* Linné 1758 was a composite animal. By page or area precedence it is *A. farinae*. Moreover, the habitat cited by Linné, "in flour," has a line's precedence over the other.

#### SUPERFAMILY TYROGLYPHOIDEA

Characters: skin of body of adult whitish; genital and anal apertures strict, not covered by separately sclerotized covers; tarsal unguis without shaft; mouth parts conspicuously exposed in dorsal aspect.

#### FAMILY TYROGLYPHIDAE

Characters: skin of adults smooth, not finely wrinkled.

#### SUBFAMILY TYROGLYPHINAE

Characters: mandibles chelate; tarsi without arolium (caruncle); body with midthoracic constriction; some of the body bristles at least half as long

<sup>6</sup> Latreille, P. A., Précis des caractères génériques des insectes, disposés dans un ordre naturel, p. 185, 1796.

<sup>7</sup> Latreille, P. A., Considérations générales sur l'ordre naturel des (animaux composant les classes des) crustacés, des arachnides, et des insectes, p. 425, 1810.

as body is broad; males with suckers near anus and often on tarsi iv; nuchal bristles on transverse plane of tarsi I, smooth or absent.

#### TRIBE RHIZOGLYPHINI

Characters: tarsi I with stout thornlike bristles on dorsal face, one of them immediately distad of the scent club; some males with legs III specialized.

#### Genus RHIZOGLYPHUS Claparède

*Rhizoglyphus* Claparède: Studien an Acariden: Zeit. f. Wiss. Zool., vol. 18, p. 506, 1869.

Characters: prothorax with only two bristles behind the cephalon; no bristles on mesal portion of post-thorax; posterior end of abdomen without plate.

Type, *Rhizoglyphus robini* Claparède: Zeit. f. Wiss. Zool., vol. 18, p. 506, 1869 = *Tyroglyphus echinopus* Fumouze and Robin: Jour. l'Anat. Phys. Robin, vol. 5, pp. 287-304, 1868.

#### **Rhizoglyphus natiformius**, new species (fig. 1, a-e).

Diagnostic characters: posterior end of abdomen bilobed; two long bristles on sides near oil gland region and another ventroposteriad of them; anal region of females with one pair of very long bristles; male tarsi iv with two suckers.

Description: size of females, body 0.787 by 0.39 mm., abdomen 0.36 mm. high; males slightly smaller; body pyriform, lobed posteriorly; cephalon an elevated, rectangular area which is finely granular on dorsal face, bearing two pairs of bristles, one pair (the rostral) rather long, fine, approximate, inserted close to anterior edge and median plane, the other (camerostomal) short, stout, mesally bent, inserted on lateral rim of camerostome; prothorax fitting about ventroproximal portion of cephalon, undulate at sides between legs I and II, dorsally bearing two pairs of bristles, one pair (nuchal) fine, mesally bent, inserted over coxae I, close to foot of curve descending from cephalon, the other pair (lateral) very long, stout, inserted where one would expect pseudostigmatic organs; post-thorax broader than prothorax and demarked by a slight constriction, dorsolaterally bearing two pairs of bristles, one pair long, fairly stout, the other short, fine, inserted anteromesad of the major pair; abdomen broader than thorax, completely fused to it, with a slight, indistinct, transverse demarcation across its middle; anterior half with two pairs of bristles inserted close to transverse line, the mesal pair long, fairly stout, the lateral pair short, fine, inserted near lateral edge of abdomen; posterior part of abdomen characteristically undulate, both at sides and behind (fig. 1, a), lateral lobe with two pairs of long bristles on dorsal face, posterior lobes with two pairs of long, stout bristles inserted at center of lobe, the lateral pair on a secondary more dorsal lobe, a fifth pair of long, fine bristles inserted on ventral face of sides of posterior lobes; finally a sixth pair of long, stout bristles inserted on ventral face of mesal edge of lobes each side of anal aperture, these being the longest and stoutest of all the bristles; between posterior lobes on dorsal face is a small median circle which has the appearance of a pore or opening.

Ventral face of thorax normal for the genus, that is, sternum articulating with coxae I, which bear a short bristle; parasterna I with a short bristle at center; parasterna II without bristle; coxae II articulating with apodemata both anterior and posterior to it, the posterior apodemata weak, forming posterior edge of midthoracic constriction; a

short bristle on these coxae; parasterna III and IV very oblique, III only with a bristle, as also coxae III; no bristle discernible on parasterna and coxae IV; a short bristle laterad of genital sucker region, another mesad of region of coxae IV.

Legs fairly short, legs I with unguis surpassing mouth parts, legs IV if stretched backward not reaching end of abdomen; legs I (fig. 1, *b*) with tarsi twice as long as broad; dorsal face with usual scent club directed laterad, laterad of it are two very small rodlike bristles; a long, fine bristle inserted laterad of base of anterior spine; a stout bristle inserted distad of dorsodistal spine, reaching nearly to apex of hook; a fine, fairly long bristle inserted proximad of base of hook; a similar one on mesal side; a fine, rather short bristle inserted distad of ventral spine. Tibiae shorter than high, dorsal face with major bristle curved strongly mesad; a ventrolateral spine inserted its length from distal edge. Genuals similar to tibiae; dorsal face with a short dorsolateral spine inserted on proximal edge; distal end with two bristles: a fairly long one, the other half as long, closely inserted. Femora with a long ventrodorsal bristle inserted a short distance from distal edge.

Legs II quite similar but without the long, dorsodistal bristle on genuals, long bristles somewhat shorter.

Legs IV of females (fig. 1, *c*) with tarsi nearly three times as long as high; with a single spine on dorsal face, inserted at distal third of segment; a very long, fine bristle inserted immediately proximad, a shorter one inserted laterad of this dorsal spine; ventral face with two spines, besides the spinelike process beneath the hook, a very short lateral spine between dorsal and ventroproximal. Tibiae longer than high; a stout, medium-long bristle inserted at dorsodistal edge; a short, slender spine inserted on ventral face near distal end. Genuals shorter than tibiae, without bristles. Femora with a fine bristle inserted at distal third of ventral face.

Legs III similar but tibiae with very much longer dorsodistal bristle; genuals with a short, stout, dorsodistal bristle; a short spine inserted at center of ventral face; no bristles on femora.

Legs IV of males (fig. 1, *d*) with sucker midway between proximal end of segment and long dorsal bristle which is shorter and broadened at distal end; another sucker in place of dorsal spine present in female; no lateral bristle. Tibiae with only the dorsodistal bristle, spinelike. Genuals without bristles. Femora with ventral face bristle better-developed. Legs III as in the female. Legs I with distal end of long bristles slightly flattened out.

Hivaoa: Matauuna, altitude 3900 feet, taken March 3, 1930, under rotting bark of *Cheirodendron* (near *platyphyllum*), several specimens, Mumford and Adamson, slide 33M17 (cotypes).

The chief chaetotaxial differences in the females of this species and *R. echinopus*<sup>8</sup> are that in this species the small bristle ventrad of the major post-thoracic is usually absent; the bristle anterior to the genital suckers is absent, but there is one mesad of coxae IV; the bristle laterad of the anterior end of the anus is absent; in legs I the small bristles laterad of the scent club are both close to the club; the long lateral bristle inserted close to the hook is a spinelike bristle; there are only two spines on ventral face; the bristle distad of the ventroproximal spine is short and very fine; the lateral bristle of the tibiae is absent; the major bristles of tibiae I and II are strongly curved mesad; the spines of the genuals are like those of the tarsus.

<sup>8</sup> Fumouze, Armand, and Robin, Charles, Observations sur une nouvelle espèce d'acariens du genre *Tyroglyphus*: Jour. l'Anat. Phys., Robin, vol. 5, pp. 287-304, pls. 20, 21, 1868.

*Rhyzoglyphus longipes*<sup>9</sup> from Tahiti has no spine before the scent club and has two collateral spines at center of ventral face of tarsi I with none at distal end. It therefore may be a *Caloglyphus*. *Rhyzoglyphus grossipes*<sup>9</sup> also from Tahiti has very stout legs.

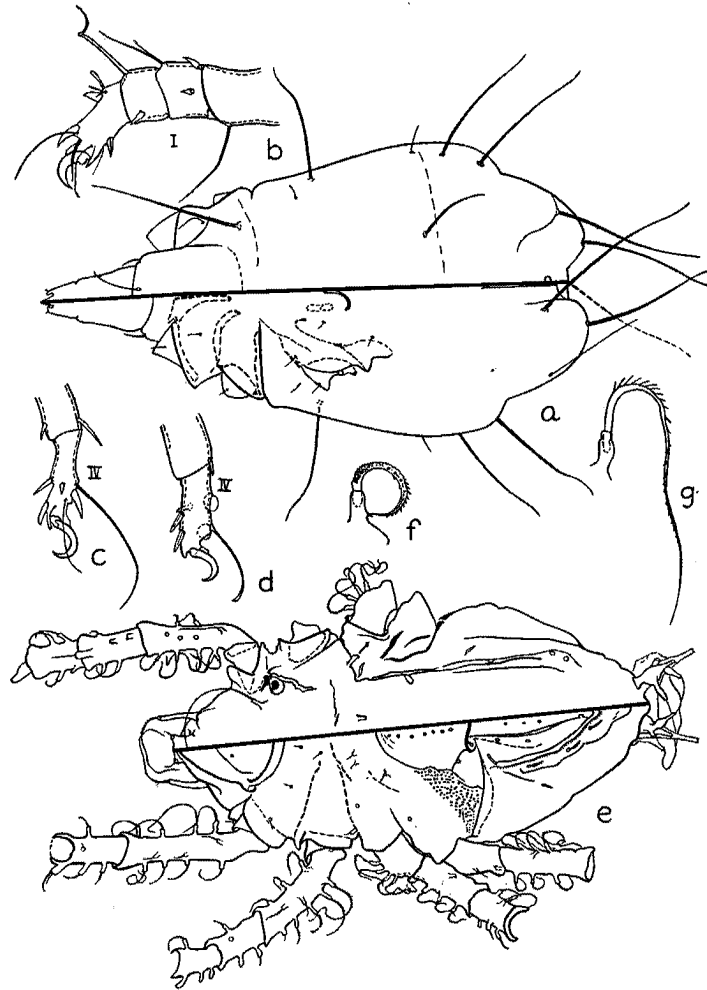


FIGURE 1. *Rhyzoglyphus natiformius*, new species, adult: *a*, dorsoventral aspects of female, legs omitted, mouth parts outlined, ratio  $\times 120$ ; *b*, legs I of female, ratio  $\times 200$ ; *c*, tarsi IV of female, ratio  $\times 200$ ; *d*, tarsi IV of male, ratio  $\times 200$ . *Acronothrus nukuhivae*, new species, adult: *e*, dorsoventral aspects, female, mouth parts omitted, ratio  $\times 60$ ; *f*, bristle of femur III, ratio  $\times 200$ ; *g*, bristle of trochanter III, ratio  $\times 200$ .

<sup>9</sup> Berlese, Antonio, Centuria quinta di Acari nuovi: Redia, vol. 14, p. 144, 1920.

## SUPERFAMILY ORIBATOIDEA

Characters: skin of body of adults yellowish to black; genital and anal apertures conspicuous, covered by separately sclerotized covers; tarsal unguis with well-formed shaft articulated to end of tarsus.

## FAMILY ORIBATIDAE

Characters: legs ventral or lateral, not capable of being withdrawn into anterior end of abdomen; if genital and anal apertures are widely spaced there is no transverse suture dividing the ventral plate, and the genital aperture is distant from apodemata IV; mouth parts usually quite hidden by extension of rostrum anteriorly and ventrad.

## SUBFAMILY CAMISIINAE

Characters: anal and genital apertures contiguous; in addition to the two genital covers, the two anal covers, the preanal, and the ventral plate, there are other plates; lamellae poorly developed. Type, *Camisia* Heyden; Isis von Oken, vol. 18, p. 612, 1825.

Genus *ACRONOTHRUS* Berlese

*Acronothrus* Berlese: Redia, vol. 12, p. 65, 1916.

Characters: Camisiinae with adanal covers distinct; anterior and posterior genital covers fused; parasterna and aggenital plates fused but distinct from the notogaster; pseudostigmata large, organs short, globular, not or barely protruding from pseudostigmata; rostrum entire.

Type, *Nothrus cophinarius* Michael: Linn. Soc. London, Jour., Zool., vol. 30, p. 142, pl. 19, figs. 13-16, 1908.

***Acronothrus nukuhivae*, new species (fig. 1, e-g).**

Diagnostic characters: posterior apophyses reduced to two pairs, the one above the other, each apophysis branched; tarsi with well-developed apophyses on dorsal, lateral, and mesal faces, usually bearing a large hump of earthy matter which completely covers the dorsal part of the body, and often coats the legs as well.

Description: size of female 1.34 by 0.66 mm.; color brown when clean; cephaloprothorax smooth; rostrum produced as a rather square, flat-roofed gable, each corner produced as a rounded knob bearing a very short, rather stout bristle, center slightly convex (fig. 1, e); lamellae practically undeveloped, the slender horn from which the bristle springs being, as elsewhere in this species, a tubular apophysis, the bristles rather long, undulate, curved mesad then posteriad, somewhat barbed; interlamellar bristles inserted on a short horn, long, fine, smooth, curving gracefully across cephalon, thus being different from all other bristles of this species; pseudostigmata ovate, anterior edge flat, organ head ovate, larger half laterad of pedicel; prothorax smooth, barely distinguishable from post-thorax, with a sharp emargination between legs I and II, the walls built out as collars to shelter trochanters (coxae), collar of legs I very much emarginate dorsad of trochanters, an irregular ridge runs back from lateral edge of pseudostigmata, especially prominent along anterior rim of pseudostigmata; post-thorax separated from prothorax



at sides by a constriction (fig. 1, *e*) built out as a strongly protruding semicup for reception of legs IV; post-thorax entirely fused to abdomen in middle of dorsum, separated at sides by a more densely sclerotized band which passes ventrad to slip under the anal plate at anterior end of anal opening; a bristle apophysis on dorsolateral aspect of mid-thoracic constriction, a shorter apophysis each side of median plane, on same transverse plane; a long pseudoforamen posterior to latter; dorsum of abdomen sculptured by two or three longitudinal wrinkles midway between median plane and lateral edge of abdomen, these wrinkles bordered by four short, bristle apophyses or knobs; superior pair of posterior apophyses (fig. 1, *e*, upper half) with an ascending mesally directed branch, inferior pair (fig. 1, *e*, lower half) with two branches; these branches of the apophyses served to retain the posterior portion of the nymphal skins, and this accumulated complex serves to retain the pile of foreign matter which is found on many individuals.

Ventral plate not encroaching on labium, forming a sharp, open V with posterior edge of cephalon, ventrad of legs I, on a collar about their base; a similar collar developed about base of legs II, which juts out as a prominent ridge anterior of coxae II (fig. 1, *e*, lower half); parasterna I with the three usual bristles, the sternal rather approximate; parasterna II with the more remote sternal bristles only; parasterna III with lateral bristle on anterior edge, projecting prominently; corresponding bristle of parasterna IV not discernible; middle bristle of parasterna III and IV nearer anterior than posterior edge of the parasterna; mesal bristles as in figure 1, *e*, the two close together on what appears to be the mesal end of parasterna III may be one from each parasternum; the single one on what appears to be the mesal end of parasterna IV may be a genital plate bristle while the other two are on the edge of the plate more posteriad (compare with *Epilohmannia*); posterior edge of parasterna IV granular. Genital covers large, lateral edges not clearly defined, median edge with eight bristles. Pre-anal plate<sup>20</sup> vertical, undulate, ends pointed, posterior edge of genital plate curving around its ends. Circular area thus enclosed, including what has the appearance of a lenticular stigma, or broad pseudofissura. It is difficult to know whether the granular area is included by the genital plate or only the area posterolaterad of the genital aperture. Ventromesal edge of notogaster with three tuberculate bristles, on a liplike evagination of the edge (marked by a broken line in fig. 1, *e*, having the appearance of a chitin ridge in mounted specimens), a pseudofissura posterolaterad of anteriormost of these peripheral bristles. Adanal covers<sup>20</sup> with a pseudofissura at anterior margin, a bristle on transverse plane slightly posteriad, another on transverse plane of anterior bristle of notogaster periphery, and another close to posterior end of the cover; anal cover with the usual three marginal bristles.

Legs with trihomamate ungues, and coarsely ciliate to tuberculate bristles (fig. 1, *f*, *g*) springing from tubular apophyses. Tarsi I long, gradually tapering; with a few sessile bristles on distal end of ventral face, 7 to 8 bristle-bearing apophyses along sides, with a broad dorsodistal apophysis giving rise to 2 or 3 long smooth bristles, 2 of which are equally long, closely inserted, curving over and beyond ungual hooks. Tibiae I very short; with a ventrolateral bristle each side, 2 on mesal, 1 on lateral and 2 on dorsal side; also a broad and longer dorsodistal apophysis bearing 2 smooth bristles. Genuals I longer, but armed very much like the tibiae, the major apophysis apparently bearing only 1 bristle. Femora I long and cylindrical; mesal face bearing 4 bristles, of which the second and third are most widely spaced, on one femur the proximal apophysis is dual and diverging; 3 rather closely spaced dorsolateral bristles; ventral face with 3 bristles, the anterior 2 somewhat lateral, the proximal 1 most widely spaced from the others; lateral face with 1 only (in fig. 1, *e*, lower femur somewhat canted showing the 3 dorsolaterals and the lateral bristle on lateral side). Legs II quite similar but femora with more bristles on lateral than mesal face.

Tarsi III and IV similar to I and II but the large dorsodistal apophysis and its bristles not so highly developed. Tibiae III and IV with a ventral bristle on each side, 2 dorsolateral and 3 dorsomesal, the proximal smaller, more erect, close to the middle one; the

<sup>20</sup> Grandjean, F. A., Observations sur les Oribates (4<sup>e</sup> sér.): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, p. 218, 1933.

only truly dorsal apophysis is the major one (on distal end). Genuals III and IV subequal to tibiae; armature similar but no third dorsomesal bristle. Femora IV with 3 dorsal bristles arranged as a crescent on distal half of segment; mesal face with 4 bristles arranged as a descending crescent on proximal two thirds of segment; lateral face with 3 bristles (fig. 1, *f*), the distal one most widely spaced; a single bristle on ventral face. Femora III similar but shorter; only 3 mesal bristles; the dorsal bristles occupying two thirds of the segment. Trochanters (coxae) IV with only one short, smooth bristle on ventrolateral face on a very short apophysis. Coxae III as IV but with 4 ciliate bristles (fig. 1, *g*) along lateral face. The type has tibia IV and genual IV of left side evidently shattered and regrown forming a single, irregular segment. The tarsal bristles have the granules widely spaced.

Nukuhiva: Tovii [Teovii], 2 miles northeast of Teuanui, altitude 2800 feet, October 26, 1929, on *Metrosideros collina*, holotype, Mumford and Adamson, slide 33M20.

***Acronothrus nukuhivae hivaoae*, new subspecies.**

Diagnostic characters: similar to the species but notogaster with only one longitudinal fold, the area immediately mesad weakly pock-marked; tarsi without apophyses, except the dorsodistal, the bristles almost sessile, those of distal half smooth, stout, rapierlike; dorsodistal apophysis of tibiae I bearing a stout bristle, and two unequal, slender bristles, the shortest as long as the apophysis; other bristles sessile, very finely burred; dorsodistal apophysis of genuals I bearing a stout bristle and a slender one, which is slightly longer than the apophysis; posterior apophyses of abdomen appear dwarfed and stunted, but may be broken off short.

Hivaoa: Mount Temetiu, altitude 3650 feet, May 27, 1929, from dead fern stipes, holotype, Mumford and Adamson, slide 33M19.

The Marquesan species of *Acronothrus* are most closely related to *A. unguifera*<sup>11</sup> but have more complex posterior apophyses.

Genus UDETALIODES Jacot

*Udetaliodes* Jacot: American Micr. Soc., Trans., vol. 48, pp. 29-43, 1929.

Characters: Camisiinae with adanal and aggenital plates fused to each other, to parasterna, and to each other and behind anal aperture, thus forming a broad ventral plate; anterior and posterior genital covers distinct.

Type, *Liodes concentricus* Banks: American Ent. Soc., Trans., vol. 22, p. 15, 1895.

Trägårdh<sup>12</sup> quotes me as appointing *Oribata concentrica*<sup>13</sup> as type of this genus when I distinctly appointed as type, specimens which I had before me, as above indicated. Thus much that Trägårdh says is to no account and only serves to cloud the issue concerning the species that Hermann actually described, and not what subsequent writers thought he described.

<sup>11</sup> Michael, A. D., Unrecorded Acari from New Zealand: Linn. Soc. London, Jour., Zool., vol. 30, p. 144, 1908.

<sup>12</sup> Trägårdh, Ivar, Acarina from the Juan Fernandez Islands: Nat. Hist. Juan Fernandez and Easter Island, vol. 3, no. 55, pp. 558-559, 1931.

<sup>13</sup> Say, Thomas, An account of the Arachnides of the United States: Acad. Nat. Sci. Phila., Jour. vol. 2, p. 73, 1821.

**Udetaliodes hawaiiensis aculeatisetae**, new subspecies (fig. 2, *a-e*).

Differs from the species<sup>14</sup> and from *U. h. wakensis*<sup>14</sup> in that the interpseudostigmatic area is coarsely corrugate, as also the entire intercoxal area of the cephaloprothorax; rostral area finely, irregularly, transversely wrinkled; pseudostigmatic organ head entirely projecting from pseudostigmata (fig. 2, *d, e*); interlamellar bristles sessile, pointed, distal end curved laterad (fig. 2, *c-e*); anteromedian portion of notogaster with but 3 to 5 parallel incisions; anterolateral tubercles faint; posterior end of abdomen with 6 to 8 stylets like the interlamellar; all bristles with distal ends pointed by attenuation of one side (fig. 2, *b*), whence the subspecific name. Distal end of tarsus very broad, with a keel on both dorsomesal and dorsolateral angles, each keel with two bristles making up the two pairs usually found on dorsodistal half of tarsi I; besides the bristles figured (fig. 2, *a*) there is a short, fine bristle with the dorsoproximal triplet.

Nukuhiva: Ooumu, altitude 4050 feet, November 12, 1929, from leaf axils of *Cyperus*, 7 specimens, Mumford and Adamson, slides 33M13a and b (cotypes). This is an unrecorded habitat for this genus.

## SUBFAMILY CERATOZETINAE

Characters: Oribatidae with lateral edges of notogaster developed laterally as flat chitinous expanses or wings (pteromorphae) which do not extend anteriorly of posterior edge of cephaloprothorax; lamellae, when present, developed as slender ridges or narrow blades extending along sides of cephaloprothorax; interlamellar bristles never clavate; mandibles massively chelate.

## TRIBE SCHELORIBATINI, NEW TRIBE

Characters: Ceratozetinae without tectopodia I. Type, *Schelorbitates* Berlese: Redia, vol. 5, p. 2, 1908.

## Genus SCHELORIBATES Berlese

Characters: Ceratozetinae with anterior edge of notogaster distinct; lamellae well-developed; no translamellae; pteromorphae confluent with body outline behind; tectopodia I not developed; distal end of lamellae with ridge (lamello-rostral) extending to rostral bristles and rim of camerostome; mesal end of apodemata IV fused to frame of genital aperture; sternum well-developed to camerostome; femora I without broad flange along ventral edge.

Type: *Oribates latipes* Koch: Deutschlands Crust., Myriap., und Arach., Regensburg, fasc. 38:14, 1844.

**Schelorbitates fimbriatus whitteni**, new subspecies (fig. 1, *f, g*).

Differs from the species<sup>15</sup> in that the body is broad; pseudostigmatic organ head with single, long distal apicule and a few short cilia along dorsal edge (fig. 2, *g*); rostral

<sup>14</sup> Jacot, A. P., Concerning the genus *Neoliodes* (Oribatoidea-Acarina): American Micr. Soc., Trans., vol. 48, pp. 16, 31, 35, figs. 159-165, 1929.

<sup>15</sup> Thor, Sig., Einige Acarina, besonders Hydracarina aus Turkestan: Zool. Anz., vol. 88, Heft 7-8, p. 196, figs. 13, 14, 1930.

and interlamellar bristles few-burred; a cluster of porose areas over posterior part of notogaster; middle pair of sternal bristles on sternum; apodemata I short, hooklike; preanal bristles on anal aperture frame.

The interlamellar area and the postgenital area is sculptured by such irregular figures as may be made by pecking a smooth board with the point of a penknife. This sculpturing obliterates the position of the paramasal bristles. The one indicated in figure 2, *f*, is taken from the form.

Although legs I resemble most closely those of *Scheloribates muiri*<sup>16</sup> the general body characters are those of *Scheloribates fimbriatus calcaratus*<sup>16</sup> and *Scheloribates oahuensis*.<sup>16</sup> It is broader (relatively) than either, with a more rounded posterior end than *Scheloribates oahuensis*. The disposition of the bristles of the ventral area is very similar to *Scheloribates oahuensis*<sup>16</sup> but the anterior pair of sternals are laterad of the sternum; I found no cilia on the pseudostigmatic organ head in *Scheloribates oahuensis*. The porose areas are much larger in *Scheloribates fimbriatus whitteni*. Thus although the disposition of the bristles of the ventral area is so much like that of *Scheloribates oahuensis*, the other differences are considerable.

From *Scheloribates fimbriatus calcaratus* this species differs in the smoother cephalo-prothoracic bristles; reduced degree of ciliation of pseudostigmatic organs; very different apodemata I; long apodemata II-III; middle pair of sternal bristles on sternum; genital cover bristles spaced midway between lateral and median edges of covers; different porose areas; greater breadth of body; and more ventrally extended pteromorphae.

I believe it is closely related to *Scheloribates fimbriatus calcaratus*, but apodemata I are those of *Scheloribates oahuensis*. It is, therefore, of *Scheloribates fimbriatus* stock with reduced ciliation and other minor modifications.

Uapou: Hakahetau, altitude 2000 feet, December 14, 1929, in dead fruits of *Aleurites moluccana*, 3 specimens, R. R. Whitten, slide 33M6 (cotypes).

***Scheloribates fimbriatus whitteni hivaoae*, new form (fig. 2, *h*).**

Differs from the subspecies in that the pseudostigmatic organ head apicule is shorter (fig. 2, *h*); preanal bristles more anterolaterad, setting them clear of the aperture frame; rostral and interlamellar bristles barbed to short ciliate; lateral postanal bristles more laterad, that is, more distant from aperture.

Hivaoa: Atuona Valley, February 28, 1929, 3 specimens, Mumford and Adamson, slide 33M3 (cotypes).

***Scheloribates fimbriatus whitteni nukuhivae*, new form.**

Differs from the subspecies in that the broadest part of the abdomen is considerably behind the pteromorphae, making a broad posterior outline; middle sternal bristles on edge of sternum; preanal bristles beyond anal aperture frame; pseudostigmatic organs often carried under pteromorphae.

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, 12 specimens, Mumford and Adamson, slide 33M2a (cotypes). Figure 2, *i*, illustrates a parasite on the lamellar bristle of one of these specimens.

The very few specimens from each island make it impossible to determine if there is any size difference between the insular forms, but if there is, it is swamped by sex dimensurism. The males (from Uapou and Hivaoa) aver-

<sup>16</sup> Jacot, A. P., Some Hawaiian Oribatoidea: B. P. Bishop Mus., Bull. 121, figs. 69, 80, 88, 1934.

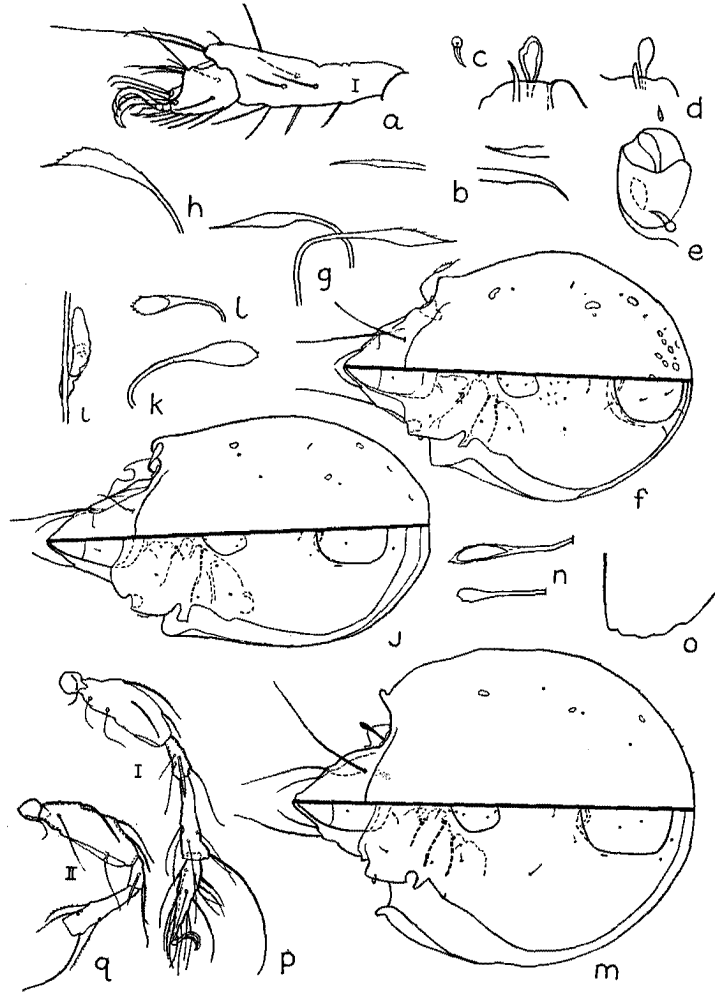


FIGURE 2. *Udetaliodes hawaiiensis aculeatisetae*, new subspecies, adult: *a*, tarsus and tibia I, ratio  $\times 120$ ; *b*, leg bristles, to right of numeral from femora III, ratio  $\times 440$ ; *c*, interlamellar bristle, from above; *d*, pseudostigmata, lateral view, pseudostigmatic organ, and interlamellar bristle, ratio  $\times 150$  and  $\times 200$ ; *e*, pseudostigma, dorsal aspect, organ, interlamellar bristle, and exopseudostigmal bristle, ratio  $\times 200$ . *Schelorbates fimbriatus whitteni*, new subspecies, adult: *f*, dorsoventral aspects, mouth parts and legs omitted, ratio  $\times 100$ ; *g*, pseudostigmatic organs, dorsal aspect, ratio  $\times 330$ . *Schelorbates fimbriatus whitteni hivaooae*, new form, adult: *h*, pseudostigmatic organs, lateral aspect, ratio  $\times 330$ . *Schelorbates fimbriatus whitteni nukuhiwae*, new form, adult: *i*, parasite on a lamellar bristle, ratio  $\times 440$ . *Schelorbates indicus marquesalis*, new subspecies, adult: *j*, dorsoventral aspects, mouth parts and legs omitted, ratio  $\times 120$ ; *k*, pseudostigmatic organs, ratio  $\times 330$ . *Schelorbates indicus marquesalis nukuhiwensis*, new form, adult: *l*, pseudostigmatic organs, ratio  $\times 330$ . *Schelorbates (Paraschelobates) mumfordi*, new species, adult: *m*, dorsoventral aspects, mouth parts and legs omitted, ratio  $\times 60$ ; *n*, pseudostigmatic organs, below numeral foreshortened, as seen in dorsal aspect, above numeral as seen in lateral view, ratio  $\times 200$ ; *o*, pteromorphae, ventral half, ratio  $\times 75$ ; *p*, legs I, ratio  $\times 75$ ; *q*, femora, genuals and tibiae II, ratio  $\times 75$ .

age 0.44 by 0.646 mm., and the females (from Nukuhiva) average 0.476 by 0.72 mm.

**Scheloribates indicus marquesalis**, new subspecies (fig. 2, *j. k*).

Differs from the species<sup>17</sup> in being more slender; notogaster with sides almost parallel, posterior end flattened (fig. 2, *j*); pteromorphae projecting forward considerably beyond transverse plane on pseudostigmata; pseudostigmatic organ head more slender, very minutely barbed, barbs barely visible with magnification of 440; cephaloprothoracic bristles burred to weakly barbed; apodemata I very short, slender, with equally long posterior spur; parasterna II with a spinelike process running out from sternum; parasterna III much restricted by expansion of mesal end of apodemata IV; bristles of parasterna IV much more widely spaced; paramasal bristles much more distant from genital aperture; genuals I with major bristle extending nearly to tarsus.

Hivaoa: Atuona Valley, 1.5 miles from sea, altitude 300 feet, July 6, 1929, under rotting wood, 2 specimens, Mumford and Adamson, slide 33M1b (cotypes); February 28, 1929, 2 specimens, Mumford and Adamson, slide 33M3.

Another specimen on slide 33M1b has the body form and sternal area of *Scheloribates indicus* but has bristle 3 of genital covers midway between lateral and median edges of cover, and the distant paramasal bristles of *Scheloribates indicus marquesalis*. As I have but one specimen and consequently cannot determine its systematic status, I merely call attention to it.

One specimen from Uapou, Hakahetau, (altitude 2000 feet, December 14, 1929, in dead fruits of *Aleurites moluccana*, R. R. Whitten, slide 33M6), has the sternum slightly broader so that the middle pair of sternal bristles are on its edge.

**Scheloribates indicus marquesalis nukuhivensis**, new form (fig. 2, *l*).

Differs from the subspecies in that the posterior apophysis of apodemata I is poorly or not developed; the spine on parasterna II is less distinct; bristle 3 of genital covers is slightly more mesad; the pseudostigmatic organ head is distally somewhat pointed (fig. 2, *l*).

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, 6 specimens, Mumford and Adamson, slide 33M2c (cotypes).

The average size of males is 0.3 by 0.5 mm., and of females, 0.34 by 0.56 mm. The breadth measurements include the pteromorphae.

One specimen from Eiao (altitude 1800 feet, April 30, 1931, under bark of *Aleurites moluccana*, LeBronnec) seems to be this form, but the genital cover characters are not discernible.

In *Scheloribates fimbriatus whitteni* the porose areas below the lamellae (acropleurale porose areas) are larger than the pseudostigmata, while they are smaller in *Scheloribates indicus marquesalis*. The outstanding differences between the two species are the larger size and darker coloring of *Scheloribates*

<sup>17</sup> Jacot, A. P., Some Hawaiian Oribatoidea: B. P. Bishop Mus., Bull. 121, fig. 67, 1934.

*bates fimbriatus whitteni*. Both species are found on each of the same three islands.

Subgenus PARASCHELOBATES, new subgenus

Characters: as *Scheloribates* but with anterior edge and anteroventral corner of pteromorphae more developed; legs slender, femora II with very narrow flange at most.

Type, *Scheloribates (Paraschelobates) mumfordi*, new species.

**Scheloribates (Paraschelobates) mumfordi**, new species (fig. 2, *m-q*; fig. 3, *a-g*).

Diagnostic characters: body broad, almost as wide as long; cephaloprothorax broad, bristles long, stout, faintly few-burred; pseudostigmatic organ small, clavate, head small; anterior edge of pteromorphae thickened, recurved, forming a flaring lip (fig. 2, *m*); legs with long bristles; middle pair of sternal bristles at sides of sternum; genital cover bristles 3 midway between lateral and median edges of covers; paramasal bristles on transverse plane midway between apertures, more remote than breadth of anal aperture; genuals I and II with a fairly long, stout, burred spine inserted at center of lateral face.

Description: size of males 0.87 by 1.13 mm., of females 1.0 by 1.3 mm.; rostrum slender, distinct (fig. 3, *a*), distal end in certain aspects appearing lobed; lamellae projecting distinctly (fig. 3, *a*), far enough down on sides to completely cover sides of cephaloprothorax in dorsal aspect, lamellorostral ridges distinctly projecting (fig. 2, *m*); pseudostigmata barely extending beyond edge of pteromorphae, edges rounded (figs. 2, *m*; 3, *a*); pseudostigmatic organs held quite erect so that they appear quite foreshortened and the burrs are visible only as elusive undulations of the contour.

Pteromorphae extending broadly out from sides yet confluent with body outline behind, distal (ventral) end undulate, appearing nicked (fig. 2, *o*), the exact configuration of these undulations individually inconstant; porose areas small, bristle insertions few, the bristles minute, when present.

Ventral plate much broader in middle than anteriorly; tectopodia II well-developed, bristle at anterior third; tectopodia III slender, without angle or fold, tectopodia IV almost confluent with lateral outline; sternum well-developed, portion anterior to apodemata II equally wide and parallel-sided; only posterior bristles over it, the anterior pair as remote as middle pair; apodemata I short, with rounded mesal end; apodemata II-III similar, long; apodemata IV distant from II-III, well-developed; parasternal bristles normal to *Scheloribates*; genital aperture small, with strongly sloping anterior edge, joining lateral edge by a broad angle, posterior edge undulate; anal aperture large, with parallel sides; cover bristles unusually close to each other; preanal bristles near edge of aperture; lateral postanal bristles slightly more remote than diameter of aperture.

Legs slender, so that bristles are easily discernible, with triheterohamate, almost homohamate unguis; lateral hooks toothed at distal end (fig. 3, *f*). Legs I (fig. 2, *p*) with tarsus slender; the dorsoproximal quartette of bristles having the second one minute (in the figure the anterior one is the distal part of the lateral bristle of the tibia), arranged in crescent across dorsal face (fig. 3, *g*); dorsal bristle 5 long, extending well over unguis; the 3 dorsodistal pairs long, extending well out to ends of hooks (only the lateral bristles of the 2 dorsodistal pairs and the 2 ventrodistal pairs have been included in the figure); bristles of ventral face long, recurved; all bristles barbed except dorsoproximal quartette, the ventral bristles almost ciliate. Tibiae longer than their tarsi, with well-developed but not angular dorsodistal process; major bristle extending well over unguis, premajor bristle fine, smooth, rather short, all other bristles barbed, inserted as in figure 2, *p*. Genuals half length of femur, rather straight; dorsal bristle

smooth, extending nearly to insertion of dorsomesal of tibia; lateral bristle developed as a stout, burred spine, extending over a third of the tibia; other bristles fine, straight, barbed. Femora elongate oval, a slight keel along distal third of ventral edge; dorsal edge with 3 stout, barbed bristles, the proximal the longest, the distal the shortest; ventral edge with 2 fine, bent bristles, the proximal inserted near proximal end, the distal inserted proximad of center of segment. Trochanters (coxae) small with a small, smooth, curved bristle.

Legs II similar but tarsi with the dorsoproximal quartette as follows: proximal bristle long, weakly barbed, bristles 3 and 4 half as long, smooth, slightly recurved; lateral bristle on transverse plane of second dorsal; dorsodistal pairs strongly offset; the 2 single ventral bristles long, distant from each other, the distal one close to proximal pair, leaving a wide interspace to distal end; thus no fifth dorsal nor second ventral. Tibiae similar but no premajor, no dorsodistal process, and a shorter major. Genuals with lateral spine; a barbed dorsomesal bristle inserted at center of segment; a smooth dorsodistal bristle. Femora with three stout, burred, dorsal bristles, the middle one as far from dorsodistal as dorsodistal is from distal end; two subequal, normally fine, ventral bristles, the distal one almost as distad as dorsodistal, the proximal rather close to proximal end. Trochanters minute, with a small, smooth, curved bristle.

Legs IV as usual, but tarsi (fig. 3, *b*) with single dorsal bristle extending well out to center of extended hooks, the dorsal pair extending considerably further, these three very faintly barbed, the barbs appearing as scars in the single bristle; apical pair of ventral face inserted more proximally than the dorsoapical pair; ventroproximal pair also inserted more proximad than the dorsoproximal pair; all the ventral bristles conspicuously burred. Tibiae (fig. 3, *b*) with dorsal bristle inserted on transverse plane distad of ventrolateral and ventromesal. Genuals as long as half the tibia; lateral bristle inserted at center of segment. Femora with very slight keel; bristles inserted at center of segment, the dorsal very stout, the ventral very fine.

Legs III more robust, less modified. Tarsi (fig. 3, *c*) with all bristles barbed, two unpaired bristles on dorsal face, two on ventral, and a lateral, all on proximal half of segment; dorsal face with 3 pairs, ventral face with 2 pairs, inserted on distal half of segment. Tibiae (fig. 3, *c*) very similar, the lateral bristle less ventrad. Genuals shorter; lateral bristle inserted at center of segment, dorsal at distal end, smooth. Femora with 2 stout, burred, dorsal bristles, the distal one inserted at center of segment; ventral bristle longer and stouter than in femora IV. Trochanters with 2 faintly burred bristles, the proximal twice as long as the distal.

The femoral and genual spines form a cheval-de-frise under the pteromorphae that should discourage prying predators.

Figure 3, *d*, represents the trochanter with its broken articulation shaft at the right. The femoral articulation shaft is represented by cross-hatched walls. It has the appearance of being a distinct segment telescoped into the ends of the femur and of the trochanter, and functioning as a coupler. The dorsal side is short and curved so as to clip about the inside of the walls of its adjacent segments. In brief, it acts as a necklike, internal clip or coupler. The two trochanteral bristles are cut short so as not to interfere with the other figures.

Figure 3, *e*, shows the same coupler of legs IV (cross-hatched). I am not able to determine the exact point of fusion with the femur on ventral aspect. In both legs a well-marked heel is developed on the floor of the trochanter for articulation of the end of the femoral coupler. Although folds of chitin may give the chitin wall a discontinuous appearance, it is difficult to explain the structures figured where the coupler meets the femur wall.

The females bear 10 to 12 short, oval eggs.

Hivaoa: Mount Ootua summit, altitude 3000 feet, February 13, 1930, under bark of *Reynoldsia*, 19 specimens (cotypes), Mumford and Adamson,



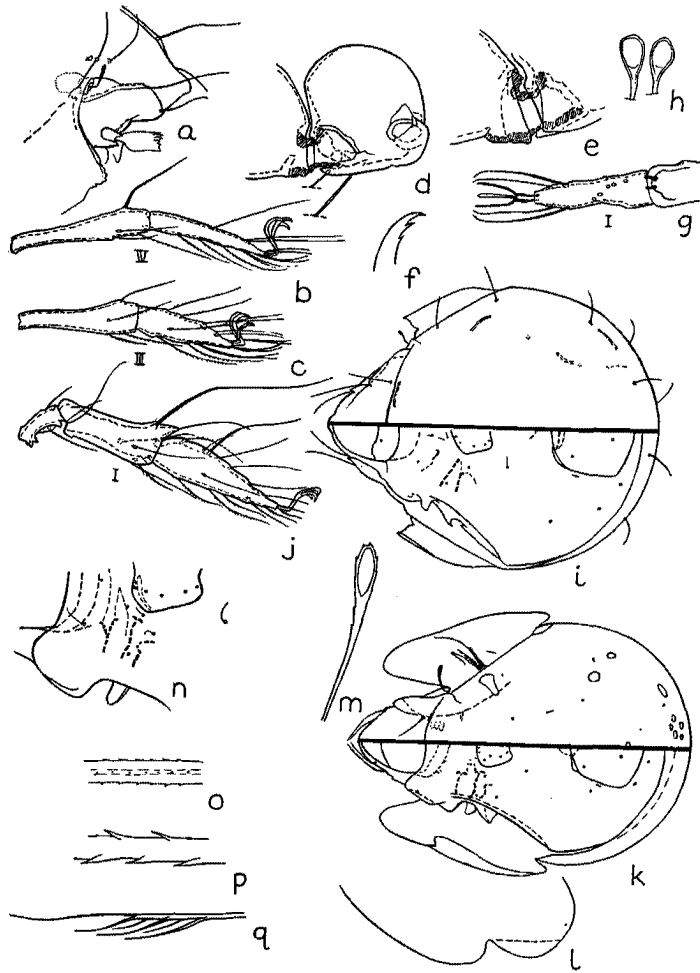


FIGURE 3. *Scheloribates (Paraschelobates) mumfordi*, new species, adult: *a*, dorso-lateral aspect of cephaloprothorax and pteromorphae, ratio  $\times 60$ ; *b*, tarsus and tibia IV, ratio  $\times 100$ ; *c*, tarsus and tibia III, ratio  $\times 100$ ; *d*, trochanters III, ratio  $\times 200$ ; *e*, femoral coupler (cross-hatched), somewhat tilted, ratio  $\times 200$ ; *f*, distal end of hook of tarsus IV, ratio  $\times 440$ ; *g*, dorsal aspect of tarsus I, ratio  $\times 120$ . *Scheloribates (Paraschelobates) mumfordi uapou*, new subspecies: *h*, pseudostigmatic organ of an individual from Hivaoa, Matauuna, to right of numeral, and one from Uapou to left, ratio  $\times 200$ . *Nesiotizetes adamsi*, new species, adult: *i*, dorsoventral aspects, mouth parts and legs omitted, ratio  $\times 75$ ; *j*, tarsus to genu I, ratio  $\times 200$ . *Zetes bryani marquesi*, new subspecies, adult: *k*, dorsoventral aspects, mouth parts and legs omitted, ratio  $\times 100$ ; *l*, ventral edge of pteromorphae, ratio  $\times 150$ ; *m*, pseudostigmatic organ, burrs exaggerated, ratio  $\times 440$ . *Galumna hawaiiensis marquesana*, new subspecies, adult: *n*, genitosternal area, ratio  $\times 120$ ; sketches of bristles: *o*, burred; *p*, barbed; *q*, ciliate.

slides 33M18a and b. A fractured specimen from Hivaoa (Teava Uhia i te Kohu, above Puamau, altitude 2100 feet, February 25, 1930, from dead stipes of *Cyathea* species, Mumford and Adamson, slides 33M9) was used for the figures of the legs. The pseudostigmatic organs are lost.

An individual from Hivaoa (Matauuna, altitude 3900 feet, March 3, 1930, on ground under dead leaves, Mumford and Adamson, slide 33M8) is typical except for the broadly spatulate pseudostigmatic organ head and the approximate anterior pair of sternal bristles, which make it appear a hybrid with the next. If future collecting shows this difference to be constant in this locality it might be recognized as a distinct form.

Five large specimens from Hivaoa (Kopaafaa [Kopaataa], altitude 2770 feet, February 26, 1930, from dead stipes of *Marattia* species, Mumford and Adamson, slide 33M4) have a longer pseudostigmatic organ head and a very slender sternum anterior to apodemata I. Average size 1.2 by 1.5 mm. This possession of three distinct characters, if later found to be constant for one locality, mountain or valley, should also be recognized as a distinct form.

**Schelorbates (Paraschelobates) mumfordi uapoui**, new subspecies (fig. 3, *h*).

Differs from the species in the elongate (oval) form with posteriorly projecting pteromorphae; spatulate (bluntly ovate) pseudostigmatic organ head; sternum anterior to apodemata I very slender, irregular, to interrupted; anterior pair of sternal bristles as approximate as posterior pair, the middle pair twice as remote; lateral postanal bristles more anteriorly inserted, leaving more space between it and aperture. Size 0.83 by 1.2 mm.

Uapou: Kohepu [Kohapu] summit, altitude 3200 feet, November 28, 1931, under dead bark of *Cheirodendron* species, 51 adults (cotypes), 1 nymph, LeBronnec, slides 33M10a and b; altitude 3300 feet, November 27, 1931, on *Weinmannia parviflora*, 1 specimen, LeBronnec, slide 33M14.

One thinly sclerotized individual has two pairs of paramasal bristles, one laterad of the other.

The nearest related species seems to be *Chamobates marginidentata*<sup>18</sup> from Juan Fernandez. Figure 92<sup>18</sup> however shows no lamellorostral ridge, though figure 91 hints at one. Furthermore, figure 97<sup>18</sup> shows a large flange on femur II. The pseudostigmatic organs resemble those of *S. (P.) mumfordi*, but the body shape is that of *S. (P.) m. uapoui*. Thus, although placed in *Chamobates*, it is closely related to these common large Marquesan oribatids and suggests a South American relation.

TRIBE CERATOZETINI JACOT

Ceratozetini Jacot: B. P. Bishop Mus., Bull. 121, 1934.

Characters: Ceratozetinae with tectopedia I distinctly developed. Type, *Ceratozetes* Berlese: Redia, vol. 5, p. 4, 1908.

<sup>18</sup> Trägårdh, Ivar, Acarina from the Juan Fernandez Islands: Nat. Hist. Juan Fernandez and Easter Island, vol. 3, no. 55, p. 597, figs. 91-100, 1931.

## Genus NESIOTIZETES, new genus

Characters: anterior edge of notogaster distinct; pteromorphae developed as subtriangular ventrally deflected expanses of the notogaster; lamellae slender, far down on sides of cephaloprothorax, hiding the slender tectopedia I in dorsal view; notogaster with bristles; unguis triheterohamate.

Type, *Nesiotizetes adamsoni*, new species.

In *Indoribates*<sup>19</sup> there are no tectopedia I. Sellnick regards what he describes as a flat, short, chitin swelling, as a tectopedium. A tectopedium, however, is a ridge and when long enough to reach the rostral bristles is usually produced as a tooth or spine. I therefore regard *Indoribates punctulatus*<sup>20</sup> as lacking tectopedia I. Otherwise it is closely related.

*Peloribates*<sup>21</sup> is closely related, but no one can tell from Berlese's description and figure if tectopedia I are present. The rostral bristles seem too close together for relation to this group, the lamellae are unusually long, the notogastral bristles stiff (straight) and the unguis trihamate.

The present genus superficially resembles *Terrazetes*<sup>22</sup> but has the anterior edge of notogaster distinct and no hint of translamellar ridge or slope.

Finally, it differs from *Globozetes*<sup>23</sup> in that the lamellae are far down on sides of cephaloprothorax, hiding tectopedia I in dorsal aspect.

***Nesiotizetes adamsoni*, new species (fig. 3, i, j).**

Diagnostic characters: pseudostigmatic organs erect, small, with small head; pteromorphae with anterior edge emarginate near juncture to abdomen; porose areas long, very slender; anterior and posterior sternal bristles subequally approximate, middle pair more remote, close to posterior pair; genital cover bristles close to lateral edge of covers; preanal bristles far laterad of aperture; lateral postanal bristles also far laterad of aperture but not as remote as paramesal; mesal postanals slightly more remote than diameter of aperture.

Description: body very broad; depressed; size 0.6 by 0.74 mm.; cephaloprothorax short, broad, blunt; rostrum not demarked in dorsoventral aspects, but with a slight impression each side of median plane making it slightly lobed in center; rostral bristles inserted rather far back, in anterior angle of tectopedia I; cephaloprothoracic bristles well-developed, the interlamellar faintly barbed; lamellae very low, distal end rounded, without cusp, lamellar bristles inserted at base, mesal buttresses faint; pseudostigmata projecting somewhat; pseudostigmatic organs with slender pedicel, slenderly clavate; tectopedia I forming a distinct anterior cusp in dorso/ventral aspects.

Notogaster broader than long; pteromorphae triangular, curving ventrad probably to insertions of legs, anteroventral corner well-developed; two notogastral bristles at base of pteromorphae; adalar porose areas rather posteriad of usual position; at least five other notogastral bristles as in figure 3, i. As the body is filled with rather opaque granular matter along a broad median band, it is not possible to determine to what extent the

<sup>19</sup> Jacot, A. P., Genera of pterogasterine Oribatidae (Acarina): American Micr. Soc., Trans., vol. 48, p. 429, 1929.

<sup>20</sup> Sellnick, Max, Javanische Oribatiden (Acar.): Treubia, vol. 6, p. 473, figs. 22-24, 1925.

<sup>21</sup> Berlese, Antonio, Elenco di Generi e Specie nuove di Acari: Redia, vol. 5, p. 3, 1908.

<sup>22</sup> Jacot, A. P., Genera of pterogasterine Oribatidae (Acarina): American Micr. Soc., Trans., vol. 48, p. 429, 1929.

<sup>23</sup> Sellnick, Max, Oribatei: Tierwelt Mitteleuropas, vol. 3, no. 9, p. 14, 1929.

notogaster bristles are present. The parts indicated by broken lines are present, but their exact relative positions are uncertain.

Ventral plate broadest posterior to pteromorphae, anterior portion quite narrow, tectopodia II poorly developed, posterior corner rounded, undeveloped, the bristle on posterior portion!; tectopodia III well-developed, rather broad, posterior corner sharp; tectopodia IV fairly well developed to cup over insertion of legs IV; apodemata I short, mesal end with short, anterior hook; apodemata II-III long, straight, mesal end simple; apodemata IV fairly long, oblique, mesal end somewhat curved posteriad; parasternal bristles as far as discernible as in figure 3, *i* (lower half); genital aperture with strongly bent anterior edge, lateral edges slightly incurved, posterior edge strongly undulate; genital cover bristles fairly evenly spaced and rather close to lateral edge; paramasal bristles as distant from aperture as greatest diameter of a cover, more remote than diameter of genital aperture; anal aperture situated rather far posteriad, leaving a narrow band of the ventral plate behind it, quite large, sides slightly converging anteriorly, anterior corner rounded, ample, posterior edge not strongly bent; anterior cover bristles close to anterior corners, posterior bristles quite approximate and near posterior edge; pseudofissurae short, anteriorly of center of aperture.

Legs slender, with rather long bristles, unguis triheterohamate, nearly homohamate. Tarsi I (fig. 3, *j*) with dorsoproximal bristle barbed, inserted less than diameter of segment from proximal end; bristle 2 as long as unguis hooks, fine; bristle 3 quite long, longest and stoutest of tarsal bristles; bristles 4 and 5 fine, smooth; other bristles much as usual, the single ventral barbed. Tibiae I (fig. 3, *j*) with broad proximal end, no distinct pedicel, dorsodistal edge produced as a conical cusp bearing well-developed premajor bristle on its apex; major bristle quite long, inserted some distance from premajor; dorso-lateral rather lateral in position. Genual bristles well-developed, dorsodistal long, barely reaching insertion of major of tibia. Femora with short low keel along distal half.

Femora II with well-developed flange along ventral face, similar to that of *Schelorbates* though probably not quite so deep. Legs otherwise not notably differentiated.

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, holotype, Mumford and Adamson, slides 33M2d and e.

#### SUBFAMILY GALUMNINAE

Characters: Oribatidae with pteromorphae hinged to sides of notogaster, extending far anteriorly of notogaster, completely covering legs when withdrawn into recess in side of body; lamellae slender blades, often reduced to flattened bands appressed to sides of cephaloprothorax and discernible as a slight projecting rim curving posteroventrad to tectopodia II; tectopodia I almost entirely internal.

#### Genus ZETES Koch

*Zetes* Koch: Uebers. des Arachn., vol. 3, Abt. 1, p. 99, 1842.

Characters: Galumninae with appressed, bandlike lamellae which curve posteroventrad to anterior end of ventral plate wings; pteromorphae with a transverse groove across mesal (inner) face, ventral edge emarginate; mid-thoracic suture (anterior edge of notogaster) distinct. Type, *Zetes elimatus* (Koch: Uebers. des Arachn., vol. 3, Abt. 1, pl. 11, fig. 55, 1842.

**Zetes bryani marquesi**, new subspecies (fig. 3, *k-m*).

Diagnostic characters: cephaloprothoracic bristles well-developed; lamellar bristles mesal; pseudostigmatic organs slenderly clavate (fig. 3, *m*), rather small; adalar porose areas cuneiform; median pseudoforamen present; anteroventral region of pteromorphae produced as a rounded lobe which extends beyond notch (fig. 3, *l*); genital cover bristles near longitudinal center of covers, forming a zigzag row; paranal bristles near center of sides of aperture; ventral plate wing small, posterior end of tectopedia II broadly exposed.

Description: size medium, males 0.39 by 0.57, females 0.41 by 0.59 mm.; body ovate, high; cephaloprothorax rather narrow; rostrum long but not differentiated, blunt; rostral bristles long, meeting on median plane, inserted below bulge of rostrum; lamellar bristles inserted near lamellae, stout, bent to meet near distal end of rostral; lamellae distinct nearly to interlamellar bristles, projecting distinctly; tectopedia I not forming external ridge; interlamellar bristles not long, inserted almost over edge of tectopedia I; anterior porose areas small; pseudostigmatic organs barely extending halfway across pteromorphae, apparently smooth, sometimes seen to be faintly burred, the center often undehydrated.

Pteromorphae with groove clearly demarked, posterior rib long; pseudofissurae fine, bristle insertion and its groove distinct; mandible adductor scars distinct, forming an oblique row; mesonotic porose areas smaller than diameter of adalar, posterior larger; a pseudofissura between mesal adalar insertion and mesal mesonotic.

Ventral plate wings poorly developed, anterior end slender, posterior end broadly rounded off; tectopedia III broad; apodemata with well-developed ceriphs; apodemata II-III with posterior ceriph quite long; genital aperture with rather straight anterior edge, anterior corners well-rounded, posterior edge undulate; paramesal bristles in usual position; subanal muscle plate rather large, slightly ovate; anal aperture with strongly tapering sides, anterior edge strongly bent, posterior edge gently curved; anterior cover bristles quite close to anterior corners, posterior cover bristles quite approximate; pseudofissurae short, at center of sides, paranal bristles slightly anterior of pseudofissurae; postanal bristles subequally spaced, the lateral pair a short distance from corners of aperture.

Hivaoa: Atuona Valley, 1.5 miles from sea, altitude 3000 feet, July 6, 1929, under rotting wood, 7 specimens, Mumford and Adamson, slide 33M1a (cotypes).

Two specimens from Eiao (altitude 1800 feet, April 30, 1931, under bark of *Aleurites moluccana*, LeBrons, slide 33M16), as far as I can see, are identical.

I place these Marquesan *Zetes* under *Z. bryani*<sup>24</sup> with considerable certainty. I regret not having noted the shape of the anterior lobe of the pteromorphae and of the shape of the ventral plate wings of *Z. bryani*. The latter I consider an important specific character.

**Zetes bryani marquesi matauuna**, new form.

Differs from the subspecies in the larger size, 0.48 by 0.695, the much larger mesonotic porose areas which are as large as diameter of adalar, and the larger anterior porose areas. In one specimen the adalar porose areas are short-triangular.

Hivaoa: Matauuna, altitude 3900 feet, March 3, 1930, on ground under dead leaves, 2 specimens, Mumford and Adamson, slide 33M8 (cotypes).

As there are no differences in the position of the bristles on the ventral plate, a matter of importance in distinguishing geographical races in North America, I regard this as a form rather than as a subspecies.

<sup>24</sup> Jacot, A. P., Some Hawaiian Oribatoidea: B. P. Bishop Mus., Bull. 121, figs. 126, 127, 1934.

**Zetes bryani uapouï**, new subspecies.

Differs from the species in that the pteromorphae are granular-sculptured along their ventral fourth; interlamellar bristles are longer and gracefully curved; pseudostigmatic organs longer, the head very short, lanceolate, pedicel curved proximad of head; adalar porose areas cuneate, large, curved; mesonotic porose areas joined to form a large, ovate, diagonal area (each side); posterior porose areas long; genital cover bristles 2 and 3 more widely spaced, arranged in a straight line.

Uapou: Hakahetau [Hakahetou], altitude 2000 feet, December 14, 1929, in dead fruits of *Aleurites moluccana*, holotype, R. R. Whitten, slide 33M6a.

Genus **GALUMNA** Heyden

*Galumna* Heyden: Isis von Oken, vol. 18, p. 612, 1825.

Characters: Galumninae with appressed, bandlike lamellae which curve posteroventrad to anterior end of ventral plate wings; pteromorphae with a transverse groove across mesal (inner) face, ventral edge emarginate; mid-thoracic suture (anterior edge of notogaster) lacking.

Type, *Notaspis alatus* Herman: Mém. Aptérol., p. 92, pl. 4, fig. 6, 1804.

**Galumna hawaiiensis marquesana**, new subspecies (fig. 3, n).

Differs from the species<sup>25</sup> in the absence of any cephaloprothoracic sculpture; much larger mandible retractor scars, situated directly behind interlamellar bristles, the two groups quite parallel to each other; anterior porose areas on transverse plane passing over anterior end of mandible retractor scar group; adalar porose areas much larger, elongate, irregular; a long pseudoforamen laterad, about diameter of area from it; median foraminal cluster lacking, an irregular, ill-formed porose area instead; genital cover bristles ranged in crescent formation almost halfway between lateral and median edges of covers; ceriph of apodemata iv very long, a bristle between ends of apodemata II-III and iv; ceriph of other apodemata also somewhat longer, those of apodemata I quite widely spread on two levels; pseudofissuræ of anal aperture much longer, curved; paranal bristles closer to aperture; mesal postanal bristles usually as approximate as posterior anal cover bristles. Size of females, 0.55 by 0.7 mm.

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, 4 specimens, Mumford and Adamson, slide 33M2b (cotypes).

## FAMILY PHTHIRACARIDAE

Characters: Oribatoidea with legs attached to a small V-shaped yoke, capable of being drawn into anterior end of body, and enclosed by cephaloprothoracic shield (aspis).

## SUBFAMILY PHTHIRACARINAE

Characters: Phthiracaridae with notogaster formed of a single unit; genital and anal covers approximate.

<sup>25</sup> Jacot, A. P., Some Hawaiian Oribatoidea: B. P. Bishop Mus., Bull. 121, figs. 128-135, 1934.

## TRIBE PHTHIRACARINI

Characters: Phthiracarinae with anogenital area about as broad (or broader) than length of any one of the four rectangular plates, and never as long as ventral face of abdomen.<sup>26</sup>

## Genus PHTHIRACARUS Perty

*Phthiracarus* Perty: Allg. Naturg., vol. 3, p. 874, 1843.

Characters: anal covers quite flattened, often completely retracted into body cavity, their median edge usually bearing but 2 or 3 well-spaced bristles; vertex bristles invisible or lying close to surface of aspis.<sup>26</sup>

Type, *Phthiracarus contractilis* Perty (monotype): Allg. Naturg., vol. 3, p. 874, 1843.

***Phthiracarus insularis***, new species (fig. 4, *a*, *b*).

Diagnostic characters: pseudostigmatic organs short, ovate; aspis high; rim very slender, not projecting beyond rostrum; rostral bristles rather high and long; notogastral bristles fairly long, sharply bent forward, a:1 rather distant from collar; genital cover bristles 1:1 and 1:2 rather long, sharply bent forward; genital covers without projecting rim.

Description: size medium (length of notogaster about 0.5 mm.), total length of aspis 0.27 mm., breadth 0.2, length anterior to pseudostigmata 0.168; color olive green; texture sanded; aspis high, tapering rapidly; rostrum tapering gradually into vertex; a slight impression on posterior part of vertex (fig. 4, *a*); carina, if present, very indistinct to lacking; rim as above described; vertex bristles long, remote; figure 5 of Sellnick's Javanese *Phthiracarus*<sup>27</sup> is so much like this species in the position of the aspal bristles that it will do for the present except that the rostral bristles are slightly more remote, there is no median ridge, and I found no exopseudostigmatic bristles.

Notogaster oval, long, not high, rising gently in front; collar broad; notch fairly well developed; bristles very fine, a:1 quite approximate, b:1 much more remote; others disposed as in figure 4, *a*. Ventral plate broad; rim not projecting ventrad, no denticles; the three bristles subequally spaced, VP2 and VP3 distant from margin.

Anterior rim of accessory plate with recurved rim, aggenital bristle 1<sup>28</sup> seems to be present on one side, invisible on the other; in Grandjean's notation<sup>28</sup> of the marginal bristles, all the bristles are numbered as of one series. I think he is right in regarding my anterior and marginal bristles<sup>29</sup> as constituting one series. He definitely recognizes my outer series as distinct. I would, therefore, refer to the marginal series as bristles gm:1 to 5 (genitomarginal) and the outer as gl:1 to 4 (genitolateral). Gl:1 between gm:3 and gm:4, and just posteriad of rim of cover; gl:2 between gm:4 and gm:5 but more laterad; gl:3 and gl:4 widely spaced (fig. 4, *b*). Figure 4, *b* shows ventral edge of lapet slipped out from between accessory plate ("rebord antérieur" of Grandjean) and rim of genital cover, with ventral edge of ventral plate which fits over (ventrad of)

<sup>26</sup> Jacot, A. P., Phthiracarid mites of Florida: Elisha Mitchell Sci. Soc., Jour., vol. 48, pp. 238, 244, 1933.

<sup>27</sup> Sellnick, Max, Javanische Oribatiden (Acar.): Treubia, vol. 6, p. 462, 1925.

<sup>28</sup> Grandjean, F. A., Structure de la région ventrale chez quelques *Ptyctima* (Oribates): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, p. 312, fig. 3A, 1933.

<sup>29</sup> Jacot, A. P., Oribatid mites of the subfamily Phthiracarinae of the northeastern United States: Boston Soc. Nat. Hist., Proc., vol. 39, p. 222, 1930.

genital cover and curves down (dorsad) to lapet, thus enclosing anterolateral corner of genital cover between them. Nubbins of genital covers well-developed (fig. 4, *b*).

Anal covers with well-developed nubbins; crossbar broad (broken line). Grandjean's nomenclature<sup>30</sup> for these bristles as compared to mine is: 1:1 = a1; 1:2 = a2; 1:3 = ad3; 11:1 = ad1; 11:2 = ad2. I believe Grandjean's interpretation is correct and adopt his nomenclature as more descriptive. In the present species the bristles occupy their normal positions for the genus, ad2 being on transverse plane just anterior to a2.

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, holotype, Mumford and Adamson, slide 33M2g.

This species brings to mind the American *Phthiracarus bryobium*,<sup>31</sup> but it may be closer to Sellnick's Javanese species<sup>32</sup> in which the notogastral bristles are moderately long and posteriorly inclined. It is not related to *Ph. maculatus*<sup>33</sup> from Juan Fernandez Island.

#### TRIBE EUPHTHIRACARINI

Characters: Phthiracarinae with anogenital area much narrower than length of any one of its 4 or 6 straplike plates, one pair of which extends along entire ventral face of abdomen.

#### Genus INDOTRITIA Jacot

*Indotritia* Jacot: Psyche, vol. 35, p. 213, 1928.

Characters: Euphthiracarini without interlocking ridges at center of anogenital plate; and with genital covers fused to anogenital plate which according to Grandjean<sup>34</sup> are the fused aggenital and adanal plates; palps three-jointed.<sup>35</sup>

Type, *Tritia krakatauensis* Sellnick: Treubia, vol. 5, p. 372, figs. 1-3, 1924.

#### *Indotritia lebronneci*, new species (fig. 4, *c-h*).

Diagnostic characters: anterior portion of aspis thin, combed; pseudostigmatic organs pointed, medium-long, twisted; lid above pseudostigmata; bristles rather short; anterior edge of anogenital plate without flaring ridge; sides of aspis with but one keel; aggenital plate with but 2 bristles; anal covers with but 1 bristle at anterior end; adanal plates with pseudoforamen near middle bristle!

Description: aspis (fig. 4, *c, d*) quite long with flattened, lateral profile, distal edge sharp, combing fairly extensive, rostral bristles more approximate than in *I. kraka-*

<sup>30</sup> Grandjean, F. A., Structure de la région ventrale chez quelques *Ptyctima* (Oribates): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, fig. 3B, 1933.

<sup>31</sup> Jacot, A. P., Oribatid mites of the subfamily Phthiracarinae of the northeastern United States: Boston Soc. Nat. Hist., Proc., vol. 39, fig. 19, 1930.

<sup>32</sup> Sellnick, Max, Javanische Oribatiden (Acar.): Treubia, vol. 6, p. 461, 1925.

<sup>33</sup> Trägårdh, Ivar, Acarina from the Juan Fernandez Islands: Nat. Hist. Juan Fernandez and Easter Island, vol. 3, no. 53, p. 553, 1931.

<sup>34</sup> Grandjean, F. A., Observations sur les Oribates (4<sup>e</sup> sér.): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, p. 221, 1933.

<sup>35</sup> Grandjean, F. A., Structure de la région ventrale chez quelques *Ptyctima* (Oribates): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, pp. 309-315, 1933.



*tauensis*;<sup>36</sup> vertex and lateral bristles more nearly on the same transverse plane than in *I. bryani*;<sup>37</sup> lid broader than in the latter; pseudostigmata with many "chambers" (fig. 4, *d*); organs somewhat awl-shaped, twisted (fig. 4, *h*), bent close to proximal end, thus appearing stiff.

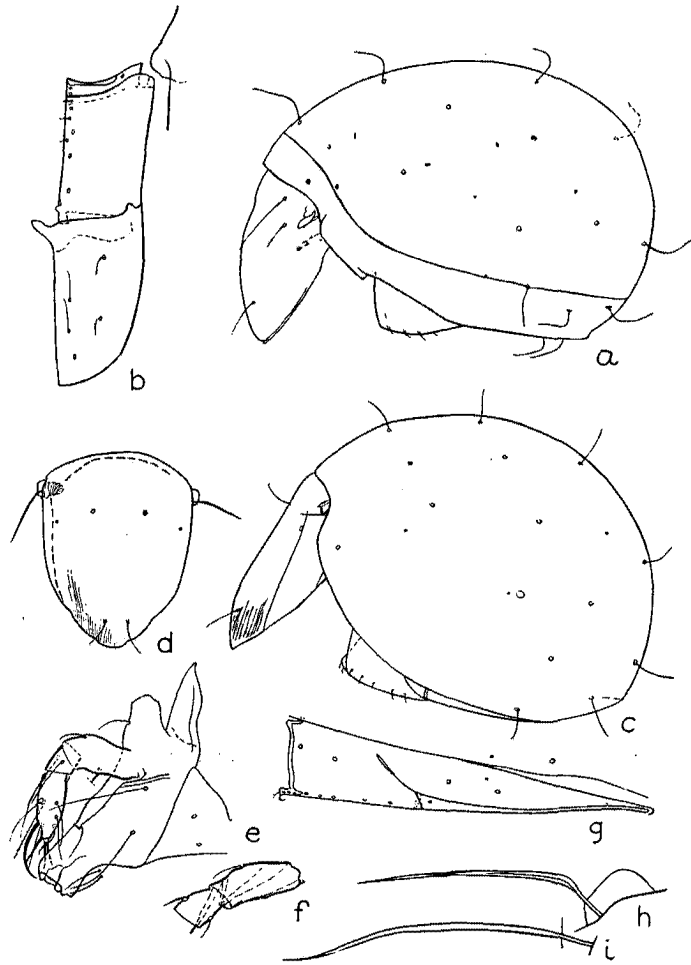


FIGURE 4. *Phthiracarus insularis*, new species, adult: *a*, lateral aspect, legs and mouth parts omitted, ratio  $\times 120$ ; *b*, genital and anal covers, with lower corner of lapet, which fits between genital cover and accessory plate, ratio  $\times 150$ . *Indotritia lebronneci*, new species, adult: *c*, lateral aspect, legs and mouth parts omitted, ratio  $\times 75$ ; *d*, aspis, ratio  $\times 75$ ; *e*, palp and adjoining maxilla, ratio  $\times 150$ ; *f*, proximal segment of palp to show composite nature, ratio  $\times 200$ ; *g*, anogenital area, ratio  $\times 100$ ; *h*, pseudostigmatic organ, ventral aspect, ratio  $\times 330$ . *Indotritia lebronneci crassiori*, new subspecies, adult: *i*, pseudostigmatic organ, ventral aspect, ratio  $\times 330$ .

<sup>36</sup> Sellnick, Max, Oribatiden der Insel Krakatau: Treubia, vol. 5, pp. 371-373, 3 figs., 1924.

<sup>37</sup> Jacot, A. P., Some Hawaiian Oribatoidea: B. P. Bishop Mus., Bull. 121, fig. 148, 1934.

Notogaster not steeply rising in front, somewhat rounded behind, thus more of the general shape of *I. krakatauensis* than of *I. bryani*. Thus this genus has a greater tendency to rounded posterior end than has *Oribotritia*. Bristles and porose areas as in figure 4, *c*; mesal row of bristles subequally approximate, except that anterior and fourth (d:1) are slightly more approximate than second (b:1) and fourth (c:1).

Anogenital area broad (fig. 4, *g*). I see no reason for not accepting Grandjean's interpretation of the fusions that have occurred in this region and of his terminology, except that I retain the term "covers" for the mesal pairs. Median edge of genital covers with 5 bristles, widest space between the third and fourth; 4 bristles on mesal apophysis; posterior bristle of adanal plate close to median edge. I interpret the adanal pseudoforamen to be the pseudofissura of the Oribatidae.

In 1930, I figured the mouth parts of *Euphthiracarus* and *Oribotritia*.<sup>38</sup> Stimulated by my somewhat terse English, Trägårdh later described the mouth parts of *Phthiracarus*<sup>39</sup> and, still later, of *Oribotritia* and *Tropacarus*.<sup>40</sup> My statement that the maxillae bear 3 long bristles<sup>38</sup> should be changed to 2, one of the bristles being labial. I now add the mouth parts of *Indotritia*.

Maxillae and labium normal for the subfamily; process posterior to palp (palpigerous process) well-developed; with a well-developed bristle. Palps three-segmented; proximal segment bearing usual 2 bristles (fig. 4, *e*). Trägårdh figures 3 for *Oribotritia decumana*.<sup>39</sup> Grandjean finds that the normal number for all oribatids examined but one is 2.<sup>41</sup> These bristles are immediately preceded by the fused second segment, which is usually without bristles. My figure 4, *f*, shows a diagonal muscle springing from proximal end of this thoroughly fused segment. Middle segment with usual 2 bristles, one of them quite long. *Oribotritia decumana* is figured with 3.<sup>39</sup> Distal segment with 6 normal bristles, a stout, strongly arched bristle near distal end; a short, stout bristle just beyond the chitinous distal edge; and a short, triangular hyaline apex bearing 2 equal, short, stout bristles. Thus there seem to be more bristles on the distal segment of the palp of this species than figured by Trägårdh for other genera<sup>42</sup> and by Grandjean for *Perlohmannia*.<sup>43</sup> The two pairs of bristles of the ligula are stout and strigose. The mandibles bear two bristles on the main segment.

Dimensions of only three measurable specimens: length of notogaster, 0.71-0.87 mm., of aspis 0.43-0.45 mm.; height of notogaster (largest), 0.68 mm., of aspis (average), 0.16 mm.; breadth of aspis (smallest), 0.34 mm.

Nukuhiva: Tekao Hill, altitude 3300 feet, July 23, 1931, 6 specimens, LeBronnec and H. Tauraa, slide 33M15 (cotypes).

#### *Indotritia lebronnci flagelloides*, new form.

Differs from the species in that the pseudostigmatic organ is longer (164  $\mu$  contrasted to 113  $\mu$  in the species), not angled, more slender, flexile, lashlike; widest space between genital cover bristles is between bristles 4 and 5 (not 3 and 4).

Nukuhiva: Teuanui, Tovii [Toovii], altitude 2000 feet, October 29, 1929, under dead leaves, holotype, Mumford and Adamson, slide 33M2f.

<sup>38</sup> Jacot, A. P., Oribatid mites of the subfamily Phthiracarinae of the northeastern United States: Boston Soc. Nat. His., Proc., vol. 39, fig. 57, 59, 75, 1930.

<sup>39</sup> Trägårdh, Ivar, Concerning the mouth parts of the oribatids: Ent. Tids., vol. 52, figs. 1, 11, 1931.

<sup>40</sup> Trägårdh, Ivar, Further notes on the mouth parts of the oribatids: Ent. Tids., vol. 53, pp. 119-122, figs. 1, 2, 3, 1932.

<sup>41</sup> Grandjean, F. A., Etude sur le développement des Oribates: Soc. Zool. France, Bull., vol. 58, p. 34, 1933.

<sup>42</sup> Trägårdh, Ivar, Concerning the mouth parts of the oribatids: Ent. Tids., vol. 52, pp. 209-217, 12 figs., 1931. Further notes on the mouth parts of the oribatids: Ent. Tids., vol. 53, pp. 119-122, 5 figs., 1932.

**Indotritia lebronneci crassiori**, new subspecies (fig. 4, *i*).

Differs from the species in that the pseudostigmatic organs are held at right angles to aspis, proximal three fifths stiff, straight, distal two fifths stiff, flexuous, 148  $\mu$  long; rostral bristles not extending beyond distal end of rostrum in dorsal aspect (that is, shorter); anterior end of genital covers strongly bent dorsad and with a more densely sclerotized ridge at the bend; anterior aggenital bristles inserted on the bend; genital cover bristles 3, 4, and 5 subequally spaced; adanal cover bristles stout, posterior one distant from edge of cover; pseudoforamen almost on transverse plane of middle adanal bristle.

Hivaoa: Matauuna, altitude 3900 feet, March 3, 1930, on ground under dead leaves, holotype, Mumford and Adamson, slide 33M8b.

## GEOGRAPHICAL DISTRIBUTION

As special collecting methods must be employed to secure the free-living Acarina of any locality in representative numbers, the above-described forms represent only a small part of the total population occurring in the Marquesas. Small as the collection may be, it brings out the following phenomena.

## DERIVATION OF FAUNA

The relations of the fauna are with New Zealand (*Acronothrus nuku-hivae*), South America (*Paraschelobates*), but chiefly with the East Indies and Hawaii. Unfortunately the fauna of the other island groups is unknown, so that no further conclusions concerning origins and migrations or transportations can be made.

## ENDEMISM

Endemism is prominently developed. For instance, East Indian species like *Scheloribates indicus* and *Scheloribates fimbriatus*, which have reached both Hawaii and the Marquesas, are represented by different subspecies in each archipelago. In the Marquesas these subspecies are further differentiated on each island. In my opinion these individual island populations should be recognized as forms, and this system has been generally used in this report except for species not yet recorded from other island groups, for in those instances the subspecies are not known.

Another phenomenon is the finding of different forms of the same subspecies on different hills of the same island. Examples of these local differences are to be found in *Scheloribates (Paraschelobates) mumfordi*, in which I find differences between individuals from Mount Ootua, Matauuna, and Kopaafaa [Kopaataa], all on Hivaoa. Another example is *Zetes bryani marquesi* from Atuona Valley, with a different form from Matauuna; the form from Atuona Valley also comes from Eiao. On the other hand, on the intervening island of Uapou there is a distinct subspecies. More material

<sup>48</sup> Grandjean, F. A., Observations sur les Oribates (4<sup>e</sup> sér.): Mus. d'Hist. Nat. Paris, Bull., ser. 2, vol. 5, pp. 215-222, 3 text figs., 1933.

from Eiao may prove the Eiao population to be morphologically distinct. *Indotritia lebronneci* also has two distinct forms on Nukuhiva, one on Tekao Hill, the other at Teuanui, Tovii [Toovii], as well as a subspecies on Hivaoa.

I have already presented observations setting forth a reason for such montane differentiation.<sup>44</sup> Briefly stated it is as follows.

Animals with positive rheotropic reactions ascend hills and mountains. Due to the conical shape of these elevations, the higher the individuals climb the more they become concentrated, until at the restricted, narrow tops the animals are densely aggregated (this is true of Mollusca on the deforested limestone hills of North China). In concentrating species on hills, positive rheotropism likewise causes segregation. For instance, individuals washed down the hill, or otherwise carried down, will reascend the same hill if it is the only available slope. Of eggs washed down, hatching on the lower slopes (unless carried out to sea), the young will likewise ascend the same hill. It is only in rare cases of species washed into streams and then drifted into a pocket at the foot of the opposite hill that possible mixtures of strains occur, and then the chances would be 50-50 for each hillside (brookside). The outstanding tendency is to isolate each lot to its own hill and concentrate it about the summit where the breeding takes place.

This aggregation through configuration brings about isolation. Isolation and concentration are of direct value in causing inbreeding, and thus the materialization or establishment of recessive mutational characters. Thus evolution should be much more rapid among hill species than among those which wander aimlessly, indeterminately about the plain.

It should be unnecessary to point out that the larger the hill or mountain, the greater the concentration and the greater the isolation.

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<sup>44</sup> Jacot, A. P., Rheotropism and evolution: Peking Nat. Hist. Soc., Bull., vol. 5, pp. 39-40, 1931.