

MARIE HAMMER

# TAHITI

INVESTIGATION ON THE ORIBATID  
FAUNA OF TAHITI, AND ON SOME ORIBATIDS  
FOUND ON THE ATOLL RANGIROA

Det Kongelige Danske Videnskabernes Selskab  
Biologiske Skrifter 19, 3



Kommissionær: Munksgaard

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### Synopsis

In the present investigation of Tahitian oribatid fauna, undertaken with the object of perhaps finding species introduced with plant products from Europe, a total of 102 species was found. Of these, 61 species have been described earlier. 41 new species are described, and 5 new genera are established as well as 5 new varieties. 9 species were found which are known from Europe, but which also have a wide distribution over the whole earth. These can have come to Tahiti from any area of land other than Europe, and for this reason a European influence cannot be established.

Subtracting species with a worldwide distribution Tahiti has 40 species in common with Southeast Asia-Indonesia, and only 15 species in common with America. In addition, 6 of the 9 species found on Tahiti that have a worldwide distribution are also found in Southeast Asia-Indonesia, while 8 of these species are found in America. Perhaps the close ties between the fauna of Tahiti and that of Southeast Asia-Indonesia can be explained by an introduction with plant products by the Polynesians during their wanderings, but transport by ocean currents cannot be disproved.

On the atoll Rangiroa 13 species were found, of which 2 were not found on Tahiti.

## Preface

The collection on which the present investigation is based was made in December 1969 and January 1970. The object of the investigation of Tahitian oribatids was if possible to determine if oribatids—perhaps introduced from Europe during the last 200 years with plant products, etc.—could have survived in Tahiti and reproduced under foreign conditions.

I should like to offer my grateful thanks to the Carlsberg Foundation and to the Danish Research Foundation, who paid travelling and other expenses for me and my assistant, cand. scient. BIRGITTE HAMMER. The Carlsberg Foundation have furthermore covered my expenses during the preparation of the collected material. In addition, I am very much indebted to the Royal Danish Academy of Sciences and Letters, who for many years have undertaken the publication of my papers on the distribution of the oribatids. The Rask-Ørsted Foundation have likewise for many years covered the costs of the translation into English of my numerous articles for which once again I wish to offer the Foundation my thanks.

Mrs. JENNIFER DUPUIS-STARCKE has kindly undertaken the translation of part of the manuscript and assisted me with a revision of the remainder.

*Fredensborg, March 1971.*

MARIE HAMMER



## Introduction

For decades it has been a matter of speculation how representatives of the micro-fauna, among them the oribatids that cannot fly or swim, or even survive transport with ocean currents over longer distances, have been able to populate distant, isolated coral islands or islands of volcanic origin. There is hardly doubt any longer that ocean current must be considered as the means of transport for a part of the fauna. However, is it not possible that some creatures can have been introduced indirectly by humans, i.e. carried in with the many imported materials of plant origin—vegetables, fruit, root crops, etc.? Investigations at plant quarantine stations (HAMMER 1969) have shown that numerous living creatures are carried into every country in the world, but it is not known whether these creatures are able to survive and reproduce under foreign conditions. Tahiti was chosen as a suitable area to investigate this question due to its isolation from all continents and to its 200-year-old trading ties with Europe among other areas. Any introduced European elements of the fauna would easily be distinguished from animals introduced from nearer-lying areas, where the fauna must be supposed partly related to that of Tahiti.

On these grounds I made exhaustive collections of oribatids on Tahiti in the autumn of 1969/winter of 1970. Particular weight was laid on making collections from the town of Papeete and its vicinity, as this area must be supposed the easiest in which to find introduced animals. Later on collections were made along large stretches of the coast, particularly the north coast which is most suitable and has rather varied biotopes. Finally collections were made in almost virgin areas in the mountains.

Since it is of no particular significance in this investigation to know in which locality or biotope the individual species were found in so limited an area as Tahiti, and also to avoid the continual repetition of the many sample numbers (114 samples—each of roughly a handful), the material is classified into four groups as follows:

I: Papeete (lawns in the park, garden rubbish, edges of ditches, brooks, private gardens, playgrounds, water reservoirs, etc.). The majority of the samples with scant vegetation and quite without moss.

II: The coast (rocky road sides, slopes with small ferns, low vegetation, moss, moss growing in water trickling down cliff sides, swampy marshes, moss on the foot of coconut palms, rotting leaves, etc.).

III: In the mountains above Papeete along a road leading to the Fare Rau Ape café at a height of 600 m above sea level. Up to this height the mountains are covered with Casuarina and numerous deciduous trees with a rich undergrowth of bushes and plants. In addition collections were made from 600 to 800 m above sea level. Above this stretch the earlier forest has been felled and the mountain crests are now mainly covered with a 1 m height thicket of bracken. In group III collections were made from Casuarina needles, in rotten, deciduous leaves, in bracken litter, sparse moss, lichens and moss on dry bark, bits of crumbling branches, damp leaves under paper sacks, low plants, etc.

IV: This group comprises the atoll Rangiroa, approximately 300 km northeast of Tahiti (rotting leaves between blocks of coral under rather low tree/bush vegetation).

In the following, the locality grouping for each individual species is indicated by the Roman numerals I–IV. The number of individuals found is given in brackets thereafter, while the following number denotes the number of samples in which the species was found. The last number gives an indication of the general distribution of the species. If a species was found in few samples, or only in a single sample, further information is given on the biotope.

There is little information on earlier finds of oribatids on Tahiti. JACOT (1934b) mentions only one species, *Austrotritia (Indotritia) lebronneci tahitiana*, while SELLNICK (1959) mentions the following six species: *Liodes hawaiiensis* (Jacot), *Humerobates perkinsi* (Jacot), *Galumna hawaiiensis* Jacot, *Scheloribates muii* Jacot, *Austrotritia lebronneci* (Jacot), and *Pseudotritia loricata* (Rathke) = *Rhysotritia ardua* (Koch). Of these six species, only two were found again in this investigation.



## List and Descriptions of the Species Found

### Palaeacaridae

*Andacarus ligamentifer* Ham.

— — — , 1967, p. 59, fig. 79.

The specimens from Tahiti deviate from the type specimen by having a much shorter f2. The latter is about one half to one third as long as d1. Furthermore f1 and f2 are set very close together. In the type specimen they are situated with a mutual distance as long as f1.

II (1: wet moss and litter), III (3: moist moss; lichens and moss on bark).

### Hypochthoniidae

*Malacoangelia remigera* Berl.

— — — , 1913, p. 101, fig. 86.

II (2: low Cyperus vegetation under a hedge).

*Hypochthoniella minutissima* (Berl.).

*Hypochthonius minutissimus* Berl., 1903, p. 252.

III (4: Leucobryum, moist; thick moss).

*Eohypochthonius gracilis* (Jacot).

*Hypochthonius gracilis* — — — , 1936, p. 251, fig. 9.

The specimens from Tahiti differ from the type in the same way as the specimens found in Viti Levu, the Fiji Islands (HAMMER 1971), i.e. the pseudostigmatic organs have longer branches and the notogastral setae are shorter and do not overlap.

II (15: wet Cyperus meadow).

*Eohypochthonius gracilis* (Jacot) v. *crassisetiger* Aoki.; fig. 1.

— — — — — , 1959, p. 3, fig. 2.

Length about 0.34 mm. Colour light brown.

The specimens from Tahiti differ from the type from South Japan by the shape of the interlamellar hair, which in most specimens is directed forwards, being long, oval, rounded at the tip and soft as down. The pseudostigmatic organ has 9–11 branches

and furthermore some very fine bristles on its posterior border. In one specimen the usually rudimentary setae e1 are present, fig. 1. These two hairs differ from the other notogastral hairs being stiff, slightly uneven, and shorter.

II (5: Cyperus vegetation; met moss).

#### Phthiracaridae

*Hoplophorella rangiroaensis* n.sp.; fig. 2.

Length of notogaster about 0.38 mm.

— — aspis — 0.20 — . Colour grey with bluish reticulation.

In the posterior part of the aspis, fig. 2a, there is a broad area with a coarse reticulation consisting of three rows of pits on either side of the carina. The lamellar hairs are lanceolate and hyaline. The interlamellar hairs are missing or not discernible. The curved rostral hairs are directed forwards and situated on either side of the rostral keel. The integument is irregularly pitted. The distal part of the pseudostigmatic organs, which are strongly bent, is directed backwards. This part is uneven or perhaps covered with mucus or minute bristles.

Anteriorly the notogaster has a prominent collar like *H. cucullata* (Ewing), on which the three anterior notogastral hairs are situated. In profile the notogastral hairs are narrow, the tip is spoon-shaped, and the hollow part not much broader than the stalk. In a dorsal view the hairs are lanceolate, from their underside they are broad spoons, fig. 2b. The sculpture of the notogaster consists of strong bluish ribs surrounding angular to round large pits. No punctation.

Ano-genital region. The genital plate has four small hairs, the distance being longest between the third and the fourth. Anteriorly on the anal plate there is a rather short stiff hair, ad 1, and further posteriorly a longer lanceolate hair, ad 2, fig. 2c. Further medially there are three hairs almost equally thick throughout, only slightly thinner at the tip. They represent an 1, an 2, and ad 3.

IV (11: moist, rotten leaves).

*Hoplophorella glauca* n.sp.; fig. 3.

Length of notogaster about 0.40 mm.

— — aspis — 0.20 —

Colour grey, when highly magnified showing a bluish-grey reticulation surrounding the light pits.

Seen in a lateral view the aspis has a transverse shallow depression in front of the lamellar hairs. In front of this furrow there is a low aspis keel. The rostral hairs are short, stiff, slightly curved, they are bent forwards, and situated on either side of the keel. The latter is bordered laterally by a broad depression, fig. 3a. The lamellar hairs are lanceolate and hyaline. The interlamellar hairs, also hyaline, are only half as long as the lamellar hairs. Due to their hyaline structure, I am unable to see them in a dorsal view. In the posterior part of the aspis there is a broad area with faint

longitudinal and indistinct transverse stripes together forming an indistinct reticulate pattern. The dorsal carina is shorter than the longitudinal stripes. The pseudostigmatic organs are almost equally thick throughout. They are undulating with the tip bent backwards. The distal end is set with a hyaline uneven structure, fig. 3a. A scale covers the opening of the pseudostigma from above. It has a forwards directed tip.

The notogaster has no prominent collar, on the contrary it slopes forwards. Seen in a dorsal view, fig. 3b, the notogaster is broadest a little in front of the middle line. On either side of the shoulder there is a short backwards directed keel. The posterior end of the notogaster is truncate. There are 15 notogastral hairs, which are shaped as small spoons, the distal end being hollow spoon-shaped, fig. 3c. In a dorsal view the hairs are lanceolate to narrow foliate. The sculpture consists of pits surrounded by bluish-grey ribs forming a distinct reticulation. No punctation.

Ano-genital region. On the genital plate there are four tiny hairs. Due to their hyaline structure they are only just discernible, the shortest distance being between number two and three. Anteriorly in the anal region there is a short, stiff backwards directed hair, ad1, further posteriorly a lanceolate hair, ad2. The anal hairs, which are bent forwards, are rather strong, thinner at the tip and a little shorter than the lanceolate hair. This species can be distinguished from *H. rangiroaensis*, also reticulate, by the absence of a prominent collar, and from *H. scapellata* (see later) by its short rostral hairs and its reticulate structure, *H. scapellata* being densely punctate.

I (1 : moist to wet Cyperus vegetation).

*Hoplophorella scapellata* Aoki; fig. 4.

— — — , 1965a, p. 131, figs. 2-3.

There can hardly be any doubt that the specimens from Tahiti, shown in fig. 4, belong to AOKI's species from Thailand, although there are small differences concerning the aspis. On the posterior part of the aspis, fig. 4a, there are more stripes than in the type and these are restricted to an area behind the lamellar hairs. I have not been able to see the interlamellar hairs probably due to their minute size. Between the rostral keels there is a deeper incurvation than in the type, but this may be due to the position of the specimen while being drawn. The notogaster is densely punctate and for that reason the pits are rather indistinct as mentioned by AOKI.

I (4:3), II (2:2), III (1).

*Phthiracarus crispus* n.sp.; fig. 5.

Length of notogaster about 0.43 mm.

— — aspis — 0.23 —

Colour greyish.

The aspis is highest in its posterior third, in the middle flat or rather slightly hollow, whereafter it bends sharply ventrally. There is a distinct rostral keel. The

rostral hairs, which are directed forwards, are short and thin. The very long, extremely thin lamellar hairs are directed forwards and slightly upwards. The interlamellar hairs are also very thin and rather long. The exact length of the lamellar and the interlamellar hairs is difficult to determine, as due to their delicate structure they cannot be seen in a dorsal view, only in profile. They may be equally long. The pseudostigmatic organ is setaceous, thinnest at the tip and directed forwards in a large curve. The exopseudostigmatic hair is distinct.

Notogaster is rounded, highest across its middle. The collar is broad. The notogastral hairs are very thin and difficult to see, the pores, however, are reddish and very distinct in the densely punctate greenish ground. The hairs are curly (hence the specific name). Most of them are directed forwards, the tip often bent backwards. There are several very distinct pores.

Ano-genital region, fig. 5 and 5a. On the genital plate 7 hairs can be seen, viz. five in a marginal row and two further laterally. Not all these hairs have been observed in profile. The adanal hairs are extremely thin decreasing in length towards the posterior end of the plate. The anal hairs, which are much stronger and equally long, are bent forwards and dorsally in a semicircular curve. In fig. 5a it can be seen that the sides of the notogaster are faintly depressed off the genital plates, which may be due to shrinkage although this seems unlikely.

III (6: rotten leaves; moss, *Cyperus* on moist soil; *Oxalis*, grass, small ferns on moist soil).

*Phthiracarus ?insularis* Jacot; fig. 6.

— — — — —, 1934a, p. 233, fig. 4a, b.

Length of notogaster about 0.42 mm.

— — aspis — — 0.215 —

Colour light grey.

The Tahitian specimens recall *P. insularis* Jacot (1934a) from the Marquesas Islands. *P. insularis* is, however, a little larger, the notogaster measuring about 0.5 mm, while the pseudostigmatic organ is short and oval. Many of the notogastral hairs are not illustrated and for that reason a direct comparison cannot be made.

The Tahitian specimens have a flat aspis with a short posterior carina, fig. 6a. In profile a few light spots or reticulate meshes can be seen laterally to the carina. The rostral hairs are thin and curved upwards and forwards. The lamellar hairs are extremely thin but can be seen because their anterior part is raised above the surface of the aspis. They are approximately as long as their mutual distance. The interlamellar hairs are hardly discernible. The pseudostigmatic organs are short, lanceolate to almost round depending on the view in which they are seen. They consist of an inner transparent part surrounded by a broad hyaline border, fig. 6b. Exopseudostigmatic hair is absent. The integument of the aspis is densely punctate.

The notogaster is evenly rounded, highest at a level from e1 to the border between the genital and the anal plate. The collar is rather broad. There are 14 pairs of very

thin, curved notogastral hairs. In the middle of the notogaster they are bent forwards, on the sides backwards. Several distinct pores can be seen. Ps3 and ps2 are situated rather close together. This is indicated in JACOT's fig. 4a. The integument is densely punctate, the dots being yellow to yellowish-red on a light green ground.

Ano-genital region, fig. 6c. Only 7 pairs of genital hairs have been illustrated, but there may be 9–10, the anterior ones densely crowded on the anterior brim. The anal and adanal hairs are rather long and strong, directed forwards in a faint curve; ad1, however, thinner, shorter, and straight.

II (2: thick, moist moss on the base of a coconut palm; thin layer of moss on bark, III (2: short moss on moist soil).

*Phthiracarus tubulus* n.sp.; fig. 7.

Length of notogaster about 0.295 mm.

— — aspis — 0.113 —

Colour greyish-whitish.

The posterior part of the aspis is rounded; it is more flat in the middle. On the posterior border there is a carina. The rostral hairs, which are almost bent at a right-angle, the two halves being equally long, are slightly rough. The lamellar hairs, which are directed backwards in a curve, are rather strong, distally they are uneven. Their mutual distance is about half as long as the hairs. The interlamellar hairs are hardly discernible. Behind and above the pseudostigma there is a scale covering just a small part of the pseudostigma. The smooth pseudostigmatic organ is long and slender, tapering towards the thin tip. No exopseudostigmatic hair has been observed.

The notogaster is evenly rounded. It is highest in the middle of its length. The collar is broad. There are 14 pairs of notogastral hairs. They are bent near their base, whereafter they form a broad curve. They are almost equally thick throughout, i.e. rather strong and easily seen. Ps3 and ps2 are situated in a deep tube situated ventrally to the line separating the notogaster from the anal plates (hence the specific name).

Ano-genital region, fig. 7a. The border between the genital and the anal plates is very rough with small irregular tongues and laterally on the genital plates with a tooth fitting into a notch in the anal plates. On the anterior part of the anal plates there is a curved line directed backwards and medially meeting the opposite one a short distance in front of an1. There are six genital hairs, of which the posterior one is stronger and longer than the others and separated from the anterior ones by a good distance. In the anal region there are five identical hairs bent and curved like the notogastral hairs. The anal hairs are directed forwards, the adanal hairs backwards. Ad1 and ad2 are situated approximately off the tubes with ps3 and ps2. In fig. 7a the adanal hairs are turned forwards. The left an2 is displaced posteriorly towards ad3, and the right ad3 is removed a little further from the median border than the left ad3.

II (4: *Cyperus* vegetation).

*Hoplophthiracarus siamensis* Aoki; fig. 8.

— — —, 1965a, p. 133, figs. 4–6.

This very characteristic mite has been found in many samples. It agrees very well with AOKI's excellent description and illustrations of the type from Thailand. The pits in the specimens from Tahiti are always very distinct, at a lower level shining gold on a bluish-green ground, which is densely punctate.

I (5:2), II (2:2), III (6:4), IV (11:4).

#### Euphthiracaridae

*Microtritia tropica* Märkel.

— — —, 1964, p. 48, fig. 11.

III (2: moist moss; moist *Leucobryum*).

*Rhysotritia ardua* (C. L. Koch) var. *otaheitensis* n. var.; fig. 9.

Length of notogaster about 0.545 mm. Length of aspis about 0.240 mm.

The specimens from Tahiti differ from the main form by the shape of the pseudostigmatic organ and by a different number of claws. The pseudostigmatic organ is dilated distally into a flat head set with coarse bristles on its surface, fig. 9a; in a dorsal view bristles can be seen only on its distal border, fig. 9b. Some specimens have one claw only on all tarsi, while others have three claws on all tarsi. The specimen shown in fig. 9 is monodactylous. The ano-genital region is shown in fig. 9c.

*Rhysotritia ardua* ssp. *penicillata* Pérez-Iñigo (1968, p. 214, fig. 29) differs from the main form almost in the same way as the new variety from Tahiti having a clavate pseudostigmatic organ and two claws on all tarsi.

I (2: moist grass), II (4: moist moss; dead leaves, and rotten twigs), III (9: moist dead leaves; lichens on a tree trunk; moist *Casuarina* needles).

*Indotritia sellnicki* Aoki.

— — —, 1965a, p. 137, figs. 14–16.

II (15: wet moss; moist dead leaves), IV (7: moist moss and rotten twigs under shrub).

*Austrotritia lebronneci* Jacot; fig. 10.

— — —, 1934a, p. 234, fig. 4c-h.

Length of notogaster about 0.93 mm. Length of aspis about 0.48 mm. Colour of notogaster black to mahogany red; aspis, legs, and ano-genital region light brown.

The specimens from Tahiti agree with JACOT's description of the type from the Marquesas Islands apart from a few features. There are two lateral keels separated by a good distance; the hairs both of the aspis and of the notogaster are rather thick and smooth, most of them directed forwards. Not all the notogastral hairs could be seen. The palps have five segments, not three as mentioned by JACOT. Coxa III has three hairs, Coxa IV five hairs, but I have not ascertained whether the latter is abnormal, fig. 10c. The genital and the aggenital plates are completely fused as also shown by JACOT, fig. 10b.

III (6: moist moss; dead leaves).

## Epilohmanniidae

*Epilohmannia pallida* Wallw. susp. *pacifica* Aoki.

— — — — —, 1965b, p. 312, figs. 4–9.

The only specimen found agrees in every detail with AOKI's description of the sub-species from Laysan Island, the Hawaiian Islands, apart from its slightly lesser size, measuring about 0,325 mm in length; the material measured from Laysan Island varying from 0.372 to 0.428 mm in length.

I (1: Cyperus vegetation beneath a hedge).

## Lohmanniidae

*Papillacarus hirsutus* (Aoki), fig. 11.

*Cryptacarus* — — — — —, 1961, p. 64, fig. 2.

Length about 0.37 mm. Colour light brown.

The specimens from Tahiti differ a little from the type from Japan. The hyaline rostrum has an incurvation in the middle (AOKI: vorn fast gerade abgeschnitten). The pseudostigmatic organ has about 10 equally long secondary bristles besides three shorter, proximal ones. On its posterior border a few very fine bristles can be seen. In fig. 2b AOKI shows 14 bristles increasing in length towards the end of the organ, the second and the third distal ones differing by being much shorter.

The notogastral hairs as well as the many neutrichian hairs are much longer in the Tahitian specimens than in the type from Japan.

The ventral side, fig. 11a. In the type most of the genital hairs are branched. I am unable to see the branches.

II (2: Cyperus vegetation beneath a hedge).

*Meristacarus tahitiensis* n. sp.; fig. 12.

Length about 1.17 mm. Colour reddish brown.

This species agrees in most features with *M. madagascarensis* Balogh, 1962, p. 121, figs. 1–2, and also with the sub-species *M. mad. obscurus* Aoki, 1965a, p. 139, figs. 17–18, from Thailand. The latter differs from the main form only by the absence of distinct fossulae and by having a characteristic indentation in the posterior end of the notogaster.

*M. tahitiensis* has the same indentation although less pronounced, but it differs in some important characteristics both from the main form and from the sub-species. Only these differences will be mentioned. Fossulae vitiformes are hardly discernible and there may be more than shown in fig. 12. In *M. madagascarensis* the fossulae are arranged in transverse bands only, in *M. tahitiensis* some are arranged in a more or less closed ring between d1–d1. The notogastral hair f1 is longer than in *M. madagascarensis* and in the sub-species *obscurus* and longer than the other notogastral hairs. The greatest difference is, however, the distance h1–h1, which is longer than e1–e1, almost as long as f1–f1, and almost twice as long as ps1–ps1. In *M. madagascarensis*

the distance h1-h1 is the same as c1-c1 and e1-e1, whereas h1-h1 in *M. mad. obscurus* is the same as c1-c1 and shorter than the distance between any of the other pairs of hairs on the dorsal surface. Fig. 12a shows the hair ps1.

The ventral side, fig. 12b, differs slightly from that of *M. madagascarensis* and its sub-species *obscurus*. Thus the epimeric hairs 3c and 4c are thick and feathered like the notogastral hairs, fig. 12a. 2a and 3a are very short, thin, and finely barbed, the others are longer, thicker and have longer barbs. In *M. madagascarensis* and its sub-species all the epimeric hairs are alike, short and finely barbed. *M. tahitiensis* has only three pairs of adanal hairs. BALOGH mentions four for *M. madagascarensis* and illustrates a specimen with four on the right, five on the left plate. *M. mad. obscurus* has four adanal hairs.

II (3: short moss on a shaded slope).

*Nesiacarus granulatus* n. sp.; fig. 13.

Length about 0.52 mm. Colour light brown.

In the anterior border of the rostrum there is a low incurvation. The rostral hairs, the lamellar, the anterior exopseudostigmatic, and the posterior exopseudostigmatic hairs are approximately of the same length and alike, being finely feathered for most of their length, the tip smooth. The interlamellar hairs are similar to the others, only shorter. There is a distinct lateral tip or tooth a short distance in front of the hair exa. The pseudostigmatic organ is bent outwards and slightly backwards, its distal end thereafter a little forwards. It has about 12 secondary branches of which the two distal ones are a little shorter than the others. On its posterior border there are some very fine secondary bristles. A broad densely punctate band runs forward in a curve from the latero-posterior corner of the propodosoma almost touching the posterior border of the pseudostigmata. The entire integument is decorated with small granules except on the tip of the rostrum, which is hyaline, and along the lateral border.

The notogaster has two kinds of hairs, those on the dorsal surface being much shorter than those on the borders. The finely barbed dorsal hairs are bent and for that reason they appear too short in fig. 13. The distance d1-d1 is a little longer than f1-f1. E1-e1 is shorter than f1-f1. D2 and h1 are longer than the other hairs of the dorsal surface. The marginal hairs are long, undulating, finely barbed and have a smooth tip. In the posterior part of the notogaster there are some neotrichian hairs, partly a short one laterally to f1, partly 8 long, barbed hairs on the posterior border. Immediately behind c1 and c2 there is a broad punctate band, and in front of these hairs a thin line can be seen. Besides these distinct bands, there are four transversal bands, of which the two anterior ones do not meet in the middle of the dorsum. In the one, between e2-e2, some round spots can be seen, especially between e1-e1. The third fourth band is situated behind h1-h1. The integument is densely granulate.

The ventral side is shown in fig. 13a. The epimeric hair formula is 3:1:3:4. These hairs are short and barbed. The six medial genital hairs are short, the four lateral ones long, undulating, barbed and with a smooth tip. The two anal hairs are



apparently smooth, while the four adanal hairs are long, undulating with a very thin, smooth tip, and barbed for their proximal two thirds.

This species can be distinguished from *N. reticulatus* Csiszar, 1961, p. 346, figs. 1–2, from Java by its granulate sculpture, (*N. reticulatus* with a reticulate pattern), by the incurvation at the tip of the rostrum, and by its long undulating hairs, both on the notogaster and on the genital and adanal plates. The neotrichian hairs are in both species similar to the ordinary hairs.

II (1: Cyperus vegetation beneath a hedge).

*Javacarus kühnelti* Bal. var. *foliatus* n. var.; fig. 14.

– – – , 1961 a, p. 31, figs. 39–40.

Length about 0.65 mm. Colour light brown.

So many features of the specimens from Tahiti agree with those of the type from Java that I do not hesitate in identifying them as *J. kühnelti*. Nevertheless there are differences justifying the establishment of a new variety. Thus the rostrum is hyaline without any sculpture, and the sculpture of the propodosoma consists of much larger spots than in the type. The pseudostigmatic organs have from 8 to 11 secondary branches besides some very short ones distally on the posterior border. In the main form there are 7 secondary branches. Most important are the much longer notogastral hairs, which are foliate. In the main form the hairs are lanceolate without a middle rib. I pay little attention to the difference between the main form and the variety in the pattern of the fossulae vittiformes as it is not even fully symmetric on the two sides of the dorsum in fig. 14. The variety has some undulating chitinized keels along the sides of the dorsum. They are especially well developed anteriorly, but not equally well developed in all specimens. The ventral side (HAMMER 1971 fig. 4 a) agrees with that of the main form apart from a more irregular pattern of the sculpture. In the main form there is a linear pattern.

After having studied several specimens from Tahiti, it is evident to me that the only specimen found on Viti Levu, the Fiji Islands (HAMMER 1971, p. 7, fig. 4) also belongs to the new variety with a hyaline rostrum, pseudostigmatic organs with 10 secondary branches and foliate notogastral hairs. The keels along the sides of notogaster are less pronounced, but indicated in fig. 4. The pattern of fossulae vittiformes is a little different from that in fig. 14 from Tahiti.

II (27: 10).

#### Hermanniiidae

*Phyllhermannia pacifica* n. sp.; fig. 15.

Length about 0.57–0.70 mm. Colour light brown.

*P. pacifica* belongs to a group of *Phyllhermannia* species having two curved ridges in the anterior part of notogaster as is the case with *P. kanoi* Aoki, 1959, from South Japan and *P. gladiata* Aoki, 1965 a, Thailand. The present species differs from

these two by having two large oval areas between the pseudostigmata and in the foliate notogastral hairs.

The rostral and lamellar hairs are situated laterally and are short and smooth. The interlamellar hairs, situated on the anterior border of a large, slightly oval area, are broad and leaf-shaped ending in a thin tip. They are directed backwards. The oval areas are surrounded by a ridge, which is indistinct medially. On their posterior border there is a rounded brown lobe. The areas are densely punctate. The pseudostigmatic organs are slightly thicker at the tip, which is covered with minute barbs and secretion. Along the sides of the propodosoma there is a pronounced ridge, ending posteriorly in a strong lobe or tooth.

Notogaster. On either side the anterior part of the notogaster is a curved ridge opening medially. In a large specimen this ridge runs backwards to i3. Its anterior end continues medially, but more indistinctly, then it turns backwards thus forming a large framed area on either side of the middle of the dorsum, almost like the two areas between the pseudostigmata. The 16 pairs of notogastral hairs are leaf-shaped and translucent. They are narrowest at their base, then widen slightly towards the end, which tapers into a short thin tip. This is not always easy to see as the end is often bent ventrally. Apparently the hairs have proximally a rib disappearing towards the end of the hair. The dorsal surface of the hairs is set with minute bristles in longitudinal rows. Most of the hairs are of equal length, only those on the posterior border being shorter.

Ventral side, fig. 15 a. Epimeres I, II, and III from the two sides are separated by a faintly chitinized sternal plate with a furrow at the middle. The posterior part of Epimeres III is a yellowish brown colour and differs from the anterior part, which is greyish and densely punctate like the other epimeres. Epimeres III and IV are separated by a strongly chitinized ridge, which is curved slightly backwards behind the sternal plate. The epimeric hair formula is 3:1:3(4?):5. The length of the hairs is difficult to see as many are directed ventrally.

On the genital plate there are six short medial hairs and three longer thin lateral hairs, of which the anterior one is much stronger than the two behind it. There are two aggenital hairs, one off either end of the genital field. The two anal hairs and the three adanal hairs are very short, smooth and thin.

The hairs of the legs are mostly thin and smooth, some are broader and more or less shaped like those on the notogaster.

*Phyllhermannia* species with the curved dorsal ridges mentioned above have so far only been found in Japan, Thailand, and Polynesia.

II (9: wet moss on stone wall; moist moss on foot of coconut palm), III (thin layer of moss on rotten tree stump).

## Nothridae

*Nothrus oceanicus* Selln.

— — — , 1959, p. 110, fig. 1.  
II (49: 9), III (24: 5).

*Allonothrus schuilingi* van der Hammen.

— — — — — , 1953, p. 244, figs. 1–3.  
II (246: 16), IV (375: 5).

*Allonothrus russeolus* Wallw. var. *reticulatus* n. var.; fig. 16.

— — — , 1960, p. 569, figs. 4–5.  
— — — , Hammer, 1971, p. 10, fig. 9.

Length about 0.56 mm. Colour brown.

The new variety was first found on Viti Levu, the Fiji Islands (HAMMER 1971). It was, however, not established as a new variety, and only few differences from the main form were mentioned. More specimens have now been examined (only one adult was found on Viti Levu) and so many differences from the main form were found during this investigation that they justify the establishment of a new variety.

As already mentioned for the specimen from Viti Levu, the two oblique dark ridges in the middle of the propodosoma meet in a tip. The alveoli on the notogaster are not round or of the same size. They are of different shapes and sizes, very clear, almost luminous and separated from one another by a fine reticulation consisting of thin, white meshes on the brown ground (hence the specific name). Many of the notogastral hairs are rounded distally and not so distinctly truncate as in the main form.

The ventral side, fig. 16. The position of the epimeric hairs differs from that of the main form. Thus 1b is situated almost in the middle of the plate (in the main form further anteriorly), 3b is nearest the anterior border (in the main form near the posterior border). In the main form 1a, 2a, 3a, 3c, 4a, and 4c are setaceous, the remainder smooth. Most of these hairs are very short and furthermore erect for which reason it is almost impossible to see them distinctly and determine their appearance. 1a, 2a, and 3a might be setaceous, 1c and 3c I am unable to see. 4c is distinctly setaceous. The genital field has 13–14 pairs of rather long, apparently smooth hairs lying medially, crossing those from the opposite side. In the main form most of the hairs are setaceous and lie laterally. The distance between the genital hairs is shorter at the anterior end of the plates. There are no aggenital hairs. Medially to ps3 a few indistinct alveoli can be seen. The posterior border of the ventral side between ps2–ps2 is rounded. All tarsi are tridactylous.

I (201: grass on dry soil under a tree), II (109: Cyperus vegetation; grass and Cyperus under coconut palms), III (77: moist rotten leaves).

*Nanhermannia transversaria* n. sp.; fig. 17.

Length about 0.53 mm. Colour clear brown.

The tip of the rostrum forms a small snout, on the lateral sides of which the rostral hairs are situated. They are bent ventrally. The sides of the rostrum form an

even cone. The lamellar hairs do not reach beyond the tip of the rostrum. The interlamellar hairs are very long and almost equally thick throughout. The pseudostigmatic organs are distinctly thicker towards the tip where they widen into a small head, the upper surface of which is set with short spines, fig. 17a. Each of the two crests on the posterior part of the propodosoma have three rounded tubercles, i.e. the medial ones broad, the middle ones narrow, and the lateral ones short and narrow. Further laterally less defined tubercles can be seen. There is no deep or distinct furrow between the interlamellar hairs, nor is the middle field well defined further anterior. The integument is pitted and densely punctate, also outside the middle field.

The hysterosoma is broadest across its posterior half. The 14 pairs of notogastral hairs, are very long, rather broad for most of their length, but the tip is very thin. Some of the hairs of the posterior end lie transversally across the notogaster (hence the specific name). The pits of the notogaster are of different sizes and are arranged more or less in oblique rows.

This species can be distinguished from *N. nana* (Nic.) (STRENZKE, 1953, p. 73, fig. 4) by the absence of a deep furrow between the interlamellar hairs, by the long distance between the posterior crests, and by the broad pseudostigmatic organs. III (11: thick luxurious moss).

*Cyrthermannia luminosa* Hammer; figs. 18.

— — — — —, 1971, p. 8, fig. 5. Viti Levu, the Fiji Isl.

Length about 0.54 mm.

The specimens from Tahiti differ a little from the type. They are a little longer, the type being 0.50 mm. The pseudostigmatic organs are longer and narrower. In fig. 18a two pseudostigmatic organs are shown, in fig. 18b two from specimens from the Fiji Islands. The latter are shorter and the head round and broad. The backwards directed triangular processes in the posterior part of the propodosoma are closer together than in the specimens from the Fiji Islands and their medial borders are almost parallel, fig. 18c. In specimens from the Fiji Islands, fig. 18d, the processes lie more laterally and proceed for a short distance into the transverse ridge. The furrow between the interlamellar hairs is well defined, deep and with two rows of small pits. In specimens from the Fiji Islands the furrow is less distinct, while its border diverges posteriorly and seems to continue into the medial border of the posterior processes. The propodosoma is decorated with deep regular pits, which are longest in the anterior part of the propodosoma. In specimens from the Fiji Islands the sculpture is irregular, the pits confluent, separated by thick ribs.

Notogaster. No difference can be seen between the specimens from Tahiti and from the Fiji Islands concerning the notogaster. The notogastral hairs with the basal spur and the peculiar luminous dots in the light spots are alike in both groups, wherefore the differences found are probably only variations not justifying the establishment of a new variety.

This species can be distinguished from other *Cyrthermannia* species by the shape of the notogastral hairs with a spur and by the sculpture with the luminous dots. II (39: wet Cyperus meadow; rotten moist leaves).

*Masthermannia mammillaris* (Berlese).

— — — — —, 1913, p. 100, fig. 92.  
II (65: 6), III (1).

#### Trhypochthoniidae

*Trhypochthonius excavatus* (Willm.).

*Camisia excavata* — — — — —, 1919, p. 552, fig. 3.

I (5: in a brook in the park), II (159: wet moss in oozing water).

*Afronothrus sulcatus* n. sp.; fig. 19.

Length about 0.53 mm. Width about 0.29 mm. Colour pale, the posterior part of the hysterosoma light brown.

This species agrees in most essential features with *A. incisivus* Wallw. 1961, p. 238, figs. 6–7. It differs, however, primarily by having a very distinct transverse furrow (sulcus) between the hairs d2. Laterally to d2 it widens, at the same time becoming more indistinct. There are lesser differences besides this important difference.

The rostrum is rounded. The rostral hairs, situated at some distance behind the tip of the rostrum, are long, smooth, and flexible. The lamellar hairs are situated on a narrow ridge, which apparently continues backwards as a lateral lamella. They are approximately as long as their mutual distance, stiff and erect. The interlamellar hairs are very long, thin, and flexible. The pseudostigmatic organ has a small almost circular, flat head on a short thin stalk. The integument of the propodosoma is densely punctate.

The notogaster is without a lateral incision on each side off cp. The humeral region is rounded and there is no tubercle anteriorly to the incertion of c3. The notogastral hairs are of very different lengths. C2 is very short, d2 about two thirds as long as c1, c3, cp, d1, e1, and e2, and thinner. F1 is absent, f2 is stiff and sickle-shaped. H2 is very long and thin, h3 is also thin, but a little shorter than h2. Ps1 is stiff like a spine, while ps2 is flexible and thinner. The fissure ia is not transversal but situated obliquely behind c3. Im can be seen as a faint indentation in the lateral border off d2, and ip between h1 and h2. The integument is reticulate to foveolate, the pattern being especially distinct at the posterior end of the notogaster. The lateral gland has a short protruding tube.

The ventral side, fig. 19 a. The position of the epimeric hairs differs from that of *A. incisivus*. Thus 3b is not situated along the lateral border, but more medially. 4c is situated on the latero-anterior corner of Epimer IV and not in the middle of the lateral border. There are four genital hairs of which the two anterior ones are situated close together at the anterior end, one in the middle of the plate and the fourth between

the third and the posterior border. The anal hair is absent but its pore can be seen between ad3 and ad2. There are two adanal hairs. All the hairs of the ventral side are smooth. The sculpture consists of hexagonal meshes forming a reticulate pattern, which can be seen distinctly laterally to the genital plates.

All the tarsi have three equally thick claws.

IV (13: dead moist leaves).

*Trhypochthonius javonicus* Csiszar, 1961, p. 349, fig. 10, has long, thin and curved h3 and ps3 corresponding to h2, h3 in fig. 19 and in most features it shows great similarity to *Afronothrus sulcatus*. CSISZAR, however, shows no ventral side, for which reason its relation to the present species cannot be concluded. *Trhypochthonius breviclava* Hammer, 1958, p. 24, fig. 20, which whole appearance recalls *Afronothrus*, does not, however, belong to the genus *Afronothrus* as it has six pairs of genital hairs, two pairs of anal hairs, and three pairs of adanal hairs. Epimeric formula is 3:1:3:2.

*Archegozetes longisetosus* Aoki.

— — — — —, 1965 a, p. 147, figs. 26–28.

II (2: wet Cyperus meadow), III (81: moist rotten leaves).

#### Malaco-nothridae

*Malaco-nothrus hexasetosus* Hammer.

— — — — —, 1971, p. 9, fig. 7.

II (20: 8).

*Malaco-nothrus geminus* n. sp.; fig. 20.

Length about 0.425 mm. Colour light to dirty brown.

Propodosoma. The rostral hairs, which are as long as their mutual distance, are very thin, smooth and are directed forwards. The lamellar hairs situated on the end of the lamellae, are thicker than the rostral hairs. They are directed forwards and reach beyond the tip of the rostrum, where they bend ventrally. The interlamellar hairs are very thin, flexible and almost reach the corner of the shoulder. The exopseudostigmatic hair is moderately long. The strongly curved lamellae are posteriorly parallel, then bend slightly medially and are again for some distance parallel, whereafter they turn medially almost at a right angle. They are equally broad for their whole length. Between Leg I and II there is a rather sharp process. The middle field between the lamellae is punctate with coarse, luminous punctures.

Hysterosoma. This is broadest off f2, however, the lateral borders are almost parallel. Behind h2 there is an incurvation followed by a small edge. The posterior end is slightly concave. There are two longitudinal ridges, with distinct lateral border, indistinct medial border, Furthermore there are two lateral ridges which only run to d2. All the ridges are dirty brown. Between the dorsal longitudinal ridges there are

two indistinct transverse brown bands thus dividing the middle field into three parts. Surrounding the base of e1 there is a light area. The notogastral hairs are very variable both in length and thickness, but all are smooth. C1 and d1 are a little longer than c2, c3, cp, and d2. They are all strong and pointed at the tip. F2, h1, h3, and ps1 are shorter than c2, c3, etc., in addition h1 is besides thinner. E1, e2, and h2 are much longer than the others, flexible and very thin towards the tip. E1 and e2 are directed forwards. No sculpture can be seen.

Ventral side, fig. 20 a. The mentotectum has "nose-like" projections. The epimeric hair formula is 3:1:3:3. Some of the lateral epimeric hairs are rather long. The genital plates are much longer than the anal plates. There are 4(5?) very long, smooth genital hairs situated in the anterior two thirds of the plates. The distance between the anterior hairs is less than between the posterior ones. The three pairs of adanal hairs are almost as long as the genital hairs and also smooth. Anal hairs are absent. Ps3 and ps2 situated close together (geminus), are parallel and directed medially. They are smooth and as strong as the adanal hairs.

II (3: wet moss on stone wall; low vegetation of moss, grass, ferns, Cyperus).

*Malacothrus pachypilus* n. sp.; fig. 21.

Length about 0.405 mm. Colour light brown.

Propodosoma. The anterior half of the propodosoma is narrow, the sides rounded, whereafter it suddenly widens forming on either side a strong process between Leg I and II. The rostral hairs, which are almost as long as their mutual distance, are thick and barbed (hence the specific name), their tip is thin. The lamellar hairs, situated close behind the rostral hairs, are very thin and twice as long as their mutual distance. The interlamellar hairs are thinner than the lamellar hairs and as long as the latter. There are two short curved posterior lamellar ridges, one on either side and situated laterally to the interlamellar hairs. Their anterior end has apparently no direct connection with the long curved lamellae along the sides of the rostrum. The middle field is densely punctate.

The hysterosoma has parallel sides, and a rounded posterior end with an incurvation behind h2. Its anterior border is slightly convex. There are two distinct longitudinal ridges and more indistinct lines running partly to h3, partly backwards to a short curved transverse ridge situated between ps1. The two posterior fields bordered by these lines are a lighter colour than the three long anterior parts of the notogastral surface. All the notogastral hairs are alike, short, smooth, and thin. Their situation is shown in fig. 21. H1 is situated at the posterior end of the longitudinal ridge, i.e. further medially than found in most species. H2 and h3 are much longer and thinner than the hairs from the dorsal surface. The fissure ia is longitudinal, situated close to c2. Im can be seen in front of e2 and ip in front of h3. The integument is smooth.

Ventral side, fig. 21 a. The mentotectum has "nose-like" projections. The epimeric formula is 3:1:3:3. The genital and anal plates are equally long. There are

four pairs of genital hairs situated in the anterior half of the plates. The two posterior hairs are very long and rather broad but tapering towards the tip. The two anterior hairs are apparently much shorter, but their actual length is difficult to see as the tips lie close together. The three pairs of adanal hairs are also very long and broad proximally. Anal hairs are absent. Ps3 is situated on a level with ps2. The latter, which bends outwards, is thinner and longer than ps3. All the hairs are smooth.

I (3: low plant), II (8: moist moss, grass, ferns, Cyperus), IV (1: moist dead leaves).

*Trimalaconothrus crassisetosus* Willm. var. *fijiensis* Hammer.

— — — 1931 a, — — —, 1971, p. 10, fig. 8.

II (2: wet moss on stone wall).

*Trimalaconothrus albulus* n. sp.; fig. 22.

Length about 0.60 mm. Colour whitish.

The propodosoma is narrower at its base than the hysterosoma. The rostrum is broad and rounded. The rostral hairs are broad proximally, very thin at the tip. The lamellar hairs are as long as the rostral hairs, and are equally thick throughout. The lamellae are strongly curved being more or less S-shaped. Behind them a straight keel runs obliquely towards the anterior border of the hysterosoma. The interlamellar hairs are curved and extremely thin at the tip. The exopseudostigmatic hair is minute. Between Legs I and II there is a rounded projection. The space between the lamellae is densely punctate.

Hysterosoma. Its anterior border is straight almost forming a right angle to the lateral border. The lateral sides are slightly undulating especially behind e2. The posterior end is slightly pointed, its outline smooth. In the middle of the hysterosoma there is a broad groove bordered by round tubercles covering the whole surface, which can be seen at a deeper level in the groove. Between the tubercles the integument is densely punctate. All the notogastral hairs are thin and smooth; some of them, viz. e2, h1 and h2, are rather long ending in a thin curved thread. The distance c1-c2 is one and a half times longer than c1-c1; c2-c3 less than half c1-c1. C1-c1 and d1-d1 are approximately equal, e1-e1 a little longer. D1-e1 is one and a half times longer than d1-d1. The fissure ia is situated directly behind c2.

Ventral side, fig. 22 a. The mentotectum has "nose-like" projections. The epimeric hair formula is 2:1:2:2. Coxisternum IV from the two sides are separated anteriorly, fused posteriorly. Their posterior border has on either side a deep incurvation. The genital field is longer than the anal field. There are six pairs of genital hairs, all smooth. They are situated in the anterior two thirds of the plates. The adanal hairs are short, the distance ad1-ad2 is very short. The anal hairs are long and hardly discernible. Ps3 is short, ps2 long and curved. Faint tubercles can be seen also on the ventral side. The middle claw is a little thicker than the lateral claws only. This species is viviparous.

II (37: wet moss in oozing water).



## Lioididae

*Liodes bataviensis* (Selln.).

*Neoliodes bataviensis* —, 1925a, p. 463, figs. 7–9.

II (1: wet Cyperus meadow).

## Eremobelbidae

*Fosseremus quadripertitus* Grandjean.

— — —, 1965, p. 343, figs. 1–8.

II (7: wet Cyperus meadow).

*Eremulus avenifer* Berlese; fig. 23.

— — —, 1913, p. 96, fig. 77.

Length about 0.395 mm, and thus considerably longer than mentioned by BERLESE (0.32 mm). It is very characteristic with its extremely coarse pseudostigmatic organs, which have several rows of stiff spines in their expanded middle, whereas the distal part is thin with scattered short and thin spines. However, the specimens from Tahiti have much longer rostral and lamellar hairs than shown by BERLESE. The interlamellar hairs are short and situated in the middle of the space behind the longitudinal lamellar ridges and the chitinous band between the pseudostigmata. The notogastral hairs are stiff and strong, slightly curved and unilaterally barbed. They are a dark colour but transparent at their base. The two anterior pairs are thinner than the others. Across the anterior part of the hysterosoma is a chitinous, undulating band, which is not always as distinct as shown in fig. 23. Behind it there are some light pits.

The three aggenital hairs are branched or star-shaped, the adanal hairs are smooth.

II (5: wet Cyperus meadow; wet moss on stone wall).

*Eremulus curviseta* Hammer.

— — —, 1971, p. 15, fig. 14.

Length about 0.34 mm. Colour light brown.

This species can be distinguished by its long, thin interlamellar hairs, its broad band of pits across the anterior part of the notogaster on either end of which there is a hair, and by its slightly curved notogastral hairs.

III (1: Oxalis, grass, small ferns on moist soil).

*Eremulus monstrosus* n. sp.; fig. 24.

Length about 0.295 mm. Colour clear light brown.

This small species can be distinguished by its peculiar pseudostigmatic organs, which are very thick proximally and here set with five to six spines of various lengths, the longest distally. After this long spine follows a part without spines, the stalk at the same time becoming much thinner. On the distal half of the organ there are six very thin spines exclusive the long smooth tip.

Propodosoma. The rostral hairs and the lamellar hairs are both very thin, the latter three times as long as their mutual distance. The distance between the lamellar ridges is longest anteriorly. At the posterior end of the lamellar ridges there is a slightly curved transverse ridge. Laterally to the lamellar ridges there is on either side a strong, curved ridge reaching to the base of the rostral hair. The interlamellar hairs are situated at a good distance behind the transverse ridge. They are very thin and longer than their mutual distance. Between the pseudostigmata can be seen several light spots or pits, and between the interlamellar hairs large polygone meshes.

The hysterosoma is much longer than broad. It is narrow anteriorly, rounded at the posterior end and broadest across the middle. A short distance behind the anterior border there is a transverse, very distinctly undulating, grey line behind which there is a row of light pits. The notogastral hairs are a light colour, and very thin, especially towards the tip. Those on the posterior border are curly. The anterior pairs are shorter than those behind the transverse band.

The ventral side has not been illustrated. It has the same appearance as shown by BALOGH for *E. flagellifer* Berl. in his Synopsis 1965, table 10, fig. 17. The branched, star-shaped and the ordinary smooth hairs are arranged in the same way. III (2: low moss on moist loomy soil beneath bracken).

#### Liacaridae

*Furcoppia cornuta* n. sp.; fig. 25.

Length about 0.425 mm. Colour light brown.

The propodosoma is narrow and partly hidden below the lamellae. The latter have cusps, which at their base are as broad as the proximal part of the lamellae. The latter are fused for a length corresponding to the length of the cusps. On the cusps there is a short medial tooth. The lamellar hairs are thick, feathered and approximately one and a half times longer than the cusps. The rostral hairs are situated on short apophyses. They are broad, pointed at the tip and set with long thin bristles, fig. 25a,b. In a dorsal view they are hidden under the cusps and the lamellar hairs. At the tip of the rostrum three pointed tips can be seen, fig. 25a. In profile the lateral tips are almost as long as the lamellar hairs, ending in an extremely thin tip, fig. 25b. They are slightly bent at right angles and look like horns (hence the specific name). Their tip is bent ventrally; the right one can be seen behind the rostral hair, fig. 25b. Immediately behind the tip of the rostrum there is a light hole with a forwards directed tip on its posterior border, fig. 25a. The tutorium ends in a thin free tip at the base of the lamellar hair. The interlamellar hairs, situated on low apophyses, cross between the cusps. They are much thinner than the lamellar hairs and densely feathered. The feathered exopseudostigmatic hair is as long as the lamellar hair, but thinner. The pseudostigmata are completely hidden below the proximal part of the lamellae. The pseudostigmatic organs are spindle-shaped and for most of their length set with short upstanding bristles on both edges.

The hysterosoma is longish, oval, apart from the anterior border, which is almost straight. There are short, prominent shoulders. The 11 pairs of notogastral hairs are hardly discernible, two of them are situated on the shoulder.

The ventral side is shown in fig. 25c. Apodemata II form together with the sejugal apodemata an almost regular broad oval, though faintly developed in its posterior middle border. There is a very faint sternal line. The epimeric hairs are thick and feathered and of different lengths. 3a, the longest, is situated on the anterior border of the fused Epimeres III–IV. 2a is the shortest. There are six genital hairs, viz. three on the anterior border, two near the lateral border, and one on the posterior border. The thick aggenital hair is situated rather laterally. The anal field is very broad, and the anal hairs extremely short and thin. The anterior one is situated close behind the anterior border and off iad, which is a little distance from the anal field. The adanal hairs, situated with the same mutual distance behind the anal field, are as thin and as short as the notogastral hairs. The legs are rather long and slender with long, soft, densely feathered hairs. Genus I–II have a specially long ventral hair. On its ventral keel Femur II has a strong pointed distal tooth, fig. 25d. Femora III–IV have a low ventral keel. All the tarsi have three claws of which the lateral one are very thin.

Remarks. *F. cornuta* is closely related to *F. parva*, Balogh and Mahunka, 1967, p. 43, figs. 15–16, Vietnam. However, it differs in several features as follows: the hysterosoma is longish, in *F. parva* almost circular; the tutorium has a free tip off the base of the lamellar hair, in *F. parva* it is much shorter; the exopseudostigmatic hair is very long and feathered, in *F. parva* it is a short thick brush; the tip of the rostrum has three long pointed tips, but in *F. parva* it has three rounded lobes; the aggenital hair is short and apparently smooth, while in *F. parva* it is thick and feathered; the broad oval between Apodemata II and the sejugal apodemata is not defined in *F. parva*; *F. parva* is smaller, being 0.372 mm long.

I (6: moist Cyperus; moist rotten leaves on the lawn in the park).

#### Carabodidae

*Austrocarabodes imperfectus* (Selln.).

*Carabodes imperfecta* Sellnick, 1959, p. 119, fig. 4b.

III (2: moss; dead leaves beneath shrub).

*Carabodes luteo-auratus* n. sp.; fig. 26.

Length about 0.35 mm. Colour yellowish-golden.

The rostral and the lamellar hairs are equally long, thin and smooth. The interlamellar hairs are perhaps a little shorter, smooth, and very thin. The lamellae are not distinctly defined medially. Their latero-anterior edge is thickened and greyish with deep pits surrounded by strong ribs. The posterior part of the lamellae has a smooth lateral border, but immediately in front of the pseudostigma there are small

tubercles. The head of the pseudostigmatic organ looks like the head of a snake with a large fang. The integument between the lamellae is decorated with low, greyish tubercles on a yellowish-golden ground.

The border between the propodosoma and the hysterosoma is straight and there is no furrow separating the two parts. The shoulder has an undulating lateral border, but immediately behind the shoulder the lateral border is smooth for a very short distance. Then follow numerous round tubercles. The 10 pairs of notogastral hairs are short, foliate and have a middle rib, which is in the bottom of a groove, the sides of the hair being directed upwards, fig. 26 a. The end of those on the posterior border is directed ventrally and these hairs recall short fans, the ribs being very distinct in the hyaline hair and the end of the hairs invisible. Greyish tubercles cover the surface of the notogaster. The ground is yellowish-golden.

The ventral side, fig. 26 b. The sternal plate is faintly developed between Epimeres II, otherwise well chitinized. The apodemata are brown bands on a greyish-yellowish, reticulate ground. The sejugal apodemata form a brown transverse band, which is broadest in the middle. Apodemata III do not reach the sternal plate. In front of the genital field there is a curved brown band. The epimeric hairs are thin and smooth. The distance between the genital and the anal field is shorter than the length of the genital field. There are two pairs of genital hairs. The aggenital hairs are short and thin. Ad3 is situated off the latero-anterior corner of the anal field; it is thin. Ad1 and ad2, situated in a curve behind the anal field, resemble the notogastral hairs. Also the anal hairs are leaf-shaped. The sculpture of the ventral plate consists of low tubercles resembling those of the dorsal surface.

II (7: moss on coconut palm; moist rotten leaves; Cyperus meadow).

### Otocephidae

*Nesotocepheus* n. gen.

The lamellae are well developed, but do not extend beyond the insertion of the lamellar hair. There are two pairs of prodorsal and two pairs of notogastral condyles, 10 pairs of notogastral hairs, five pairs of notogastral fissurae, three pairs of genital hairs, one pair of aggenital hairs, three pairs of adanal hairs, and two pairs of anal hairs. The fissure iad is parallel to the sides of the anal field, not preanal. Coxa III has extremely long seta. The ultimate hairs of the tarsi are long, hook-shaped, and thickened at the tip.

*Nesotocepheus setiger* n. sp.; fig. 27.

Length about 0.73 mm. Colour dirty, light brown.

Propodosoma. The margin of the rostrum is hyaline. The rostral hairs are inserted laterally and cross in front of the tip of the rostrum. They are unilaterally dentate and taper towards the tip. The rostral hairs, situated on the end of the lamellae, are straight, thick, feathered to bushy, at the base less bushy, and reach for half their

length beyond the tip of the rostrum. The lamellae are low, almost parallel keels, which are proximally smooth, distally undulating. Between the lamellar hairs there is a ridge continuing laterally to the lateral border of the rostrum. The interlamellar hairs resemble the lamellar hairs. They are situated at a level a little in front of the pseudostigmata and their base is surrounded by a ring, which is most pronounced laterally. The pseudostigmata are small cups, which open laterally. The pseudostigmatic organs are short, spatulate, broadest distally and the head is set with coarse bristles. On the posterior border of the propodosoma there are four condyles of approximately the same size. The medial condyles are separated by a distance a little longer than the width of the condyles. Their medial border continues forwards as faint keels between which there is a furrow with faint pits. The integument of the propodosoma is decorated with deep round pits, anteriorly arranged in transverse rows, posteriorly in curved rows.

The hysterosoma is broadest across *ms*–*ms*. The posterior end is rounded, the anterior border slightly concave and set with four condyles. The two lateral condyles are rounded and protrude only slightly, whereas the two medial ones are short, angular and separated by a distance much shorter than that between the anterior medial condyles, fig. 27a. There are 10 pairs of notogastral hairs which are stiff, almost smooth in their proximal third, bushy to feathered distally, and equally long. There are five pairs of fissures. *Ia* is longitudinal, off *ta*. *Im* is transversally situated between *te* and *ti* but more laterally. *Ih* can be seen in front of *ms*, *ips* between *r3* and *p3*, and *ip* between *p3* and *p2*. The integument is decorated with small, irregularly scattered luminous dots.

Ventral side, fig. 27b. The sternum is well developed. Apodemata II and the sejugal apodemata are straight and parallel. Apodemata III do not reach the genital field. The epimeric hair formula is 3:1:4:2. The hairs are smooth; 1b, 1c, and 3b are longer than the others. The integument of the epimeres is pitted, medially with larger grooves. The genital field is separated from the anal field by a distance three and a half times the length of the genital field. It is the same light colour as its surroundings and the plates are smooth. There are three pairs of smooth genital hairs, the two anterior pairs being the longer. Also the aggenital hairs are smooth. The anal plates have parallel sides, the anal hairs being long and slightly barbed distally. The adanal hairs are a little thicker than the anal hairs and distinctly barbed in their distal half. *Ad3* are preanal. The two hairs are situated with the same mutual distance as *ad2*. *Ad1* are postanal and their mutual distance is shorter. *Iad* is almost parallel to the side of the anal field, a little distance from the latter. The integument of the ventral plate is decorated with small light dots between which the integument is densely punctate.

Legs. Coxa III with a feathered hair as long as the coxa and the femur together. Distally all femora have a broad, soft, feathered hair, fig. 27, the genus with a similar but shorter hair. Fig. 27c shows Tibia and Tarsus I.  
III (4: moss; dead leaves; moist, rotten branches).

## Oppiidae

*Quadroppia circumita* (Hammer).

*Oppia* — — — — —, 1961, p. 48, fig. 39.

II (1: moss on tree trunk), III (1: moist moss on the ground).

*Oppiella nova* (Oudms.).

*Oppia neerlandica* (Oudms.), Willmann, 1931 b, p. 128, fig. 132.

II (2: 2), III (11: 5).

*Oppiella polynesia* n. sp.; fig. 28.

Length about 0.205 mm. Colour light brown to brown.

Propodosoma. The rostral hairs are almost smooth, and situated on the dorsal surface but far laterally. In front of them can be seen a faint curved line. The very narrow lamellae converge for most of their length but are parallel in their distal third. There is a translamella and short cusps, which are square. Only the outer border of the lamellae is distinct. The lamellar hairs, which are directed medio-anteriorly, are shorter than their mutual distance. Off the cusps a distinct line runs obliquely forwards disappearing. The integument of the anterior part of the propodosoma is smooth. In the space within the lamellae there are anteriorly four square spots, besides some irregular spots laterally to the latter. In the posterior half there are round light spots arranged round a darker middle area. The interlamellar hairs, that are as long as the lamellar hairs, are situated off the posterior round spots. Behind the interlamellar hairs there are two oblong chitinous projections, almost reaching the anterior border of the hysterosoma. On its posterior border the pseudostigma has a tooth corresponding to a lateral tooth on the hysterosoma. The pseudostigmatic organs are spindle-shaped, the head pointed at the tip and the outer border set with 9–12 bristles as long as the width of the head, the proximal ones shorter.

The hysterosoma. On the anterior border there are two strong teeth, the inner margin of which proceed backwards as faint keels. Ta is situated medially to these teeth. The notogastral hairs are arranged as shown in fig. 28. They are strong, slightly pectinate. Ti, ms, and r2 are directed medially. The distance r1–r1 is only a little longer than p1–p1.

The ventral side is shown in fig. 28a. It shows no characteristic features.

This species closely resembles *Oppia bituberculata* Balogh, 1958, p. 15; 1961 b, p. 71, figs. 12–14, *Oppiella suramericana* (Hammer), 1958, p. 48, fig. 51, and *Oppia africana* Evans, 1953, p. 260, fig. 2. Both in *O. bituberculata* and in *O. africana* the integument in front of the lamellar region is finely pitted, in *O. suramericana* and in the present species it is smooth. *O. suramericana* has a semilunar chitinous plate immediately in front of the anterior border of the hysterosoma, but this is absent in *O. polynesia*. None of the three comparable species has the lines running forwards in front of the lamellae, nor the nicely decorated field between the lamellae.

II (9: moss on the trunk of a coconut palm).

*Oppia Winkleri* Hammer.

— — — — —, 1968, p. 56, fig. 76.

I (1: moist rotten leaves in a ditch).

*Oppia lanceosetoides* Hammer.

— — — — —, 1971, p. 25, fig. 25.

II (25: moist moss on dead branches).

*Striatoppia opuntiseta* Balogh & Mahunka; fig. 29.

— — — — —, 1968, p. 342, figs. 3–4.

The Tahitian specimen illustrated is 0.235 mm. long. Colour brown.

Although there are small differences between the type specimen from Indonesia and the specimen from Tahiti, especially concerning the development of the lamellae, which are much better developed in the Tahitian specimen, both specimens belong without any doubt to the same species. For this reason only a few features will be mentioned. Besides having stronger lamellae, on either side of the area with the four spots a ridge runs oblique to the lamella reaching the latter a little in front of the pseudostigma. The minute interlamellar hairs are situated between this ridge and the lateral border of the area with the four spots.

On the anterior border of the hysterosoma there are two rounded teeth on which *ta* is situated. The fissure *ia* can be seen immediately behind *ta*.

On the ventral side, fig. 29 a, a longitudinal ridge can be seen running across the fused epimeres III–IV. Medially to this ridge there is a feature resembling a split. The posterior border of the fused Epimeres III–IV partly covers the lateral border of the genital field. The length and the thickness of the hairs of the ventral side differ in the type and in the Tahitian specimen, but this may be due to the position of the hairs, erect or lying appressed. The epimeres are reticulate, the integument of the ventral plate densely punctate between the longitudinal lines running rather symmetrically on the two sides.

II (1: wet Cyperus meadow).

*Striatoppia lanceolata* n. sp.; fig. 30.

Length about 0.215 mm. Colour yellowish-light brown, usually dirty.

The present species is much like the preceding one and for that reason mainly the differences will be mentioned. The lamellar hairs are lanceolate, narrow at the base, pointed distally. They are set with tiny bristles. The interlamellar hairs are tiny as in the preceding species and are situated similarly. The integument within the space of the lamellae, and on the long keels with the rostral hairs, is longitudinally striated and the lines are set with small dark tubercles.

On either side of the anterior border of the hysterosoma there is a small rounded tubercle on which is situated *ta*, that is brush-shaped and directed forwards. The remaining notogastral hairs are lanceolate like the lamellar hairs. Those on the po-

sterior border are smaller. Issuing from the anterior border of the hysterosoma, a few lines run backwards for a short distance.

The ventral side is shown in fig. 30a. Epimeres I are separated by a broad sternal plate, Epimeres II and the fused Epimeres III–IV are separated by a narrow ridge only. Apodemata II are narrow, the sejugal apodemata very broad. The epimeric hairs are short, some of them lanceolate. The epimeres are bordered by lateral ridges as is also the case in the preceding species. The longitudinal ridge in the fused Epimeres III–IV is short. From this ridge a thin line runs backwards to the posterior border of the epimeres. The epimeres are reticulate. The distance ad3–ad3 is much longer than in the preceding species. There are a few lines only on the ventral plate, all of them issuing near the genital field.

This species is related to *S. papillata*, Balogh & Mahunka, 1966, p. 32, figs. 15–16, Brazzaville-Congo. However, the latter does not have the two distinct keels on the propodosoma with the rostral hairs, and the lamellae are only faintly developed. Also the ventral side shows differences. Thus the short longitudinal ridge in Epimeres III–IV is absent and the hair b3, which is lanceolate and situated on this ridge, is displaced laterally and is very thin in *S. papillata*. On the ventral plate there are many irregularly running lines.

I (59: 13), II (3: 3), III (1).

*Multioppia wilsoni* Aoki.

— — —, 1964a, p. 652, figs. 6–8.

I (5: moist Cyperus vegetation in the park).

*Multioppia gracilis* n. sp.; fig. 31.

Length about 0.335 mm. Colour light brown.

The rostral hairs are barbed proximally, the distal part smooth and bent medio-ventrally. The lamellar hairs are situated on the end of two strongly converging lamellae of which, only the distal part is developed. These hairs are smooth and shorter than their mutual distance. The interlamellar hairs, which are directed upwards, are perhaps a little longer than the lamellar hairs and also smooth. The three pairs of light spots between the interlamellar hairs are of different width, the middle one being broadest, and having the shortest mutual distance. The three from each row are situated closely together. The exopseudostigmatic hairs are slightly barbed and situated on low tubercles. The pseudostigmatic organ differs from that of most other species within the genus by its very long and slender secondary branches on a thin stalk (hence the specific name). From fig. 31 a, b it can be seen that there are four long branches on the posterior border, slightly decreasing in length towards the distal end of the organ and 4–5 short ones on the anterior border. The proximal one is as long as the stalk. The latter is a little broader off the long branches.





## Suctobelbidae

*Suctobelba variosetosa* Hammer.

— — —, 1961, p. 43, fig. 35.

I (31: mouldering leaves on a lawn), II (5: 4).

*Suctobelba semiplumosa* Bal. & Mah., var. *tahitiensis* n. var.; fig. 33.

— — —, 1967, p. 48, figs. 27–28, Vietnam; o. 1825 mm long.

Length about 0.205 mm. Colour very light brown.

The specimens from Tahiti resemble the type from Vietnam in most characteristic, viz. by the proportionately long propodosoma, the long tectopedial field and the space between the latter, the two long projecting rostral teeth (which for the variety can be seen in fig. 33a), the very coarse proximal part of the rostral hairs, the closed lamellar knob, the large interpseudostigmatic ridges, and the long, barbed pseudostigmatic organs. BALOGH & MAHUNKA neither mention nor illustrate the well developed lamellae.

The variety differs in the shape of the median teeth on the anterior border of the hysterosoma. They are strong, triangular and not "semicircular, short". Of the notogastral hairs only two are feathered, besides the short ones on the posterior border, viz. r2 and r1. R2, which is the thickest, is directed medio-posteriorly. The remaining hairs appear smooth or perhaps slightly uneven. BALOGH & MAHUNKA write "others smooth or hardly ciliate" but ti, ms, and r3 are shown distinctly feathered leaving only ta and te smooth.

The ventral side agrees with that of the main form. All the hairs of the ventral plate are rather long and all except ad1 are directed medially. Ad1 are situated off the latero-posterior corner of the anal field. The two posterior genital hairs are situated closely together.

III (2: moist Leucobryum).

*Suctobelba insulana* n. sp.; fig. 34.

Length about 0.175 mm. Colour light brown.

The propodosoma is short as compared to the hysterosoma. The rostrum protrudes slightly and appears broad due to the broad apical lobe. There are two almost equally long rostral teeth, separated by an incision, which is rounded at the bottom, fig. 34a. Behind the teeth there is a slit. The tectopedial field is short, and its outer border is smooth without tubercles. There are no tubercles in the space between the tectopedial fields. The lamellar knob is pointed anteriorly, closed posteriorly. The lamellae are short, not fully reaching the lamellar knob. Each lamella has two small tubercles corresponding to similar tubercles on the posterior border of the tectopedial field. The interpseudostigmatic ridges, situated close to the pseudostigmata, are large, ending posteriorly in a small lobe opposite the medial tooth of the hysterosoma. The pseudostigmatic organs are very long, their end tapering to a thin tip. Most of the head is set with numerous, short bristles. Exopseudostigmatic hair was not observed.

The hysterosoma has four equally strong teeth, all proceeding for some distance backwards as faint keels. The 9 pairs of notogastral hairs are all smooth. Apart from those on the posterior border most are long and strong. Many of them are situated unusually far medially, this applies especially to r3 and r2. The mutual distance of r2 is only a little longer than that of r1.

Ventral side, fig. 34b. The sternal plate is dilated between Apodemata II, and still more between the sejugal apodemata, narrow between the fused Epimeres III–IV. The latter are surrounded by a chitinous ring, which does not reach the sternal plate. There are six genital hairs, of which the two anterior ones are very long and directed forwards. The aggenital hairs, and ad3, ad2 are long and directed medially. Ad1, situated on the latero-posterior corner of the anal field, is directed posteriorly. II (1: thin moss on the ground in deep shade), III (1: moist moss on the ground).

*Suctobelbila dentata* (Hammer).

*Rhyncobella* – – , 1961, p. 46, fig. 37.

I (10: dead leaves on a lawn), II (10: wet Cyperus meadow).

*Suctobelbila squamosa* (Hammer) var. *scutata* n. var.; fig. 35.

*Rhyncobella* – – , 1961, p. 47, fig. 38.

Length about 0.16 mm. Colour light brown.

The variety differs from the main form primarily by the shape of the anterior part of the notogaster being shield-shaped (hence the variety name). Two long keels run from the latero-anterior border of the hysterosoma medio-posteriorly forming faintly protruding shoulders. The variety has, moreover, very distinct notogastral alveoli, surrounded especially laterally by strong ridges. In profile they appear like tubercles or embossments. The notogastral hairs are partly situated within these alveoli. Only 9 pairs could be seen, the anterior one being absent or impossible to see. The sculpture of the hysterosoma consists of irregular scales arranged in irregular rows.

The sculpture of the propodosoma is much like that of the main form, but the dark scales are arranged in regular, transverse rows. No rostral teeth were observed. The lamellar hairs are absent, their pores situated closely together between two dark, rounded scales. The interlamellar hair pores can be seen on the posterior ridge near the pseudostigmata.

Remarks. I am a little in doubt whether the only specimen found represents a separate species or a variety as described above. The notogaster in *S. squamosa* is embossed, which can be seen in HAMMER, 1961, fig. 38, 38b, although not to the same degree as shown for the variety. BALOGH, 1968, p. 268, figs. 41–44, has established two new species from New Guinea, without teeth on the anterior border of the hysterosoma, based especially on the number of tubercles or embossments on the notogaster, but without showing details of the propodosoma. As long as we do not know how much the structure of the propodosoma and of the notogaster varies it is perhaps too early to establish too many new species.

II (1: Cyperus vegetation beneath a hedge).

## Hydrozetidae

*Hydrozetes lemnae* (de Coggi).

— — — — —, Grandjean 1948, p. 328, figs. 2–3.  
I (7: brook in the park), II (128: moss in oozing water).

## Tectocephidae

*Tectocephus velatus* (Michael).

*Tegeocranus* — — — — —, 1884, p. 313, plate 21, figs. 9–15.  
I (numerous: 17), II (56: 8), III (11: 7).

## Cymbaeremaeidae

*Scapheremaeus bicornutus* Hammer.

— — — — —, 1971, p. 30, fig. 32.  
I (1: rotten leaves on a lawn).

## Licneremaeidae

*Licneremaeus polygonalis* Hammer.

— — — — —, 1971, p. 29, fig. 31.  
II (1: moss on dead branches), III (2: dead branches), IV (8: rotten leaves).

## Eutegaeidae

*Eutegaeus biovatus* n. sp.; fig. 36.

Length about 0.82 mm. Colour mahogany red.

The cusps project for a good distance beyond the tip of the rostrum. The latter is rounded. The rostral hairs, situated on low apophyses, are short, thick and apparently smooth. They are bent ventrally. The distal fourth of the lamellae bends slightly downwards along a rather sharp crest issuing near the medio anterior border of the lamellae and running obliquely forwards and laterally. The cusps are broader than the lamellae leaving a rather narrow space between them. In this space the tip of the rostrum can be seen. The cusps are evenly rounded laterally, their lateral border ending in a strong tooth, their medial border in a much more pointed tooth, directed medially. The lamellar hairs are thick, serrate and strongly curled into a sling. The interlamellar hairs are situated on the anterior border of two bent ridges forming the anterior end of two ovals. The posterior border of the ovals is composed of two short semilunar ridges. The anterior and the posterior ridges are connected by indistinct lines, thus forming two oval areas (*biovatus*), which are a slightly lighter colour than the surroundings. The interlamellar hairs are rather short, directed forwards, their tip medially. The pseudostigmatic organ is clavate, broadest distally and set with minute bristles. It almost reaches the lateral border of the forwards directed projection from the hysterosoma.

The hysterosoma is a little broader than long. The forwards directed projections have parallel sides, their tips are rounded although a little flattened laterally. On their ventral border there is a small finger-like distal tip. An indentation can be seen in the lateral border at the transition between the projections and the sides of the hysterosoma. There are five pairs of equally long and thick notogastral hairs situated more or less in two rows parallel to the sides of the hysterosoma. On the posterior border there are three pairs, viz. two stiff hairs, r1 in the middle situated on two small tubercles and on either sides of these two very short and fine hairs, p1 and p2. P3 was not observed. All the hairs are smooth.

The ventral side was not studied as it is in poor condition and most of the hairs are missing.

This species can be distinguished from *E. papuensis* (Aoki 1964b, p. 301, figs. 1–11), with which it is closest related of the species described so far, by its pointed lamellar teeth, its strongly curled lamellar hairs, the narrow space between the cusps, the two ovals behind the interlamellar hairs, and the longer club-shaped pseudostigmatic organ.

III (5: moist moss on the ground; moss on a rotten tree stump).

#### Microzetidae

*Microzetes auxiliaris* Grandjean.

— — —, 1936, p. 138, figs. 1–4.

I (6: rotten leaves), II (1: moss on a coconut palm trunk), III (5: dry moss).

#### Pelopsidae

*Eupelops tahitiensis* n. sp.; fig. 37.

Length about 0.50 mm. Colour brown.

The tip of the rostrum is rounded; the longitudinal furrow in the rostrum widens anteriorly. The lamellae are apparently narrow, vertical blades with a horizontal medial part connecting the lateral parts. I am, however, not sure that the structure has been interpreted correctly. The cusps, which are almost as long as the lamellae, are very narrow and pointed, their tips lying close to the rostrum. The lamellar hairs, situated a good distance behind the tip of the cusps on the ventral side of the latter, are almost as long as the lamellae. They are densely barbed. In front of the indistinct translamellar line there is a forwards directed tip. There is a very long, slightly uneven hair (the rostral hair?) laterally to the interlamellar hair, disappearing under the pseudostigmatic organ. It reaches as far forwards as the lamellar hair. The pseudostigmatic organs are slightly thicker in their distal half. Tectopedium I is dark brown and has a keel on its outer side.

The hysterosoma is seen in an oblique view in fig 37 and for that reason it appears too short. No layer of secretion. The anterior projection between the pseudostigmata is slightly concave at the middle. The notogastral hairs are short, approxi-

mately equally long, slightly curved, uneven, and almost equally thick throughout. I2 and s3 are situated close together. Medially to i1 there is a small pore. R2 and r3 cannot be seen due to the oblique position of the mite.

The legs. Tibia I has a lateral, almost smooth, sword-like spine, Tarsus II and Tibia II a similar lateral spine, the largest one on the tarsus. All the tarsi are tridactylous.

II (8: wet moss; moist Cyperus vegetation; Cyperus and red clover).

*Eupelops crassus* n. sp.; fig. 38.

Length about 0.70 mm. Colour mahogany red.

The tip of the rostrum projects as far forwards as the tip of the lamellae. The latter are very broad, strongly chitinized and have broad cusps. The medial border of the cusps is evenly rounded, in its lateral border there is an incurvation thus forming an outwards directed tooth. The lamellar hairs, situated on the ventral side of the cusps at a good distance from the tip, are very coarse, thick, and bushy. They are directed obliquely forwards and medially, fig. 38a. The rostral hairs, seen in fig. 38a, are longer than the lamellar hairs, equally thick throughout, and uneven or finely barbed. The translamella is broad. The interlamellar hairs are of the usual shape, hyaline, broad, and set with cilia. The pseudostigmatic organs are fusiform and reach the lamellar hairs.

The hysterosoma. The broad anterior projection is slightly concave, its sides sloping rather steeply to the anterior border of the pteromorphae, but without pronounced lateral lobes. The notogastral hairs are thin, stiff, clear, slightly serrate spines. S1, s2, and s3 are situated along the side near the pteromorphae, s4 in the posterior end. Not all the hairs could be seen.

The legs. Tarsus II has a strong, serrate, lateral spine, Tarsus I a much thinner one. Tibiae I–II have a spine similar to that of Tarsus II. Monodactylous, the claw with a tiny secondary inner tooth near its base.

III (30: dead leaves).

*Eupelops polynesius* n. sp.; fig. 39.

Length about 0.49 mm. Colour mahogany red.

As in the preceding species the lamellae are very strong. The tip of the cusps are bent medially, almost forming a ring round the very narrow rostrum. The latter projects for a good distance beyond the cusps. Its tip is pointed. On the tip of the cusps there is a small clear spine behind which the lamellar hair is inserted, fig. 39a. The latter is equally thick throughout and finely barbed. It is directed straight forwards and reaches almost to the tip of the rostrum. The rostral hairs resemble the lamellar hairs, but are longer, and run parallel to the lamellar hairs. The interlamellar hairs are very short (broken?) and do not reach beyond the cusps. The pseudostigmatic organ is densely set with bristles, and slightly thicker in its distal half.

The hysterosoma. The anterior projection is slightly concave at the middle with low rounded lateral corners. The notogastral hairs are thin, stiff, and hyaline. They are arranged as in the preceding species.

The legs. Tarsus II has a short serrate lateral spine, Tarsus I a much tinner spine. Tibiae I–II have a lateral spine as strong as that of Tarsus II. Tarsus III has two branched spines. Genu and Tibia IV each with a short, almost smooth, distal spine. Monodactylous.

III (3: moss; dead leaves).

#### Oribatellidae

*Lamellobates palustris* Hammer.

— — —, 1958, p. 100, fig. 124.

I (very common: 31), III (8: 4), IV (3: 2).

*Eremaeozetes tuberculatus* Berlese.

— — —, 1913, p. 92, plate VI, fig. 63.

I (2: clover, grass in a lawn; dead leaves, bark, branches on a lawn).

#### Galumnidae

*Galumna flabellifera* Hammer.

— — —, 1958, p. 93, fig. 116.

I (102: 15), II (11: 2), III (10: 2).

*Galumna pterolineata* n. sp.; fig. 40.

Length about 0.60 mm. Colour light brown (young individual).

The rostrum is rounded distally. The rostral hairs, situated on the ventral surface, fig. 40 a, are straight and barbed. They reach only a little beyond the tip of the rostrum. The lamellar hairs are stronger than the rostral hairs, and are unilaterally barbed. They follow the outline of rostrum and reach the tip of the latter. The interlamellar hairs are as thick and as long as the rostral hairs, but are almost equally thick throughout, not thin at the tip as the lamellar hairs. The lamellae are indistinct, the sublamella well developed. The integument of the propodosoma is very finely wrinkled, but perhaps this pattern can only be seen because a young individual is illustrated. Behind a line a little in front of the interlamellar hairs the wrinkles are less dense. The pseudostigmatic organs are thin setae, densely barbed in their distal two thirds.

The hysterosoma is not separated from the propodosoma by a dorso-sejugal line, not even by a different colour or another pattern as the thin wrinkles can be seen as far as Aa. The pteromorphae have distinct narrow yellow ribs with a rough surface (hence the specific name). The areae porosae are not well defined probably due to the youth of the individual. For this reason it is difficult to see the exact shape of the areae porosae. Aa and A1 are approximately of the same size and round. A2 is absent.

A3 is oblong, but as large as Aa and A1. The hair pores are arranged as shown in fig. 40. No hairs were observed.

The ventral side is shown in fig. 40a. The three anterior apodemata are short chitinous ridges. Apodemata IV are absent. The epimeric hair formula is 1:0:2:2. All the hairs are long and barbed. The hairs issue from a small pore situated in the close vicinity of a much larger pore, fig. 40b, which shows 4a. Only five pairs of genital hairs can be seen. The two anterior ones are long, thin, and barbed, the others shorter and apparently smooth. The aggenital, anal, and adanal hairs are minute. No area porosa postanalis was observed. All the tarsi are tridactylous, the middle claw being only twice as strong as the lateral claws.

III (9: moist Casuarina needles; moist rotten leaves and grass).

*Galumna imperfecta* n. sp.; fig. 41.

Length about 0.64 mm. Colour reddish to mahogany red in a broad belt in front of A1.

Only one specimen was found of this very characteristic *Galumna* and unfortunately the left pseudostigmatic organ is missing and the tip of the right one apparently broken. Nevertheless it will be established as a new species, as probably it cannot be taken for any other species. The tip of the rostrum is pointed and on either side between the tip of the rostrum and the lamellar hair there is a deep incurvation. The rostral hairs are long, thin, finely serrate, and curved. The lamellar hairs are very thin but can be easily seen. They are situated between lamella and sublamella. The lamella is S-shaped and reaches halfway to the interlamellar hair. The latter is minute. The areae porosae dorso-sejugales are long and narrow. The pseudostigmatic organ bent at right angles a short distance outside the pseudostigma. The stalk is strong becoming a little thicker towards the end, which apparently is missing.

The hysterosoma is separated from the propodosoma by an indistinct dorso-sejugal line. The hysterosoma is broadly rounded posteriorly, much narrower at the anterior end. On the pteromorphae, which are light brown, fine ribs can be seen. Aa is very large, T-shaped. Its posterior part along the side of the hysterosoma is long and narrow, its anterior part shorter, irregular and with a dilatation medially. The part directed medially and slightly backwards is shorter than the latero-posterior part. A1 is oblong, A2 also oblong and a little longer than A1. A3 is twice as long as A1. The hair-pores are arranged as shown in fig. 41. Im, which is very indistinct, is situated in front of A1, the gland laterally to r3. P2 and p3 were not observed. There is an indistinct median pore in the notogaster.

Ventral side, fig. 41a. The three anterior apodemata are narrow ridges. Apodema II is rather short, the sejugal apodema longer and narrower, and Apodema III is angle-bent. Apodema IV is absent. Of the epimeric hairs 1a, 3a, and 4a only were observed. The six pairs of genital hairs, the aggenital hairs, the anal hairs, and the adanal hairs are all minute. Iad is situated in front of ad3 removed from the anal field. All the tarsi are tridactylous, the middle claw only twice as strong as the lateral claws. III (1: moss on dead branches).



*Galumna* sp.; fig. 42.

Length approximately 0.42 mm. Colour light brown.

The only specimen found is subfossil and furthermore crushed. The rostrum is triangular. The rostral hairs, which are situated ventrally and cross in front of the tip of the rostrum, are thin and barbed. The lamellar hairs, situated immediately laterally to the lamellae, have a smooth sharp tooth at their base. They are thinner than the rostral hairs and uneven. The interlamellar hairs, which are equally thick throughout, are short, rather strong and barbed. They are directed medially. The pseudostigmatic organs have a very thin lanceolate head on a very thin stalk.

The hysterosoma and the propodosoma are not separated by a dorso-sejugal line. The hysterosoma is broadly rounded at its posterior end. Aa is situated near the side of the hysterosoma. It is round. A1 and A2 are smaller and round, too; A3 perhaps a little larger than the two former. Im was not observed. The notogastral hair pores are arranged as shown in fig. 42. P1 and p2 could not be seen. In front of the pore of ta there are two smaller pores, fig. 42a. The same applies to all the notogastral pores.

Ventral side. There are six pairs of genital hairs. Iad is situated close to the anal field. All tarsi are tridactylous, the claws are almost equally strong.

I (1: moist bark on the lawn in the park).

*Acrogalumna abrupta* n. sp.; fig. 43.

Length about 0.395 mm. Colour light brown, being darkest in front of the interlamellar hairs and in a broad belt across the hysterosoma between Aa and A1.

The rostrum projects a little and the strong, barbed rostral hairs do not reach far beyond the tip of the rostrum. The very thin lamellar hairs can be seen in front of the tip of the sublamellae. The interlamellar hairs, which are longer than their mutual distance, the latter being short, are equally thick throughout, barbed, and slightly curved, the tip directed outwards. The interlamellar hairs are situated at the anterior end of a long, light, curved line, the two lines, one from either side, together forming a huge arch, which is broken (*abrupta*) in the middle between the interlamellar hairs. The pseudostigmatic organs are filiform, finely barbed distally.

The hysterosoma and the propodosoma are not separated by a dorso-sejugal line. The hysterosoma is broadest across the middle, the posterior end being slightly pointed. The fissure on the pteromorphae is very distinct and from its medial end a strong chitinous band runs forwards. Aa is removed from the side of the hysterosoma. It is round or slightly oval. A1 is oblong and situated longitudinally. It is as big as Aa. A3 is narrow and the smallest, A2 being absent. The fissure im, situated immediately in front of A1, is very distinct. The hair pores are arranged as shown in fig. 43. Small dark scales can be seen laterally on the dorsal surface of the anterior part of the hysterosoma.

The ventral side seen slightly obliquely is shown in fig. 43a. The epimeres are very light, almost whitish. The hair 1a is strong, smooth, and longer than the others. The six genital hairs and the two anal hairs are alike, rather long and smooth. Aggenital

hairs were not observed. The same holds good for ad1 and ad2. Ad3 is minute. All the tarsi are tridactylous with thin lateral claws.

III (56: 11, mostly in moss on the ground).

*Acrogalumna ventralis* (Willmann); fig. 44.

*Galumna* — — — — —, 1931 a, p. 284, figs. 67–68.

Length about 0.36 mm. Colour light brown, darker in a belt across the hysterosoma between Aa and A1.

The rostrum is rounded distally. The rostral hairs are thin and slightly uneven. They almost reach the tip of the rostrum. The lamellar and the interlamellar hairs are hardly discernible, but they can be seen on a sketch, fig. 44 a, of the lateral side of the propodosoma. Lamellae are absent. The area porosa dorso-sejugal is small, oblong. The pseudostigmatic organ has a broad, greyish fan on the end of a long, thin stalk. The anterior border of the head is rounded, the posterior border straight and its end tapers into a pointed tip, fig. 44 b.

There is no dorso-sejugal line separating the propodosoma and the hysterosoma. The latter is broadest across the middle. The pteromorphae are a lighter colour in their anterior half, a darker in their posterior half. Ta is long. Aa is oblong and is situated obliquely to the side of the hysterosoma. A1 is round and almost as large as Aa. A2 is only half as large as A1. It is situated within a short distance from A1. A3 is approximately as large as A1. The fissure im is very indistinct, and found at some distance behind Aa. The hair pores are arranged as shown in fig. 44. On the posterior border p1, p2, and p3 can be seen in profile.

Ventral side, fig. 44 c. Epimeres I–II are yellow. Apodemata II and the sejugal apodemata are dark ridges, the latter are bent at right angles. Apodemata III–IV are absent. The epimeric hair formula is 1:0:1:1. All hairs are absent on the ventral side. There are six pairs of genital hair pores. Iad is situated rather close to the side of the anal field in front of ad3. There is a small round area porosa postanal.

All the tarsi are tridactylous. The middle claw is strong, the lateral claws are much thinner.

II (1: crumbling braken), III (1: Casuarina needles).

WILLMANN described this species from Sumatra. He named it *ventralis* due to the coxal region forming a solid plate with a few fainter chitinized holes. In the specimen from Tahiti illustrated in fig. 44 c, the posterior half of the ventral side from the anterior border of the genital field is a darker colour than the coxal region, i.e. the opposite of WILLMANN'S observation.

?*Pergalumna dubitanda* n. sp.; fig. 45.

Length about 0.74 mm. Colour mahogany red.

The rostrum is very broad at the tip. The rostral hairs are situated ventrally. They are as long as the lamellar hairs. Both pairs are strong and unilaterally barbed. They all nearly meet at a short distance in front of the tip of the rostrum. The lamellar

hairs are situated at a short distance medially to the lamellae, which are faint lines seen in a lateral view. The interlamellar hairs, which are about half as long as their mutual distance, are equally thick throughout and serrate or finely barbed. No area porosa dorso-sejugal is observed. The pseudostigmatic organs are filiform, barbed in their distal two thirds.

The hysterosoma and the propodosoma are not separated by a dorso-sejugal line. The posterior half of the hysterosoma is broad, semicircular. The pteromorphae are a light brown colour and have strong dark ribs. There is no actual fissure, in its place there is only a dark irregular chitinous rib. For this reason I am uncertain where to place this species in the system (dubitanda-doubtful). The areae porosae are very indistinct. Aa is apparently broadest medially. A1 is round and a little smaller than Aa. A3 is oblong and as large as A1. A2 is absent. The arrangement of the hairs can be seen from fig. 45. P1–p3 were not observed.

The ventral side, fig. 45 a. Apodemata II, the sejugal apodemata, and Apodemata III are short undulating ridges. Apodemata IV are absent. The epimeric hair formula is 1:0:2:1, 1a being the longest. They are barbed. Only five genital hairs could be seen on each plate. The two anterior hairs are very long, the others shorter, all are distinctly barbed. The aggenital hairs are as long as the posterior genital hairs, and also barbed.

In fig. 45a the anal hairs are situated very asymmetrically; on the right plate there is only one hair, on the left two close together. Iad is adjacent to the lateral border of the anal field. No area porosa postanal is observed. All the tarsi are tridactylous, the middle one being only a little stronger than the lateral ones. III (3: moss on the ground).

*Pergalumna bifissurata* n. sp.; fig. 46.

Length about 0.62 mm. Colour mahogany red.

The tip of the rostrum is very pointed forming a small sharp point, at the end of which the rostral hairs meet. The latter are rather thin and finely barbed. The lamellar hairs resemble the rostral hairs, fig. 46 a. Interlamellar hairs are absent. The area porosa dorso-sejugal is a small, bright spot on a dark ground. The pseudostigmatic organs are filiform, strongly barbed in their distal two thirds.

The hysterosoma and the propodosoma are not separated by a dorso-sejugal line. The posterior border of the hysterosoma is slightly undulating. On the pteromorphae there are two large light spots resembling fissures (hence the specific name), i.e. one in continuation of the fissure and another further anteriorly. Both are broadest distally and bordered by darker ridges. Ta is situated between them. Aa is round, removed a good distance from the side of the hysterosoma. A1 is more or less semicircular, rounded medially, and slightly concave or straight laterally. A1 is a little longer than Aa. A3 is round and almost as large as Aa. The notogastral hairs are arranged as shown in fig. 46. In front of Aa 4–6 bright holes can be seen.

The ventral side, fig. 46b. Apodemata II and the sejugal apodemata are rather long, undulating ridges, Apodemata III much shorter and thinner. Apodemata IV are absent. The epimeric hair formula is 1:0:2:1. All the hairs are very short and thin. There are six pairs of genital hairs. The posterior hair and the aggenital hair are not discernible. Ad3 is situated off iad, which is close to the side of the anal field. Ad1 and ad2 are postanal, the distance ad1-ad1 being a little shorter than ad1-ad2. The area porosa postanal is very indistinct and might be questionable. All the tarsi are tridactylous, the middle claw being much stronger than the lateral ones. II (14: wet Cyperus meadow; wet moss on a wall; moist leaves in a ditch).

*Pergalumna montana* n. sp.; fig. 47.

Length about 0.40 mm. Colour light brown, darker in a belt across the hysterosoma between Aa and A1.

The rostrum is conical. Rostral hairs were not observed. The lamellar hairs, situated at a slightly higher level than the tip of the rostrum, almost meet in front of the latter. They are unilaterally barbed. Interlamellar hairs are absent. The lamella and the sublamella are almost parallel, see the sketch, fig. 47a. The pseudostigmatic organs are filiform and very thin. They are directed backwards in an elegant curve. Their distal half is very finely ciliate. The integument of the propodosoma is smooth. No area porosa dorso-sejugal is.

The propodosoma and the hysterosoma are not separated by a dorso-sejugal suture. The propodosoma is, however, a slightly darker colour than the anterior part of the hysterosoma, which is a yellowish colour. On either side of the hysterosoma there is a thin line running from the anterior gland backwards parallel to the sides of the hysterosoma. From the fissure in the pteromorphae a chitinous band continues forwards disappearing along the anterior border of the pteromorphae. There is no characteristic pattern or ribs on the pteromorphae. Ia is unusually long. Aa is rounded, A1 slightly oblong and considerably larger than Aa. A2 is absent. A3 is the smallest. The arrangement of the hair pores can be seen in fig. 47. P3 was not observed. Im is situated at a short distance in front of A1. In the anterior part of the hysterosoma there are small dark scales, arranged especially round Aa.

The ventral side, fig. 47b, is faintly chitinized. Two pairs of light alveoli can be seen in front of the genital field. Only a few epimeric hairs are present, Ia being the longest. Apodemata II and the sejugal apodemata are long and narrow; Apodemata III shorter, its medial part situated longitudinally. On either side of the genital field a thin line runs latero-posteriorly to the insertion of Leg IV. There are six pairs of genital hairs. They are bent at right angles outside the pore. Ad3 is situated off the side of the anal field, in front of iad. Ad2 and ad1 are postanal. The adanal hairs are short and apparently finely barbed. No area porosa postanal. All the tarsi have three claws.

III (1: dead leaves).

*Leptogalumna ciliata* Balogh; fig. 48.

— — —, 1960, p. 32, figs. 38–40.

Length about 0.32 mm. Colour light brown.

The Tahitian specimens differ from the type from Angola in only a few characteristics, which are of no great importance. Thus it is larger, the type being 0.286 mm long. The cilia of the pseudostigmatic organs are longer, almost as long as the diameter of Aa. Im on the right side is round and as large as A1. The latter is smaller than A2 and A3. In the type A1 is larger than A2 and A3. Furthermore an area porosa dorso-sejugalis can be seen behind the interlamellar hair. On the pteromorphae there is a long V-shaped white spot, on the lateral branch of which ta is situated. The ventral side agrees with that of the type (fig. 40).

II (2: wet Cyperus meadow).

#### Haplozetidae

*Peloribates rangiroaensis* n. sp.; fig. 49.

Length about 0.375 mm. Colour clear brown.

Apart from the slightly protruding rostrum the propodosoma is triangular. The rostral hairs, situated in front of a sharp free tip of the tutorium, are unilaterally barbed, strong and reach a little beyond the tip of the rostrum. The lamellae are very broad and project beyond the sides of the propodosoma. The lamellar hairs are very long and reach beyond the tip of the rostrum. They are thin and barbed. The interlamellar hairs, situated very close to the anterior border of the hysterosoma, are a little shorter than the lamellar hairs, barbed, and thin. The pseudostigmata are half covered by the border of the hysterosoma. The pseudostigmatic organs are short, club-shaped, the head set with stiff bristles. Their stalk is 3–4 times longer than the head. The sculpture of the propodosoma consists of light pits increasing in size towards the posterior end of the propodosoma. The tip of the rostrum in front of a faint transverse line is smooth.

The anterior margin of the hysterosoma is convex, whereas the anterior border of the pteromorphae is concave with a small swelling immediately behind the pseudostigmata. The 14 pairs of notogastral hairs are alike apart from c2, which is a trifle longer. They are very coarse, equally thick throughout, dull at the tip and all the way set with upstanding stiff bristles, which are shorter at the base of the hair. The distances c1–c1, da–da, h2–h2, and h1–h1 are approximately equally long, dm–dm a little longer. Lm–lm, lp–lp, and h3–h3 are equally long. Ps3, lp, and dp are situated in a broad though slightly irregular curve; h3, h2 form another curve. There are four pairs of sacculi, viz. Sa laterally to lm, S1 medially to lp, S2 laterally to h3, and S3 laterally to h1. The sculpture of the hysterosoma consists of round, regular, light pits, arranged in undulating rows.

The ventral side, fig. 49a. The sternal plate is faintly chitinized, its posterior end clasping the anterior part of the genital field. Apodemata II, the sejugal apodemata,

and Apodemata III are narrow, almost parallel ridges, the anterior with a medial knot. The epimeric hairs are smooth, 1b, 3b, and 4b longer than the others. The genital field is separated from the anal field by a distance twice its length. There are five pairs of genital hairs, all of them situated along the outer border with the same distance between them. One pair of rather long aggenital hairs. Two pairs of anal hairs, and three pairs of adanal hairs. The latter are situated rather close to the anal field, ad3 at the latero-anterior corner, ad2 more or less at the latero-posterior corner, and ad1 postanal. They are apparently smooth. Iad is parallel to the side of the anal field. The sculpture of the ventral plate consists of round, light pits, also seen on the sternal plate. The genital plates are smooth, whereas the anal plates are decorated with very small, irregular dots.

Femur II has a very broad, pitted ventral keel. All the tarsi are tridactylous, the middle claw being the thickest.

IV (21: moist, dead leaves).

*Xylobates capucinus* (Berlese).

*Protoribates* – – , 1908, p. 2.

I (1: wet *Cyperus* vegetation), II (11: wet moss and dead leaves).

*Xylobates seminudus* Hammer.

– – – , 1971, p. 38, fig. 44.

I (1: *Cyperus* vegetation on the bank of a brook), II (11: *Cyperus* vegetation on the road side).

*Xylobates bipilus* n. sp.; fig. 50.

Length about 0.75 mm. Colour light brown.

The anterior margin of the rostrum is hyaline. It projects beyond a well chitinized border with a short incision in the middle. The rostral hairs, which are as long as their mutual distance, are barbed and directed straight forwards. The lamellar hairs, situated on the rounded tip of the lamellae, are for most of their length very strong, the tip, however, very thin. They are scattered barbed or serrate and appear almost smooth. They cross in front of the rostrum. The interlamellar hairs resemble the lamellar hairs. The lamellae are vertical blades, their tip directed slightly medially. Their medial border seems to proceed to the rostral hair. The pseudostigmatic organs are almost as long as the interlamellar hairs. They are slender, thicker in their posterior third, with a thin tip, and set with cilia on the distal two thirds of their anterior border.

In the anterior border of the hysterosoma there are two incurvations, viz. one behind the pseudostigma and another further laterally. The latero-anterior tip of the pteromorpha projects and its distal triangular tip is bent ventrally. In a dorsal view the pteromorphae are strongly undulating with an anterior incurvation and a posterior bulge, the hysterosoma thus being broadest across Aa–Aa. Notogastral hairs are absent. The arrangement of the hair pores is seen in fig. 50. Ms, which within this genus

is usually situated close to A1, is displaced more medially. Aa and A3 are larger than A1 and A2, which are situated with almost the same mutual distance, i.e. A1 rather laterally. There are five genital hairs.

Ad1 are seen in a dorsal view and are much longer than ad2, ad1 being the only hairs seen in a dorsal view (hence the specific name). This species can be distinguished by the undulating lateral border of its hysterosoma, the position of the areae porosae, and the two long ad1. Tridactylous.

I (1: Cyperus vegetation in the park).

*Xylobates rhomboides* n. sp.; fig. 51.

Length about 0.76 mm. Colour light brown.

The tip of the rostrum is more or less truncate. The rostral, the lamellar and the interlamellar hairs are scattered barbed and rather thin. The latter two are equally long. The lamellae are broad; their medial part seems to be at a lower level than their lateral part. The pseudostigmatic organs are very delicate. The stalk is very thin, becoming gradually slightly thicker towards the end, which tapers into a very thin tip, fig. 57 a. On their anterior border there are about 11 to 12 cilia, the distal ones upstanding, the proximal ones appressed.

The hysterosoma. The anterior border of the hysterosoma is almost straight and the pteromorphae do not project beyond this border. The pteromorphae are long and reach im. On either side of the hysterosoma there is a rhomboid spot, situated laterally and in front of Aa. From its border fine lines radiate posterially and laterally but not medially. The spot is a light colour, its border dark. Along the medial border of the pteromorphae the integument is densely punctate. All the areae porosae are surrounded by a very distinct ring. Aa is the largest, A2 and A3 are equally large, and A1 the smallest. The distance A1–A1 is only a little longer than A3–A3. The 10 pairs of notogastral hairs are arranged as shown in fig. 51. Beside each pore there is a long tunnel, fig. 51b. The hairs are extremely small. Im is situated rather far laterally in front of the lateral gland.

The ventral side, fig. 51c. There is no sternal plate, only a short undulating line. Apodemata II are very short brown plates. The sejugal apodemata reach the anterior border of the genital field, Apodemata III are connected with the latter by a thin line. Round light spots can be seen on the epimeres. Not all the epimeric hairs could be seen. The genital plate has five hairs, the two anterior ones being far longer than the others. Ad1 is much longer than ad2 and ad3, as is also the case in *X. bipilus*. *X. rhomboides* can easily be distinguished from *X. bipilus* by its rhomboid spots, its delicate pseudostigmatic organs and by the position of A1 with the hair ms close by.

II (1: Cyperus vegetation under a hedge).

*Perxylobates* n. gen.

In general appearance much like *Xylobates*, but without a dorso-sejugal line between the propodosoma and the hysterosoma. The lamellar hairs are situated me-

dially to the end of the lamellae. Interlamellar hairs removed from lamellae; pseudostigmatic organs filiform, ciliate. Pteromorphae mobile. 10 pairs of notogastral hairs; 3 pairs of areae porosae, A3 being absent. Five pairs of genital hairs, one pair of aggenital hairs, three pairs of adanal hairs, and two pairs of anal hairs. Iad parallel to the side of the anal field. Monodactylous.

A species of this genus was described as ?*Xylobates sinlimes* Hammer, 1961, p. 39, fig. 45. In Tahiti two more species were found.

*Perxylobates vermiseta* (Balogh & Mahunka); fig. 52.

*Xylobates* — — — — —, 1968, p. 344, figs. 7–8.

Length about 0.35 mm. Colour clear light brown.

The rostrum is conical. The rostral hairs, situated on the dorsal side, are thin and slightly barbed. The lamellae, which are only half as long as the propodosoma, are almost parallel, tapering towards their tip. A dark ridge below the lamella continues forwards reaching the rostral hair. The lamellar hairs, situated medially to the tip of the lamellae, are equally thick throughout, smooth and long enough to reach the tip of the rostrum. The interlamellar hairs, situated at some distance from the lateral margin of the lamellae, are thin and slightly barbed, apparently as long as the rostral hairs. The pseudostigmata are hidden below the proximal part of the lamellae. The pseudostigmatic organ is filiform, ciliate, viz. densely set with cilia on its anterior border, more scattered on the posterior border. The pseudostigmatic organs reach far beyond the lateral border of the pteromorphae. The integument of the propodosoma is faintly pitted. Behind the interlamellar hairs there are two long clear yellow glands on a ground lighter than that in front of the interlamellar hairs.

The hysterosoma is not separated from the propodosoma by a dorso-sejugal line. The mobile pteromorphae are short with a convex anterior border. 10 pairs of short and thin notogastral hairs; 3 pairs of areae porosae. Aa is the largest, A1 and A2 are very small. A3 is absent. (In *P. sinlimes*, Hammer 1971, fig. 45, A3 is shown. It appeared, however, to be only an indistinct light spot). Im is situated unusually far anteriorly, at a short distance behind te, and ip is situated between r1 and p2. The integument of the hysterosoma is faintly pitted.

Ventral side, fig. 52a. The whole length of the sternum is broad, but faintly chitinized with deep alveoli cutting into its sides. Apodemata II are short knobs on a very thin ridge, the sejugal apodema and Apodemata III also narrow, the latter being shorter so that they do not meet. The epimeric hairs are all very short and apparently smooth. Light pits can be seen everywhere, also inside the alveoli. The genital field is small and narrow with five pairs of hairs, of which the anterior one is long. The aggenital hairs are short and thin. Compared to the genital field, the anal field is large. Ad3 is preanal, situated immediately in front of the anal field. Ad2 is situated off an2, and ad1 is postanal. The distance ad1–ad1 is the same as ad3–ad3, and shorter than ad1–ad2. Ad1 and ad2 are longer than ad3. The anal hairs are approximately as long as ad2. Iad is situated close to the side of the anal field. As most of the hairs of the



ventral side are very short and erect, it is extremely difficult to see whether they are barbed or smooth. The ventral plate is faintly pitted. The legs are short. Femora I–II with a broad ventral keel. The tarsi have one claw only.

II (3: Cyperus vegetation beneath a hedge).

*Perxylobates barbatus* n. sp.; fig. 53.

Length about 0.39 mm. Colour light brown.

This species is slightly larger but otherwise much like the preceding species for which reason only a few features will be mentioned. The lamellar hairs, situated at a good distance medially to the tip of the lamellae, are barbed (hence the specific name); they are shorter than their mutual distance and do not reach the tip of the rostrum. In front of them a faint transverse line can be seen. The pseudostigmatic organs are thinner and denser ciliate than those of the preceding species and the cilia are found only on the posterior border (left side in fig. 53). Behind an imaginary line (dotted) the integument is a yellowish colour, in front of it more brown. The notogastral hairs are a little longer than in the preceding species. The integument is pitted. The pits are especially distinct in the darker integument of the propodosoma in front of the interlamellar hairs. The hysterosoma is densely punctate between the small pits.

Ventral side, fig. 53a. The sternal plate is faintly chitinized and hardly limited from the epimeres. The hairs of Epimeres I are barbed and longer than those of *P. vermiseta*. The ventral side is faintly pitted almost everywhere. Monodactylous.

III (3: moss, Cyperus; Oxalis, grass, small ferns on moist soil).

#### Scheloribatidae

?*Scheloribates praeincisus* (Berl.) var. *interruptus* Berlese.

*Protoribates* (*Scheloribates*) *praeincisus* var. *interruptus* Berl. 1916, p. 315.

I find no differences between the specimens from Tahiti and those described and which I illustrated from Viti Levu, the Fiji Islands, 1971, p. 42, fig. 50, except the considerably larger size of the Tahitian specimens which measure about 0.635 mm in length.

I (extremely common, up to about 200 specimens in one sample: 29), II (common: 13), III (common: 13), IV (many: 4).

*Scheloribates praeincisus* (Berlese).

*Protoribates* (*Protoribates*) *praeincisus* Berl., 1910, p. 384.

*Scheloribates praeincisus* (Berlese), Hammer 1971, p. 43, fig. 51 a.

I (common: 26), II (common: 14), III (common: 17), IV (1).

*Scheloribates thermophilus* var. *corolevuensis* Hammer.

— — — — —, 1971, p. 44, fig. 53.

I (26: 6), II (1), IV (1).

*Scheloribates fimbriatus* Thor, var. *javensis* Willm.

— — — — —, 1931, p. 273, figs. 46–47.

The specimens from Tahiti agree with WILLMANN's description, although the remains of the translamellar line are rather indistinct. It is tridactylous.

I (common: 25).

?*Scheloribates imperfectus* n. sp.; fig. 54.

Length about 0.32 mm. Colour yellowish-light brown.

This small mite is not a true *Scheloribates* (therefore the questionmark) although very alike. The establishment of a separate genus will have to wait until more species have been found. In most characteristics it is a *Scheloribates*, the species of which are very similar and often difficult to distinguish. Their common features have been repeated so frequently that it is sufficient here to mention only the characteristics of the new species. Like most *Scheloribates* in the Pacific area it has a faint, very short transverse line medially to the lamellar hair, which does not meet the opposite one. The prolamellar ridge is incomplete, the anterior half being very indistinct, fig. 54 a (hence the specific name). Ventrally to the lamella there is an area porosa. The pseudo-stigmatic organs are short clubs, fig. 54 a.

The hysterosoma, fig. 54. Across the pteromorphae there is a distinct curved line which may indicate mobile pteromorphae. There are 10 pairs of clear bright hair pores. The hairs are absent except p1. There are many cracks in the integument of the dorsal surface. Sa is longer than the other sacculi. Im is very long. It is situated approximately in the middle of the hysterosoma at a short distance in front of S1, i.e. rather medially.

The ventral side, fig. 54 b. From the appearance of the ventral side it is evident that this species does not belong to the genus *Scheloribates*, in the species of which the sejugal apodema and Apodema III meet at the latero-anterior border of the genital field. Apodema III is very short and only the sejugal apodema reaches the border of the genital field. The latter has four pairs of short thin hairs, viz. one on the anterior border, one at a good distance more posteriorly, and the third and fourth near the posterior border\*. The aggenital hairs are short and thin, the anal hairs, and the adanal hairs longer. Iad is situated close to the side of the anal field.

Femora I–II have a ventral keel. All tarsi with three claws, the lateral ones very thin. Pedotectum I is hyaline.

I (3: pieces of bark on the lawn in the park), II (1: moss on coconut palm trunk), III (14: 8).

*Maculobates ventroacutus* Hammer.

— — — — —, 1971, p. 41, fig. 47.

II (4: wet moss on a stone wall).

\*) By a mistake only three pairs of genital hairs are shown in fig. 54 b.

?*Reductobates latiohumeralis* n. sp.; fig. 55.

Length about 0.43 mm. Colour clear light brown.

Compared with the hysterosoma the propodosoma is narrow. The rostrum is pointed. The rostral hairs, situated at a good distance behind the tip of the rostrum, are longer than their mutual distance, very thin, and distinctly barbed. The lamellae are narrow, slightly converging. The lamellar hairs, situated on the tip of the lamellae, are more than one and a half times longer than their mutual distance, thin and barbed. When laid bare the interlamellar hairs are as long as the lamellar hairs, fig. 55 a. They are situated at the medio-anterior end of the pteromorphae, which reach forwards beyond the proximal free part of the lamellae. A short distance latero-posteriorly to the interlamellar hairs the pteromorphae bend sharply forming a small edge, also seen in fig. 55 a, which shows a lateral view of the lamellar system. There is no accessory ridge. The pseudostigmata are hidden below the anterior border of the pteromorphae. The pseudostigmatic organ is a short club set with minute bristles.

There is no suture between the propodosoma and the hysterosoma. The hysterosoma is very broad compared to the propodosoma. It is especially broad across the shoulder region (hence the specific name). The latero-anterior borders of the pteromorphae run almost transversally, their medial borders reaching the interlamellar hair in a broad curve. The pteromorphae are perhaps mobile. The posterior end of the hysterosoma is semicircular, and apart from the pteromorphae the hysterosoma is globular, although slightly elongated. There are 10 pairs of short, thin, smooth notogastral hairs, ta and te being longer than the others. Three pairs of areae porosae, approximately of the same size. A1 is absent. In front of Aa a small light spot can be seen and medially to A2 there is a further light spot.

Ventral side, fig. 55b. The sternum is faintly chitinized. It is narrow between Epimeres I, widening posteriorly and clasping the anterior part of the genital field. Apodemata II are short, the sejugal apodemata twice as long. Apodemata III are short. Epimeres III–IV are more or less fused. The epimeric hairs are thin, short, and smooth. The discidium, custodium, and circumpedal ridge are absent. The genital field has only two pairs of hairs, viz. one on the anterior border and the other in the middle line in the posterior end of the plate. The aggenital hairs are short and thin. The three pairs of adanal hairs and the two pairs of anal hairs are a little longer than the aggenital hairs. Ad3 is situated off the latero-anterior corner of the anal field, ad2 near the latero-posterior corner, and ad1 behind the anal field. All the hairs of the ventral side are short, thin, smooth, and flexible. Iad is parallel to the side of the anal field.

The legs are short. All tarsi are monodactylous.

III (50: moist Casuarina needles).

*Subulobates* n. gen.

No suture between the propodosoma and the hysterosoma. Lamellae, prolamellae, and interlamellar ridges present. Interlamellar hairs close to the lamellae. Pseudostigmata covered by base of pteromorphae. Pseudostigmatic organs clavate. Ptero-

morphae not mobile. Areae porosae present. 10 pairs of notogastral hairs. Sternum a straight, narrow ridge widening into a broad, trinangular plate in front of the genital field. Three pairs of genital hairs. From the acetabulum of each leg a pointed chitinization like an awl (subula) is directed forwards. Circumpedal ridge absent. Monodactylous.

*Subulobates albulus* n. sp.; fig. 56.

Length about 0.242 mm. Colour yellowish-white.

The general appearance resembles *Maculobates*. The rostrum is pointed. The rostral hairs situated laterally, are longer than their mutual distance, thin, and barbed. The prolamella does not run to the base of the rostral hair but more medially thus forming together with the lateral border a free tip in front of the base of the rostral hair, fig. 56 a. The lamellae cover the sides of the propodosoma. They converge slightly and are almost equally thick throughout. The lamellar hairs are as long as the rostral hairs, thin, and barbed. The interlamellar hairs are situated close to the medial border of the lamellae. Below the lamella can be seen a curved ridge issuing from the base of the pseudostigma and running to the base of the interlamellar hair, fig. 56, 56 a. Apparently there is also a connection between the medial border of the lamella and the base of the interlamellar hair, fig. 56 a. The interlamellar hairs are shorter than the lamellar hairs and like the latter barbed. The pseudostigmata are almost hidden below the base of the pteromorphae. Only a small part of their broad lateral lobe can be seen in a dorsal view. The pseudostigmatic organs are rough, flat clubs with an undulating outline, apparently set with short scales.

The propodosoma and the hysterosoma are not separated by a dorso-sejugal suture although a very faint line can be seen between the interlamellar hairs. The anterior border of the hysterosoma cannot be seen beyond the pseudostigmata, whereas in i.e. *Maculobates* it proceeds to the base of the interlamellar hair. The pteromorphae are separated from the notogaster by a clear line, but they are apparently not hinged. They are hyaline. On the lateral part of the pteromorphae short white radiating lines can be seen. There are three pairs of areae porosae, A1 being absent. Aa is the largest. 10 pairs of notogastral hairs, all of them short, soft, and thin.

Ventral side, fig. 56 b. The sternum is a very narrow ridge, widening into a broad, triangular plate surrounding the anterior part of the genital field. Apodemata II do not reach the sternal ridge. The sejugal apodemata almost reach the sternal triangular plate. Apodemata III are very short. The epimeric hairs are short and thin, 3c and 4c were not observed. The genital field has three pairs of hairs, viz. one on the anterior border, two in the posterior end of the plates situated rather close together. One pair of aggenital hairs, two pairs of anal hairs, and three pairs of adanal hairs. Ad3 is situated at the latero-anterior corner of the anal field, ad2 off the middle of the field, and ad1 at the latero-posterior corner. All these hairs resemble the notogastral hairs, the aggenital hairs although a little shorter. Iad is parallel to the side of the anal field. From the acetabulum of each leg a very pointed chitinized awl apparently proceeds

forwards to the acetabulum immediately in front of it. This can be seen also in a slightly oblique ventral view, fig. 56c. The awls of Leg III have a backwards-directed free dull tip.

The legs are short. Femora I, II and IV with a broad ventral keel. Tarsi bilaterally flattened, especially of Legs I–II. Monodactylous.  
II (9: moss on a coconut palm trunk).

*Pachygena* n.gen.

Sides of propodosoma convex, making the latter appear thick-headed. Lamellae present, translamella absent. Pseudostigmatic organs sickle-shaped. Suture between propodosoma and hysterosoma. 10 pairs of notogastral hairs. Four pairs of sacculi. Glandular funnel behind Sa. Sternum well developed. Apodemata II short, sejugal apodemata and Apodemata III meeting in front of genital field. Four pairs of genital hairs, one pair of aggenital hairs, two pairs of anal hairs, and three pairs of adanal hairs. Iad parallel to side of anal field. Circumpedal ridge absent. Monodactylous.

*Pachygena falcata* n.sp.; fig. 57.

Length about 0.44 mm. Colour light brown.

Compared to the hysterosoma the propodosoma is narrow and is more or less conical. The rostral hairs, situated laterally on a prolamellar ridge, are very thin and slightly rough. They reach for half their length beyond the tip of the rostrum. The lamellae cover the sides of the propodosoma almost to the rostral hairs. They are apparently erect blades, tapering towards their tip, and are finely longitudinally striped. The lamellar hairs are thinner than the rostral hairs and smooth. The interlamellar hairs, situated near the anterior border of the hysterosoma and at a good distance from the lamellae, are longer than their mutual distance and very thin, smooth, and flexible. The pseudostigmata are hidden below the border of the hysterosoma. Seen in a dorsal view the pseudostigmatic organs are spindle-shaped, the end drawn out into a thin tip. In profile they are broad, sickle-shaped with a short thin stalk. They are hyaline, fig. 57a.

The hysterosoma and the propodosoma are separated by a dorsal suture. The anterior border of the hysterosoma is slightly convex in the middle, laterally concave. The posterior end of the hysterosoma is semicircular. The hysterosoma is broadest across the pteromorphae. The latter are not mobile and only a narrow part of their distal margin is bent ventrally. There are 10 pairs of extremely thin, smooth, and slightly curly hairs. Ta is a little longer than the others. Four pairs of very distinct sacculi. Behind Sa there is apparently a slight depression and here a funnel-shaped gland can be seen. The integument is smooth.

Ventral side, fig. 57b. Between Apodemata II the sternum is expanded into a transverse plate, and in front of the genital field it is dilated again forming a broad plate on the anterior border of which the sejugal apodemata and Apodemata III meet. The two latter are much longer than Apodemata II. The epimeric hairs are thin and

smooth, 1b longer than the others. 3c and 4c were not observed. The genital field, which is much smaller than the anal field, is separated from the latter by a distance twice its length. There are four pairs of genital hairs, viz. two on the anterior border and two much shorter at the posterior end of the plates. The two aggenital hairs are very short. Three pairs of adanal hairs. Ad3 is situated at a short distance in front of the anal field, ad2 at some distance off the sides of the field, and ad1 behind the latero-posterior corner of the anal field. Iad is parallel to the sides of the field. Tectopedium I is rounded, almost hyaline, Teep. III rounded without a projecting tip. The legs are short. Femora II–III with a broad, rounded, ventral keel. Tarsi are bilaterally flattened, short with a concave anterior border set with two rows of hairs between which the claw rests when bent backwards. All tarsi with one strong claw.

II (15: thin moss on dead branches), III (6: lichens and moss on bark; moss on decaying tree stump; moss on the ground).

*Rostrzetes foveolatus* Sellnick.

— — — — —, 1925b, p. 84, figs. 6–7.

The integument of the specimens found in Tahiti is decorated with small luminous dots, much smaller than illustrated by SELLNICK.

I (common: 12), II (common: 3), III (common: 3).

*Tuberemaeus perforatus* (Willmann); fig. 58.

*Liebstadia perforata* — — — — —, 1931a, p. 268, fig. 42 a, b.

Length about 0.424 mm. According to WILLMANN it is 0.45 mm long.

There can be no doubt that the specimens from Tahiti are identical with *T. perforatus* from Java. The interlamellar hairs appear much shorter in the Tahitian specimens, but this is due to their more or less erect position, when laid bare they are longer than the lamellar hairs. WILLMANN does not illustrate the sacculi, which are very small. The sculpture of the propodosoma consists of small round yellow pits, and in the hysterosoma of small, luminous dots, which appear oblong along the lateral and posterior borders.

The ventral side is shown in fig. 58a. WILLMANN describes and illustrates how the proximal part of Trochanter IV in *Tuberemaeus (Liebstadia) thienemanni* issues from a slit or groove, which is bridged by a ridge (1931, p. 268, fig. 41 b). The same can be seen in fig. 58a. Only four pairs of genital hairs were observed. Shallow pits can be seen on the anal plates only. All the tarsi with one strong claw.

II (9: moss on bark; dead leaves).

*Otaheitea* n.gen.

Propodosoma with a longitudinal furrow on either side. Lamellar tip ending in front of a furrow. Rostral, lamellar, and interlamellar hairs present. Pseudostigmatic organs club-shaped. Propodosoma and hysterosoma separated. Pteromorphae projecting beyond pseudostigmata, not mobile. Four pairs of sacculi, 10 pairs of noto-

gastral hairs. Ventral side with a deep, longitudinal furrow on either side. Three pairs of genital hairs. On either side of the ventral plate there are two furrows, which fuse off the anal field. Tridactylous.

*Otaheitea sulcata* n.sp.; fig. 59.

Length about 0.323 mm. Colour light brown.

The tip of the rostrum ends in a well chitinized labium the lateral ends of which apparently proceed for some distance backwards. The rostral hairs, situated laterally, reach for more than half their length beyond the rostrum. They are slightly barbed. This also applies to the lamellar and the interlamellar hairs. The lamellar hairs are a little longer than the interlamellar hairs. The lamellae, situated at some distance from the sides of the propodosoma, are curved, their tip directed medially ending immediately in front of a short, curved slit or furrow. Between the lamellae there is a clear, transverse band; its anterior border is straight, its posterior border with a deep incurvation. Laterally it reaches a longitudinal furrow, which anteriorly apparently runs to the labium, posteriorly disappears under the lamella and reappears medially to the lamella. The pseudostigmata are situated at some distance in front of the anterior border of the hysterosoma. The pseudostigmatic organs are club-shaped, the left one appears much larger than the right one, perhaps due to different views.

The hysterosoma. Its anterior border is almost straight at the middle; laterally it projects as far as the anterior border of the pseudostigmata. At a short distance from the anterior border there is on either side a short transverse ridge towards which the surface seems to be pinched in, forming a groove in front of the ridges. The pteromorphae and the anterior part of the hysterosoma in front of these ridges appear like a "collar" surrounding the posterior part of the propodosoma. There are four pairs of sacculi and 10 pairs of notogastral hair pores. Only the hairs p1 are present. They are almost as long as their mutual distance. No sculpture.

The ventral side, fig. 59a. Apodemata II, the sejugal apodemata, and Apodemata III are present, none of them reaching the sides of the hysterosoma, nor the sternum. The latter is indicated by two grey longitudinal lines, which posteriorly diverge in front of the genital field. The epimeric hair formula is 3:1:3:3. 3a are situated after each other in front of the genital field in a triangular greyish spot. Light alveoli can be seen in the epimeres. On either side of the ventral side there is a deep furrow which runs in a curve forwards to Tectopedium II, then as a straight line proceeds to Acetabulum I. The genital field has three pairs of hairs, viz. two long hairs on the anterior border, two short ones immediately behind the latter, and two short hairs at the posterior end of the plates. The aggenital hairs are very short. The three pairs of adanal hairs are likewise short. Ad3 is preanal; ad2 and ad1 are situated in a curve behind the anal field. The distance ad1-ad1 is twice as long as ad1-ad2. Behind the anal field there is a curved ridge (or furrow?) the ends of which run forwards almost to the aggenital hairs. Anteriorly these ridges are double. Iad is situated near the latero-anterior corner of the anal field.

The legs are slender. Femora I–III with a broad ventral keel. Tibiae I–II have a very long solenidium. All the tarsi are tridactylous, the lateral claws are very thin. III (1: almost dry moss).

#### Oribatulidae

*Zygoribatula oceana* n.sp.; fig. 60.

Length about 0.39 mm. Colour light brown.

The sides of the rostrum are rounded, the tip very pointed. The rostral hairs, situated on the dorsal surface immediately behind a curved transverse line, are parallel, about one and a half times longer than their mutual distance, and faintly barbed. The lamellae converge strongly towards their anterior end, which ends in a rounded low cuspis. The distance between the cusps is a little shorter than that between the interlamellar hairs. The lamellar hairs are about twice as long as their mutual distance, thick, and barbed. The interlamellar hairs resemble the lamellar hairs. The exopseudostigmatic hairs are shorter, thinner and slightly barbed. Laterally to the lamellae there is on either side of the propodosoma a narrow furrow bordered on its lateral side by a narrow ridge. Area porosa dorso-sejugalis present.

The hysterosoma is broadest across the middle. The anterior border projects a little, the posterior end is semicircular. The shoulder edge is very small. The 13 pairs of notogastral hairs are stiff, thick, slightly curved, and barbed. Apart from the short hair on the shoulder and those on the posterior border, they are equally long. The integument is faintly pitted. On the sloping sides of the hysterosoma it appears like a faint reticulation. The distance A1–A2 is equal to A2–A3.

The ventral side, fig. 60 a. The sternum is hardly indicated. Apodemata II are very short; the same applies to Apodemata III, whereas the sejugal apodemata form a broad transverse belt immediately in front of the genital field. All the epimeric hairs are smooth, 1a, 2a, and 3a are shorter than the others. Four pairs of genital hairs. From the posterior border of Tectopedium I a line runs backwards crossing the tectopodia of the other legs and ending at the lateral border of the ventral plate. Iad is preanal, situated obliquely and medially to ad3. Ad2 and ad1 are situated on a slightly projecting tongue from the ventral plate behind the anal field. The ventral plate is faintly pitted. Legs II–IV are inserted behind the fold, which is indicated by the above mentioned lateral line issuing from Tectopedium I. There are three claws, the middle a little stronger than the lateral ones.

III (5: moist dead leaves).



## Conclusions

Of the 102 species discussed in the preceding pages, 61 have been described earlier and only 41 are new to science. 4 new genera are established.

Had this investigation been undertaken e.g. 20 years ago, the majority of the species would presumably have been considered endemic. In a further 20 to 50 years' time, when thorough investigations of the oribatid fauna have been made on other islands in the Pacific ocean and the surrounding areas of land, it will probably appear that practically all the species on e.g. Tahiti are known in these areas.

In table 1 the 102 species are listed under the locality in which they were found. From this it is seen that in Group I: Papeete, only 30 species were found, while in Group II: the coast, there were 67 species, in Group III: the mountains above Papeete, 47 species, and in Group IV: Rangiroa, 13 species.

In the following table which gives the number of samples (of approx. 1/1000 m<sup>2</sup>) etc., the paucity of species of oribatid fauna in Papeete appears even clearer, since only 30 species were found in 44 % of the total samples, and in 65 % of the total of individuals collected. This paucity of species must be considered in the light of the poor living conditions for oribatids in the town which has only few biotopes and those that exist—lawns with twining grass and practically without other plants—are subjected to burning sun throughout large parts of the year, for which reason there is no moss. With regard to individuals the hardy *Scheloribates* species constitute a very large part of the mites found. Of *Scheloribates praeincisus v. interruptus* 1391 individuals were found, of *Scheloribates praeincisus* 609, and of *Scheloribates fimbriatus* 578 individuals. Together this gives 2578 individuals, or 42 % of the total number of oribatids found in Papeete. These 3 species apparently exist for the most part on leaves fallen from the large, spreading *Enterolobium* trees, on rotten pieces of bark from the same tree (on which they sat thickly), as well as on heaped garden rubbish.

Location	No. of Sampes	No. of Individuals	No. of Species
I.....	50	6158	30
II.....	26	1773	67
III.....	33	984	47
IV.....	5	639	13
Total .....	114	9554	102

Much greater possibilities of existence are offered in the many varied biotopes along the coast and in the mountains, where all biotopes are in the shade, even in

TABLE 1. Showing Distribution of the species found in Tahiti and in Rangiroa.

	I	II	III	IV		I	II	III	IV
<i>Andacarus ligamentifer</i> . . . . .		×	×		<i>Multioppia gracilis</i> . . . . .				×
<i>Malacoangelia remigera</i> . . . . .		×			<i>Ramusella chulumaniensis</i>				
<i>Hypochthoniella minutissima</i> . . . . .			×		<i>v. curtipilus</i> . . . . .		×		
<i>Eohypochthonius gracilis</i> . . . . .		×			<i>Machuella ventrisetosa</i> . . . . .		×		
<i>v. crassisetiger</i> . . . . .		×			<i>Suctobelba variosetosa</i> . . . . .	×	×		
<i>Hoplophorella rangiroaensis</i> . . . . .				×	— <i>sempiulmosa v.</i>				
— <i>glauca</i> . . . . .	×				<i>tahitiensis</i> . . . . .				×
— <i>scapellata</i> . . . . .	×	×	×		— <i>insulana</i> . . . . .		×	×	
<i>Phthiracarus crispus</i> . . . . .			×		<i>Suctobelbida dentata</i> . . . . .	×	×		
— <i>insularis</i> . . . . .		×	×		— <i>squamosa v. scutata</i> . . . . .		×		
<i>Hoplophthiracarus tubulus</i> . . . . .		×	×		<i>Hydrozetes lemnae</i> . . . . .	×	×		
— <i>siamensis</i> . . . . .	×	×	×	×	<i>Tectocephus velatus</i> . . . . .	×	×	×	
<i>Microtritia tropica</i> . . . . .			×		<i>Scapheremaeus bicornutus</i> . . . . .	×			
<i>Rhysotritia ardua v. otaheitisensis</i> . . . . .	×	×	×		<i>Licneremaeus polygonalis</i> . . . . .		×	×	×
<i>Indotritia sellnicki</i> . . . . .		×	×	×	<i>Eutegaeus biovatus</i> . . . . .				×
<i>Austrotritia lebronneci</i> . . . . .			×		<i>Microzetes auxiliaris</i> . . . . .	×	×	×	
<i>Epilohmannia pallida v. pacifica</i> . . . . .		×			<i>Eupelops tahitiensis</i> . . . . .		×		
<i>Papillacarus hirsutus</i> . . . . .		×			— <i>crassus</i> . . . . .				×
<i>Meristacarus tahitiensis</i> . . . . .		×			— <i>polynesia</i> . . . . .				×
<i>Nesiacarus granulatus</i> . . . . .		×			<i>Lamellobates palustris</i> . . . . .	×			×
<i>Javacarus kühnelti v. foliatus</i> . . . . .		×			<i>Eremaeozetes tuberculatus</i> . . . . .	×			
<i>Phyllhermannia pacifica</i> . . . . .		×	×		<i>Galumna flabellifera</i> . . . . .	×	×	×	
<i>Nothrus oceanicus</i> . . . . .		×	×		— <i>pterolineata</i> . . . . .		×		
<i>Allonothrus schuilingi</i> . . . . .		×		×	— <i>imperfecta</i> . . . . .				×
— <i>russeolus v. reticulatus</i> . . . . .	×	×	×		— <i>sp.</i> . . . . .	×			
<i>Nanhermannia transversaria</i> . . . . .			×		<i>Acrogalumna abrupta</i> . . . . .				×
<i>Cyrlhermannia luminosa</i> . . . . .		×			— <i>ventralis</i> . . . . .		×	×	
<i>Masthermannia mammillaris</i> . . . . .		×	×		<i>Pergalumna dubitanda</i> . . . . .				×
<i>Trhypochthonius excavatus</i> . . . . .	×	×			— <i>bifissurata</i> . . . . .		×		
<i>Afronothrus sulcatus</i> . . . . .				×	— <i>montana</i> . . . . .				×
<i>Archegozetes longisetosus</i> . . . . .		×	×		<i>Leptogalumna ciliata</i> . . . . .		×		
<i>Malacothrus hexasetosus</i> . . . . .		×			<i>Peloribates rangiroaensis</i> . . . . .				×
— <i>geminus</i> . . . . .		×			<i>Xylobates capucinus</i> . . . . .	×	×		
— <i>pachypilus</i> . . . . .	×	×		×	— <i>seminudus</i> . . . . .	×	×		
<i>Trimalaconothrus crassisetosus</i>					— <i>bipilus</i> . . . . .	×			
<i>v. fijiensis</i> . . . . .		×			— <i>rhomboides</i> . . . . .		×		
<i>Trimalaconothrus albulus</i> . . . . .		×			<i>Perxylobates vermiseta</i> . . . . .		×		
<i>Liodes bataviensis</i> . . . . .		×			— <i>barbatus</i> . . . . .				×
<i>Fosseremus quadripertitus</i> . . . . .		×			<i>Scheloribates praeincisus v.</i>				
<i>Eremulus avenifer</i> . . . . .		×			<i>interruptus</i> . . . . .	×	×	×	×
— <i>curviseta</i> . . . . .			×	×	<i>Scheloribates praeincisus</i> . . . . .	×	×	×	×
— <i>monstrosus</i> . . . . .			×		— <i>thermophilus v.</i>				
<i>Furcoppia cornuta</i> . . . . .	×				<i>corolevuensis</i> . . . . .	×	×		×
<i>Austrocarabodes imperfectus</i> . . . . .			×		— <i>fimbriatus v. javensis</i>	×			
<i>Carabodes luteauratus</i> . . . . .		×			? <i>Scheloribates imperfectus</i> . . . . .	×	×	×	
<i>Nesotocephus setiger</i> . . . . .			×		<i>Maculobates ventroacutus</i> . . . . .		×		
<i>Quadroppia circumita</i> . . . . .		×	×		<i>Reductobates latiohumeralis</i> . . . . .				×
<i>Oppiella nova</i> . . . . .		×	×		<i>Subulobates albulus</i> . . . . .		×		
— <i>polynesia</i> . . . . .		×			<i>Pachygena falcata</i> . . . . .		×	×	
<i>Oppia winkleri</i> . . . . .	×				<i>Rostrozetes foveolatus</i> . . . . .	×	×	×	
— <i>lanceosetoides</i> . . . . .		×			<i>Tuberemaeus perforatus</i> . . . . .		×		
<i>Striatoppia opuntiseta</i> . . . . .		×			<i>Otaheitea sulcata</i> . . . . .				×
— <i>lanceolata</i> . . . . .	×	×	×		<i>Zygoribatula oceana</i> . . . . .				×
<i>Multioppia wilsoni</i> . . . . .	×				Total 102 species . . . . .	30	67	47	13

the mountains the bracken shades the sparse moss. Along the coast 67 species were found in 19 % of the animals collected, in the mountains 47 species in 13 %.

Of the 9 species known in Europe (marked with an asterisk in table 2), 5 were found in Papeete, all 9 along the coast and 5 in the mountains. From table 2, where the earlier described species and their varieties are listed together with a broad outline of their known distribution, it appears that these 9 "European" species are not in fact European or western species, but have a worldwide distribution, with the exception perhaps of *Masthermannia mammillaris* where there is little information on its distribution. Therefore they can just as well have come to Tahiti from any area of land in the vicinity of Tahiti as from Europe. Introduction from Europe seems therefore unlikely, and the many plant products that since the time of Wallis, Bougainville and Cook have been imported from Europe have hardly contributed a European strain to the Tahitian oribatid fauna.

Species from countries having a climate and vegetation similar to that of Tahiti doubtless have greater possibilities of survival than the European species. It appears from table 2 that Tahiti has 32 species (disregarding varieties) common with the Fiji Islands, 15 common with Indonesia, 11 common with Thailand and Vietnam together, 18 with the Pacific area, and 23 with America. Tahiti has comparatively few species common with Japan and Africa from what can be determined from the literature at present. Our almost absolute lack of knowledge of the possible occurrence of earlier described oribatids in New Guinea originates from the fact that there is only documentation on new species from this area (BALOGH and MAHUNKA).

Adding up the species that Tahiti has in common with Thailand, Vietnam, Indonesia, New Guinea and the Fiji Islands, we find that Tahiti has 46 species in common with Southeast Asia-Indonesia. On the other hand, Tahiti has 23 species in common with America. 6 of the 9 "European" species found on Tahiti that have a worldwide distribution are also found in Southeast Asia-Indonesia, 8 of these species are found in America. Subtracting these species from the total, it appears that Tahiti has 40 species in common with Southeast Asia-Indonesia, and only 14 in common with America, which lies much closer to Tahiti. The close relationship between the oribatid fauna of Tahiti and of Southeast Asia-Indonesia is thus established. This information tallies with Gressitt 1961, p. 16: "but in the eastern portions [of the Pacific] such as Hawaii and the southeastern extremities of Polynesia, there are varying degrees of American influence, with some Holarctic influence in Hawaii. However, the Oriental influence still dominates". How the species have spread, not only to Tahiti but also to many other islands in the Pacific, is a matter of guesswork—but it cannot be disproved that some of the species may have been introduced by the Polynesians in plant products on their long journey throughout hundreds of years step by step across the Pacific. It seems extremely improbable that transportation by currents of air during violent storms should have contributed to the distribution of these fragile creatures across vast distances. It cannot be disproved, however, that some species may have been brought hither by ocean currents perhaps throughout



TABLE 2 continued.

	Europe	West Africa	East Africa	Thailand	Vietnam	Japan	Indonesia	New Guinea	New Zealand	Fiji Islands	Hawaii	Pacific area	South America	North America
* <i>Xylobates capucinus</i> . . . . .	×								×	×			×	×
– <i>seminudus</i> . . . . .										×				
<i>Perxylobates vermiseta</i> . . . . .							×			×				
<i>Scheloribates praeincisus</i> v. <i>interruptus</i> . . . . .							×			×				
– . . . . .							×			×				
– <i>thermophilus</i> v. <i>corolevuensis</i> . . . . .							×			×		×		
– <i>fimbriatus</i> v. <i>javensis</i> . . . . .		×					×			×	×		×	
<i>Maculobates ventroacutus</i> . . . . .							×			×				
<i>Rostrozetes foveolatus</i> . . . . .		×	×				×		×	×			×	
<i>Tuberemaeus perforatus</i> . . . . .							×			×			×	
	9	8		11		8	15	1	14	32	18		23	

millions of years. However, it is worth noting in this connection that the earlier known species listed in table 2 have not developed into endemic species on Tahiti—although there would appear to have been ample time for this. JACOT 1934c, p. 85, states about the origin of oribatid fauna on Hawaii: "It is certain, however, that species originating from east or west are sufficiently modified even after a few decades to be recognized as geographical races". I much doubt that species can alter themselves in the space of a few decades, even though it is only a question of racial difference. On the contrary, it is my impression that it takes millions of years to produce a new species of the oribatids (cp. HAMMER 1965a regarding *Mucronothrus*, which however is a representative of a very special biotope with a constant, low temperature).

Regarding possible transport by ocean currents it is furthermore worth noting that the ocean currents round Tahiti—the equatorial current—runs from east to west, while the weaker and more irregular counter-current runs from west to east. As a result one would expect a stronger American strain in the fauna, but the opposite is the case.

The spreading of the oribatids across the Pacific is presumably a very complicated matter, where perhaps the geological alterations should be taken into account—earlier existing coral and volcanic islands could have constituted "stepping stones" from island to island group (GRESSITT 1961, p. 21).

The atoll Rangiroa presents a striking example of the difficulties that must be overcome by creatures washed ashore: surf thundering against the coral reef, and burning sun and scorching heat on the higher-lying dry blocks of coral. Finally a walk of some 20–50 m over coral rocks only to reach the bone-dry coral sand, where *Pandanus* and other bushes often with stiff foliage, but also an *Abuliton*-like bush with soft leaves, form a compact thicket. There is no top soil, but in the withered dead leaves under the thicket animals can find a little nourishment. In such places, but rather further inland, 13 species were found under the *Abuliton*-like bushes (see table 1). The species could just as well have been introduced by the natives, e.g. with yams which are cultivated by the inhabitants under the mango and breadfruit trees on the lagoon side of the atoll, as by the sea. Of the 13 species found, 11 are common with Tahiti, and thus not endemic indicating a rather recent introduction to the atoll. Neither on Tahiti, nor on Rangiroa, were representatives found of the *Brachychthoniidae* family, which appears nearly the world over in numerous species. They belong to the smallest and most thin-skinned of all oribatids. In this connection it is interesting that neither were they found in an investigation of oribatids introduced with plant products from the whole world at the plant quarantine stations in the USA (HAMMER 1969). Presumably because of their skin they cannot survive transport over long distances when subjected to dehydration.

Thus the great distance to the islands in the Pacific presumably in itself limits the introduction of oribatids to the hardy and often strongly chitinized species. This must apply to all oribatids regardless of the method of spreading.

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## Explanation of the Figures of Plates I–XXVI

- Fig. 1. *Eohypochthonius gracilis* (Jacot) v. *crassisetiger* Aoki.  
 – 2. *Hoplophorella rangiroaensis* n. sp.  
 – 2a. – – aspis.  
 – 2b. – – notogastral hairs, different views.  
 – 2c. – – ad2.  
 – 3. – *glauca* n. sp.  
 – 3a. – – aspis (in shortening).  
 – 3b. – – dorsal view.  
 – 3c. – – notogastral hairs.  
 – 4. – *scapellata* Aoki.  
 – 4a. – – aspis.  
 – 5. *Phthiracarus crispus* n. sp.  
 – 5a. – – ventral view.  
 – 6. – *?insularis* Jacot.  
 – 6a. – – aspis.  
 – 6b. – – pseudostigmatic organ.  
 – 7. *Hoplophthiracarus tubulus* n. sp.  
 – 7a. – – ventral view.  
 – 8. – *siamensis* Aoki.  
 – 9. *Rhysotritia ardua* (Koch) v. *otaheitensis* n. var.  
 – 9a. – – – – pseudostigmatic organ.  
 – 9b. – – – – aspis.  
 – 9c. – – – – ano-genital region.  
 – 10. *Austrotritia lebronneci* (Jacot).  
 – 10a. – – aspis.  
 – 10b. – – ano-genital region.  
 – 10c. – – Trochanter III–IV.  
 – 11. *Papillacarus hirsutus* (Aoki).  
 – 11a. – – ventral view.  
 – 12. *Meristacarus tahitiensis* n. sp.  
 – 12. – – hair ps1.  
 – 13. *Nesiacarus granulatus* n. sp.  
 – 13a. – – ventral view.  
 – 14. *Javacarus kühneli* Bal. v. *foliatus* n. var.  
 – 15. *Phyllhermannia pacifica* n. sp.  
 – 15a. – – ventral view.  
 – 16. *Allonothrus russeolus* Wallw. v. *reticulatus* n. var. ventral view.  
 – 17. *Nanhermannia transversaria* n. sp.

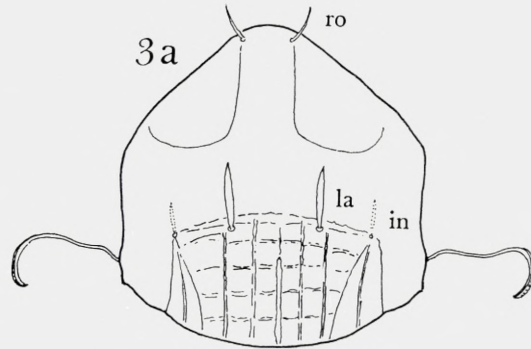
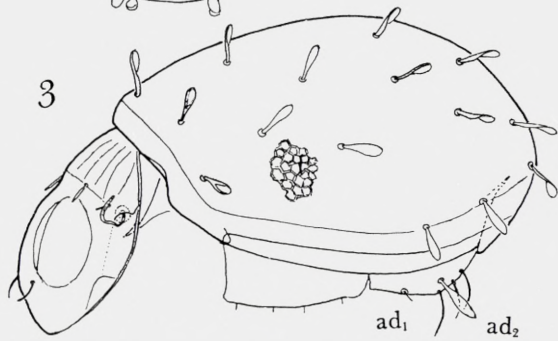
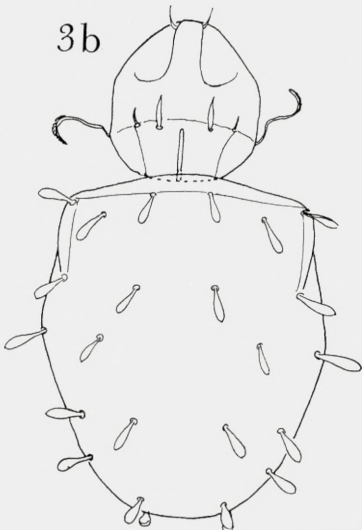
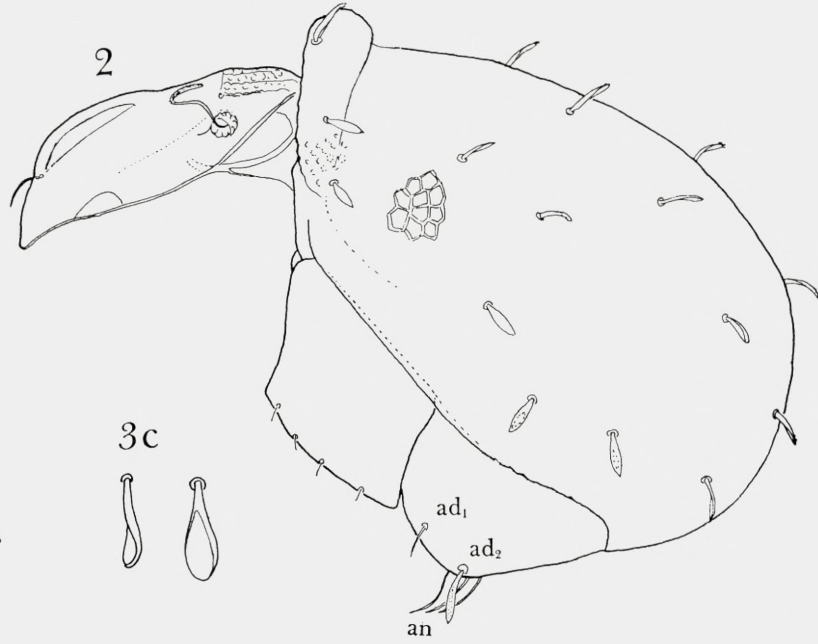
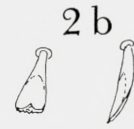
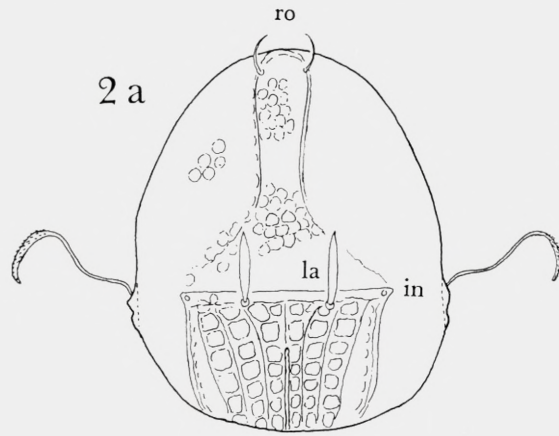
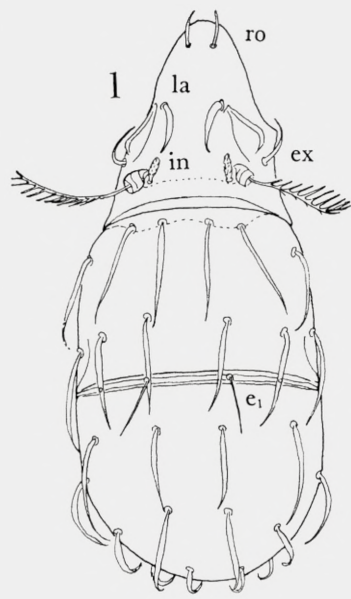
- Fig. 17a. *Nanhermannia transversaria* pseudostigmatic organ.  
 - 18a. *Cyrthermannia luminosa* Ham. pseudostigmatic organ.  
 - 18b. - - - - , The Fiji Islands.  
 - 18c. - - - - posterior projectionns.  
 - 18d. - - - - , The Fiji Islands.  
 - 19. *Afronothrus sulcatus* n. sp.  
 - 19a. - - ventral view.  
 - 20. *Malaconothrus geminus* n. sp.  
 - 20a. - - ventral view.  
 - 21. - *pachypilus* n. sp.  
 - 21a. - - ventral view.  
 - 22. *Trimalaconothrus albulus* n. sp.  
 - 22a. - - ventral view.  
 - 23. *Eremulus avenifer* Berlese.  
 - 24. - *monstrosus* n. sp.  
 - 25. *Furcoppia cornuta* n. sp.  
 - 25a. - - tip of rostrum with rostral hairs.  
 - 25b. - - lateral view of lamella and surroundings.  
 - 25c. - - ventral view.  
 - 25d. - - Femur II.  
 - 26. *Carabodes luteoauratus* n. sp.  
 - 26a. - - notogastral hairs in different views.  
 - 26b. - - ventral view.  
 - 27. *Nesotocepheus setiger* n. gen., n. sp.  
 - 27a. - - condyles and surroundings.  
 - 27b. - - ventral view.  
 - 27c. - - Tibia and Tarsus I.  
 - 28. *Oppiella polynesia* n. sp.  
 - 28a. - - ventral view.  
 - 29. *Striatoppia opuntiseta* Bal. and Mah.  
 - 29a. - - ventral view.  
 - 30. - *lanceolata* n. sp.  
 - 30a. - - ventral view.  
 - 31. *Multioppia gracilis* n. sp.  
 - 31a. - - pseudostigmatic organ.  
 - 31b. - - - - twisted.  
 - 31c. - - ventral view.  
 - 32. *Machuella* sp.  
 - 32a. - - pseudostigmatic organ.  
 - 33. *Suctobelba semiplumosa* Bal. and Mah. v. *tahitiensis* n. var.  
 - 33a. - - - - rostral teeth.  
 - 34. - *insulana* n. sp.  
 - 34a. - - rostral teeth.  
 - 34b. - - ventral view.  
 - 35. *Suctobelbilla squamosa* (Ham.) v. *scutata* n. var.  
 - 36. *Eutegaeus biovatus* n. sp.  
 - 37. *Eupelops tahitiensis* n. sp.  
 - 38. - *crassus* n. sp.  
 - 38a. - - tip of rostrum and surrounddings.  
 - 39. - *polynesius* n. sp.  
 - 39a. - - tip of lamella.

- Fig. 40. *Galumna plerolineata* n. sp.  
 - 40a. - - ventral view.  
 - 40b. - - the hair 4a.  
 - 41. - *imperfecta* n. sp.  
 - 41a. - - ventral view.  
 - 42. - sp.  
 - 42a. - - hair pore ta.  
 - 43. *Acrogalumna abrupta* n. sp.  
 - 43a. - - ventral view.  
 - 44. - *ventralis* (Willm.).  
 - 44a. - - sketch of anterior part of propodosoma, lateral view.  
 - 44b. - - pseudostigmatic organ.  
 - 44c. - - ventral view.  
 - 45. *Pergalumna dubitanda* n. sp.  
 - 45a. - - ventral view.  
 - 46. - *bifissurata* n. spp.  
 - 46a. - - propodosoma in lateral view.  
 - 46b. - - ventral view.  
 - 47. - *montana* n. sp.  
 - 47a. - - propodosoma in lateral view, sketch.  
 - 47b. - - ventral view.  
 - 48. *Leptogalumna ciliata* Bal.  
 - 49. *Peloribates rangiroaensis* n. sp.  
 - 49a. - - ventral view.  
 - 50. *Xylobates bipilus* n. sp.  
 - 51. - *rhomboides* n. sp.  
 - 51a. - - ventral view.  
 - 51b. - - notogastral hair in its pore.  
 - 52. *Perxylobates vermiseta* (Bal. and Mah.).  
 - 52a. - - ventral view.  
 - 53. - *barbatus* n. sp.  
 - 53a. - - ventral view.  
 - 54. ?*Schelorbates imperfectus* n. sp.  
 - 54a. - - propodosoma in oblique lateral view.  
 - 54b. - - ventral view.  
 - 55. ?*Reductobates latiohumeralis* n. sp.  
 - 55a. - - propodosoma in lateral view, left side.  
 - 55b. - - ventral view.  
 - 56. *Subulobates albulus* n. gen., n. sp.  
 - 56a. - - lamellar system in oblique lateral view.  
 - 56b. - - ventral view.  
 - 56c. - - coxal region.  
 - 57. *Pachygena falcata* n. gen., n. sp.  
 - 57a. - - pseudostigmatic organ.  
 - 57b. - - ventral view.  
 - 58. *Tuberemaeus perforatus* (Willm.).  
 - 58a. - - ventral view.  
 - 59. *Otaheitea sulcata* n. gen., n. sp.  
 - 59a. - - ventral view.  
 - 60. *Zygoribatula oceana* n. sp.  
 - 60a. - - ventral view.

Indleveret til Selskabet den 10. juli 1971.  
Færdig fra trykkeriet den 18. august 1972.

PLATES









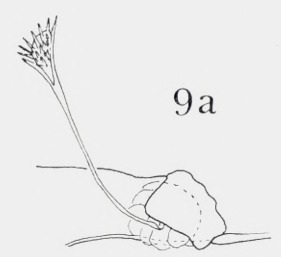
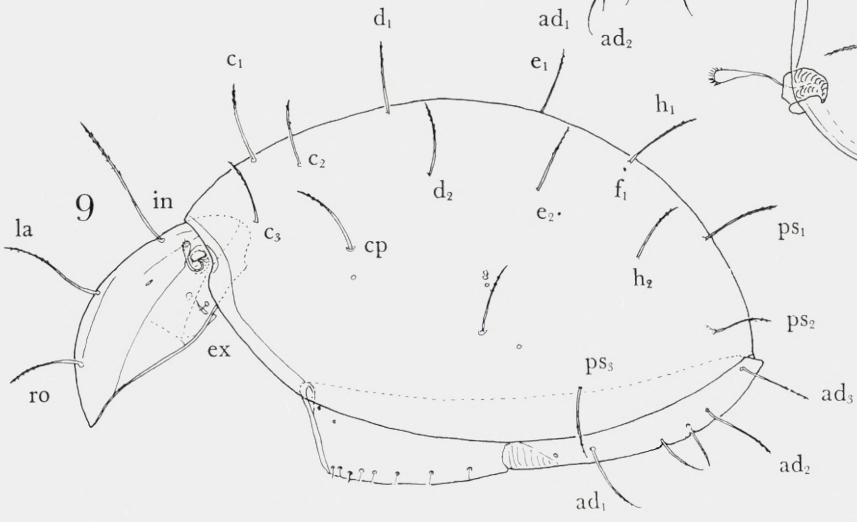
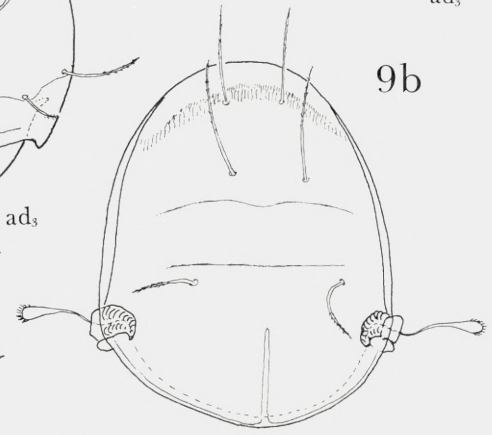
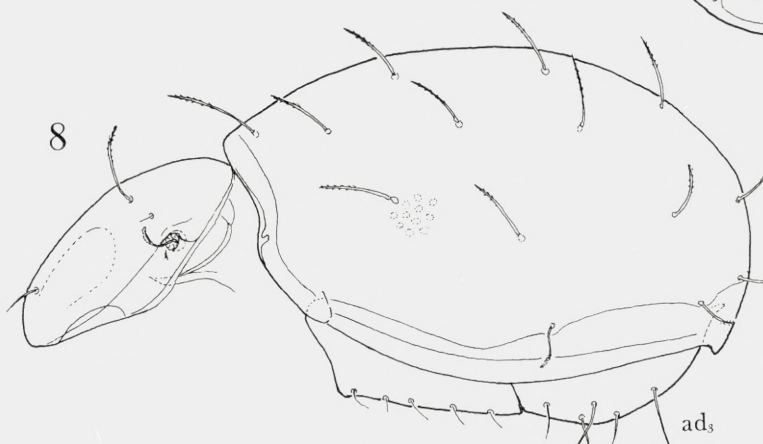
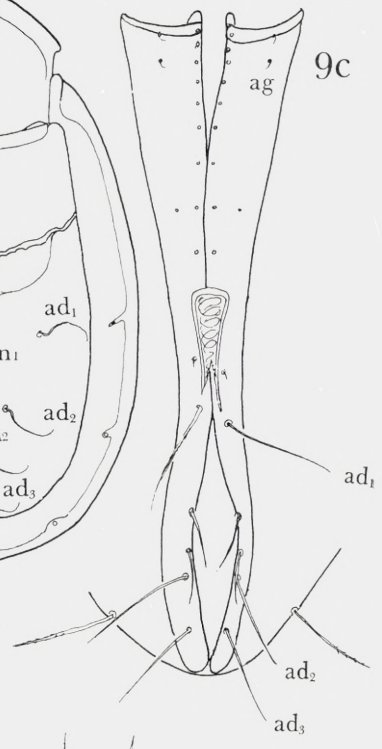
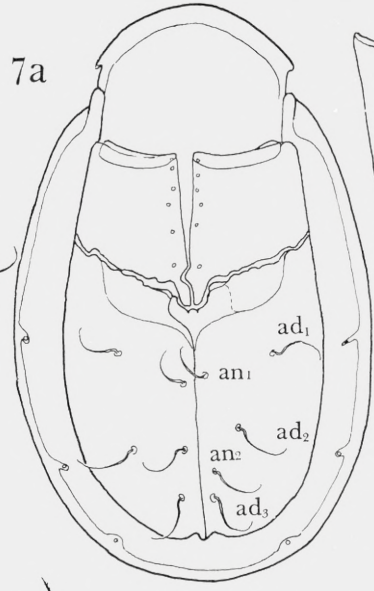
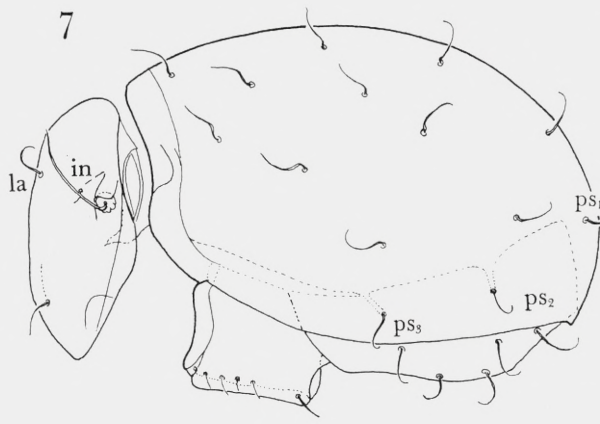
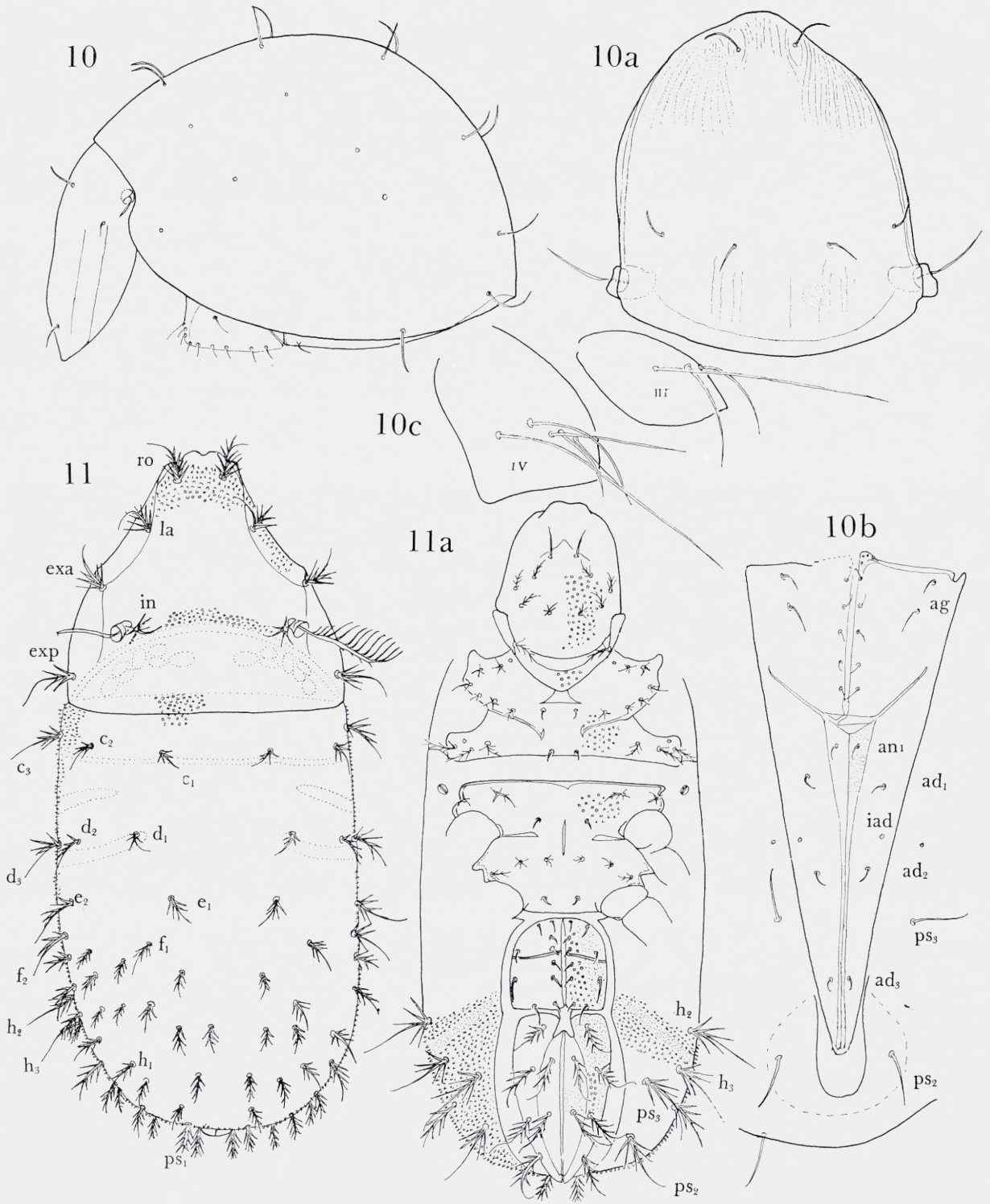
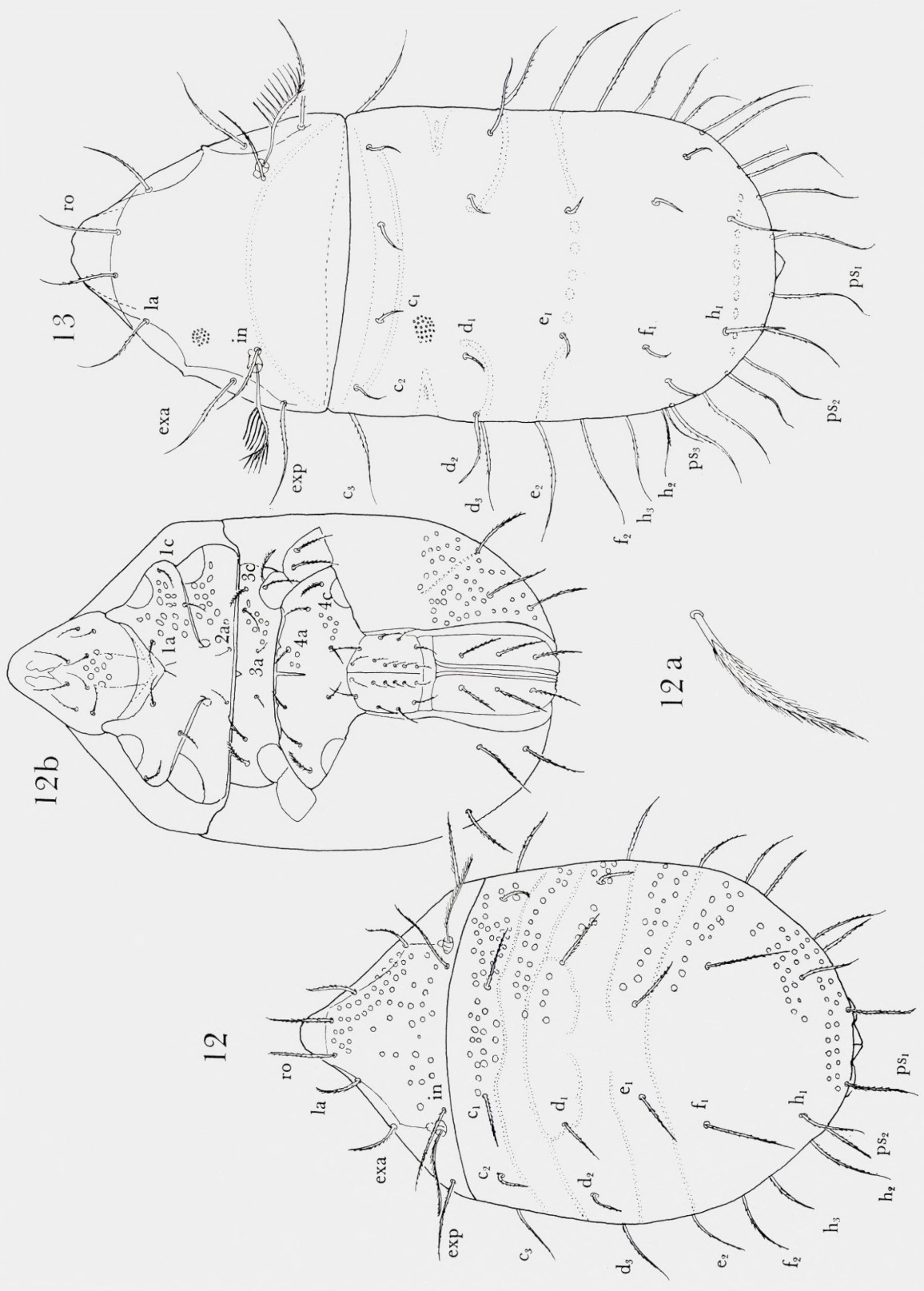
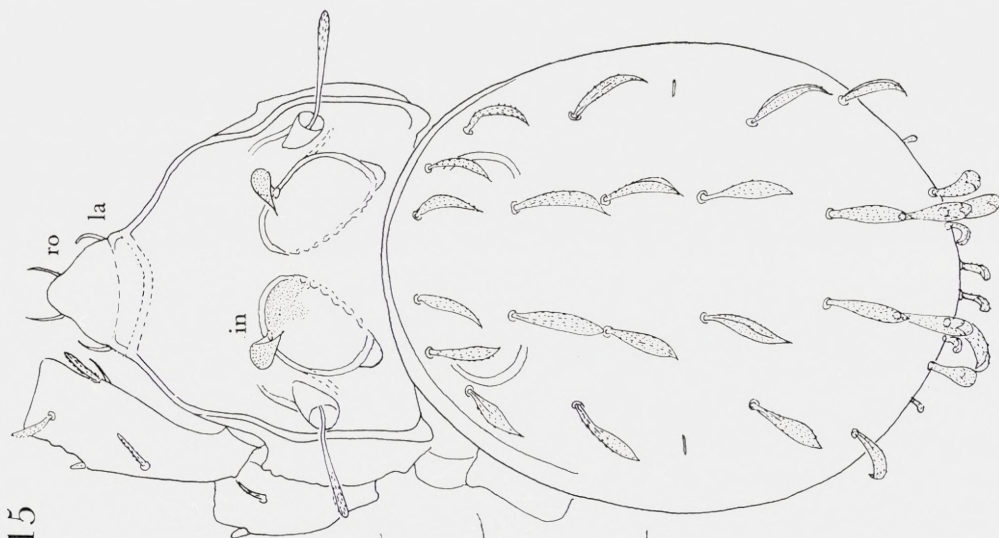


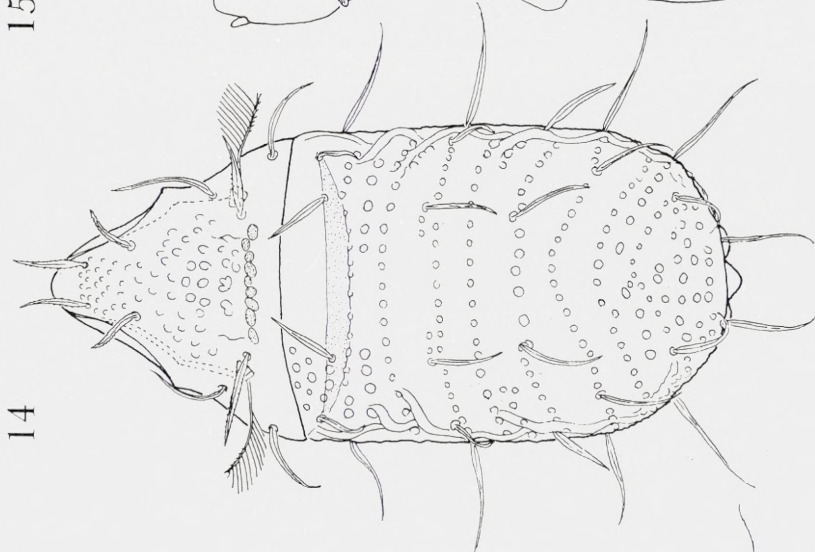
PLATE IV



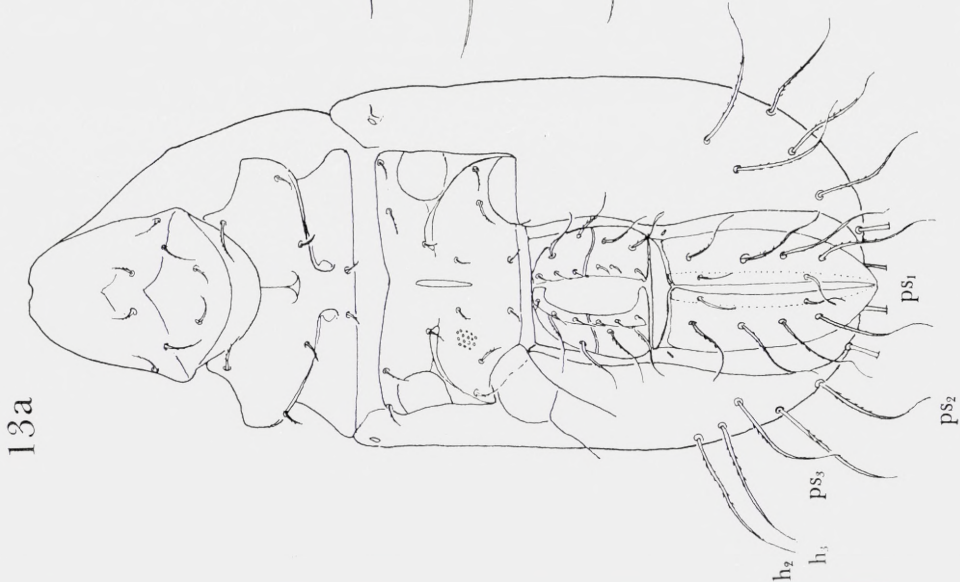




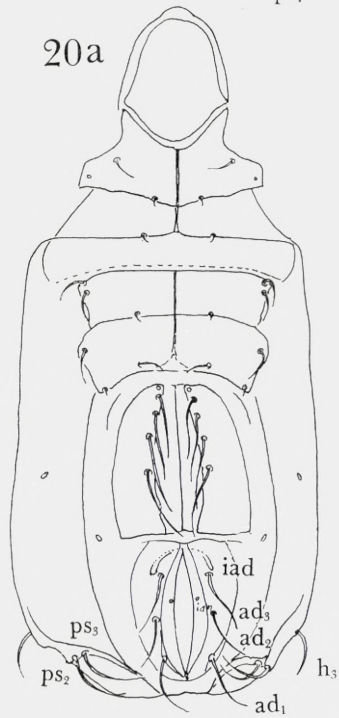
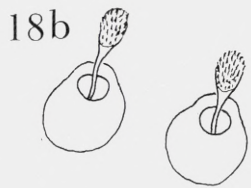
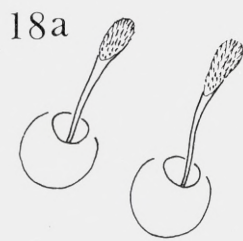
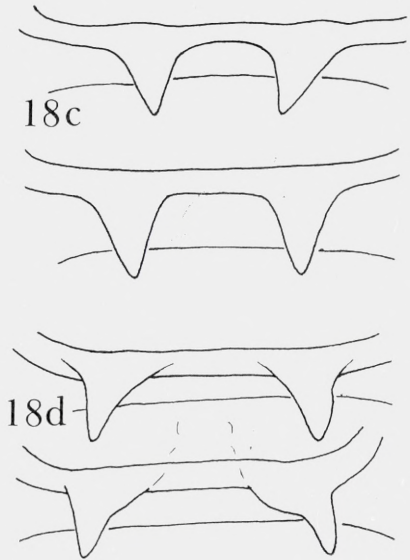
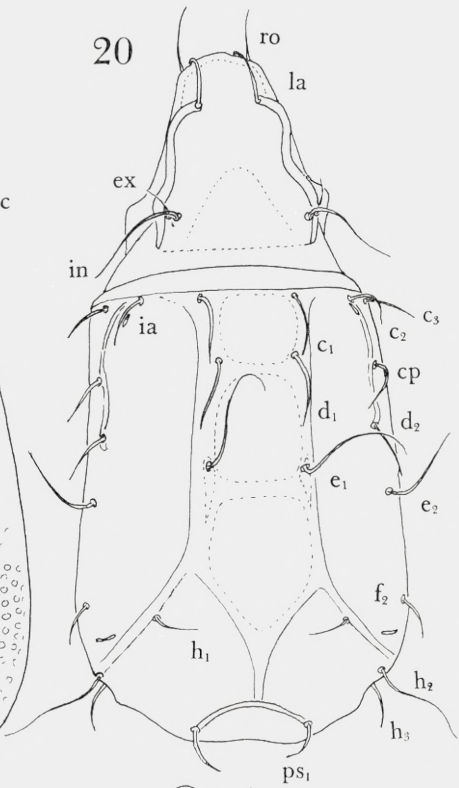
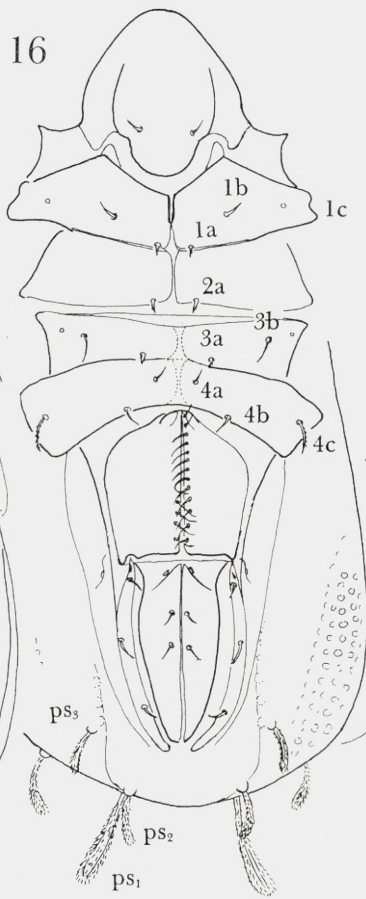
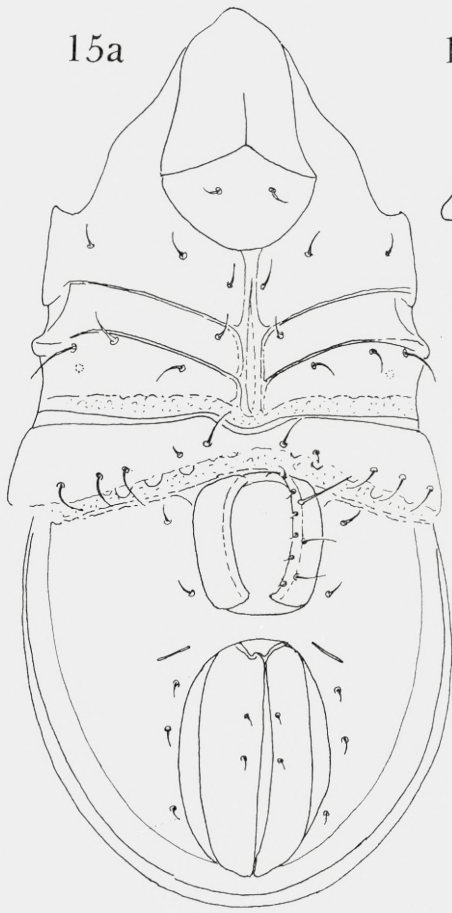
15

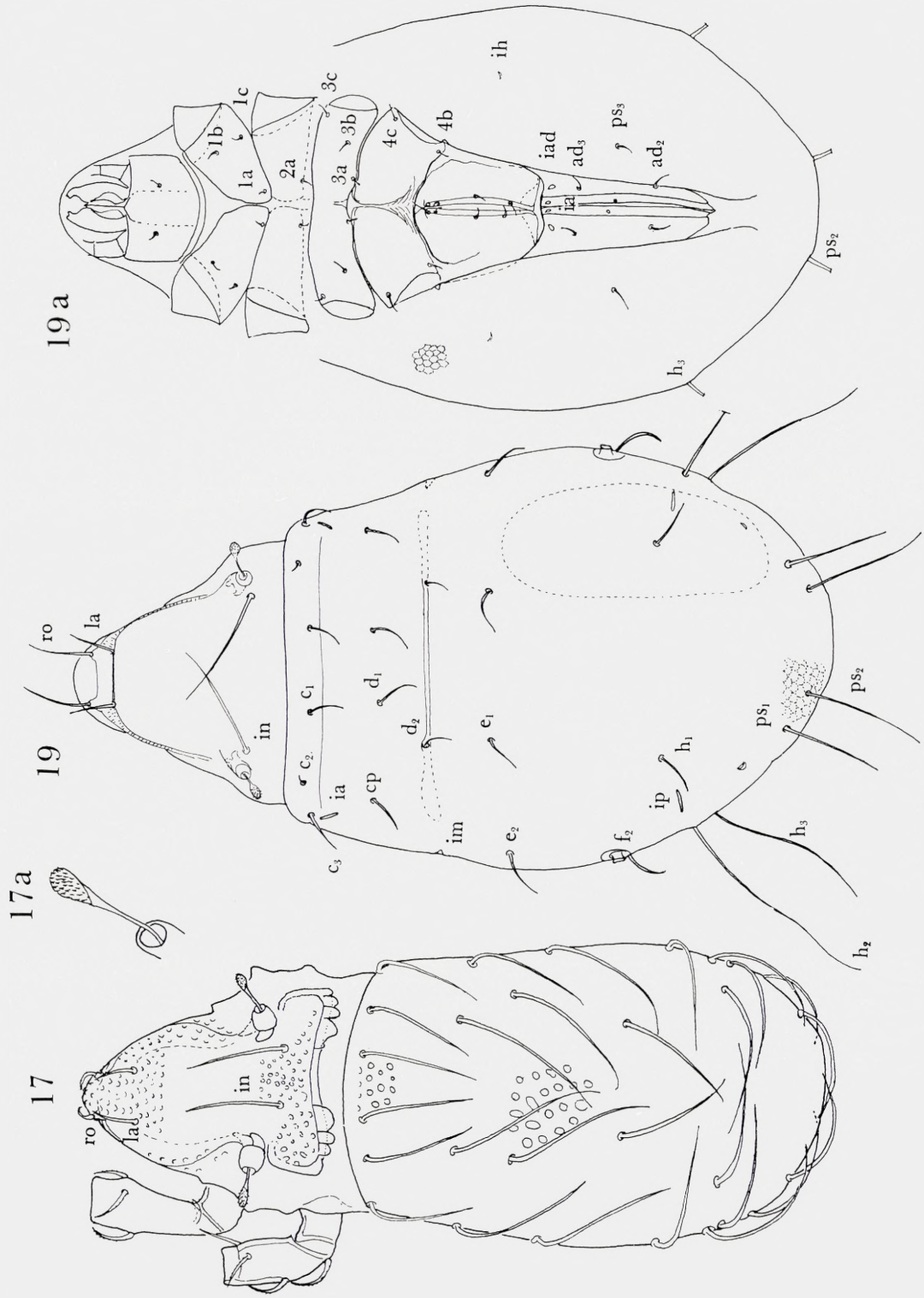


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13a





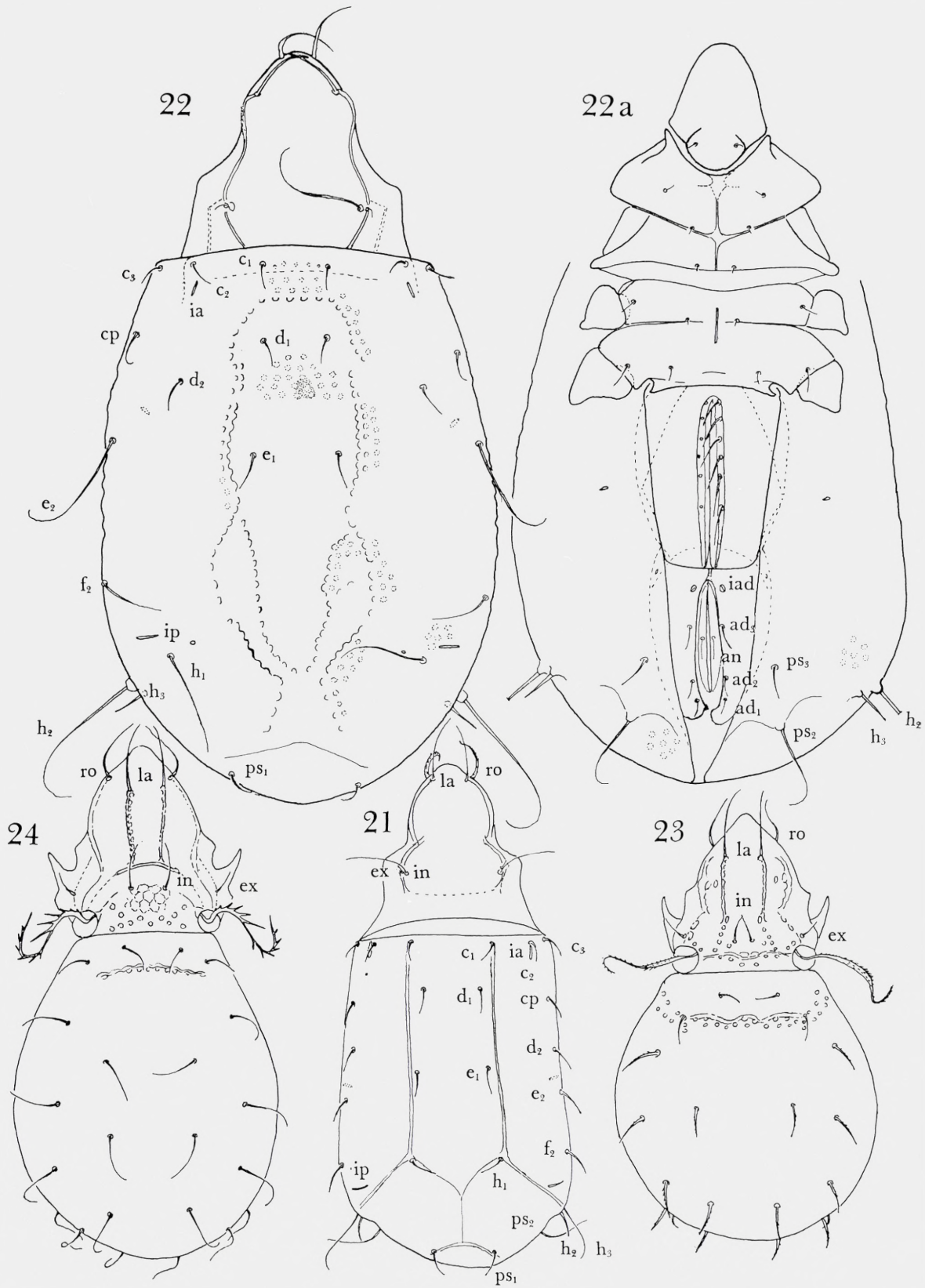
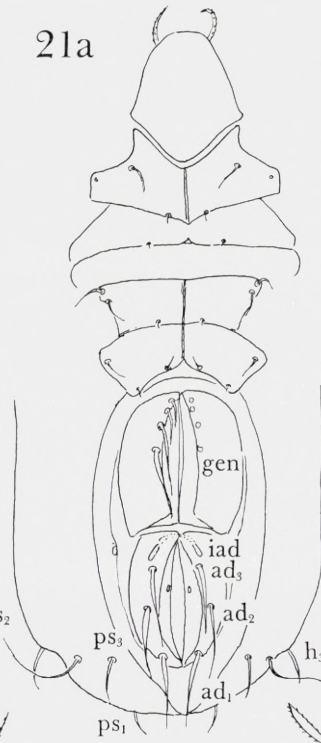


PLATE X

25a



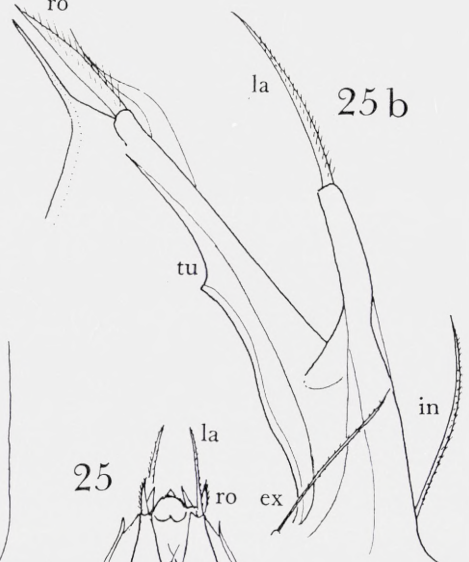
21a



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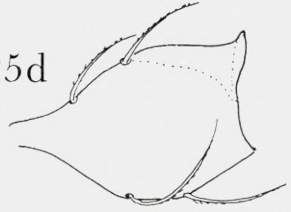
25b



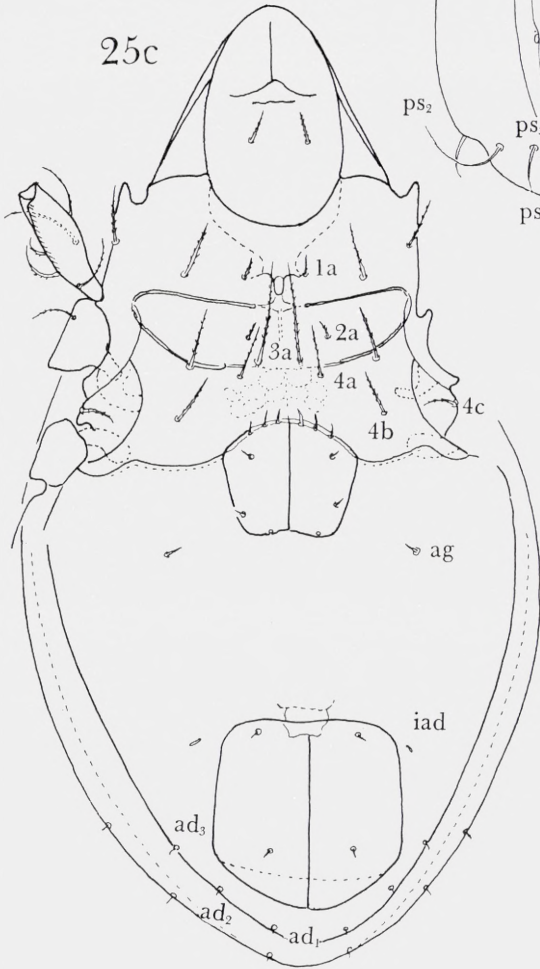
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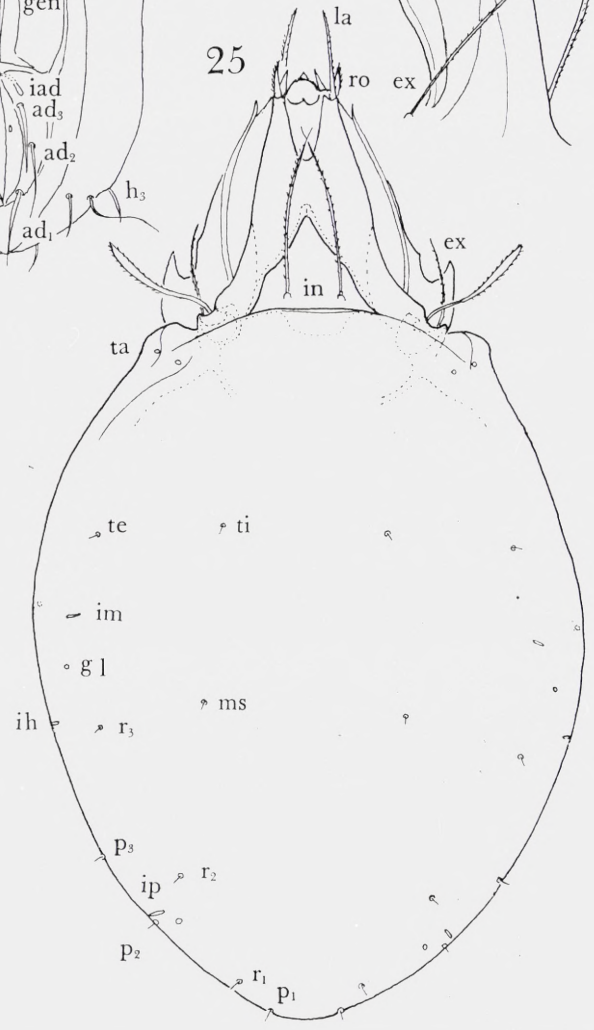
25d



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r<sub>3</sub>

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p<sub>3</sub>

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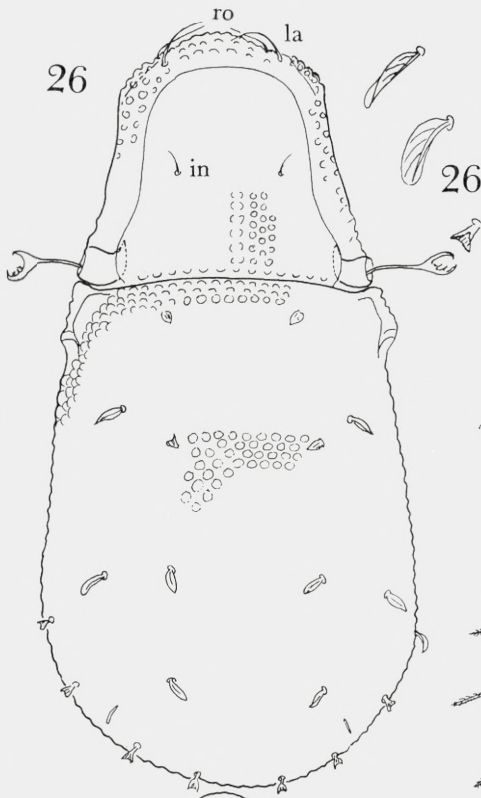
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p<sub>2</sub>

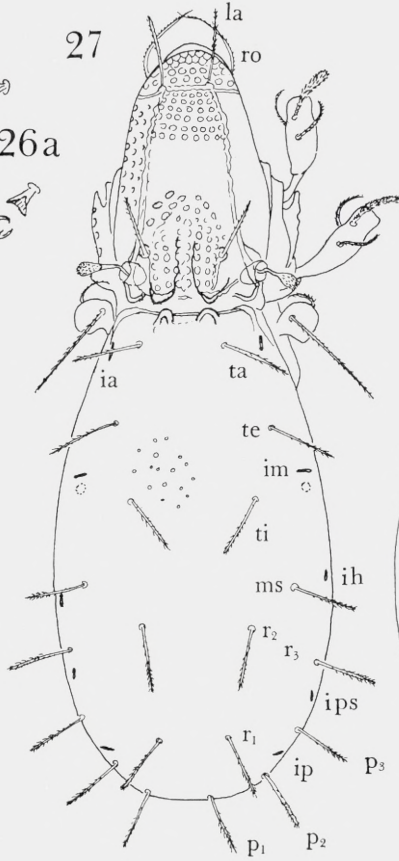
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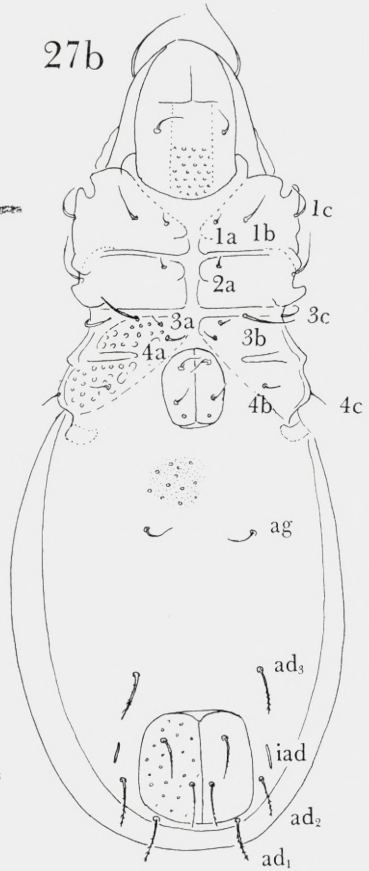




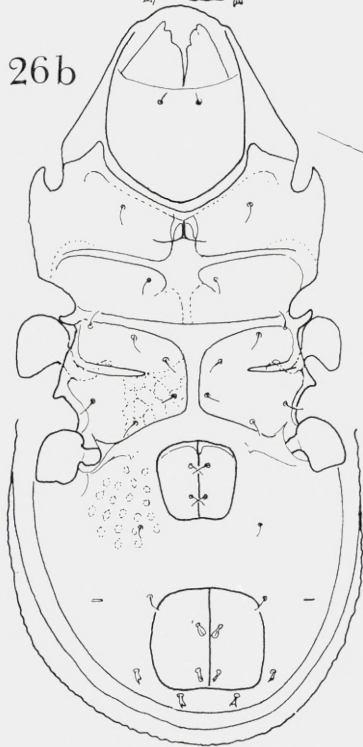
26a



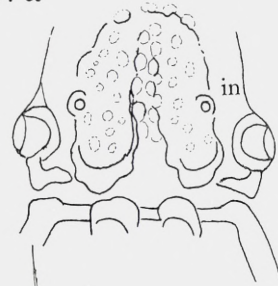
27b



26b



27a



27c

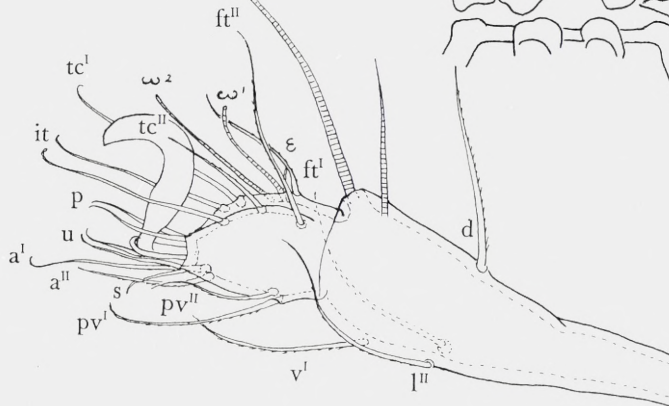
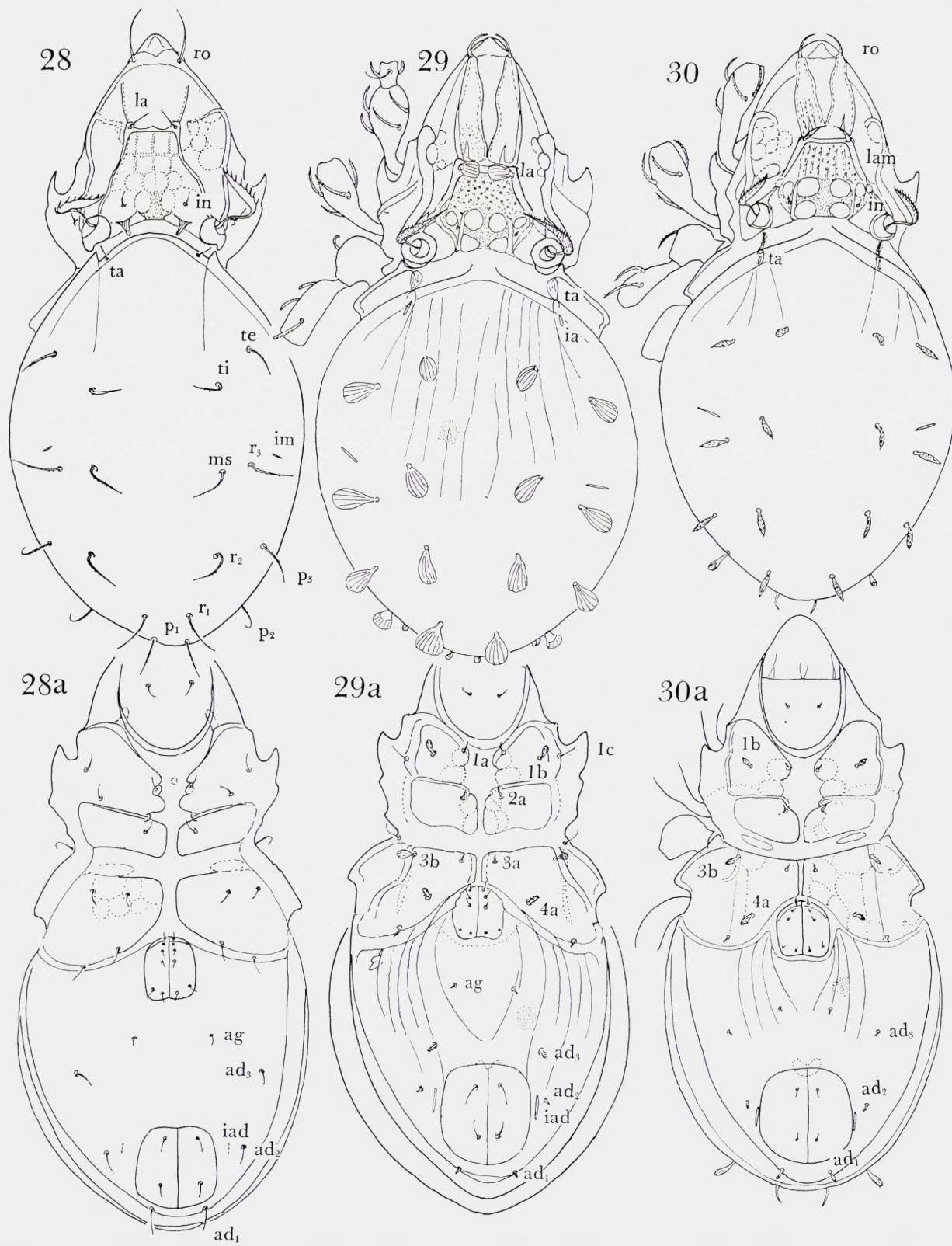
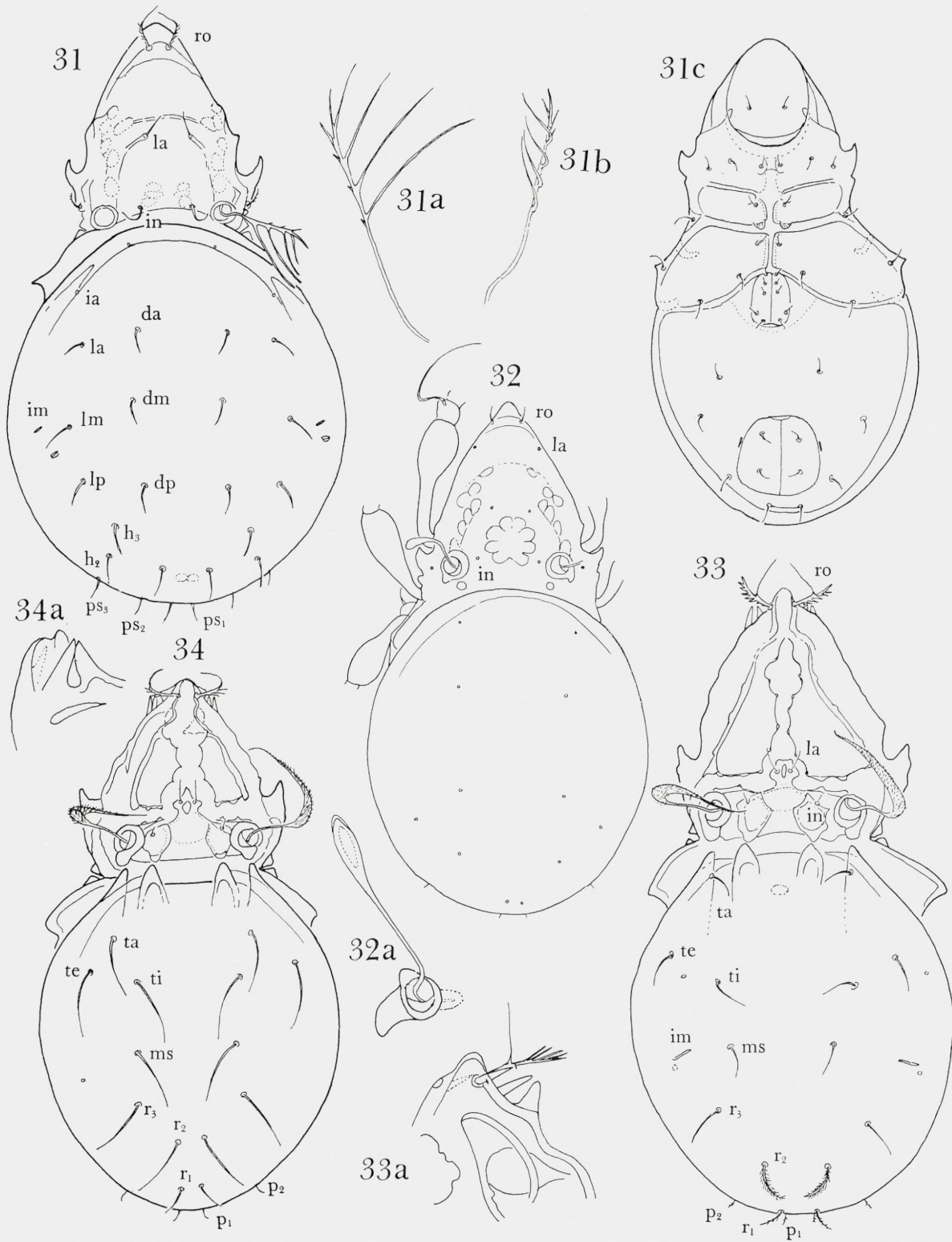
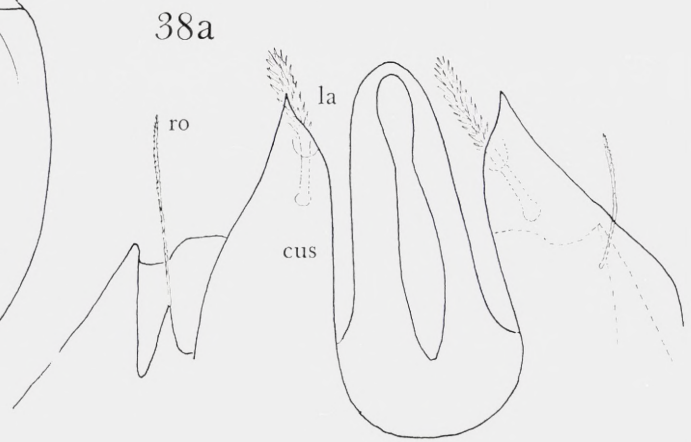
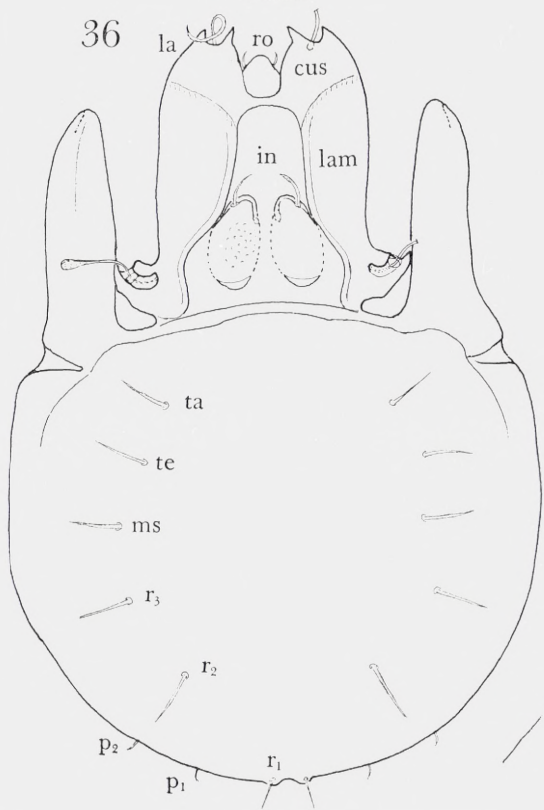
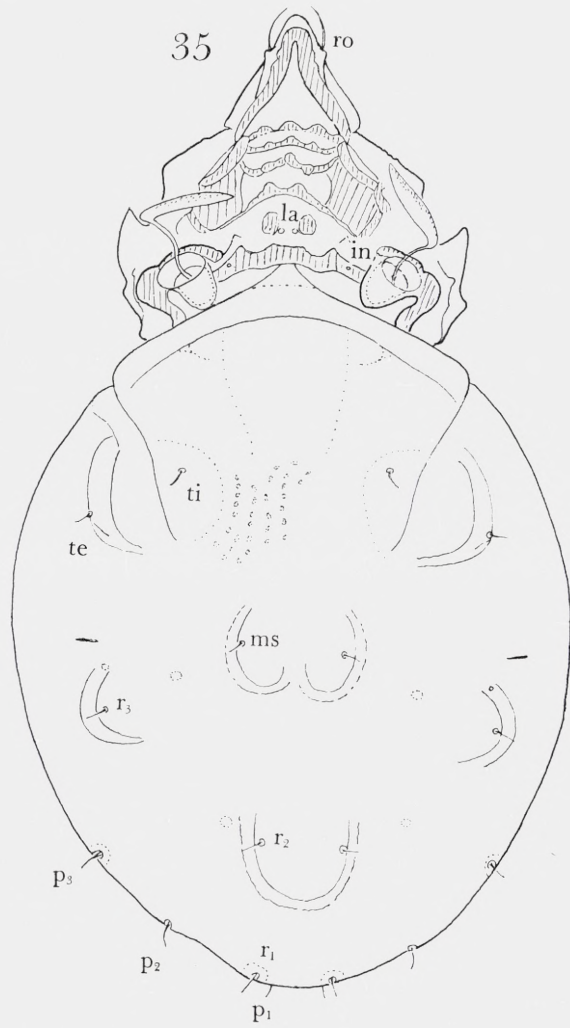
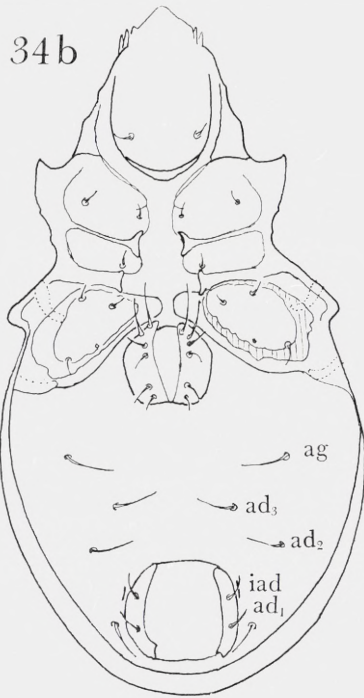


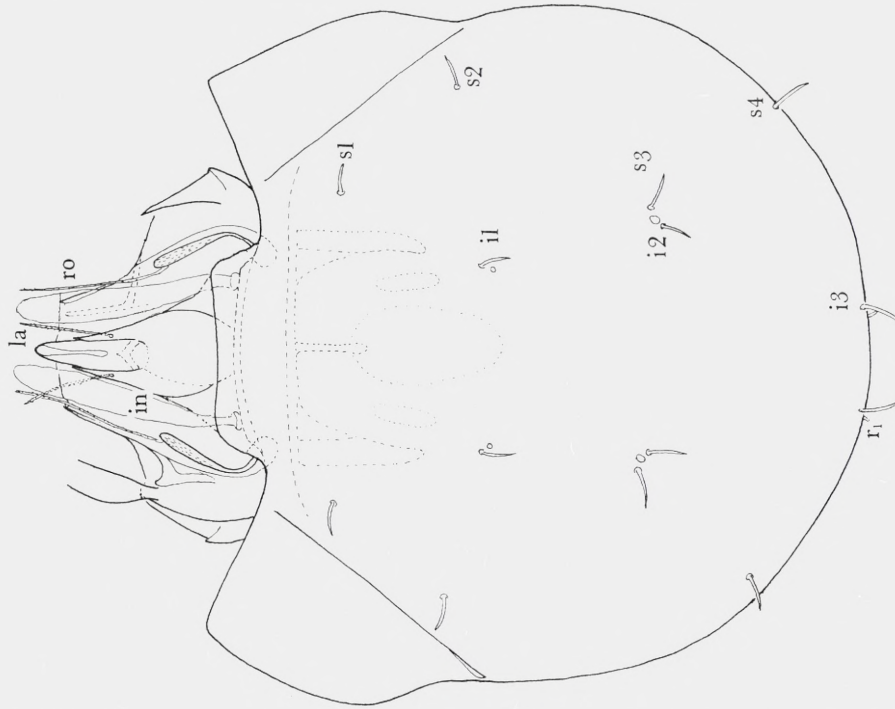
PLATE XII



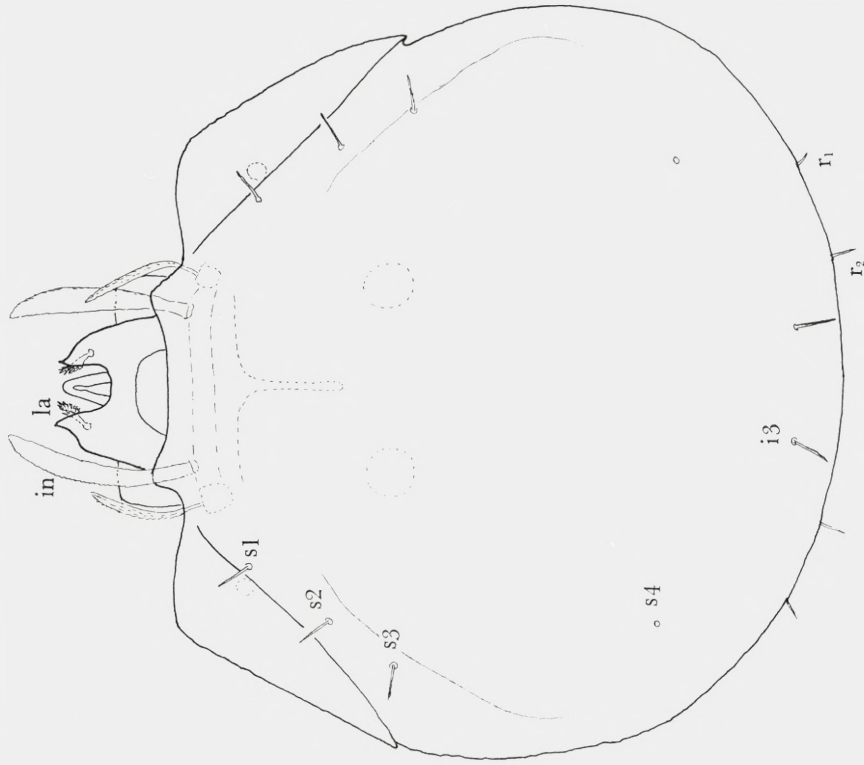


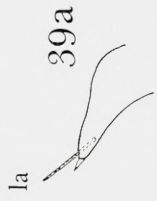
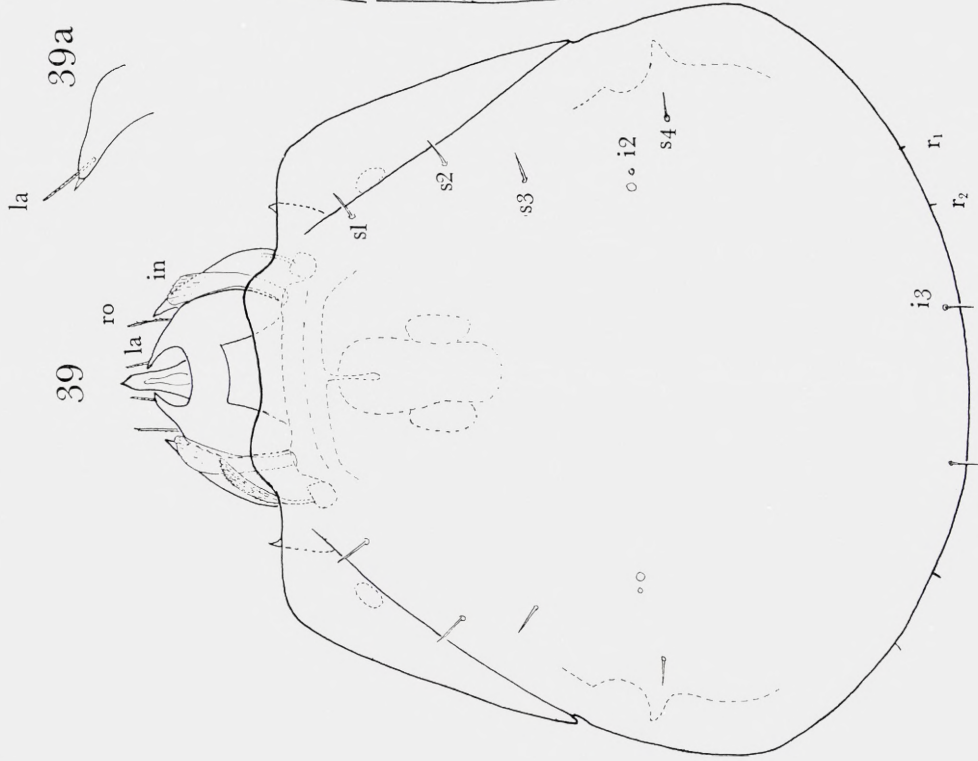
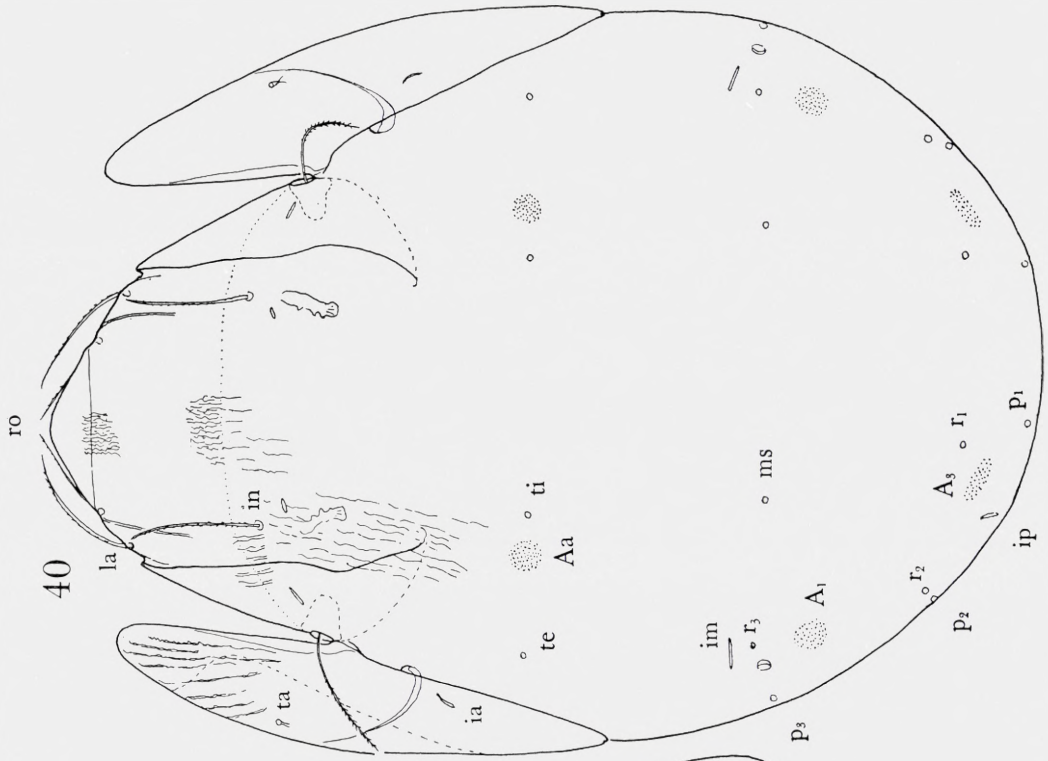


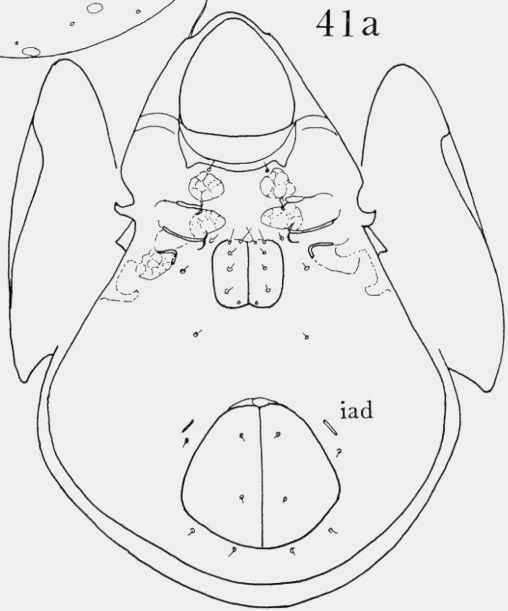
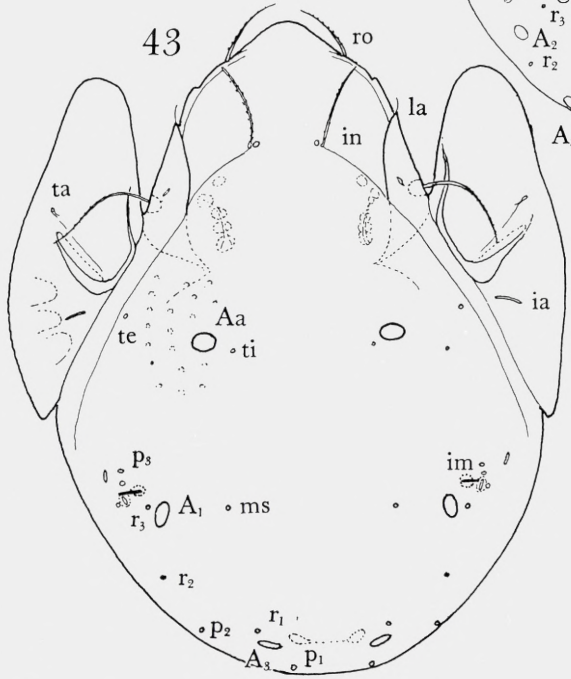
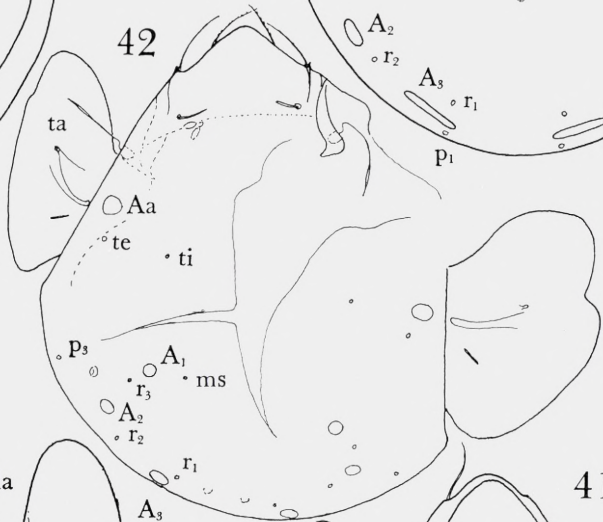
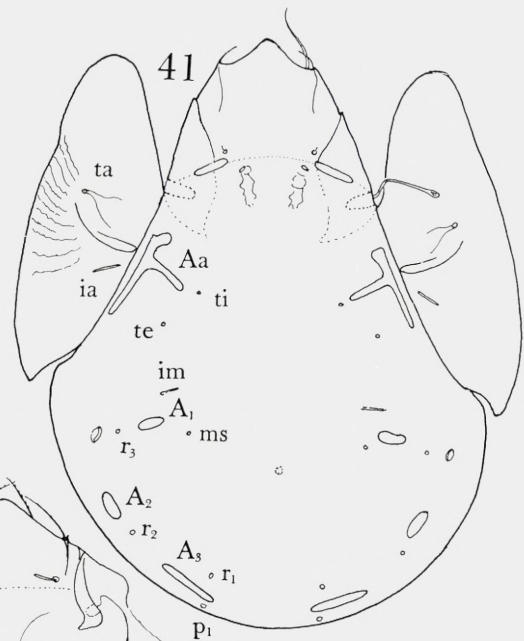
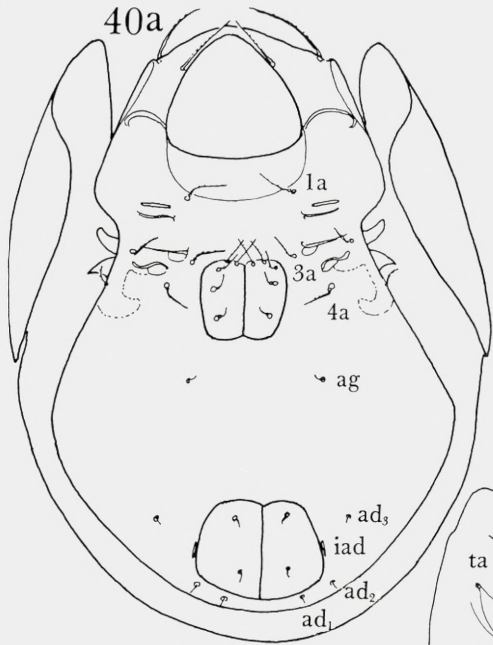
37

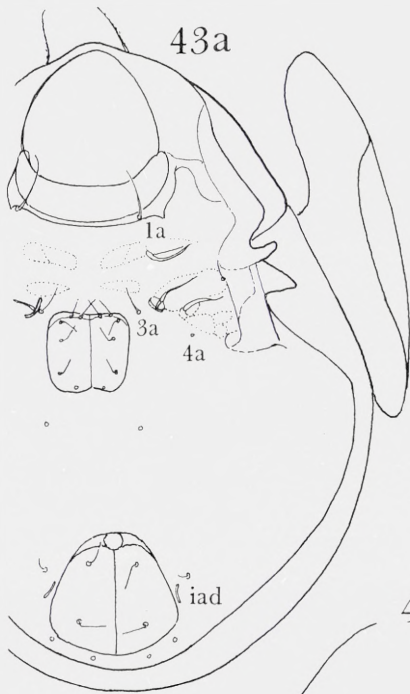


38

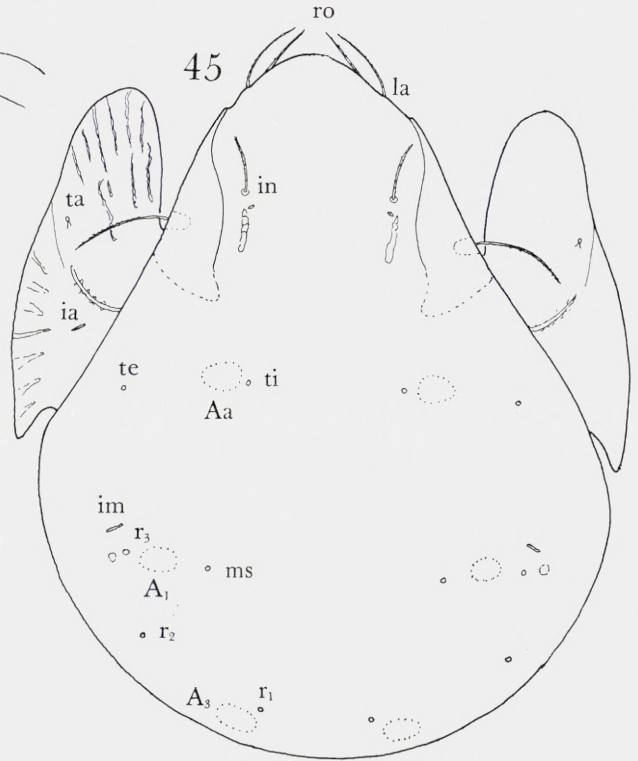
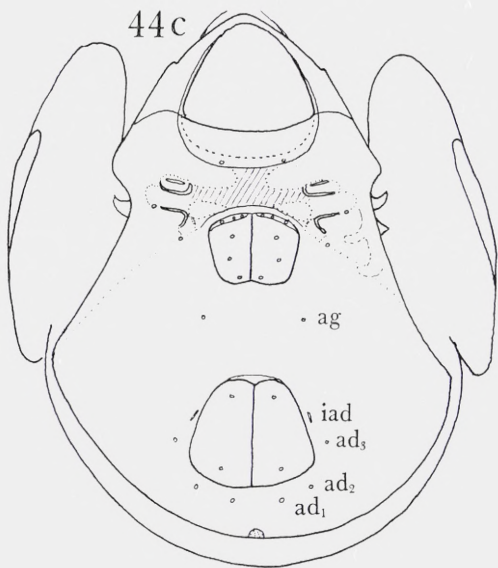
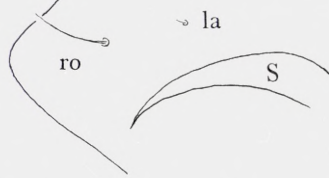
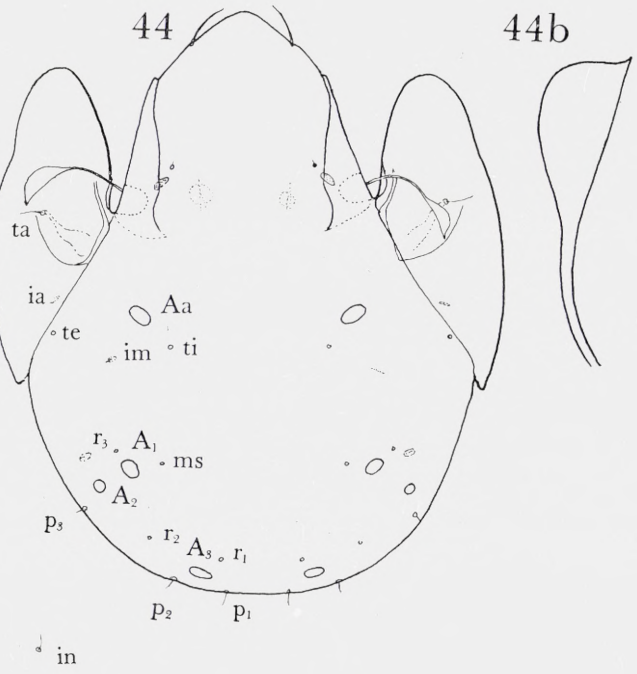




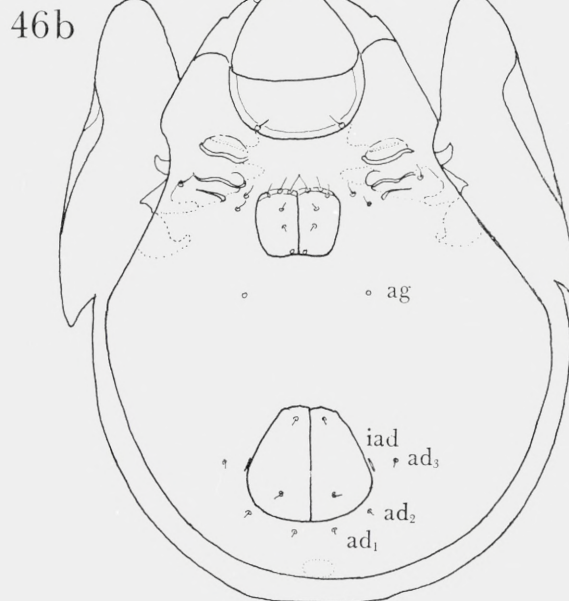
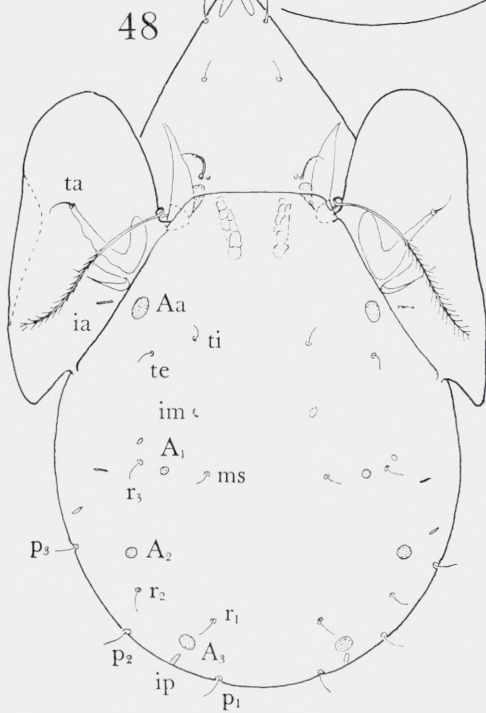
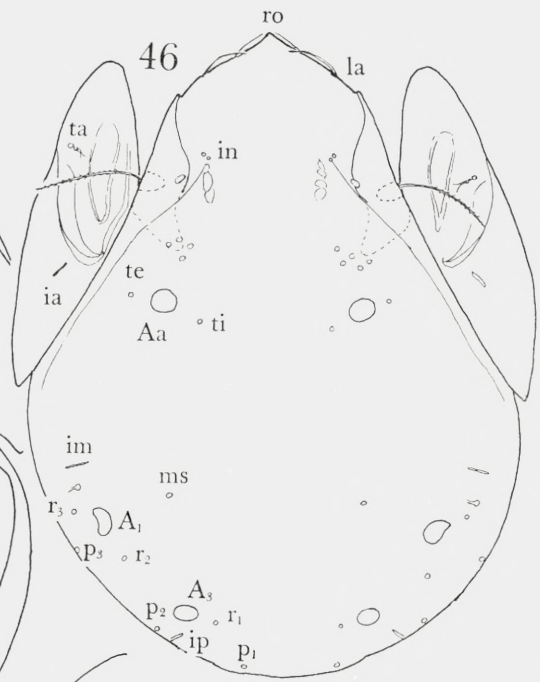


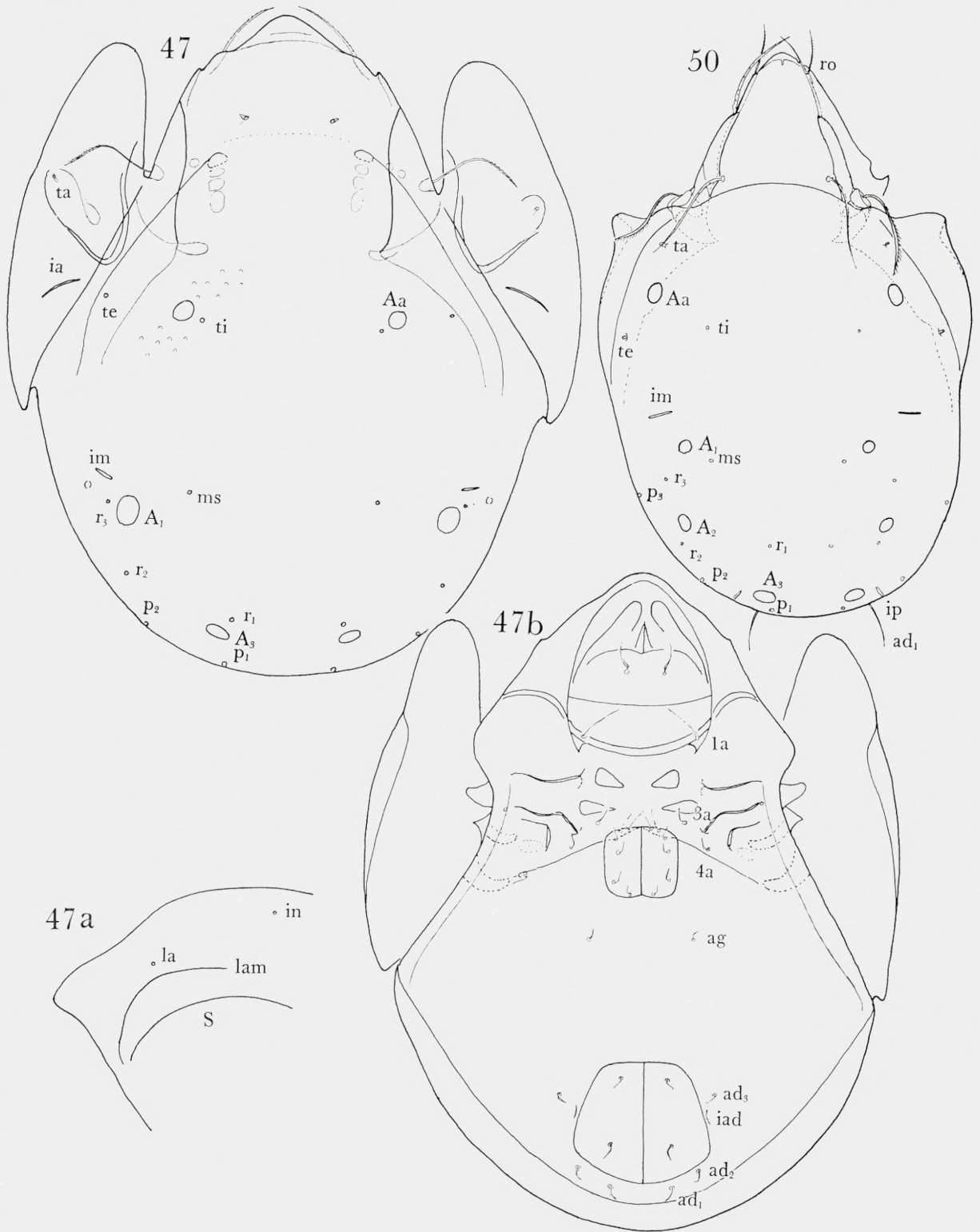


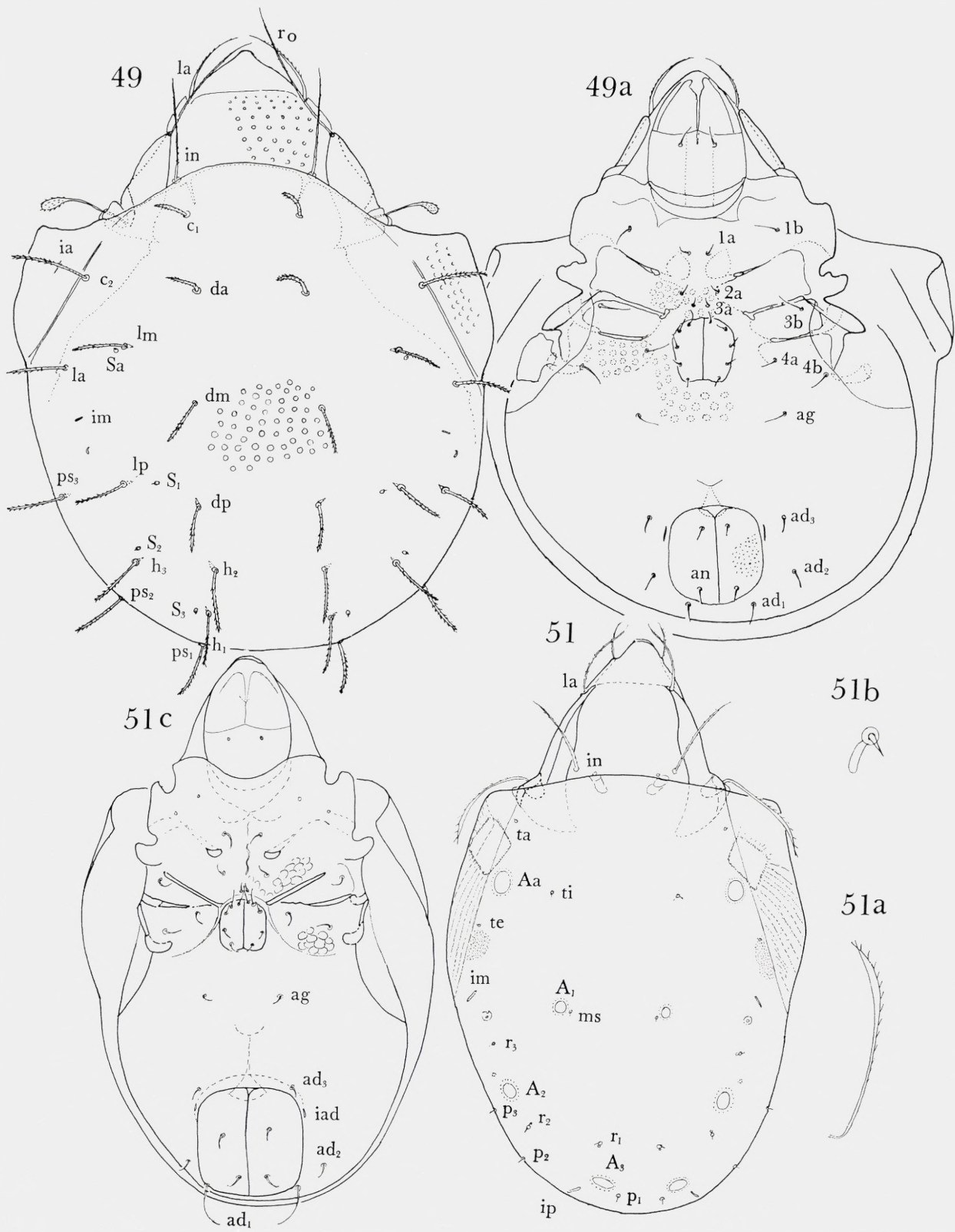
44a









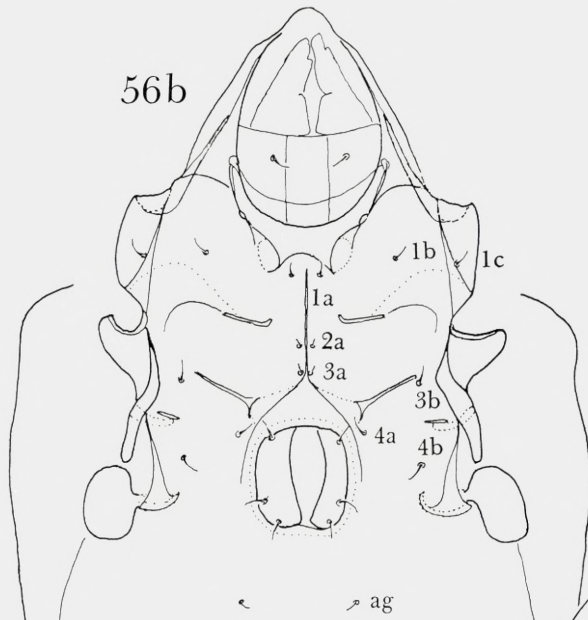




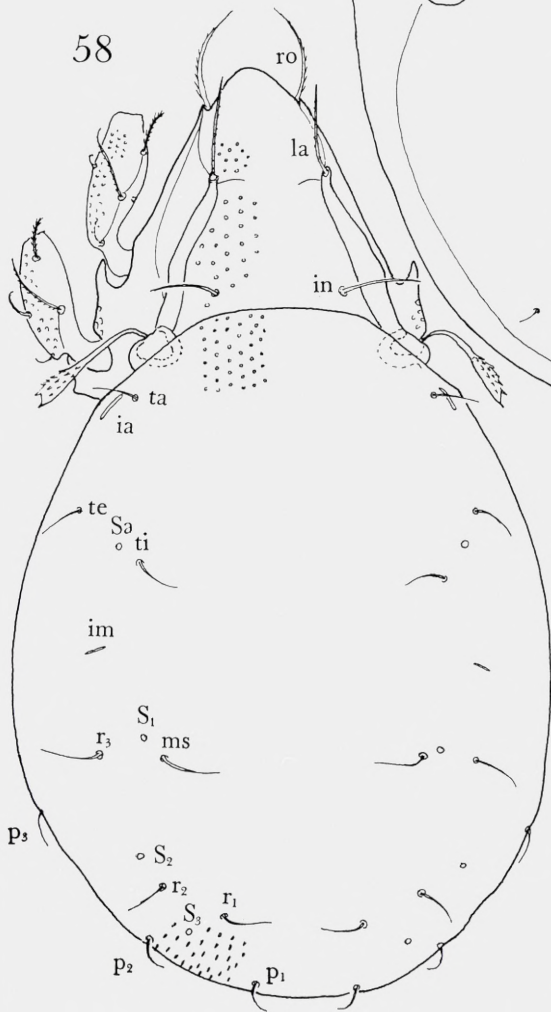




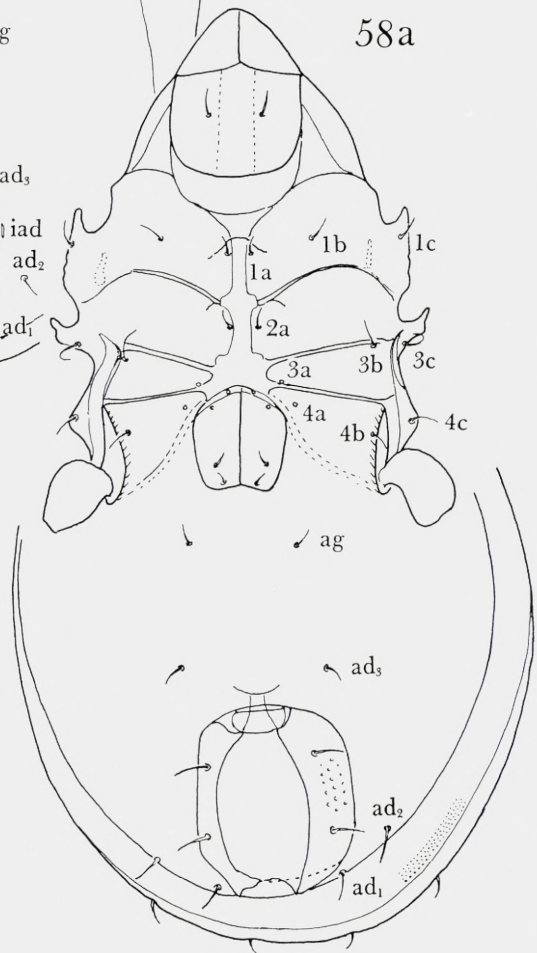
56b



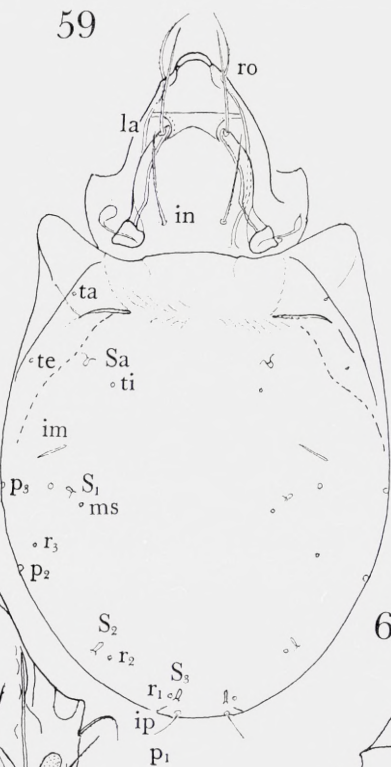
58



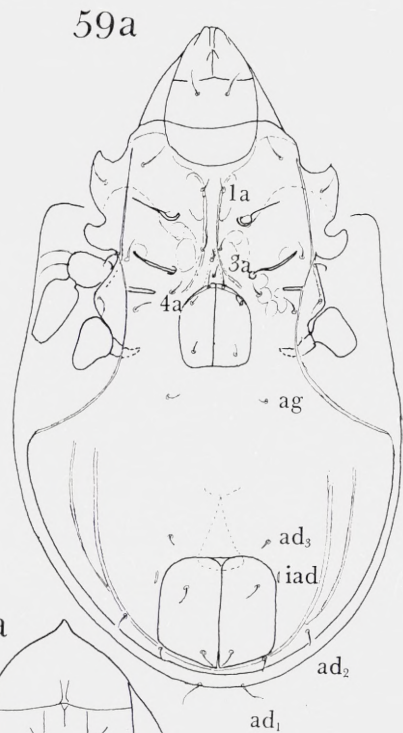
58a



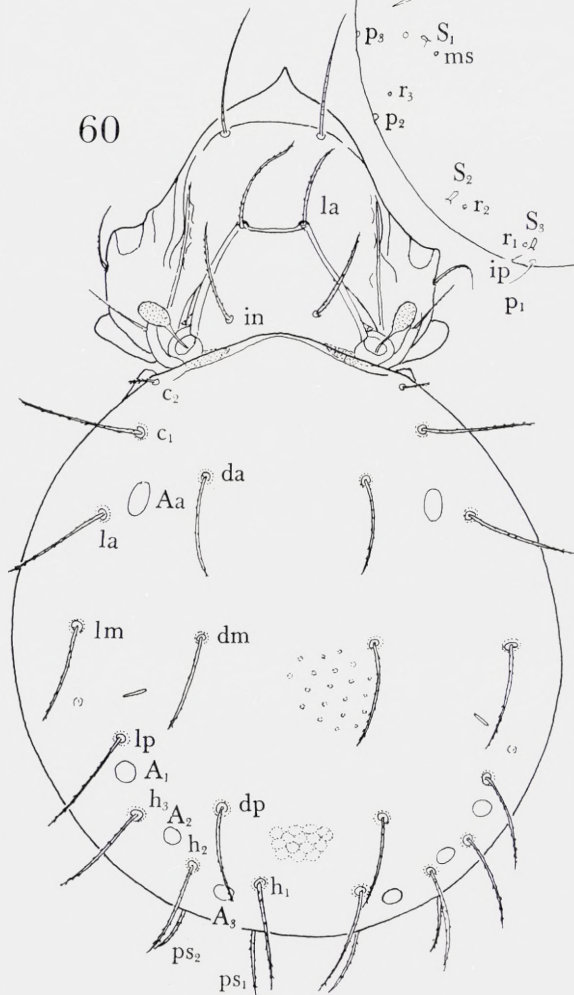
59



59a



60



60a

