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Number 4

Eriophyoidea
except Eriophyinae
(Arachnida: Acari)

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Front cover: The mites depicted are (top to bottom) *Aculops lycopersici* (Masse),
Phytoptus avellanae Nalepa, and *Diptacus gigantorhynchus* (Nalepa)

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ABSTRACT

A total of 49 species of eriophyoid mites are described and figured. This total comprises the 17 species hitherto known from New Zealand and 32 newly recorded ones, 25 of which are new to science. They are grouped into 3 families, 6 subfamilies, and 31 genera.

There are 12 new genera, as follows: Diptilomiopinae - *Brevulacus*, *Dacundiopus*, *Lambella*, *Levonga*; Cecidophyinae - *Chrecidus*; Nothopodinae - *Pangacarus*; Phyllocoptinae - *Arectus*, *Litaculus*, *Nothacus*, *Parulops*, *Pedaculops*, *Rectalox*.

Three new combinations are proposed: Diptilomiopinae - *Lambella cerina*; Phyllocoptinae - *Aculops gaultheriae*, *Aculops haloragis*.

The text includes a brief historical review of the superfamily and notes on mounting techniques, morphology, life cycle, classification, and economic importance. Host-plant records are listed for each mite species, and the mites (including eriophyines) recorded from each known host plant are listed in an appendix.

The 6 genera and 60 species of subfamily Eriophyinae are keyed, described, and illustrated in *Fauna of New Zealand* number 5, where also a taxonomic index to both numbers 4 and 5 may be found.

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INTRODUCTION

Mites of the superfamily Eriophyoidea are of worldwide distribution, and are invariably associated with plants. They are extremely small, ranging in length from 101 to 306 μm (approximately 0.1-0.3 mm), so are often invisible to the naked eye. A microscope is therefore essential to their study. Their general appearance is rather worm-like (Figures 1 and 2), and unlike most mites they have only two pairs of legs. Their small size and secretive habits cause them to be ignored or overlooked, so they are little understood and appreciated by most people. Nevertheless, some species are of considerable economic significance, and the recent appearance in New Zealand of such species as the wheat curl mite (*Aceria tulipae*), the citrus rust mite (*Phyllocoptruta oleivora*), and the apple rust mite (*Aculus schlechtendali*) calls for a greater awareness of them.

Information on eriophyoid mites in New Zealand is often difficult to obtain, since it is scattered through a variety of journals, some not now readily obtainable. Also, original descriptions are frequently inadequate, and in the light of recent knowledge of eriophyoid taxonomy some species should be renamed and reclassified.

With recent improvements in understanding of these mites, and with the accumulation of many additional species, it now seems appropriate to bring all this information together to provide a foundation for further studies. The main aim of this work, therefore, is to adequately describe and illustrate all the species now known from New Zealand, and to provide information on

their host plants, distribution, and economic significance. Identification keys are provided, to assist with discrimination of species using morphological characters. I have also drawn up a host/mite list (see Appendix); this is an important guide to identification, since many eriophyoid mites are host-specific or are found on a few plant species only, usually of the same genus. Accurate identification of the host plant can therefore be an important clue to their identity.

The nucleus of this work is a drawing of each species, highly magnified, showing the key diagnostic characters, together with a detailed description based on several specimens (usually about six), to give a more accurate overall picture.

To adequately describe the 109 eriophyoid species now known from New Zealand in a single *Fauna* contribution would produce a thick and unwieldy volume. Consequently, the 60 species in subfamily Eriophyinae are described separately, in *Fauna of New Zealand* number 5.

There is little doubt that many more species await discovery in New Zealand. With our unique flora it can be expected that our native eriophyoid species will tend to be unique; it is also likely that more introduced species exist here. The life cycles and biology of many economically significant species under New Zealand conditions are poorly understood, and this field of study deserves considerable future attention.

HISTORICAL REVIEW

Alfred Nalepa, an Austrian working in the period 1886-1929, was a dominant figure in early studies of eriophyoid mites. He was the first to provide adequate species descriptions and information on hosts and life histories, and his work was a solid foundation for further studies. In 1929 he published a host list of eriophyoids of the world, including all the species then known.

Mr H. H. Keifer, of California, began studying eriophyoid mites in the 1930s, and is today to the forefront of this field. His descriptions are models of precision, and his classification is largely followed by other workers. Keifer has published numerous articles on his studies, and much of his knowledge of eriophyoids, particularly economically important forms, is summarised in the book *Mites Injurious to Economic Plants* (Jeppson *et al.* 1975, pp. 327-591).

In New Zealand it was the economic forms that first gained attention, probably because of the damage caused to the host plants, which is far more obvious than the mites themselves. The first eriophyoid mite recorded from New Zealand was *Eriophyes pyri*, regarding which Thomson (1922) states: "... reported in 1896 and 1897 as very common in the colony. It appears in spring and early summer and attacks foliage. In 1909 the Agriculture Department reported it as very prevalent, and doing considerable damage on unsprayed trees. Generally distributed throughout New Zealand on pear trees." Woodfin (1927) noted the grape erineum mite, *Colomerus*

vitis (as *Eriophyes vitis*). Cottier & Taylor (1937) recorded the tomato russet mite, *Phyllocoptes lycopersici*, on glass-house tomato plants at Auckland - isolated attacks occurred in some Auckland areas. Keifer (1939c) described *Eriophyes waltheri* from *Nothofagus menziesii* at San Francisco, the plant having been imported from New Zealand; the mites caused severe terminal stunting and branching, producing a heavy cluster of large, aborted buds. This shows how easy it is for pest species to be introduced into other countries through shipments of infested plants, and also shows the importance of plant quarantine services in preventing the establishment and spread of such pests. Miller (1944) recorded the walnut blister mite, *Eriophyes tristriatus*; and Hamilton (1948) recorded the blackberry mite (*Aceria essigi*) from the Nelson area, where it caused "redberry disease".

Dr K. P. Lamb was the first New Zealand worker to concentrate specifically on eriophyoid mites, particularly native species, which had been largely ignored previously. Again, the species dealt with affected the host plant to some extent, forming either galls or leaf erineum (see 'Damage to Host Plants'). In 1952 he described nine new species from galls on native plants, and his preliminary list of New Zealand Acarina showed a total of 16 species of eriophyoid mites occurring here. In 1953 Lamb described a further eight species, and in his 1960 checklist of New Zealand plant galls he recorded a total of 23 species, together with hosts and distribution records, and mentioned the presence of a

number of undescribed species. This latter is an important data source on which to base further studies.

Ramsay (1958) described a new species of gall mite, *Aceria victoriae*, from *Haloragis erecta* and gave an account of its life cycle - the first of an eriophyoid mite from New Zealand.

Manson (1959, 1965, 1970) added nine further species to the New Zealand fauna, but as recently as 1971 Spain & Luxton were able to list only 38 species known from this country.

CLASSIFICATION

During this work on the eriophyoid mites I have had the problem of deciding the appropriate taxonomic framework to use in the classification of species.

One of the most recent classifications is that of Newkirk & Keifer, in *Mites Injurious to Economic Plants* (Jeppson et al. 1975), and one of the key papers cited there is that of Newkirk & Keifer (1971), whereby drastic changes were proposed in the usage and definition of the well known genera *Aceria*, *Eriophyes*, and *Phytoptus*. A major proposal was that species in the genus *Aceria* Keifer, 1944 would be removed to *Eriophyes* Siebold, 1851, and species in *Eriophyes* would be transferred to *Phytoptus* Dujardin, 1851. These changes were in formal agreement with the International Code of Zoological Nomenclature, but they tended to create confusion amongst students of the Eriophyoidea and acarologists in general, particularly as in the 33 years

preceding 1971 the existing definition and usage of *Aceria*, *Eriophyes*, and *Phytoptus* had become well established.

Subsequently a case was presented to the International Commission on Zoological Nomenclature (*Bulletin of Zoological Nomenclature* 32 (1), p. 17-18, and 32 (2), p. 86-94; 1975) to negate the proposals of Newkirk & Keifer and retain the pre-1971 usage for the above genera. V. G. Shevtchenko and E. E. Lindquist were leading proponents of this action, and have been supported by other acarologists. Their view was upheld by the Commission (*Bulletin of Zoological Nomenclature* 36 (1), p. 63-64; 1979) and it is my intention to follow this decision here.

However, one other problem has arisen. An examination of *Eriophyes vitis*, designated the type species of *Eriophyes*, by Keifer (1938b) shows that it is quite distinct from - and hence not congeneric with - the vast majority of species placed in *Eriophyes*. Keifer (1944) recognised this when he stated: "Thus the genotype is at once unharmonious with the bulk of species herein referred to *Eriophyes* and may have to be separated." Subsequently, Newkirk & Keifer (1971) erected a new genus, *Colomerus*, to which they transferred *E. vitis*. Now, to abide by the 1979 ruling of the Commission would be to transfer the vast majority of species now in *Eriophyes* to another genus, which would defeat the underlying principle of their decision.

I discussed this problem with Dr G. W. Ramsay (Entomology Division, DSIR, Auckland), and we jointly submitted a note to the Secretary of ICZN proposing that the

Commission use its plenary powers to designate a new type species for *Eriophyes*. We believe this would be the best means of retaining the name *Eriophyes* in the usage proposed by the Commission in 1979. No action has been taken on this proposal, so I have decided to transfer *Eriophyes vitis* to genus *Colomerus*, as has already been done by Newkirk & Keifer (1971), Jeppson *et al.* (1975), Savage (1978), and Ramsay (1980), and retain the name *Eriophyes* in its original context. This course creates the least disturbance to the present classification while abiding in principle by the ICZN decision.

MORPHOLOGY

A knowledge of structure is essential for correct diagnosis and classification. Typical eriophyoid mites are depicted in Figures 1 and 2. There are three main body divisions - the rostrum, the dorsal shield or cephalothoracic shield, and the abdomen.

THE ROSTRUM is an important structure in classification at the family level. It is of a beaklike form and directed downwards.

There are two main types of rostrum. In the first, found in the Diptilomiopidae, the rostrum is large in relation to the body and apically attenuate. Here we have the long-form oral stylet, in which the distal recurved portion is longer than the stylet base plus pharyngeal pump (Figure 12). In the Sierraphytoptidae and Eriophyidae, on the other hand, the rostrum is usually small relative to the

body and the short-form oral stylet occurs (Figure 13), i.e., the distal recurved portion of the stylet is usually shorter than the stylet base plus pharyngeal pump. In some females (deutogynes) of the subfamily Aberoptinae the rostrum is unusual in terminating in a spatulate or shovel-nosed structure.

Keifer (1959a) investigated the eriophyoid rostrum and associated structures, and to know more of its form and function one should consult Keifer's article.

In many species, arising shortly before the rostrum termination, there is an antapical seta. Its occurrence and length are of some assistance in species recognition.

THE CEPHALOTHORACIC SHIELD is sometimes known as the propodosomal or dorsal shield, or simply 'shield'. Usually it is triangular or semicircular, and bears a pattern of lines, granules, or broken lines which is distinctive for individual species. The pattern may vary slightly or differ in intensity in any given species, but it is an important diagnostic feature. Keifer (1952) recognises and names several of the principal lines on the shield - the median (usually running the full length of the shield), admedians, and submedians; these are depicted in Figure 7.

The cephalothoracic shield sometimes has a projection, the anterior shield lobe (Figure 2), the occurrence of which is an important character at subfamily and genus level. In a few instances the lobe is thin and flap-like; in *Rectalox falita* n. gen. & sp. for instance it is almost rectangular. The lobe's variation in shape and

prominence is of importance in species identification. In genus *Aculus* the protogynes have two small spines projecting from under the anterior margin of the lobe. (Note. Measurements of the dorsal shield exclude the anterior shield lobe, where this is present.)

The cephalothoracic shield may bear from one to four dorsal tubercles and setae, although a few species - e.g., *Cecidophyopsis ribis* and *Calacarus carinatus* - lack these completely. Most commonly, two tuberculate setae are situated near the posterior shield margin. So far, no species have been found in New Zealand with three setae, but when present the third seta is situated on the midline, near the anterior margin of the shield. A few species have four setae, for instance *Phytoptus avellanae* and *P. rufensis*. The direction and length of the shield setae has an important bearing on generic placement; for instance, in *Aceria* they are directed to the rear, in *Eriophyes* anteriorly, and in *Phyllocoptes* usually towards the midline.

THE ABDOMEN, the principal part of the eriophyoid body, usually tapers towards the rear, and is 'worm-like' - divided transversely into a number of superficial rings which in bud and gall mites are regular dorsoventrally. Free-living forms are less worm-like, and may have flattened abdomens with longitudinal ridges or grooves or lateral structures. They may also have the body clearly divided dorsoventrally into tergites and sternites, the two sections being quite different in structure. Some species have rows of a white, waxy secretion on the dorsal surface of the abdomen,

or may cover themselves with flocculent wax.

The body rings are frequently studded with elongate-oval or rounded structures, called microtubercles, which may completely cover the body, or occur on the sternites only, or be lacking on some posterior rings. The form, number, and arrangement of microtubercles are useful diagnostic characters.

The abdomen bears a limited number of setae - the lateral seta, the first to third ventral setae, the caudal seta, and the accessory seta. A few species, e.g., *Phytoptus avellanae* and *P. rufensis*, also have an anterior subdorsal seta. The relative length of the setae is a valuable specific and generic character, as is the absence of certain setae; for instance, *Dacundiopus stylosus* n. gen. & sp. lacks a lateral seta, and *Asetilobus hodgkinsi* n. comb. lacks the second ventral seta. The accessory seta is often absent. The body setae sometimes taper very finely at their distal extremity, making accurate measurement difficult.

GENITALIA. The transverse genital opening is located anteriorly, just behind the hind coxae. Figures 3 and 4 illustrate the female and male genital openings of *Aceria tulipae*. The easiest means of distinguishing the sex of specimens is the inverted 'V'-shaped nature of the male opening. The female genital opening is covered by a semicircular hinged flap, the coverflap, which may have longitudinal markings or scoring, crescentic scoring, granules, or some other type of ornamentation on its surface. In a few species the coverflap may be devoid of markings. The degree and nature of the coverflap markings are of

significance in the generic and specific placement of some species.

A pair of genital setae are always present; their length can be of assistance in species placement.

The internal female genitalia consist of an anterior apodeme behind which are the spermathecal tube and paired, bulb-like spermathecae (Figures 8 and 9). The shape of the apodeme is of considerable significance. The normal type is shown in Figure 8, but in some instances the apodeme is considerably shortened (Figure 9), and may appear as a heavy, transverse black line. Members of the Cecidophyinae have a much shortened apodeme of this type. *Phytoptus rufensis* has long spermathecal tubes, as compared with the more typical shortened tubes of species of *Aceria*. The nature of the tubes is a useful diagnostic character.

Female internal genitalia have been drawn where possible, but in some species they are difficult to observe, particularly the spermathecae and spermathecal tubes.

LEGS. All eriophyoid mites have only two pairs of legs, divided into coxa, trochanter, patella or genu, tibia, and tarsus (Figure 10). The foreleg and hind leg are essentially similar. In some species there may be a reduction in leg segmentation, or some segments may be fused. Members of the Nothopodinae (*Cosella*, and *Pangacarus* n. gen.) lack a distinct tibia, or the tibia and tarsus are fused.

Leg setation is an important character, and it is necessary to be able to clearly locate the respective setae or establish their absence. There are usually three

pairs of coxal setae (Figure 6), and from a taxonomic viewpoint the forecoxal or first coxal setae are the most important. Their occurrence, position, and length are all features worth noting. The trochanter lacks setae. The femur usually has a single ventral seta; its absence is of significance. The genu or patella has a single distinctive seta. The foretibia has a single seta, but the hind tibia always lacks it. The tarsi have two long, closely associated setae on the upper surface, and often a short, fine seta arises ventrally, near the distal margin.

The claw and featherclaw arise from the distal part of the tarsus; both are important structures. The rod-like claw may be straight or curved, and often terminates as a knob. The actual and relative length of the claws are of use for species identification. In genus *Cosella* the foreclaw is unusual in being angled outwards (Figure 146) instead of parallel to the featherclaw. The featherclaw is usually one of two main types. The simple type (Figure 14), which is commonest, has a central stem from which arise branches or rays. The number of rays is an important species character. The second type, less frequently seen, is the divided featherclaw - e.g., in *Dacundiopus stylosus* (Figure 15) and *Diptacus gigantorhynchus* (Figure 55) - or some modification of this, as in *Brevulacus reticulatus* n. gen. & sp. (Figure 16), the featherclaw of which is most unusual. Featherclaw structure is important in genus and species placement.

LIFE CYCLE

Two main types of life cycle occur in erio-phyoid mites. The first, sometimes called a simple life cycle, involves only one type of female. The female lays eggs, there are two nymphal stages, and finally the adults develop. The nymphs differ from the adult in being smaller (although the second nymph reaches adult size before moulting), in lacking external genitalia, and in the extent of body microtuberculation.

Ramsay (1958) studied the life cycle of *Aceria victoriae*, a species causing bud galls on *Haloragis erecta*. The sizes of the respective stages were: first nymph, 100-110 μm long; second nymph, 126-164 μm ; and adult 170-220 μm . Ramsay pointed out that the microtubercles of the first nymph are somewhat irregularly arranged and widely spaced, becoming more regularly arranged and more closely spaced in the second nymph. The first nymph has 60-64 dorsal rings, reduced ventrally to about 35; the second nymph has 65-70 dorsal rings, reduced to 54-60 rings ventrally; and the adult has about 70-80 closely spaced and regularly arranged dorsal rings, reduced to about 65-72 ventrally. Another feature he noticed was the differing position of the dorsal shield setae in the three stages. In the first nymph these are directed anteriorly; in the second nymph they are directed posteriorly and upwards; and in the adult, posteriorly. The duration of the life cycle was not stated. Hall (1967) states that a simple life-history cycle takes from 10 days to 2 weeks to complete.

The second type of life cycle, sometimes called a complex life cycle, involves

two types of female: the protogyne or primary form, which is associated with males and structurally is very similar to them; and the secondary female or deutogyne, which is not associated with males and is quite different in appearance to the protogyne. Protogynes frequently occur on the leaves of the host plant, whereas deutogynes usually appear in response to leaf hardening or the onset of winter, and hibernate in bark crevices or lateral buds, emerging the following spring to lay eggs on the new foliage. These eggs give rise to protogynes and males. Deutogynes preserve the species during less favourable times of the year when food is not freely available.

Deutogynes and protogynes of a species may differ from each other so much that in the past they have been placed not only in separate species but even in separate genera. It is important both taxonomically and from a pest management standpoint to realise that deutogynes do exist, and that they usually have different habits from the protogyne.

In the New Zealand fauna there are species that are known to be deuterogynous, and where material has been available both protogyne and deutogyne are described. In the keys to genera and species, however, deutogynes have been ignored; only the protogyne form is referred to. The keys will not function for deutogynes.

In general, deutogynes can be distinguished from protogynes in the following respects:

(a) they usually have reduced microtuberculation or, where microtuberculation is

complete, the microtubercles differ in shape from those of the protogyne;
(b) the dorsal shield usually has less ornamentation, and the anterior lobe is thinner and more downturned;
(c) rust mite deutogynes usually have narrower tergites and are without ridges, furrows, or other body projections.

Where two types of female occur on a host plant they may be the protogyne and deutogyne of the same species. Apart from their genitalia protogynes are identical to males, and so detection and examination of males is an excellent guide to the structure of the protogyne. Consequently, if two types of male are present, and correspond in structure to females, then neither female is a deutogyne.

Until recently it was considered that deutogynes occurred only on deciduous or partially deciduous host plants, but Keifer (1976) has described *Phytoptus adenostomae* as an eriophyid living on an evergreen host (*Adenostoma fasciculatum*) in California and yet having the two female morphs characteristic of deuterogyny.

Ten species of eriophyoid mite are known to have deutogynes in New Zealand, and two of these are from the evergreen *Nothofagus menziesii* - *Aceria simonensis* n. sp. and *A. waltheri*. In addition, *Aceria titirangiensis* is suspected of showing deuterogyny, and both *Acalitus lowei* and *A. morrisoni* are variable in structure, to a quite considerable extent in *A. lowei*.

Keifer (in Jeppson *et al.* 1975) states that the probable life span of an active protogyne is about a month or 5 weeks, and that new protogynes continue to develop as long as conditions are favourable.

There has been no study of the life cycle of deuterogynous forms in New Zealand.

I have made no detailed investigations of males in the course of this work, and simply state whether they are known to occur for each species. The keys deal solely with adult females.

The mechanics of fertilisation in the Eriophyoidea were not understood until recently, when work by Oldfield *et al.* (1970), Sternlicht (1970), and Sternlicht & Goldenberg (1971) showed the occurrence of spermatophores and the phenomenon of female self-fertilisation. Sternlicht & Griffiths (1974) studied the emission and form of spermatophores in *Aceria sheldoni*. Males lay down stalked spermatophores where females can find them; the female moves up over the sperm sac, and presumably squeezes the sperm from it by using the hinged coverflap (Sternlicht & Goldenberg 1971, Oldfield *et al.* 1972). There is no transfer of sperm by direct contact between male and female.

DAMAGE TO HOST PLANTS

Of the 109 species recorded in this study, 82 - a surprisingly high proportion - cause damage of some kind to the host plant.

LEAF ERINEUM

Feeding by the mites on the leaf surfaces results in an abnormal proliferation of the surface hairs, with the production of a felt-like mass called an erineum. The mites shelter within this growth. Erinea may be of various colours, such as white, red, brown, or black, and can easily be

mistaken for fungi. Among the best known are those caused by the grape erineum mite, *Colomerus vitis*: the white, felt-like erineum occur on the undersurface of the leaves. *Phyllocoptes coprosmae* can cause a distinctive whitish erineum on leaves of *Coprosma robusta*; *Acalitus australis* n. comb. causes a brownish erineum on leaves of puriri (*Vitex lucens*); *Aceria erineum* causes a whitish, furry erineum on walnut leaves; and *Colomerus nudi* n. sp. causes a reddish erineum on the leaves of *Phed-
alium nudum*.

'WITCHES BROOM' EFFECT

This type of damage is so called because the final result reminds one of the besom, or broom, traditionally ridden by witches. Twigs or buds show abnormal growth patterns resulting in a twisted mass of shoots. Keifer (in Jeppson *et al.* 1975) comments as follows: "Brooming appears as twig elongation, or bud proliferation, accompanied by either absence of leaves, or stunted leaves, and often internode shortening. Twigs and flower clusters may show this effect". Examples of this type of damage in New Zealand are the green witches brooms on *Clialanthus puniceus* caused by *Aceria clianthi*; abnormal flower-bud development on *Gaultheria depressa* caused by *Aculops gaultheriae* n. comb.; and the witches broom formations on the terminal twigs of *Nothofagus menziesii* caused by *Aceria waltheri*.

LEAF GALLS

Abnormal development of epidermal cells forms various types of galls, each species of mite usually having a distinctively

shaped gall. The mites shelter and feed within the galls, which are principally developed on the upper leaf surface, with an exit hole on the undersurface. *Acalitus lowei* forms pouch galls on both leaf surfaces of beech (*Nothofagus* species), and unlike most mites appears to produce two types, a thin-walled, striated gall up to 1 mm in diameter and a greenish, globular gall up to 2 mm in diameter. *Acalitus taurangensis* n. comb. forms unusual purple, papillate galls on the upper leaf surfaces of *Coprosma tenuicaulis*; *Eriophyes lambi* forms reddish, pocket-type galls on leaves of *Muehlenbeckia* species; and *Vittacus mansonii* forms woolly bead galls on stinging nettle, *Urtica ferox*.

STEM AND BUD GALLS

The outstanding example of this type of damage is the presence of typical roughened stem galls of 1-2 cm diameter on our native lacebark, *Hoheria populnea*, caused by *Eriophyes hoheriae*. *Acalitus morrisoni* can cause large bud galls up to 2 cm in diameter on *Nothofagus* species. *Aceria carmichaeliae* causes very distinctive stem or bud galls up to 3 cm in diameter on *Carmichaelia* species.

RUSSETING OF LEAVES AND FRUIT

Heavy feeding by mites can cause leaves to become russeted and shrivel, with a consequent deterioration of the plant's health. Fruit can be similarly affected, and its market value drastically reduced. Tomato russet mite (*Aculops lycopersici*) can be a serious pest of tomato, causing russeting and cracking of the fruit and subsequent death of the plant. The citrus rust mite,

Phyllocoptruta oleivora, can be a serious pest of citrus trees; both leaves and fruit are attacked. The fruit turns a russet colour, and its size and quality are much reduced. The apple rust mites, *Aculus schlechtendali* and *Calepitrimerus baileyi*, are capable of causing a browning and rusting of foliage. These species have not been studied closely in New Zealand, but in the U.S.A. *A. schlechtendali* is a widespread pest of apples damaging terminal growth of trees and causing leaves to curl and become rusty brown.

ENLARGED BUDS

Filbert bud mite (*Phytoptus avellanae*) is a serious pest of hazel and filbert trees in Europe and North America. It has been recorded from Havelock North and Blenheim in New Zealand, but seems so far to be of minor consequence here, possibly because filbert is of limited distribution. More extensive plantings may result in this mite becoming more important. Infested terminal buds become swollen and deformed, a condition known as 'big bud'. The currant bud mite, *Cecidophyopsis ribis*, causes greatly swollen buds in black currant, although in New Zealand it seems to be more severe on gooseberries, infested buds failing to produce satisfactory growth. *Eriophyes duguidae*, a native mite, causes swollen leaf buds on *Raoulia tenuicaulis*.

BUD DEFORMATION

The best known agent of this type of damage is the citrus bud mite, *Aceria sheldoni*, which lives inside or in the vicinity of buds of citrus trees, usually lemons. Buds may be killed or so damaged that the

resulting leaves, blossoms, and fruits become malformed, often assuming grotesque shapes. The native mite *Aceria parvensis* causes swollen leaf buds on *Stellaria parviflora*.

FLOWER DAMAGE

Cosetacus camelliae, the camellia bud mite, probably contributes to premature flower drop of camellia and associated browning of the flower parts and buds.

FRUIT DAMAGE

Acalitus essigi, the redberry mite, attacks the fruit of blackberry and boysenberry, causing what is known as 'redberry disease'. The mites congregate between the individual drupelets of the fruit, and developing berries become hard, red, and inedible. *Acalitus orthomerus*, the boysenberry bud mite, has been found associated with *A. essigi*, and is possibly a contributing factor in redberry disease.

ROSETTING OF SHOOT APEX

Aceria capreae is associated with rosetting of the shoot apex of the willow *Salix caprea*. *Aceria strictae* is associated with shoot rosetting on *Hebe stricta*.

BULB DAMAGE

The wheat curl mite, *Aceria tulipae*, has been recorded from the Blenheim area, where heavy infestations have been found in stored garlic bulbs and cloves. Damaged cloves dry out, becoming withered, yellowish, and virtually worthless. Overseas this mite also attacks wheat and other grasses, and is responsible for kernel red streak, a major corn disease in the U.S.A. caused by the injection of a salivary toxin. *A. tulipae* is regarded as one of

the most injurious eriophyoid pests known, because it both damages agricultural crops and transmits virus disease (see below).

TRANSMISSION OF VIRUS DISEASES

This is an important aspect of applied studies of eriophyoid mites. The first report of virus transmission was published in Britain in 1927 by Amos *et al.*, who suspected that currant reversion was due to a virus transmitted by the mite *Cecidophyopsis ribis*. This was later confirmed by Massee (1952). Overseas workers have now shown a definite correlation between some viruses and certain mite species. For instance, wheat streak mosaic virus and wheat spot mosaic virus are transmitted by *Aceria tulipae*, fig mosaic by *A. ficus*, ryegrass mosaic by *Abacarus hystrix*, and peach mosaic by *Eriophyes insidiosus*. No work has yet been done in New Zealand on eriophyoid mite transmission of virus disease, although the vectors *A. tulipae* and *C. ribis* occur here.

WEB-SPINNING BY ERIOPHYID MITES

This unusual phenomenon was first recorded by Knorr *et al.* (1976). Large colonies of an eriophyid mite, *Aculops knorri*, were encountered under web-like coatings on leaves of *Lepisanthes rubiginosa* in Thailand. It is believed that the mites are responsible for this webbing, even though they have no silk-spinning organs.

In 1982 Dr Uri Gerson drew my attention to small, web-like patches on the leaf undersurface of the tree-fern *Dicksonia squarrosa* growing near Hamilton. Small numbers of mites were present under the webbing, and proved to be a new species, here described as *Aceria gersoni*. This is

the first record of this type of 'damage' in New Zealand.

MIXED DAMAGE

It has usually been assumed that each species of eriophyoid mite causes only one particular type of damage to a plant, but I have seen instances where this is not so. For example, *Acalitus lowei* normally occurs within galls on *Nothofagus* species, but in several samples these mites were present in leaf erineae; this now appears not to be accidental, as I had at first suspected. *Aceria waltheri* has been found associated with witches brooms, gall formations, and leaf erineae, although in some of the erineae *Aceria simonensis* was present, and may have been the causal agent. *Eriophyes lambi*, normally a gall former on *Muehlenbeckia*, has in one instance been taken in a leaf erineum on *Nothofagus menziesii*, and *Nothacus tuberculatus* has been taken from leaf galls and a leaf erineum on *N. menziesii*.

Interestingly enough, all these records involve species of *Nothofagus* as the host plant. Examples such as this must tend to weaken criteria of the International Code of Zoological Nomenclature, notably 16(a) (viii), which states that a description of the damage caused by an animal can be used in establishing a name for it.

METHODS AND CONVENTIONS

The mites studied in this work have been mounted in Hoyer's medium (distilled water, 50 ml; gum arabic, 30 g; chloral hydrate, 200 g; glycerine, 20 g) or in modified Hoyer's medium (distilled water, 50 ml; gum arabic, 50 g; chloral hydrate, 125 g; glycerine, 30 g - see Singer (1967)).

There seems to be little difference between these mountants, although my impression is that the first is slightly superior, having less tendency to crystallise on the slide.

The mites are first gently heated in a drop of lactic acid on a slide; this expands and clears them. They are then transferred directly to the Hoyer's medium on a microscope slide, a coverslip is applied, and the mites are oriented, if necessary, by pushing on the coverslip with a pair of forceps or some similar instrument. The slide is then dried in a low-temperature oven at about 40°C for at least 1 day. The completed slides are ringed with Glyceel for permanence.

Eriophyoid mites in dried plant material can be located and removed by cutting out a small portion of the plant, lightly teasing out the tissue with a pair of needles, and then gently heating it in lactic acid in a cavity slide or a small evaporating dish. The desiccated mites swell to almost their normal size and usually float free, when they can readily be detected with a low-power binocular microscope. They are then transferred direct to Hoyer's medium, as mentioned above.

For this study, detailed examination of the mites has been made with a Zeiss Standard WL Research Microscope, using a phase-contrast condenser. Drawings have been prepared with the aid of a camera lucida attachment.

DESCRIPTIONS

For the sake of brevity, fractions of length have been used to express position on structures. On the dorsal shield, for

example, "admedians converging at about one-third to form an inverted 'V'-shape" indicates a point of convergence at one-third of the shield's length along the midline from the anterior margin. On the legs, the fraction would indicate a distance from the basal (proximal) end of the segment concerned.

KEYS TO SPECIES

Unlike the keys to higher taxa (p. 20-23), the keys to species are given immediately after the descriptions of each genus. Note that only species that have been recorded in New Zealand are included in the keys.

ABBREVIATIONS

Distribution records. The system of area codes proposed by Crosby *et al.* (1976) has been used to categorise and summarise records. Further details and a reference map are given on the inside back cover.

Specimen repositories. Material is held in the following institutional and private collections:

HKSC collection of Mr H. H. Keifer, 1112 Swanston Drive, Sacramento, California 95818, U.S.A.

NZAC New Zealand Arthropod Collection, Entomology Division, DSIR, Auckland

PLNZ Plant Health and Diagnostic Station, Ministry of Agriculture and Fisheries, Levin

NOTE. Type slides and other eriophyoid material here listed as held at PLNZ will move during 1984, with the author, to a new facility:

Plant Health Station

Lynfield Agricultural Centre

Ministry of Agriculture and Fisheries

131 Boundary Road
 Blockhouse Bay
 P.O. Box 41, Auckland

KEYS TO SUBFAMILIES AND GENERA

It will be associated there with the collections of the Auckland Plant Health and Diagnostic Station (PANZ), currently held at Mount Albert Research Centre, Auckland.

Illustrations. The following abbreviations are used on figures:

API internal genitalia of female
 D dorsal aspect
 DA anterior dorsal shield
 ES lateral aspect, enlarged
 F featherclaw
 GFI female genitalia and coxae
 L1,L2 foreleg, hind leg
 S habitus, lateral aspect
 SA anterior end, lateral aspect

Index. A taxonomic index to both contributions on New Zealand's Eriophyoidea may be found in number 5, commencing on p. 121.

KEY TO FAMILIES OF ERIOPHYOIDEA

(All keys are to females only. Keys to genera and species are for protogynes only; they will not work for deutogynes.)

- 1 Dorsal shield with 3 or 4 setae; female genital coverflap without longitudinal markings SIERRAPHYTOPTIDAE
 -- Dorsal shield with 2 setae or none; female genital coverflap often with longitudinal markings 2
 2 Rostrum always large, abruptly bent down, tapering, with long-form oral stylet (Figure 12) DIPTILOMIOPIDAE
 -- Rostrum usually small, with short-form oral stylet (Figure 13) ERIOPHYIDAE

I. SIERRAPHYTOPTIDAE

- 1 Elongate, worm-like mites; genitalia separated from coxae by 12-16 uncontracted rings; body rings subequal dorsoventrally; dorsal shield with 4 setae NOVOPHYTOPTINAE
 (not known in New Zealand)
 -- Genitalia separated from coxae by a few rings only; mites either worm-like, with body rings subequal dorsoventrally, or with robust bodies, or with tergal/sternal differentiation; 1 or 2 anterior shield setae 2
 2 One central anterior shield seta; dorsal shield setae present or absent; female spermathecal tubes 3-5x (or more) longer than spermathecae; body either worm-like, with subdorsal abdominal setae, or more robust and fusiform, without subdorsal setae NALEPELLINAE
 (not known in New Zealand)
 -- Four dorsal shield setae; spermathecal tubes short 3
 3 Body worm-like; rings subequal dorsoventrally; subdorsal abdominal setae present (p. 23) .. PHYTOPTINAE (*Phytoptus*)
 -- Body more fusiform, often flattened; rings divided laterally into broad tergites and narrower sternites; subdorsal abdominal setae present or absent SIERRAPHYTOPTINAE
 (not known in New Zealand)

II. DIPTILOMIOPIDAE

- 1 Featherclaw simple, undivided
 RHYNCPHYTOPTINAE .. 2

- Featherclaw divided
 DIPTILOMIOPINAE .. 3
 - 2 Dorsal shield tubercles elongate; dorsal setae long, extending ahead of anterior shield margin
 (p. 32) .. *Rhynchaphytoptus*
 - Dorsal shield tubercles of normal size, not elongate; dorsal setae short, not reaching even half length of dorsal shield
 (p. 31) .. *Abacoptes*
 - 3 Dorsal shield with a collar-like anterior lobe; dorsal setae directed anteriorly, projecting beyond anterior shield margin (p. 25) .. *Brevulacus*
 - Not with this combination of characters
 4
 - 4 Lateral seta present
 (p. 28) .. *Diptacus*
 - Lateral seta absent
 5
 - 5 Abdomen with a longitudinal, mid-dorsal 'V'-shaped trough; sternum anteriorly with 4 finger-like projections; femur and genu fused
 (p. 27) .. *Dacundiopus*
 - Not with this combination of characters
 6
 - 6 Abdomen with 3 longitudinal dorsal ridges; fore genu without a seta
 (p. 29) .. *Lambella*
 - Abdomen without longitudinal ridges; fore genu with a seta
 (p. 30) .. *Levonga*
- with 2 setae on proximal segment; fore-tibial seta absent
 2
 - Legs normal, the tibia distinct; tarsus usually undivided; foretibial seta present
 3
 - 2 Spatulate or shovel-shaped projections present either on apex of rostrum or on tarsi; featherclaws large
 ABEROPTINAE
 (newly recorded; indeterminate)
 - Spatulate projections absent; first setiferous coxal tubercles and setae absent; featherclaw smaller
 NOTHOPODINAE
 - 3 Genitalia noticeably projecting from ventral body surface, appressed to coxae; anterior internal apodeme bent up, appearing shortened, usually present as a heavy, transverse line when viewed ventrally; coverflap typically with ribbing in 2 uneven ranks CECIDOPHYINAE
 - Genitalia not markedly projecting from ventral body surface, not appressed to coxae; anterior internal apodeme extending a moderate distance forward; coverflap seldom with ribbing in 2 uneven ranks
 4
 - 4 Anterior shield lobe prominent, or body fusiform, with tergites broader and less numerous than sternites, or a combination of these characters
 PHYLLOCOPTINAE
 - Anterior shield lobe absent or very short and narrow; body usually worm-like, with abdominal rings similar dorsoventrally for greater part of body length
 ERIOPHYINAE
 (see *Fauna of N.Z.* No. 5)

III. ERIOPHYIDAE

A. Key to subfamilies

- 1 Legs reduced, without a distinct tibia; tarsus sometimes appearing 2-segmented,

B. Key to genera

CECIDOPHYINAE

- 1 Dorsal shield setae absent 2 -- Not with this combination of characters
-- Dorsal shield setae present 3 4
- 2 Featherclaw divided; abdomen divided into tergites and sternites (p. 34) .. *Chreacidus* 4 Dorsal tubercles on, or very near, rear shield margin, directing setae posteriorly 5
-- Featherclaw simple; abdominal rings similar dorsoventrally (p. 33) .. *Cecidophyopsis* -- Dorsal tubercles ahead of rear shield margin, directing setae upwards, ahead, or towards midline 12
- 3 Fore tibial seta absent (p. 38) .. *Cosetacus* 5 Abdomen with a broad, longitudinal dorsal trough 6
-- Fore tibial seta present (p. 35) .. *Colomerus* -- Abdomen with dorsum ridged, ridged and furrowed, arched, or flat 7

NOTHOPODINAE

- 1 Dorsal shield tubercles widely spaced, almost at posterolateral shield corners; abdomen with considerably more sternites than tergites (p. 40) .. *Pangacarus* 6 Anterior shield lobe in the form of a subrectangular flap (p. 63) .. *Rectalox*
-- Dorsal shield tubercles much closer together; abdomen with tergites and sternites subequal (p. 39) .. *Cosella* -- Anterior shield lobe subtriangular (p. 68) .. *Tetra*
- 7 Body with dorsum almost flat, bearing thick, transverse plates (p. 69) .. *Vittacus*
-- Not as above 8
- 8 Abdomen with a mid-dorsal longitudinal ridge (p. 65) .. *Tegolophus*
-- Abdomen without a mid-dorsal longitudinal ridge 9

PHYLLOCOPTINAE

- 1 Featherclaw divided (p. 55) .. *Litaculus* 9 Anterior shield lobe broad and rounded, with a pair of small spines or points projecting forward from under front margin (p. 46) .. *Aculus*
-- Featherclaw simple 2 -- Anterior shield lobe usually more acuminate, without a pair of small spines 10
- 2 Dorsal shield setae absent (p. 51) .. *Calacarus* 10 Featherclaw with apical rays arising direct from main stem (p. 57) .. *Parulops*
-- Dorsal shield setae present 3
- 3 Fore tibial and femoral setae absent; body short and plump; dorsal tubercles ahead of rear shield margin, directing setae posteriorly (p. 56) .. *Nothacus*

DESCRIPTIONS

- Featherclaw with apical rays normal,
arising from a terminal branch 11
- 11 Featherclaw with basal rays arising
from tarsus (p. 59) .. *Pedaculops*
- Featherclaw with basal rays arising
from main stem (p. 41) .. *Aculops*
- 12 Dorsum of abdomen flat or concave
..... (p. 62) .. *Phyllocoptruta*
- Dorsum of abdomen either arched or with
longitudinal ridges 13
- 13 Dorsum of abdomen evenly arched; long-
itudinal ridges absent 14
- Dorsum of abdomen with a central long-
itudinal ridge 16
- 14 Dorsal shield with an anterior sub-
rectangular flap; forefemur without
a seta (p. 50) .. *Arectus*
- Dorsal shield sometimes with an anter-
ior projection, but never in the form
of a subrectangular flap; forefemur
with a seta 15
- 15 Flattened, fusiform mites, usually
with a sinuate claw on hind leg
(p. 64) .. *Rhombacus*
- Body more fusiform, never with a sin-
uate claw on hind leg
..... (p. 60) .. *Phyllocoptes*
- 16 Abdomen with a mid-dorsal longitudinal
ridge and lateral or subdorsal ridges,
the mid-dorsal ridge ending before
the lateral ridges
..... (p. 52) .. *Calepitrimerus*
- Abdomen with a mid-dorsal longitudinal
ridge and lateral ridges, all fading
simultaneously to rear
..... (p. 54) .. *Epitrimerus*

Family SIERRAPHYOPTIDAE

(= Nalepellidae Roivanen, 1953 sensu New-
kirk & Keifer (1971); see Lindquist 1974)

TYPE-GENUS *Sierraphytoptus* Keifer, 1939.

Dorsal shield with 3 or 4 setae. Rostrum
varying in size, evenly downcurved, with
short-form oral stylet. Legs with all
standard setae, often with a lateral fore-
tibial spur; featherclaw simple. Abdomen
with all standard setae, often with a sub-
dorsal seta. Female genitalia with internal
apodeme moderately long; spermathecal tubes
extending diagonally ahead at first, then
recurved; genital coverflap without longi-
tudinal markings.

Subfamily PHYTOPTINAE Genus *Phytoptus* Dujardin

Phytoptus Dujardin, 1851: 166. Type-species
Phytoptus avellanae Nalepa, 1889.

Phytocoptella Newkirk & Keifer, 1971: 3.

Body worm-like, with no tergal-sternal dif-
ferentiation and with rings subequal dorso-
ventrally. Rostrum of moderate size, with
short-form oral stylet. Dorsal shield
without an anterior lobe, but with 4 setae,
an anterior and a posterior pair. Legs
with all standard setae, often with an
apicolateral foretibial spur; segmentation
usually normal, but sometimes femur and
genu fused; featherclaw simple. Coxae with
3 pairs of setiferous tubercles; forecoxae
separated by a sternal line. Abdomen with
a pair of anterior subdorsal setae; access-
ory seta prominent. Genitalia with intern-
al apodeme of moderate length; spermathecae
elongate-oval, attached to short tubes that
project diagonally ahead and then recurve
into central genital opening.

REMARKS. Members of this genus are readily
recognised by the presence of four dorsal
shield setae and anterior subdorsal setae.
Two species are known in New Zealand.

KEY TO SPECIES OF *PHYTOPTUS*
KNOWN FROM NEW ZEALAND

- Rear pair of shield setae directed anteriorly; legs with normal segmentation
.... *avellanae*
- Rear pair of shield setae directed posteriorly; legs with genu and femur fused
.... *rufensis*

***Phytoptus avellanae* Nalepa**

filbert bud mite

Figures 1 and 17-23

Phytoptus avellanae Nalepa, 1889: 126.

Phytocoptella avellanae (Nalepa). Newkirk & Keifer, 1971: 3.

FEMALE (description from 6 specimens). Length 180-255 μm , width 56-69 μm , depth 50-75 μm . Vermiform, white. Rostrum 18-22 μm long, curved down; antapical seta 1-3 μm long. Dorsal shield semicircular, unornamented, 25-29 μm long, 43-54 μm wide, bearing 2 pairs of setae; anterior setae 19-21 μm apart, 3-4 μm long, directed anteriorly; posterior setae well ahead of rear shield margin, 15-18 μm apart, 12-16 μm long, directed anteriorly.

Foreleg 25-28 μm long; tibia 5 μm long, with a seta 2-3 μm long at about one-third; tarsus 6 μm long; claw 7-10 μm long; featherclaw 4-rayed. Hind leg 22-25 μm long; tibia 3-4 μm long; tarsus 5-7 μm long; claw 7-10 μm long. Coxae unornamented; 1st coxal seta 12-15 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are just ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 75-78 microtuberculate rings; microtubercles rounded and elongate or triangular and almost tooth-like, usually on or near ring margins. Subdorsal seta on about ring 11, 39-43 μm long. Lateral seta on about ring 9, 18-20 μm long. Ventral setae: 1st on about ring 21, 20-25 μm long; 2nd on about ring 38, 12-16 μm long; 3rd on about 6th ring from rear, 25-27 μm long. Accessory caudal seta 5-6 μm long. Genitalia 22-24 μm wide, 11-13 μm long. Coverflap unornamented; genital seta 8-14 μm long.

MALE. Present.

TYPE DATA. Described from *Corylus maxima* (filbert; Betulaceae), Austria. No other data; repository unknown.

MATERIAL EXAMINED. Non-type examples from *Corylus maxima* (Havelock North, 11 Sep 1957) and *Corylus* sp. (Blenheim, 8 Oct 1974; Methven, 9 Mar 1976, 13 Aug 1978).

HB / MB, MC.

Occupying the buds of the host plant, causing them to become greatly enlarged ('big bud').

REMARKS. *Phytoptus avellanae* is distinguished from *P. rufensis*, the only other eriophyoid species in New Zealand with four dorsal setae, by the posterior shield setae being directed anteriorly and by the lack of fusion between genu and femur.

One specimen from Methven had a five-rayed featherclaw on the forelegs and a four-rayed featherclaw on the hind legs (the four-rayed condition is apparently normal). Lamb (1960) was first to record this species in New Zealand, from material collected at Hastings (14 July 1952) and Havelock North (11 September 1957). My drawings are from mounts of dried specimens of the Havelock North material.

P. avellanae has also been recorded from Australia, Austria, Finland, the U.K., and the U.S.A.

***Phytoptus rufensis* Manson**

Figures 24-31

Phytoptus rufensis Manson, 1970: 531.

FEMALE (description from 7 type specimens). Length 234-303 μm , width 60-84 μm , depth 59-73 μm . Vermiform. Rostrum 20-25 μm long, curved down; antapical seta 8-10 μm long. Dorsal shield subsemicircular, 32-39 μm long, 53-70 μm wide, bearing 2 pairs of setae; ornamentation consisting of thick longitudinal lines medially and granulation anterolaterally and posterolaterally; median line present, sometimes interrupted; admedians interrupted, sometimes converging at about one-third to form an inverted 'V'-shape; about 4 submedians (there may be slight variations to this number, and the

admedians may have 'offshoots'); anterior setae 22-30 μm apart, 13-19 μm long, directed anteriorly; posterior setae well ahead of rear shield margin, 18-28 μm apart, 11-19 μm long, directed posteriorly.

Foreleg 30-34 μm long; tibia 7-8 μm long, with a 2-4 μm seta at about one-fifth and a thick, claw-like seta posteriorly; tarsus 6-7 μm long; claw 8-9 μm long; featherclaw 6-rayed; genu and femur fused. Hind leg 28-33 μm long; tibia 6-8 μm long; tarsus 5-8 μm long; claw 8-10 μm long; genu and femur fused. Coxae with a few granules; 1st coxal seta 13-18 μm long, well behind anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are at about the same level as a line through the 3rd tubercles. Sternal line double.

Abdomen with about 75-81 rings, all microtuberculate except for about the posterior 11, which are only partly microtuberculate; microtubercles oval, on rear ring margins. Subdorsal seta on about ring 13, 71-107 μm long. Lateral seta on about ring 10, 30-33 μm long. Ventral setae: 1st on about ring 24, 18-23 μm long; 2nd on about ring 44, 12-15 μm long; 3rd on about 12th ring from rear, 37-44 μm long. Accessory caudal seta 6-11 μm long. Genitalia 21-24 μm wide, 9-11 μm long. Coverflap with a few crescentic lines posteriorly; genital seta 9-14 μm long.

MALE. Present.

TYPE DATA. Described from *Luzula rufa* var. *Rufa* (Juncaceae), Dunstan Range, 850 m, 25 March 1966, B. P. J. Molloy (PLNZ).

MATERIAL EXAMINED. Type series only.

- / CO.

Causing deformed flower heads and shoot apices.

REMARKS. The posteriorly directed rear shield setae, fused genu and femur, and posterior claw-like seta on the foretibia are distinctive features of *P. rufensis*.

The fusion of the genu and femur on both pairs of legs is unusual. The only other *Phytoptus* with a similar feature is *P. yuccae* Keifer, described from *Yucca glauca* (Syracuse, Kansas, U.S.A.) in 1954.

P. rufensis has not been recorded from outside New Zealand.

Family DIPTILOMIOPIDAE

(=Rhyncaphytoptidae Keifer, 1961; see Lindquist 1974)

TYPE-GENUS *Rhyncaphytoptus* Keifer, 1939a.

Body stout or elongate, fusiform, tapering. Dorsal shield with 2 setae or none. Rostrum large, abruptly bent down, tapering, with long-form oral stylet. Legs sometimes with reduction in segmentation and setation; foretibial spur absent. Abdomen with no subdorsal seta. Female genitalia with internal apodeme of moderate length, often acuminate; spermathecal tubes short, extending either laterally or diagonally to rear; genital coverflap usually smooth. Usually leaf vagrants causing little damage to their host plants.

Subfamily DIPTILOMIOPINAE

Brevulacus new genus

TYPE-SPECIES *Brevulacus reticulatus* new species.

(The name *Brevulacus* is a construction without formal etymological roots; gender masculine).

Body robust fusiform, divided laterally into tergites and sternites, the sternites more numerous; abdomen with weak longitudinal mid-dorsal and subdorsal ridges running about half length of body. Rostrum long, abruptly bent down. Anterior shield lobe with a broad, U-shaped indentation at middle of anterior margin; dorsal tubercles elongate, slightly ahead of rear shield margin; setae directed anteriorly. Legs with the normal segmentation and setation; claw displaced laterally; featherclaw divided, with bundles of rays on basal half or two-thirds. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Genitalia with internal apodeme of normal length.

REMARKS. Distinctive features are the collar-like anterior shield lobe, unusual featherclaw structure, and lateral displacement of the claws.

***Brevulacus reticulatus* new species**

Figures 16 and 32-46

FEMALE, protogyne (description from 6 specimens). Length 210-246 μm , width 75-85 μm , depth 72-85 μm . Robust fusiform; pale yellow. Rostrum 43-45 μm long, abruptly curved down; antapical seta 5-8 μm long. Dorsal shield subsemicircular, 31-39 μm long, 56-68 μm wide, with a broad anterior lobe bearing a deep, median indentation, giving it a collar-like appearance; ornamentation a distinct reticulum, formed as follows. Median line complete, displaced slightly posteriorly; admedians complete, diverging to about two-thirds of their length and then converging; transverse lines between median and admedians at about one-third, two-thirds, and near posterior shield margin; 3 submedian lines, the middle one shortest. Between inner submedian line and admedian line are 2 short lines, the anterior one arising from the admedian at about half its length, directed diagonally forward, and meeting or almost meeting the submedian line; 2nd line arising a short distance posterior to the 1st, running almost laterally, and near its apex subtending another, sublongitudinal line which runs towards posterior margin and forms one side of a rectangular cell. Dorsal tubercles prominent, slightly ahead of rear shield margin, 25-33 μm apart; dorsal setae 17-34 μm long, directed anteriorly.

Foreleg 38-44 μm long; tibia 11-14 μm long, with a seta 11-14 μm long at about one-fifth; tarsus 6-8 μm long; claw 8-9 μm long, displaced laterally; featherclaw divided, of unusual structure, consisting mainly of bundles of 'rays' distal to which can be faintly discerned the normal apical rays. Hind leg 36-42 μm long; tibia 8-11 μm long; tarsus 6-8 μm long; claw 9-10 μm long, displaced laterally. Coxae unornamented; 1st coxal setae 12-15 μm long; 1st setiferous coxal tubercles situated behind anterior coxal approximation, about as far apart as the 2nd tubercles, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 48-51 tergites and 70-76 sternites; tergites with faint microtubercles, sternites with small, rounded microtubercles on rear ring margins; abdomen also with a slight, longitudinal, dorsal central ridge and subdorsal ridges, which fade after about half their length.

Lateral seta on about sternite 17, 32-38 μm long. Ventral setae: 1st on about sternite 32, 51-88 μm long; 2nd on about sternite 46, 27-60 μm long; 3rd on about 6th ring from rear, 40-47 μm long. Accessory caudal seta 3-4 μm long. Genitalia 32-35 μm wide, 17-20 μm long. Coverflap unornamented; genital seta 33-38 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 159-216 μm , width 75-81 μm , depth 75-76 μm . Fusiform. Rostrum 39-41 μm long, abruptly curved down; antapical seta 8-9 μm long. Dorsal shield subsemicircular, 29-32 μm long, 55-58 μm wide, with a collar-like anterior lobe, unornamented except for 1 submedian line. Dorsal tubercles slightly ahead of rear shield margin, 26-28 μm apart; dorsal setae 17-21 μm long, directed anteriorly.

Foreleg 38-42 μm long; tibia 9-12 μm long, with a seta 11 μm long at about one-fifth; tarsus 6-8 μm long; claw 8-10 μm long, displaced laterally; featherclaw similar to that of protogyne, but bundles of rays less abundant. Hind leg 35-39 μm long; tibia 7-9 μm long; tarsus 6-7 μm long; claw 9-11 μm long, displaced laterally. Coxae unornamented except for a short, longitudinal, angled line subparallel to sternal line; 1st coxal setae 10-11 μm long; 1st setiferous coxal tubercles slightly behind anterior coxal approximation, about as far apart as the 2nd tubercles, which are ahead of a line through the 3rd tubercles.

Abdomen with 45-50 tergites lacking microtubercles, 63-67 sternites with faint microtubercles, and a longitudinal mid-dorsal ridge. Lateral seta on about sternite 14, 33-46 μm long. Ventral setae: 1st on about sternite 26, 37-56 μm long; 2nd on about sternite 40, 30-55 μm long; 3rd on 6th ring from rear, 31-43 μm long. Accessory caudal seta 4-5 μm long. Genitalia 29-32 μm wide, 14-19 μm long. Coverflap unornamented; genital seta 26-36 μm long.

MALE. Present.

TYPE DATA. From *Quercus* sp. (Oak; Fagaceae): Oxford Street, Levin, 3 January 1963 D. C. M. Manson (holotype slide); Levin 7 February 1967, A. Ward; Levin, 7 January 1973, D.C.M.M.; Upper Hutt, 1 January 1964, D.C.M.M.; north Hagley Park, Christchurch, 27 January 1976, D.C.M.M. (holotype slide)

and 6 paratype slides, PLNZ; 2 paratype slides, NZAC).

MATERIAL EXAMINED. Type series only.

WN / MC.

A vagrant on leaf undersurfaces.

REMARKS. *Brevulacus reticulatus* is easily recognisable: the net-like dorsal shield pattern, collar-like anterior shield lobe, unusual featherclaw, and lateral displacement of the claw all serve to distinguish it. It bears some superficial resemblance to *Bucculacus haweckii* Boczek, recorded from *Quercus robur* (red oak) in Poland, and to *Rhyncaphytoptus oreius* Keifer, recorded from *Q. vaccinifolia* (huckleberry oak) in California.

This species was quite common at the collection localities. Its body setae have an extremely fine taper, making accurate measurement difficult. The deutogynes differ from the protogynes mainly in lacking dorsal shield ornamentation, lacking microtubercles on the tergites, and having weaker microtubercles on the sternites.

Dacundiopus new genus

TYPE-SPECIES *Dacundiopus stylosus* new species.

(The name *Dacundiopus* is a construction without formal etymological roots; gender masculine.)

Body robust fusiform, divided laterally into tergites and sternites, the sternites more numerous; abdomen with a mid-dorsal, longitudinal, 'V'-shaped trough. Rostrum long, abruptly bent down. Dorsal shield subrectangular, with no anterior lobe; dorsal tubercles and setae minute, just ahead of rear shield margin. Sternum produced anteriorly as 4 finger-like projections. Legs with femur and patella almost fused; femoral and tibial setae absent; featherclaw divided. Coxae without 1st tubercles and setae. Lateral seta absent.

REMARKS. Distinctive features are the divided featherclaw, the presence of dorsal shield setae, the absence of the first coxal tubercles and setae, lateral seta, and tibial and femoral setae, the presence

of a 'V'-shaped dorsal trough, and the four finger-like projections of the sternum. *Dacundiopus* seems quite distinct from any other known genera.

Dacundiopus stylosus new species

Figures 15 and 47-53

FEMALE (description from 3 specimens). Length 153-191 μm , width 83 μm , depth 74 μm . Robust fusiform, white. Rostrum 44-61 μm long, abruptly curved down; antapical seta absent. Dorsal shield subrectangular, 25-34 μm long, 70 μm wide, ornamented with a network of large, double-walled 'cells'; posterior margin shallow 'V'-shaped. Dorsal tubercles minute, easily overlooked, just ahead of rear shield margin, 25 μm apart; dorsal setae 2 μm long, directed anteriorly.

Foreleg 30-38 μm long; femur and patella fused; tibia 6-8 μm long, without a seta; tarsus 2-segmented, 13 μm long; claw 6-8 μm long, knobbed; featherclaw divided. Hind leg 30-38 μm long; femur and patella fused; tibia 6 μm long; tarsus 12-13 μm long; claw 6 μm long, knobbed. Coxae granular; 1st coxal seta absent; 2nd setiferous coxal tubercles much smaller than the 3rd and ahead of a line through them. Sternum with 3 interrupted, subparallel, median longitudinal lines and anteriorly with 4 finger-like processes.

Abdomen with a longitudinal, 'V'-shaped, dorsal trough, about 44-50 smooth tergites, and about 75-79 microtuberculate sternites; microtubercles small, rounded, on rear ring margins. Lateral seta absent. Ventral setae: 1st on about sternite 31, 58-63 μm long; 2nd on about sternite 50, 15-30 μm long; 3rd on about 12th ring from rear, 43-44 μm long. Accessory caudal seta absent. Genitalia 24 μm wide, 10-14 μm long. Cover-flap unornamented; genital seta 10-11 μm long.

MALE. Not seen.

TYPE DATA. From *Hoheria sexstylosa* (Malvaceae), Marokopa, 18 February 1973, B. M. May (holotype slide, NZAC; 2 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series only.

WO / - .

An inquiline associated with *Eriophyes sexstylosae*, which was causing a leaf eri-neum.

REMARKS. The presence of dorsal shield setae, a mid-dorsal, V-shaped, longitudinal abdominal trough, and the four finger-like projections of the sternum are distinctive in *D. stylosus*. Also of note is the fusion of the genu and femur.

Genus *Diptacus* Keifer

Diptacus Keifer, 1951: 99. Type-species
Diptilomiopus sacramentae Keifer,
1939b.

Body robust fusiform, divided laterally into tergites and sternites, the sternites more numerous; abdomen with slight longitudinal subdorsal furrows. Rostrum long, abruptly bent down. Dorsal shield with an anterior lobe; dorsal tubercles ahead of rear shield margin; setae directed anteriorly. Legs with the normal segmentation; femoral setae absent; featherclaw divided. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length; coverflap smooth.

REMARKS. The shallow subdorsal longitudinal furrows and divided featherclaw are the main distinguishing features. This large genus is widespread overseas, but only one species is known in New Zealand.

Diptacus gigantorhynchus (Nalepa)

big-beaked plum mite

Figures 12 and 54-64

Phyllocoptes gigantorhynchus Nalepa 1892c:
191.

Epitrimerus gigantorhynchus (Nalepa).
Nalepa, 1896: 392.

Diptilomiopus prunorum Keifer, 1939a: 149.

Rhyncaphytoptus gigantorhynchus (Nalepa).
Liro, 1943: 40.

Diptacus gigantorhynchus (Nalepa). Keifer,
1952: 60.

FEMALE, protogyne (description from 2 specimens). Length 200-211 μm , width 102

μm , depth 100 μm . Robust fusiform, greyish-purple. Rostrum 55-61 μm long, curved abruptly down; antapical seta 15 μm long. Dorsal shield subsemicircular, 37 μm long, 88 μm wide, with a slightly protruding anterior lobe; ornamentation not always clearly visible, but apparently consisting of a network of cells (Figure 55). Dorsal tubercles ahead of rear shield margin, 29 μm apart; dorsal setae 5-6 μm long, directed anteromedially.

Foreleg 50-52 μm long; tibia 14-15 μm long, with a seta 12-13 μm long at about half its length; tarsus 10-11 μm long; claw 8 μm long, knobbed; featherclaw divided, 5-rayed. Hind leg 49-50 μm long; tibia 11-13 μm long; tarsus 10-11 μm long; claw 8 μm long, knobbed. Coxae unornamented; 1st coxal setae 19 μm long; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line double.

Abdomen with a shallow, longitudinal, subdorsal furrow, 54-62 weakly microtuberculate tergites, and 75-77 clearly microtuberculate sternites. Lateral seta on about sternite 13, 44-50 μm long. Ventral setae: 1st on about sternite 30, 77-87 μm long; 2nd on about sternite 52, 62 μm long; 3rd on about 11th ring from rear, 50 μm long. Accessory caudal seta just visible. Genitalia 37 μm wide, 20 μm long. Coverflap unornamented, but broadly triangular anterior projection with dash-like markings; genital seta 10-11 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 172-238 μm , width 94-102 μm , depth 90-106 μm . Robust fusiform, greyish-purple. Rostrum 56-63 μm long, curved abruptly down; antapical seta 13-16 μm long. Dorsal shield subsemicircular, 39-47 μm long, 71-76 μm wide, with a slight anterior lobe; ornamentation similar to that of protogyne, consisting of a network of cells. Dorsal tubercles slightly ahead of rear shield margin, 25-28 μm apart; dorsal setae 4-6 μm long, directed anteromedially.

Foreleg 50-54 μm long; tibia 13-15 μm long, with a seta 10-13 μm long at about half its length; tarsus 10-12 μm long; claw 7-9 μm long, knobbed; featherclaw divided, 5-rayed. Hind leg 46-54 μm long; tibia 11-13 μm long; tarsus 10-11 μm long; claw 7-8 μm long, knobbed. Coxae unornamented; 1st coxal setae 18-19 μm long; 1st setiferous coxal tubercles about as far apart as the

2nd, which are ahead of a line through the 3rd tubercles. Sternal line double.

Abdomen with 43-48 tergites and 72-77 weakly microtuberculate sternites. Lateral seta on about sternite 13, 41-53 μm long. Ventral setae: 1st on about sternite 29, 44-71 μm long; 2nd on about sternite 45, 47-69 μm long; 3rd on about 11th ring from rear, 41-106 μm long. Accessory caudal seta just visible, but on some specimens apparently absent. Genitalia 36 μm wide, 24-26 μm long. Coverflap unornamented; genital seta 9-11 μm long.

MALE. Present.

TYPE DATA. Described from *Prunus domestica* (plum; Rosaceae), Austria. No other data; repository unknown.

MATERIAL EXAMINED. Non-type examples from *Prunus* sp. (plum) (Levin, 2 Mar 1976; Titi-rangi, Auckland, 4 April 1977).

AK, WN / - .

Found on the undersurface of leaves, but causing no apparent damage.

REMARKS. *Diptacus gigantorhynchus* is a big-beaked mite with divided featherclaws and a shallow, longitudinal, subdorsal furrow. The deutogyne can be distinguished from the protogyne in that the tergites lack micro-tubercles, and the microtubercles of the sternites, although larger, are weakly developed. There also appear to be slightly fewer tergites (45-52, as against 54-62), and the dash-like markings on the anterior part of the coverflap are absent.

This is the first record of the species in New Zealand. It has also been recorded from Europe and the U.S.A.

Lambella new genus

TYPE-SPECIES *Diptilomiopus cerinus* Lamb, 1953a.

(Named after Dr K. P. Lamb, who contributed greatly to the study of New Zealand's eriophyoid mites; gender feminine.)

Body robust fusiform, divided laterally into tergites and sternites, the sternites more numerous; abdomen with 3 longitudinal, wax-bearing ridges, one mid-dorsal, the others subdorsal. Rostrum long, abruptly

bent down. Dorsal shield subrectangular, its posterior margin 'V'-shaped; dorsal tubercles well ahead of rear shield margin; dorsal setae directed anteriorly. Legs with normal segmentation; femoral, patellar, and tibial setae absent; featherclaw divided. Coxae without 1st tubercles and setae. Lateral seta absent. Female genitalia with internal apodeme of normal length.

REMARKS. This genus shows some similarity to *Apodiptacus* Keifer, 1960, in that there are three longitudinal dorsal ridges. It is, however, completely different from *Apodiptacus* in the absence of the lateral seta, femoral, patellar, and tibial setae, and first coxal seta. Also, the positioning of the dorsal tubercles and setae far ahead of the rear shield margin is worth noting.

Lambella cerina (Lamb) new combination

Figures 65-72

Diptilomiopus cerinus Lamb, 1953a: 367.

FEMALE (description from 8 specimens). Length 168-255 μm , width 67-75 μm , depth 72-96 μm . Robust fusiform. Rostrum 36-50 μm long, abruptly curved down; antapical seta absent. Dorsal shield subrectangular but with the posterior margin shallowly 'V'-shaped, 25-29 μm long, 56-58 μm wide, ornamented with large 'cells' (Figure 66); dorsal tubercles small, far ahead of rear shield margin, 34-38 μm apart; dorsal setae 2-7 μm long, directed anteriorly.

Foreleg 42-45 μm long; tibia 7-11 μm long, without a seta; tarsus 2-segmented, 12-17 μm long; claw 6-8 μm long, knobbed; featherclaw divided, with small setae distally. Hind leg 38-43 μm long; tibia 5-8 μm long; tarsus 11-14 μm long; claw 5-8 μm long, knobbed. Anterior coxae usually with fine granular lines; 1st coxal seta absent; 2nd setiferous coxal tubercles ahead of a line through the 3rd tubercles. Sternal area with longitudinal lines.

Abdomen wax-bearing, with 3 longitudinal ridges (one mid-dorsal, the rest subdorsal), 49-80 tergites, and 64-105 finely micro-tuberculate sternites. Lateral seta absent. Ventral setae: 1st on about sternite 27, 47-85 μm long; 2nd on about sternite 49, 7-13 μm long; 3rd on about 10th tergite from rear, 22-50 μm long. Accessory caudal seta absent. Genitalia 21-25 μm wide, 22-

27 μm long. Coverflap with fine granules; genital seta 8-11 μm long.

MALE. Present.

TYPE DATA. Described from *Coprosma australis* (Rubiaceae), Northcote, Auckland, 24 September 1951, J. Dingley (holotype slide and 1 paratype slide, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Carpodetus serratus* (Akatarawa, 1 Jan 1964), *Coprosma robusta* (Te Pangu, 24 Feb 1964), and *Coprosma* sp. (West Arm, Manapouri, 13 Jan 1970).

AK, WN / SD, FD.

An inquiline.

REMARKS. The absence of the forecoxal setae, foretibial seta, fore and hind genual setae, and lateral seta and the presence of three longitudinal abdominal dorsal ridges are distinctive in *L. cerina*. Lamb (1953a) has overlooked the presence of the dorsal setae in the adult. The number and shape of the cell elements of the dorsal shield ornamentation differ slightly in the material examined, but I believe these are variations of no taxonomic significance.

The holotype slide consists of one very poor specimen; this I have remounted, but with little, if any, improvement. The paratype slide contains several specimens, also four specimens of *Phyllocoptes coprosmae*.

Levonga new genus

TYPE-SPECIES *Levonga papaitongensis* new species.

(The name *Levonga* is a construction without formal etymological roots; gender feminine.)

Body robust fusiform, divided laterally into tergites and sternites, the sternites more numerous; abdomen wax-bearing, subcircular in cross-section, without longitudinal ridges or furrows. Rostrum long, abruptly bent down. Dorsal shield subsemicircular; dorsal tubercles well ahead of rear shield margin; dorsal setae directed medially. Legs with the normal segmentation; femoral and tibial setae absent; hind leg with no patellar seta; featherclaw divided. Coxae

without 1st tubercles and setae. Lateral seta absent.

REMARKS. This genus shows some similarity to *Lambella*, but differs in lacking longitudinal abdominal ridges and in having a seta on the fore genu. Also, the dorsal tubercles are very small, with the setae directed medially.

Levonga papaitongensis new species

Figures 73-79

FEMALE (description from 6 specimens). Length 165-195 μm , width 63-81 μm , depth 69-82 μm . Robust fusiform. Rostrum 37-47 μm long, abruptly curved down; antapical seta 11-13 μm long. Dorsal shield subsemicircular, 31-39 μm long, 73-75 μm wide, unornamented except for a 'U'-shaped line between the dorsal setae; dorsal tubercles small, well ahead of rear shield margin, 26-28 μm apart; dorsal setae 1-2 μm long, directed medially.

Foreleg 31-34 μm long; tibia 4-5 μm long, without a seta; tarsus 2-segmented, 7-9 μm long; claw 6-8 μm long, with a thick, transverse knob; featherclaw divided. Hind leg 26-30 μm long; tibia 4-5 μm long; tarsus 6-8 μm long; claw 6-8 μm long, transversely knobbed. Coxae with some light granulation anteriorly; 1st coxal seta absent; 2nd setiferous coxal tubercles ahead of a line through the 3rd tubercles. Sternal line absent.

Abdomen wax-bearing, with 33-38 smooth tergites and 59-72 finely microtuberculate sternites. Lateral seta absent. Ventral setae: 1st on about sternite 24, 32-40 μm long; 2nd on about sternite 41, 3-5 μm long; 3rd on about 7th ring from rear, 15-20 μm long. Accessory caudal seta just visible, about 1 μm long. Genitalia 26-28 μm wide, 20 μm long. Coverflap unornamented; genital seta 5-7 μm long.

MALE. Present.

TYPE DATA. From an unidentified native plant, Lake Papaitonga, Levin, August 1966, A. Ward (holotype slide, PLNZ). Also from *Rubus* sp. (bush lawyer; Rosaceae), Levin, 11 October 1963, D. C. M. Manson (paratype slide, PLNZ).

MATERIAL EXAMINED. Type series only.

WN / - .

Probably a leaf vagrant.

REMARKS. *Levonga papaitongensis* is characterised by the absence of longitudinal dorsal abdominal ridges, the presence of a seta on the fore genu, the transverse knob on the claw, and the almost complete lack of dorsal shield ornamentation.

Two of the mites on the paratype slide are another species.

Subfamily RHYNCAPHYTOPTINAE

Genus *Abacoptes* Keifer

Abacoptes Keifer, 1939d: 491. Type-species
Abacoptes platynus Keifer, 1939d.

Body robust fusiform, divided laterally into tergites and sternites, the latter more numerous. Abdomen evenly arched. Deutogyne with abdomen dorsally flattened, giving a flat-backed appearance. Rostrum long, abruptly bent down. Dorsal tubercles slightly ahead of rear shield margin, directing setae anteriorly. Legs with normal segmentation and setation. Featherclaw simple. Coxae with usual three pairs of setiferous tubercles. Abdomen with all standard setae.

REMARKS. Deutogynes have strongly ridged tergites that give a typically flat dorsum; this unusual feature distinguishes *Abacoptes* from the closely related *Rhyncaphytoptus*.

Abacoptes ulmivagrans (Keifer)

Figures 80-89

Rhyncaphytoptus ulmivagrans Keifer, 1939b: 420.

Abacoptes platynus Keifer, 1939d: 491 (deutogyne).

Rhyncaphytoptus rugatus Liro, 1941: 45 (deutogyne; Finland).

Abacoptes ulmivagrans (Keifer). Hassan & Keifer, 1978: 193.

FEMALE, protogyne (description from 6 specimens). Length 180-245 μm , width 88-102 μm , depth 85-104 μm . Robust fusiform. Rostrum

57-60 μm long, abruptly curved down; antapical seta 6-16 μm long. Dorsal shield (Figure 81) 36-38 μm long, 69-78 μm wide, with a broadly truncate anterior margin and a slightly overhanging rostrum base; ornamentation consisting of a median line, admedians diverging anteriorly and posteriorly, 1 or 2 short submedians, and a diagonal line arising adjacent to dorsal tubercles and meeting or almost meeting admedians at about half their length; dorsal tubercles slightly ahead of rear shield margin, 34-45 μm apart; dorsal setae 9-11 μm long, directed anteriorly.

Foreleg 50-56 μm long; tibia 13-14 μm long, with a seta 9-12 μm long at about one-third; tarsus 9-11 μm long; claw 7-10 μm long, curved, knobbed; featherclaw 5-rayed. Hind leg 44-54 μm long; tibia 10-12 μm long; tarsus 10-11 μm long; claw 9-10 μm long. Coxae unornamented; 1st coxal seta 11-14 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles almost as far apart as the 2nd, and close to them; 2nd tubercles ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 24-30 tergites and 74-84 microtuberculate sternites. Lateral seta on about sternite 20, 15-22 μm long. Ventral setae: 1st on about sternite 44, 49-80 μm long; 2nd on about sternite 55, 14-19 μm long; 3rd on about 6th ring from rear, 22-36 μm long. Accessory caudal seta 3-4 μm long. Genitalia 30-37 μm wide, 18-28 μm long. Coverflap unornamented; genital seta 10-15 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 144-183 μm , width 85-92 μm , depth 89-94 μm . Fusiform, brownish. Rostrum 53-57 μm long, abruptly curved down; antapical seta 14-15 μm long. Dorsal shield subtriangular, 29-35 μm long, 44-57 μm wide, with a bluntly pointed anterior projection; ornamentation a pair of subparallel lateral lines, truncate anteriorly; dorsal tubercles on rear shield margin, 39-42 μm apart; dorsal setae 4-10 μm long, directed anteriorly.

Foreleg 49-55 μm long; tibia 10-13 μm long, with a seta 9-11 μm long at about one-fifth; tarsus 10-11 μm long; claw 9-10 μm long, knobbed; featherclaw 5-rayed. Hind leg 45-48 μm long; tibia 8-11 μm long; tarsus 10 μm long; claw 10-11 μm long.

Abdomen with about 20-23 tergites, about 12 of them large and prominent, the remain-

der compressed (in dorsal view, only the 12 larger tergites may be clearly visible), and about 35-60 sternites, the actual number difficult to assess accurately. Lateral seta on about sternite 12, 18-25 μm long. Ventral setae: 1st on about sternite 26, 47-77 μm long; 2nd on about sternite 33, 12-21 μm long; 3rd on about 6th ring from rear, 25-36 μm long. Accessory caudal seta 3-4 μm long. Genitalia 28-32 μm wide, 17-21 μm long. Coverflap unornamented; genital seta 11-17 μm long.

MALE. Not seen.

TYPE DATA. Described from *Ulmus campestris* (Ulmaceae), Sacramento, California, U.S.A. No other data; type material probably lost.

MATERIAL EXAMINED. Non-type examples from *Ulmus* sp., Kimberley Road, Levin, 12 Jan 1973 and 5 Dec 1975.

WN / - .

Leaf undersurface vagrant.

REMARKS. The distinctively shaped dorsal shield of the protogyne, with its broad, slightly concave anterior margin, together with the host plant, should suffice for recognition of *Abacoptes ulmivagrans*.

The female internal genitalia and the coxal region and genital field of the deutogyne, have not been clearly visible, so no drawings of these can be included.

Keifer (1952, p. 59) gives a brief account of this species, which has also been recorded from Finland, Spain, and the U.S.A. (California).

Genus *Rhyncaphytoptus* Keifer

Rhyncaphytoptus Keifer, 1939a: 149. Type-species *Rhyncaphytoptus ficifoliae* Keifer, 1939a.

Body robust fusiform, divided laterally into tergites and sternites, the latter more numerous; abdomen evenly arched or with shallow longitudinal, dorsal, or subdorsal furrows. Rostrum long, abruptly bent down. Dorsal tubercles on rear shield margin or slightly ahead of it, directing setae anteriorly. Legs with the normal

segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. The simple featherclaw sets this genus apart from all others of the Rhyncaphytoptinae. Only one species is known from New Zealand.

Rhyncaphytoptus fagacis Boczek

Figures 90-97

Rhyncaphytoptus fagacis Boczek, 1964: 393.

FEMALE, protogyne (description from 1 specimen in dorsoventral aspect). Length 207 μm , width 102 μm . Robust fusiform. Rostrum 28 μm long, curved abruptly down; antapical seta 11 μm long. Dorsal shield (Figure 90) 41 μm long, 80 μm wide, with anterior margin curved, almost collar-like; ornamentation consisting mainly of longitudinal lines - a median, admedians, and 3 submedians, the inner submedians incomplete; dorsal tubercles on rear shield margin, prominent, finger-like, directed anteriorly, 34 μm apart; dorsal setae 63 μm long, directed anteriorly.

Foreleg 51 μm long; tibia 12 μm long, with a seta 9 μm long at about one-quarter; tarsus 9 μm long; claw 8 μm long, knobbed; featherclaw 5-rayed. Hind leg 46 μm long; tibia 9 μm long; tarsus 8 μm long; claw 7 μm long, knobbed. Coxae unornamented; 1st coxal setae 10 μm long; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line incomplete anteriorly.

Abdomen with a broad, shallow, longitudinal dorsal trough, and with 21 tergites and 76 sternites, all microtuberculate; microtubercles on tergites small, rounded, under high magnification with longitudinal lines visible (shown in Figure 90 on a few tergites only); microtubercles on sternites small, numerous. Lateral seta on about sternite 15, 22 μm long. Ventral setae: 1st on about sternite 38, 24 μm long; 2nd on about sternite 60, 14 μm long; 3rd on about 6th sternite from rear, 28 μm long. Accessory caudal seta about 1.5 μm long. Genitalia 31 μm wide, 22 μm long. Coverflap unornamented; genital seta 11 μm long.

FEMALE, deutogyne (description from 1 specimen in lateral view). Length 135 μm , depth 75 μm . Robust fusiform. Rostrum 41 μm long, curved abruptly down; antapical seta 11 μm long; a slender projection overhanging rostrum base: Dorsal shield 33 μm long; dorsal tubercles on rear shield margin, prominent, finger-like, directed anteriorly; dorsal setae 27 μm long (possibly broken), directed anteriorly.

Foreleg 44 μm long; tibia 12 μm long, with a seta 7 μm long at about one-fifth; tarsus 9 μm long; claw 6 μm long, knobbed; featherclaw 5-rayed. Hind leg 41 μm long; tibia 10 μm long; tarsus 8 μm long; claw 6 μm long, knobbed.

Abdomen with 22 tergites and about 62 sternites; microtubercles absent. Lateral seta on about sternite 13, 22 μm long. Ventral setae: 1st on about sternite 28, 27 μm long; 2nd on about sternite 53, 12 μm long; 3rd on about 6th ring from rear, 28 μm long. Accessory caudal seta 3 μm long. Genital seta 16 μm long.

MALE. Not seen.

TYPE DATA. Described from *Fagus sylvatica* (copper beech; Fagaceae), Botanical Garden, Cracow, Poland (holotype slide (female), 8 female and 2 male paratypes, and dry leaves with mites, Department of Applied Entomology, Agricultural University, Warsaw, Poland).

MATERIAL EXAMINED. Non-type examples from *Fagus sylvatica*, north Hagley Park, Christchurch, 27 Jan 1976.

- / MC.

Occurring on undersurface of leaves; no damage observed.

REMARKS. The distinctive dorsal shield and tubercles, long dorsal setae, and lack of ornamentation on the coxae and genital coverflap should distinguish *Rhyncaphytoptus fagacis*.

This is the first record of the species from New Zealand, and indeed from anywhere other than Poland. Boczek (1964) states that it causes leaf discoloration.

Family ERIOPHYIDAE

TYPE-GENUS *Eriophyes* von Siebold, 1851.

Body worm-like or fusiform, sometimes flattened. Dorsal shield with 2 setae or none. Rostrum variable, but usually short, with short-form oral stylet. Legs usually with standard segmentation, but sometimes with reduced setation; foretibial spur absent. Abdomen with no subdorsal seta. Female genitalia with internal apodeme usually of moderate length, but sometimes shortened; spermathecal tubes short, projecting either laterally or to rear.

Subfamily ERIOPHYINAE

See *Fauna of New Zealand* number 5.

Subfamily CECIDOPHYINAE

Genus *Cecidophyopsis* Keifer

Cecidophyopsis Keifer, 1959a: 273. Type-species *Eriophyes vermiformis* Nalepa, 1889.

Body worm-like, with no tergal-sternal differentiation and with rings subequal dorso-ventrally and completely microtuberculate. Rostrum short. Dorsal shield broadly rounded anteriorly; without an anterior lobe or dorsal tubercles and setae. Legs with all standard segments and setae; featherclaw simple. Abdomen with all standard setae. Female genitalia close to coxae, protruding from venter, with internal apodeme much shortened. Genital coverflap with uneven longitudinal markings.

REMARKS. Readily recognised by the absence of dorsal tubercles and setae. Only one species is known in New Zealand.

Cecidophyopsis ribis (Westwood)

currant bud mite

Figures 98-104

Phytoptus ribis Westwood, 1869: 841.

Eriophyes ribis (Westwood). Nalepa, 1910: 233.

Cecidophyes ribis (Nalepa). Masee, 1961: 116.

Cecidophyopsis ribis (Westwood). Keifer, 1959a: 273.

FEMALE (description from 6 specimens). Length 138-219 μm , width 45-51 μm , depth 47-52 μm . Vermiform, white. Rostrum 18-20 μm long, curved down; antapical seta 2-4 μm long. Dorsal shield subsemicircular, 28-33 μm long, 37-44 μm wide, with longitudinal lines - a median line, admedian lines, and 2 or 3 submedian lines, the submedians sometimes broken and curved; lateral shield areas granulate; dorsal tubercles and setae absent.

Foreleg 23-25 μm long; tibia 5-6 μm long, with a seta 6 μm long at about one-third; tarsus 4-6 μm long; claw 5-6 μm long; featherclaw 5-rayed. Hind leg 21-24 μm long; tibia 3-5 μm long; tarsus 4-6 μm long; claw 6-8 μm long. Coxae almost unornamented; 1st coxal seta 2-4 μm long, almost on a level with anterior coxal approximation; 1st setiferous coxal tubercles slightly closer together than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line forked posteriorly.

Abdomen with about 68-74 microtuberculate rings; microtubercles elongate-oval, usually on rear ring margins, fading over the last 6 rings. Lateral seta on about ring 4, 13-18 μm long. Ventral setae: 1st on about ring 18, 40-49 μm long; 2nd on about ring 32, 5-7 μm long; 3rd on about 7th ring from rear, 16-19 μm long. Accessory caudal seta absent. Genitalia 18-20 μm wide, 11-13 μm long. Coverflap with longitudinal markings; genital seta 5-7 μm long.

MALE. Present.

TYPE DATA. Described from *Ribes nigrum* (black currant; Saxifragaceae), Britain. No other data; type material probably lost.

MATERIAL EXAMINED. Non-type examples from *Ribes grossularia* (gooseberry) (Edgecumbe, Oct 1951; Palmerston North, 22 Nov 1968; Levin, 4 Nov 1957, 20 Aug 1964, 22 Nov 1968; Greytown, 22 Nov 1973; Christchurch, 31 Aug 1966; Taieri, 26 Nov 1979) and *R. nigrum* (Ohai, 26 Jul 1979).

BP, WI, WA, WN / MC, DN, SL.

Attacking the buds, which in gooseberry often show no outward sign of infestation apart from failure to produce satisfactory growth.

REMARKS. The lack of dorsal tubercles and setae is distinctive. Van Eynhoven (1967)

and Boczek & Leska (1968) showed the microtubercles of *Cecidophyopsis ribis* to be pointed anteriorly, but I have not observed this in New Zealand specimens.

This species is of some economic significance, causing 'big bud' on black currants. In New Zealand it appears to be more severe on gooseberries. It has been implicated as the vector of the virus causing 'black currant reversion' (Oldfield 1970).

Cottier (1945) was first to record this mite in New Zealand, after it was found in black currant bushes at Greytown. *C. ribis* has also been recorded from Tasmania, the U.S.S.R., Europe, and British Columbia.

Chreacidus new genus

TYPE-SPECIES *Chreacidus quercipodus* new species.

(The name *Chreacidus* is a construction without formal etymological roots; gender masculine.)

Body fusiform, differentiated into tergites and sternites, the sternites more numerous; abdomen dorsally flat or slightly concave. Rostrum short. Dorsal shield with an anterior lobe but without dorsal tubercles and setae. Legs with the normal segmentation and setation; featherclaw divided. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme shortened, appearing as a thick, transverse line.

REMARKS. The unusual featherclaw, presence of an anterior shield lobe, and division of the body rings into tergites and sternites are the main distinguishing features. The featherclaw is similar to that of *Brevulacus reticulatus*, which like *C. quercipodus* is found on oak, but the basal rays are not as numerous.

Chreacidus quercipodus new species

Figures 9 and 105-112

FEMALE (description from 6 specimens). Length 137-171 μm , width 51-55 μm , depth 55 μm . Fusiform. Rostrum 21 μm long, curved down; antapical seta 3-6 μm long (visible only in some specimens). Dorsal shield

subsemicircular, 30-34 μm long, 44-48 μm wide, with a triangular anterior lobe; ornamentation consisting of a weak median line, strongly impressed admedians and 3 weak submedian lines, as follows. Admedians subparallel anteriorly, diverging at about one-quarter, narrowing briefly and then becoming subparallel at about two-thirds. Three transverse lines crossing admedians, one at base of anterior lobe, another at about one-quarter, which also crosses the middle submedian to meet the lateral line, and a third, 'V'-shaped line near base of shield. Inner and outer submedian lines present on basal third and half of shield respectively. Arising at about mid-length on the middle submedian is a short, forward-inclined diagonal line which meets the lateral line. Dorsal tubercles and setae absent.

Foreleg 24-26 μm long; tibia 5-6 μm long, with a seta 5-7 μm long at about mid-length; tarsus 5-6 μm long; claw 6-8 μm long; featherclaw divided, though distally with 'normal' apical rays. Hind leg 23-26 μm long; tibia 4-5 μm long; tarsus 5 μm long; claw 7-9 μm long. Second coxal tubercles surrounded by subcircular lines; 1st coxal setae 6-8 μm long; 1st setiferous coxal tubercles situated ahead of anterior coxal approximation and about as far apart as the 2nd tubercles, which are ahead of a line through the 3rd tubercles. Sternal 'line' short, broad, somewhat indefinite, flaring posteriorly to take the shape of an inverted 'Y'.

Abdomen dorsally either flat or slightly concave, with about 31-34 tergites and 46-52 microtuberculate sternites; tergites without microtubercles, though a few specimens indicate that these may be faintly present. Lateral seta on about sternite 7, 19-27 μm long. Ventral setae: 1st on about sternite 17, 34-56 μm long; 2nd on about sternite 29, 9-13 μm long; 3rd on about 6th ring from rear, 20-27 μm long. Accessory caudal seta absent. Genitalia 19-22 μm wide, 12-16 μm long. Coverflap with longitudinal markings in 2 rows; genital seta 10-15 μm long.

MALE. Not seen.

TYPE DATA. From *Quercus* sp. (oak; Fagaceae), north Hagley Park, Christchurch, 27 January 1976, D. C. M. Manson (holotype slide and 4 paratype slides, PLNZ; 1 paratype slide, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Quercus* sp., Lincoln, 1 Sep 1977.

- / MC.

Probably leaf vagrants, though the specimens from Lincoln were found embedded in leaf axils.

REMARKS. The generic characters - chiefly the presence of an anterior shield lobe, the unusual featherclaw, and the division of the body into tergites and sternites - distinguish this species from other Cecidophyinae.

Genus *Colomerus* Newkirk & Keifer

Colomerus Newkirk & Keifer, 1971: 6. Type-species *Eriophyes gardeniella* Keifer, 1964.

Body worm-like, with rings subequal dorso-ventrally and not differentiated into tergites and sternites. Rostrum short. Dorsal shield with or without a short, acuminate anterior lobe; dorsal tubercles slightly ahead of rear shield margin, usually with longitudinal axes directing setae anterodorsally. Legs with the usual segmentation and all standard setae; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia protruding from venter, with internal apodeme shortened. Genital coverflap with longitudinal markings, usually in 2 uneven rows.

REMARKS. The most distinctive characters are the forward-directed dorsal setae, protruding genitalia, coverflap markings typically in two rows, and shortened apodeme, which may take the form of a thick, transverse line. Three species are here recognised, two of them new.

KEY TO SPECIES OF *COLOMERUS* KNOWN FROM NEW ZEALAND

- 1 Genital seta 15-19 μm long. On grape
.... *vitis*
- Genital seta 3-5 μm long. On hosts
other than grape 2

- 2 First setiferous coxal tubercles closer together than the 2nd, which are nearer to the 1st tubercles than to the 3rd.

On *Melicope simplex* and *M. ternata*

.... *coplus*

- First setiferous coxal tubercles about as far apart as the 2nd, which are almost equidistant from the 1st and the 3rd tubercles. On *Phebalium nudum*

.... *nudi*

Colomerus coplus new species

Figures 113-120

FEMALE (description from 6 specimens). Length 110-147 μm , width 38-41 μm , depth 34-39 μm . Vermiform. Rostrum 14-15 μm long, curved down; antapical seta absent. Dorsal shield subtriangular, 20-25 μm long, 28-31 μm wide, with a short, triangular anterior lobe; ornamentation a pattern of mainly broken longitudinal lines; dorsal tubercles slightly ahead of rear shield margin, 10-13 μm apart; dorsal setae 12-19 μm long, directed anteriorly.

Foreleg 21-23 μm long; tibia 4-5 μm long, with a seta 3 μm long at about mid-length; tarsus 5-6 μm long; claw 4-5 μm long; featherclaw 5-rayed. Hind leg 19-21 μm long; tibia 3-4 μm long; tarsus 5 μm long; claw 6 μm long. Coxae unornamented except for a few curved lines anterolateral to 2nd coxal tubercles; 1st coxal seta 4 μm long, slightly ahead of anterior coxal approximation; 1st setiferous coxal tubercles closer together than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line forked posteriorly.

Abdomen with about 53-63 microtuberculate rings; microtubercles oval, on rear ring margins. Lateral seta on about ring 6, 9-13 μm long. Ventral setae: 1st on about ring 20, 19-24 μm long; 2nd on about ring 34, 14-26 μm long; 3rd on about 6th ring from rear, 9-11 μm long. Accessory caudal seta absent. Genitalia 12-18 μm wide, 11-13 μm long. Coverflap with longitudinal markings; genital seta 4-5 μm long.

MALE. Present.

TYPE DATA. From *Melicope simplex* (Rutaceae), Destruction Gully, Huia, Auckland, 5 June 1974, B. M. May (holotype slide, 13 paratype slides, and dried material, PLNZ; 3 paratype slides, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Melicope ternata* (Trentham, 25 Mar 1953; Kahikatea Park, Waiotapu Valley, 28 Jun 1979) and *Melicope simplex* (Hurakai State Forest, 22 Feb 1983).

AK, BP, TO / - .

Causing a dark brown erineum on leaf undersurfaces.

REMARKS. *Colomerus coplus* is similar to *C. nudi*, but can be distinguished by the lack of lateral shield granules, the first coxal tubercles being closer together than the second, and the second tubercles being closer to the first tubercles than to the third.

The specimens from *M. ternata* differ slightly from the type material in that the curved coxal lines are less obvious, a few granules occur at the base of the coxae, the dorsal shield striations are not quite as numerous, and the division of the genital markings into two rows is less obvious. At present I consider these variations to be of no taxonomic significance.

Colomerus nudi new species

Figures 121-128

FEMALE (description from 7 specimens). Length 108-168 μm , width 43-47 μm , depth 38-49 μm . Vermiform, white. Rostrum 13-15 μm long, curved down; antapical seta absent. Dorsal shield subsemicircular, 18-24 μm long, 35-39 μm wide, with a small, acute anterior lobe; ornamentation a pattern of broken longitudinal lines and lateral granulations - usually a median line, admedians, and 4 or 5 submedians; dorsal tubercles ahead of rear shield margin, 8-16 μm apart; dorsal setae 12-19 μm long, directed anteriorly.

Foreleg 20-23 μm long; tibia 4-5 μm long, with a seta 1-3 μm long at about one-third; tarsus 4-6 μm long; claw 5-7 μm long; featherclaw 5-rayed. Hind leg 20-22 μm long; tibia 3-4 μm long; tarsus 3-6 μm long;

claw 6-8 μm long. Coxae unornamented; 1st coxal seta 4-7 μm long, almost on a level with anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 55-70 rings, all microtuberculate except for the last 6 or 7, which are almost unornamented; microtubercles rounded, on rear ring margins. Lateral seta on about ring 6, 11-19 μm long. Ventral setae: 1st on about ring 17, 18-25 μm long, 2nd on about ring 32, 18-30 μm long; 3rd on about 6th ring from rear, 8-10 μm long. Accessory caudal seta usually absent. Genitalia 17-19 μm wide, 8-10 μm long. Coverflap with a double row of longitudinal markings; genital seta 3-4 μm long.

MALE. Not seen.

TYPE DATA. From *Phebalium nudum* (Rutaceae), Huia, Auckland, 14 February 1974, B. M. May (holotype slide, 10 paratype slides, and dried material, PLNZ; 3 paratype slides, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Phebalium nudum*, Huia dam, 12 Jun 1981.

AK / - .

Causing a reddish erineum on leaf undersurfaces.

REMARKS. *Colomerus nudi* is similar to *C. coplus*, but can be distinguished by the presence of lateral shield granules and by the first coxal tubercles being about the same distance apart as the 2nd tubercles (much closer together in *coplus*). This species tends to shrink shortly after it is slide-mounted, giving it a more plumpish appearance than normal.

***Colomerus vitis* (Pagenstecher)**

grape erineum mite

Figures 129-135

Phytoptus (?) *vitis* Pagenstecher, 1857: 48.

Eriophyes vitis (Pagenstecher). Keifer, 1938b: 301.

Colomerus vitis (Pagenstecher). Newkirk & Keifer, 1971: 6.

FEMALE (description from 6 specimens). Length 147-201 μm , width 33-57 μm , depth 51-58 μm . Vermiform. Rostrum 12-14 μm long, curved down; antapical seta 2-3 μm long. Dorsal shield subsemicircular, 29 μm long, 38 μm wide; ornamentation consisting of longitudinal lines - a median line, ad-medians, about 10 submedians, and lateral lines; dorsal tubercles ahead of rear shield margin, 18 μm apart; dorsal setae 19-24 μm long, directed medially.

Foreleg 21-29 μm long; tibia 4-7 μm long, with a seta 5-6 μm long at a quarter; tarsus 5-8 μm long; claw 6-8 μm long; featherclaw 5-rayed. Hind leg 20-26 μm long; tibia 4-5 μm long; tarsus 5-6 μm long; claw 9 μm long. Coxae almost unornamented; 1st coxal seta 4-6 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 76-89 rings, all microtuberculate except for about the last 6; microtubercles elongate-oval, on rear ring margins. Lateral seta on about ring 7, 10-19 μm long. Ventral setae: 1st on about ring 24, 40-46 μm long; 2nd on about ring 44, 38-60 μm long; 3rd on about 5th ring from rear, 12-13 μm long. Accessory caudal seta absent. Genitalia 16-21 μm wide, 11-15 μm long, somewhat appressed to coxae. Coverflap with a double row of longitudinal markings; genital seta 15-19 μm long.

MALE. Present.

TYPE DATA. Described from *Vitis vinifera* (grape; Vitaceae), Germany. No other data; type material probably lost.

MATERIAL EXAMINED. Non-type examples from *Vitis vinifera* (Te Kauwhata, 8 Apr 1949; Gisborne, Jan 1958; Hastings, Nov 1950; Masterton, 4 Nov 1974, 5 Nov 1975, and 2 Nov 1976; Ruby Bay, near Motueka, 14 Nov 1975; Mapua, Nelson, 3 Mar 1971; in glasshouse, Cashmere Road, Christchurch, 25 Nov 1975).

WO, GB, HB, WA / NN, MC.

Causing an erineum on leaf undersurfaces.

REMARKS. *Colomerus vitis* can readily be distinguished from *C. coplus* and *C. nudi* by the greater length of its first ventral seta and genital seta (40-46 μm cf. 18-25 μm , and 15-19 μm cf. 3-5 μm respectively).

Overseas workers recognise two strains of this mite, which can be distinguished by their habitat on the vine and by the damage they cause. The erineum strain attacks only the leaves; the bud-mite strain lives only in the buds, and causes no leaf erineum. Injury caused by the bud-mite strain can result in yield losses and, possibly, the eventual death of the vines; the erineum strain is normally of little economic significance. For further information, see Smith & Stafford (1948) and Kido & Stafford (1955).

C. vitis has also been recorded from Australia (Queensland, Tasmania), California, Europe, Paraguay, and South Africa.

Genus *Cosetacus* Keifer

Cosetacus Keifer, 1966: 7. Type-species
Aceria camelliae Keifer, 1945.

Body worm-like, with rings microtuberculate, subequal dorsoventrally, and not differentiated into tergites and sternites. Rostrum short. Dorsal shield subsemicircular, without an anterior lobe; dorsal tubercles near rear shield margin, directing setae divergently to rear. Legs with the usual segmentation; foretibial seta absent; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Genitalia somewhat produced from body, transversely subelliptical; internal apodeme shortened, folded back. Genital coverflap with longitudinal ribs in 2 rows.

REMARKS. Distinctive characters are the shortened nature of the internal apodeme, the protruding genitalia with two transverse rows of longitudinal markings, and the lack of a foretibial seta. The combination of posteriorly-directed dorsal setae and lack of the foretibial seta differentiate this genus from the closely related *Colomerus*. *Cosetacus camelliae* is the only species known in New Zealand.

Cosetacus camelliae (Keifer)

camellia bud mite

Figures 136-142

Aceria camelliae Keifer, 1945: 137.

Cosetacus camelliae (Keifer). Keifer, 1966: 7.

FEMALE (description from 6 specimens). Length 159-198 μm , width 47-50 μm , depth 45-50 μm . Vermiform. Rostrum 21-23 μm long, curved down; antapical seta 3-5 μm long. Dorsal shield subsemicircular, 25-30 μm long, 41-44 μm wide, ornamented in most specimens with 6 faintly impressed longitudinal lines; dorsal tubercles slightly ahead of rear shield margin, 20 μm apart; dorsal setae 31-33 μm long, directed posteriorly.

Foreleg 22-24 μm long; tibia 4-5 μm long, without a seta; tarsus 4-5 μm long; claw 6-7 μm long; featherclaw 6-rayed. Hind leg 22-24 μm long; tibia 3-4 μm long; tarsus 4-5 μm long; claw 7-9 μm long. Coxae unornamented; 1st coxal seta 3-5 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line absent.

Abdomen with about 63-69 microtuberculate rings; microtubercles oval, usually in about centre of rings. Lateral seta on about ring 6, 13-15 μm long. Ventral setae: 1st on about ring 17, 40-46 μm long; 2nd on about ring 31, 6-7 μm long; 3rd on about 7th ring from rear, 13-16 μm long. Accessory caudal seta absent. Genitalia 18-20 μm wide, 10-12 μm long. Coverflap with 2 rows of longitudinal markings; genital seta 1-2 μm long.

MALE. Not seen.

TYPE DATA. Described from *Camellia japonica* (Theaceae), Santa Maria, California, U.S.A. (holotype slide and 6 paratype slides presumably in collection of California State Department of Agriculture).

MATERIAL EXAMINED. Non-type examples from *Camellia* sp. (Auckland, 10 Aug 1971; Levin, 1 Oct 1981).

AK, WN / - .

Inhabiting flower buds, under the scales,

and causing browning of the flower parts and buds.

REMARKS. Distinctive characters of *Coseta-cus camelliae* are the lack of a foretibial seta, the genital coverflap with two rows of longitudinal markings, and the very short genital setae. The New Zealand material differs slightly from Keifer's original description in that the central longitudinal lines on the dorsal shield are sometimes missing and the genital flap does not overlap the hind coxae. The shape of the internal genitalia is difficult to determine.

This is the first record of *C. camelliae* from New Zealand. It has also been recorded from Australia and the U.S.A.

Subfamily NOTHOPODINAE
Genus *Cosella* Newkirk & Keifer

Cosella Newkirk & Keifer (in Jeppson *et al.* 1975, p.570). Type-species *Floracarus deleari* Keifer, 1956.

Body fusiform, blunt anteriorly, tapering posteriorly; rings subequal dorsoventrally, differentiated into tergites and sternites. Rostrum short. Dorsal shield subsemicircular, with a short anterior lobe; dorsal tubercles ahead of rear shield margin, their axes diagonal or longitudinal; dorsal setae short and directed upwards, medially, or posteriorly. Legs with tibiae and tarsi fused; claw on foreleg angled outwards; featherclaw simple. Forecoxae fused; 1st setiferous coxal tubercles absent. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length. Genital coverflap granulate.

REMARKS. The main distinguishing features are the almost equal numbers of tergites and sternites, the positioning of the dorsal tubercles ahead of the rear shield margin, and the laterally angled foreclaw. *Cosella* is similar to *Floracarus* Keifer, but differs mainly in the dorsal tubercles being ahead of the rear shield margin, not on it. Also, the dorsal setae are directed upwards or medially, not posteriorly.

***Cosella simplicis* new species**

Figures 143-150

FEMALE (description from 9 specimens). Length 156-205 μm , width 69-98 μm , depth 68-92 μm . Blunt anteriorly, tapering posteriorly. Whitish or yellowish. Rostrum 19-25 μm long, curved down. Dorsal shield semicircular, 34-45 μm long, 68-88 μm wide; a short anterior shield lobe present, in some specimens often roughened and truncate in lateral aspect; ornamentation varying in intensity between individuals, as follows (in some, almost absent). Median line and admedians usually discernible, the admedians stronger, these lines running full length of shield, but in some specimens difficult to discern anteriorly, and in holotype slide fading out almost completely on anterior one-sixth. Usually 3 transverse lines crossing median and admedians: the 1st at about one-sixth, continuing laterally as a strong, sinuous line subparallel to lateral shield margin and almost reaching it; the 2nd at about one-third; the 3rd at about two-thirds, weak, sometimes displaced (as in the holotype) or absent. Often a short submedian line, usually a continuation from the dorsal tubercles, running anteriorly a short distance before forking. Dorsal tubercles ahead of rear shield margin, 28-38 μm apart; dorsal setae 12-16 μm long, directed posteromedially (their direction in Figure 144 is not a true indication of this).

Foreleg 21-26 μm long; tibia absent; tibiotarsus 7-9 μm long; claw 4-5 μm long, knobbed; featherclaw 4-rayed. Hind leg 21-25 μm long; tibiotarsus 6-9 μm long; claw 5-6 μm long. Anterior coxae fused, granulate; 1st coxal tubercles and setae absent; 2nd setiferous coxal tubercles well ahead of a line through the 3rd tubercles.

Abdomen with about 44-52 rings. Tergites without microtubercles; sternites with weak, narrow, elongate-oval microtubercles, often interrupted ventrally. Lateral seta on about ring 6, 22-33 μm long; Ventral setae: 1st on about ring 17, 46-58 μm long; 2nd on about ring 30, 8-10 μm long; 3rd on about 7th ring from rear, 16-19 μm long. Accessory caudal seta absent. Genitalia 20-25 μm wide, 15-20 μm long. Coverflap granulate, with a longitudinal line medially and some crescentic scoring posteriorly; genital seta 6-9 μm long.

MALE. Present.

TYPE DATA. From *Neopanax simplex* (Araliaceae): holotype slide and 16 paratype slides, Egmont-Stratford plateau, 14 March 1971, F. C. Duguid; 1 paratype slide, Kaimanawa Range, 17 April 1955, J. M. Dingley; 1 paratype slide, Mount Ruapehu, 4 August 1950, A. Bray; 1 paratype slide, National Park, 1949, K. P. Lamb. From *N. colensoi*: 5 paratype slides, near Chateau Tongariro, 15 March 1977, R. J. Mackenzie. (Holotype slide and 22 paratype slides, PLNZ; 2 paratype slides, NZAC.)

MATERIAL EXAMINED. Type series, plus non-type examples from *Leptospermum scoparium*, Huia, 14 Dec 1980.

AK, TK, TO / - .

Living in rolled leaves.

REMARKS. The generic characters are sufficient to distinguish *Cosella simplicis*. The unusual body shape (rather plump and squat), together with faint body markings, absence of the first coxal setae and tubercles, and apparent lack of a tibia (fused with the tarsus) are worth noting.

Eleven of the type slides from *Neopanax simplex* also contain examples of *Phyllocoptes hazelae*, and one has a specimen of *Parulops heatherae*.

This is the first record of genus *Cosella* from New Zealand.

***Pangacarus* new genus**

TYPE-SPECIES *Pangacarus grisalis* new species.

(The name *Pangacarus* is constructed from the name of the type locality and the stemword for the mites; gender masculine.)

Body fusiform, blunt anteriorly, tapering posteriorly; rings differentiated, with considerably more sternites than tergites. Rostrum short. Dorsal shield with a short anterior lobe; dorsal tubercles widely spaced, almost at posterolateral angles of shield. Legs with tibia and tarsus fused; featherclaw simple. Forecoxae fused; 1st setiferous coxal tubercles absent. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length. Genital coverflap granulate.

REMARKS. The widely spaced dorsal tubercles, sternites outnumbering tergites, and normal positioning of the foreclaw clearly separate this genus from *Cosella* and *Floracarus*.

***Pangacarus grisalis* new species**

Figures 151-158

FEMALE (description from 7 specimens). Length 144-174 μm , width 72-77 μm , depth 71-82 μm . Fusiform. Rostrum 20-22 μm long, curved down; antapical seta 2-3 μm long. Dorsal shield subsemicircular, 44-57 μm long, 62-69 μm wide, the short, blunt anterior lobe more clearly visible in lateral view; ornamentation comprising admedians only, though an occasional specimen shows a faint, partial median line; dorsal tubercles ahead of rear shield margin, almost at posterolateral angles, widely spaced (56-59 μm apart); dorsal setae 15-18 μm long, diverging posterolaterally.

Foreleg 21-24 μm long; femoral seta absent; tibiotarsus 5-7 μm long; claw 5-7 μm long, with a transverse 'knob'; featherclaw 5-rayed. Hind leg 18-22 μm long; tibiotarsus 5-7 μm long; claw 5-7 μm long. Coxae with fine granulation anteriorly; 2nd setiferous coxal tubercles well ahead of a line through the 3rd tubercles.

Abdomen with about 32-33 smooth tergites and 54-60 microtuberculate sternites. Lateral seta on about ring 8, 18-28 μm long. Ventral setae: 1st on about ring 22, 56-67 μm long; 2nd on about ring 36, 7-10 μm long; 3rd on about 6th ring from rear, 17-19 μm long. Accessory caudal seta absent. Genitalia 25-27 μm wide, 15-19 μm long. Coverflap with small granules and a median longitudinal line on basal half.

MALE. Present.

TYPE DATA. From *Griselinia littoralis* (Cornaceae), Te Pangu, Marlborough Sounds, 22 February 1964, D. C. M. Manson (holotype slide, PLNZ).

MATERIAL EXAMINED. Type slide only.

- / SD.

Free-living on leaf undersurfaces; causing no noticeable damage to host plant.

REMARKS. The almost complete lack of a dorsal shield pattern, widely spaced dorsal tubercles, and unusually shaped knob on the claw are distinctive of *P. grisalis*.

Subfamily PHYLLOCOPTINAE
Genus *Aculops* Keifer

Aculops Keifer, 1966: 9. Type-species
Aculops populivagrans Keifer, 1953.

Body fusiform; rings differentiated into tergites and sternites, the sternites usually more numerous. Rostrum of moderate length. Dorsal shield with an anterior lobe; dorsal tubercles on rear shield margin, their axes transverse, directing setae divergently to rear. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length.

REMARKS. A large genus, recognised chiefly by the presence of an anterior shield lobe, tergal-sternal differentiation, and dorsal shield tubercles with transverse axes directing the setae divergently to the rear. *Aculops* is very similar to *Aculus*, but differs in lacking small spinules projecting from under the front margin of the anterior shield lobe.

Seven species are here recognised from New Zealand.

**KEY TO SPECIES OF *ACULOPS*
 KNOWN FROM NEW ZEALAND**

- 1 Featherclaw 6-rayed or 7-rayed. On *Salix alba* (willow) *albensis*
- Featherclaw 4-rayed or 5-rayed. Not on willow 2
- 2 Dorsal shield and coxal area unornamented; lateral areas of tergites on anterior half of abdomen with distinctive triangular markings. On *Carpodetus serratus* *serrati*

-- Not with this combination of characters 3

- 3 Dorsal shield ornamentation a medial 'double-lined' network; forecoxae and anterior of genital field with dash-like markings. On *Pittosporum eugenioides* *pittospori*

-- Not with this combination of characters 4

- 4 Dorsal shield smooth, unornamented; anterior lobe short, triangular. On *Gaultheria* sp. *gaultheriae*

-- Not with this combination of characters 5

- 5 Dorsal shield with characteristic 'vase-like' markings; coxae unornamented. On *Lycopersicon esculentum* (tomato) or *Physalis peruviana* (Cape gooseberry) *lycopersici*

-- Not with this combination of characters 6

- 6 Dorsal shield with a pattern of large spots; dorsal tubercles 25-26 µm apart. On *Haloragis* spp. *haloragis*

-- Dorsal shield ornamented at most with faint spots; dorsal tubercles 34-38 µm apart. On bud galls of *Wahlenbergia* spp. *wahlenbergiae*

***Aculops albensis* new species**

Figures 159-165

FEMALE (description from 6 specimens). Length 141-183 µm, width 48-57 µm, depth 52-59 µm. Fusiform, pale brownish-cream. Rostrum 25-32 µm long, curved down; ant-apical seta 5-7 µm long. Dorsal shield subsemicircular, 28-30 µm long, 45-50 µm wide, with a prominent, acutely pointed anterior lobe; ornamentation faint, consisting of a median line on basal quarter, admedians strongly developed on basal quar-

ter but fainter on anterior two-thirds and narrowing sharply at about anterior third, and an incomplete transverse line at about basal quarter; lateral shield areas with weak broken lines; dorsal tubercles on rear shield margin, 25-28 μm apart; dorsal setae 22-25 μm long, directed posteriorly, ending in a small knob.

Foreleg 35-37 μm long; tibia 8-10 μm long, with a seta 6-8 μm long at about one-fifth; tarsus (2-segmented) 6-8 μm long; claw 7-8 μm long, curved, knobbed; featherclaw 6-rayed or 7-rayed. Hind leg 31-34 μm long; tibia 7-8 μm long; tarsus 6-8 μm long; claw 7-8 μm long. Coxae ornamented with a few dash-like lines; 1st coxal seta 11-14 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles.

Abdomen with about 29-31 tergites and 61-67 microtuberculate sternites; tergites smooth, broad, sometimes with weak, rounded microtubercles; sternal microtubercles small, rounded, on rear ring margin. Lateral seta on about sternite 8, 31-33 μm long. Ventral setae: 1st on about sternite 20, 57-64 μm long; 2nd on about sternite 38, 23-27 μm long; 3rd on about 6th ring from rear, 32-35 μm long. Accessory caudal seta 1-4 μm long. Genitalia 20-22 μm wide, 10-12 μm long. Coverflap with longitudinal markings; genital seta 18-26 μm long.

MALE. Present.

TYPE DATA. From *Salix alba* (willow; Salicaceae): holotype slide and 5 paratype slides, National Plant Materials Centre, Aokautere, Palmerston North, 14 February 1972, C. W. S. van Kraayenoord. From *S. caprea*: 5 paratype slides, same data as holotype. (Holotype slide and 8 paratype slides, PLNZ; 2 paratype slides, NZAC.)

MATERIAL EXAMINED. Type series only.

WI-WN / - .

Occurring on leaf undersurfaces, but causing no noticeable damage to host plant.

REMARKS. The prominent dorsal shield lobe, knobbed dorsal setae, six-rayed or seven-rayed featherclaw, and long second and third ventral setae are characteristic of *A. albensis*.

Aculops gaultheriae (Lamb) new combination

Figures 166-172

Vasates gaultheriae Lamb, 1953b: 376.

FEMALE (description from 6 type specimens). Length 126-180 μm , width 50-53 μm , depth 54-58 μm . Fusiform. Rostrum 19-25 μm long, curved down; antapical seta 5-7 μm long. Dorsal shield subsemicircular, 25-30 μm long, 37-41 μm wide, with a short, triangular anterior lobe, completely smooth and unornamented; dorsal tubercles on rear shield margin, 21-23 μm apart; dorsal setae 24-26 μm long, diverging posteriorly.

Foreleg 28-29 μm long; tibia 7-9 μm long, with a seta 6-8 μm long at approximately a quarter; tarsus 6 μm long; claw 6 μm long, knobbed; featherclaw 4-rayed. Hind leg 26-28 μm long; tibia 5-6 μm long; tarsus 6 μm long; claw 6 μm long, knobbed. Coxae with dash-like markings; 1st coxal seta 6 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 45-49 smooth tergites and 56-62 microtuberculate sternites; microtubercles rounded, on rear ring margin. Lateral seta on about sternite 10, 28-33 μm long. Ventral setae: 1st on about sternite 22, 38-45 μm long; 2nd on about sternite 35, 6-10 μm long; 3rd on about 6th ring from rear, 16-20 μm long. Accessory caudal seta absent. Genitalia 20-22 μm wide, 11-13 μm long. Coverflap with longitudinal markings; genital seta 9-10 μm long.

MALE. Present.

TYPE DATA. Described from *Gaultheria depressa* (Ericaceae), Tongariro National Park, 5 November 1949, K. P. Lamb (holotype slide and 2 paratype slides, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Gaultheria paniculata* (Waipawa Bridge, near Mangakino, 21 Oct 1981) and *Gaultheria* sp. (Lake Okataina, Rotorua, 1950).

BP, TO / - .

Forming 'witches brooms' of short shoots bearing green to dark red aborted flower buds with thick, fleshy calyces. Occurring in masses up to 30 mm across (type material).

Also forming galled flower buds (Lake Oka-taina material).

REMARKS. The smooth dorsal shield, short, triangular anterior shield lobe, and dash-like coxal markings should distinguish *A. gaultheriae*. The original description (Lamb 1953b) lacks an illustration of the dorsal shield, and shows insufficient detail in the coxal area. Paratypes from one slide have been remounted on two, which are marked accordingly.

***Aculops haloragis* (Lamb) new combination**

Figures 173-179

Thamnacus haloragi Lamb, 1953b: 377.

FEMALE (description from 6 specimens). Length 117-144 μm , width 51-63 μm , depth 51-62 μm . Fusiform, pale brown. Rostrum 18-19 μm long, curved down; antapical seta 4-5 μm long. Dorsal shield broadly sub-triangular, 30-33 μm long, 50-59 μm wide, with a short, broad anterior lobe; ornamentation a pattern of large spots; dorsal tubercles slightly ahead of rear shield margin, 25-26 μm apart; dorsal setae 10-13 μm long, diverging posteriorly.

Foreleg 26-29 μm long; tibia 6-7 μm long, with a seta 2-4 μm long near mid-length; tarsus 4-6 μm long; claw 5-6 μm long; featherclaw 4-rayed. Hind leg 25-28 μm long; tibia 5-6 μm long; tarsus 5-6 μm long; claw 5-6 μm long. Coxae granular, more particularly anterior coxae; 1st coxal seta 4-6 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line forked anteriorly and posteriorly.

Abdomen with about 34-40 smooth tergites and 44-56 microtuberculate sternites; microtubercles small, rounded, on rear ring margin. Lateral seta on about sternite 10, 12-19 μm long. Ventral setae: 1st on about sternite 22, 21-34 μm long; 2nd on about sternite 37, 8-10 μm long; 3rd on about 5th ring from rear, 15-18 μm long. Accessory caudal seta absent. Genitalia 18-20 μm wide, 8-9 μm long. Coverflap with longitudinal markings, and some dash-like marks anteriorly; genital seta 7-10 μm long.

MALE. Present.

TYPE DATA. Described from *Haloragis depressa* (Haloragaceae), Brown's Bay, Auckland, 2 October 1950, J. Dingley (1 paratype slide, NZAC; holotype slide lost).

MATERIAL EXAMINED. Paratype slide, plus non-type examples from *Haloragis micrantha* (swampland, north end of Lake Horowhenua, Levin, 13 Jan 1974; Upper Hutt, 13 Nov 1952), *H. procumbens* (Waikumete cemetery, Auckland, 6 Oct 1958; Three Kings Islands, Great Island, 14 Nov 1974), and *Haloragis* sp. (Destruction Gully, Huia, 20 Oct 1974).

Three Kings Is / AK, WN / - .

Causing leaf galls, bud galls, and deformed inflorescences.

REMARKS. The dorsal shield ornamentation, consisting of large spots, should distinguish *A. haloragis*.

I have re-examined Lamb's type material. Unfortunately, the holotype slide material was accidentally lost during remounting. It was in poor condition on the original slide, and of little help in attempts to observe detail. The remaining paratype slide contains one male, one female, and one immature specimen. The female had not quite completed moulting, and is not suitable for detailed drawings. Hence, drawings have been made from specimens mounted from dried material on *Haloragis procumbens* (Waikumete cemetery, Auckland); I am convinced that this is identical to the type material. I cannot appreciate Lamb's statement "abdomen with a broad dorsal arch flanked on either side by a shallow furrow extending to the cauda", and in my opinion his species is more correctly placed in *Aculops*.

***Aculops lycopersici* (Masse)**

tomato russet mite

Figures 180-185

Phyllocoptes lycopersici Masee, 1937: 403.

Phyllocoptes destructor Keifer, 1940b: 160.

Vasates destructor (Keifer). Keifer, 1946b: 570.

Vasates lycopersici (Masee). Lamb, 1953c: 347.

Aculops lycopersici (Masse) Keifer, 1966:
9 (note).

FEMALE (description from 12 specimens). Length 165-219 μm , width 62-75 μm , depth 61-75 μm . Robust fusiform, yellowish or yellowish-brown. Rostrum 18-25 μm long, curved down; antapical seta 6-10 μm long. Dorsal shield broadly triangular, 33-43 μm long, 54-69 μm wide; ornamentation variable, but usually a central 'vase-like' structure lateral to which are a few short, longitudinal lines, all confined in a clearly outlined semicircular area; dorsal tubercles on rear shield margin, 38-43 μm apart; dorsal setae 12-15 μm long, directed posteriorly.

Foreleg 30-40 μm long; tibia 6-10 μm long, with a seta 6 μm long at about one-quarter; tarsus 7-9 μm long; claw 8-10 μm long, knobbed; featherclaw 4-rayed. Hind leg 27-36 μm long; tibia 5-8 μm long; tarsus 6-9 μm long; claw 9-10 μm long. Coxae unornamented; 1st coxal seta 7-12 μm long, slightly behind the anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 26-28 broad, smooth tergites and 60-67 microtuberculate sternites; microtubercles very small, on ring margins. Lateral seta on about sternite 7, 21-34 μm long. Ventral setae: 1st on about sternite 22, 39-70 μm long; 2nd on about sternite 38, 17-23 μm long; 3rd on about 6th ring from rear, 25-30 μm long. Accessory caudal seta absent. Genitalia 18-26 μm wide, 12-17 μm long. Coverflap with longitudinal markings; genital seta 15-21 μm long.

MALE. Present.

TYPE DATA. Described from *Lycopersicon esculentum* (tomato; Solanaceae), Auckland, 1937, W. Cottier (type specimens preserved in ethanol, East Malling Research Station, Kent, England).

MATERIAL EXAMINED. Non-type examples from *Lycopersicon esculentum* (Auckland, 15 Dec 1965, and in glasshouse, 12 Feb 1979; Levin, 14 Jan 1964, 11 Feb 1969, in glasshouse 26 Nov 1971, and 16 Jan 1975) and *Physalis peruviana* (Cape gooseberry) (Nelson, 8 Feb 1973; Levin, near tomatoes, 11 Feb 1962).

AK, WN / NN.

On plants other than tomato sometimes causing discoloration of the leaves, though the plants usually continue to live. On tomato causing a silvering and curling of the leaves, bronzing of the stems, and russetting and cracking of the fruit, with formation of a characteristic 'ringed' appearance.

REMARKS. The strong differentiation into tergites and sternites, characteristic 'vase-shaped' design on the dorsal shield, and lack of coxal ornamentation should distinguish *A. lycopersici*.

This species has been recorded also from *Datura ferox*, *D. stramonium*, *Petunia* sp., *Physalis ixocarpa*, *Solanum nigrum*, (black nightshade), *S. nodifolium*, *S. tuberosum* (potato), and *S. villosum* (all Solanaceae). It was first recorded by Tryon (1917) as a pest of tomatoes in Queensland, Australia, and although named it was not described, so that the name became invalid. First recorded in New Zealand by Cottier & Taylor (1937), it has also been reported from Hawaii, continental U.S.A., Brazil, Argentina, South Africa, Egypt, Ethiopia, and Sri Lanka.

Aculops pittospori new species

Figures 186-190

FEMALE (description from 6 specimens). Length 186-233 μm , width 75-87 μm , depth not observable. Fusiform, tapering rapidly to rear. Rostrum 20-25 μm long; antapical seta 8-10 μm long. Dorsal shield semicircular, 36-39 μm long, 70-86 μm wide, with a bluntly rounded anterior lobe; ornamentation weak, often difficult to see, consisting mainly of double lines; admedians running about two-thirds length of shield, converging towards anterior margin; remainder of pattern as in Figure 186; dorsal tubercles on rear shield margin, 37-39 μm apart; dorsal setae 8-10 μm long, directed posteriorly.

Foreleg 31-36 μm long; tibia 6-8 μm long, with a seta 5-6 μm long at about three-fifths; tarsus 5-6 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed. Hind leg 30-32 μm long; tibia 6-7 μm long; tarsus 5-6 μm long; claw 5-6 μm long, knobbed. Coxae, mainly forecoxae, ornamented with dash-like markings; 1st coxal setae

6-8 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line weak.

Abdomen with about 24-27 broad, smooth tergites and 53-62 microtuberculate sternites. Lateral seta on about sternite 5, 12-19 μm long. Ventral setae: 1st on about sternite 17, 47-65 μm long, very finely tapered; 2nd on about sternite 35, 12-15 μm long; 3rd on about 6th ring from rear, 13-18 μm long. Accessory caudal seta absent. Genitalia 33-36 μm wide, 15-24 μm long. Coverflap with longitudinal markings and, in anterior area, with short dashes; genital seta 8-13 μm long.

MALE. Present.

TYPE DATA. From *Pittosporum eugenioides* (Pittosporaceae), Khandallah, Wellington, 6 October 1963, D. C. M. Manson (holotype slide and 2 paratype slides, PLNZ; 1 paratype slide, NZAC).

MATERIAL EXAMINED. Type series only.

WN / - .

A leaf vagrant.

REMARKS. The double-lined nature of the dorsal shield ornamentation (unfortunately sometimes weak) and dash-like markings on the forecoxae and anterior genital field should distinguish *A. pittospori*.

***Aculops serrati* new species**

Figures 191-197

FEMALES (description from 6 specimens). Length 158-183 μm , width 55-56 μm , depth 52-63 μm . Fusiform. Rostrum 18-20 μm long, curved down; antapical seta 3-4 μm long. Dorsal shield subsemicircular, 30-37 μm long, 50-52 μm wide, with a prominent anterior lobe, virtually unornamented; dorsal tubercles on rear shield margin, 30-32 μm apart; dorsal setae 14-19 μm long, directed posteriorly.

Foreleg 28-31 μm long; tibia 5-8 μm long, with a seta 4-5 μm long at about mid-length; tarsus 5-6 μm long; claw 5-6 μm long, curved, knobbed; featherclaw 4-rayed. Hind leg 28-29 μm long; tibia 5-6 μm long;

tarsus 5-7 μm long; claw 5-6 μm long. Coxae unornamented; 1st coxal seta 5-6 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line double.

Abdomen with about 24-27 tergites and 52-63 microtuberculate sternites; tergites on anterior half to two-thirds of abdomen, viewed laterally, usually with a triangular marking and, ventral to this, several faint, transverse, bar-like markings; viewed dorsally, tergites with 2 or 3 light, median, longitudinal markings. Lateral seta on about tergite 6, 17-25 μm long. Ventral setae: 1st on about tergite 20, 34-47 μm long; 2nd on about tergite 38, 12-17 μm long; 3rd on about 6th ring from rear, 13-18 μm long. Accessory caudal seta absent. Genitalia 17-21 μm wide, 8-11 μm long. Coverflap with longitudinal markings; subrectangular area immediately anterior to it unornamented; genital seta 10-13 μm long.

MALE. Present.

TYPE DATA. From *Carpodetus serratus* (Escalloniaceae): holotype slide and 4 paratype slides, Tautuku Beach, Catlins area, 24 January 1957, J. M. Dingley; 1 paratype slide, Titirangi, Auckland, November 1951, E. Bray (holotype slide and 1 paratype slide, NZAC; 4 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series only.

AK / SL.

In leaf erinea, often associated with *Acalitus carpatus*.

REMARKS. The smooth dorsal shield and coxal area and the distinctive lateral and dorsal ornamentation of the tergites should distinguish *A. serrati*.

***Aculops wahlenbergiae* new species**

Figures 198-204

FEMALE (description from 6 specimens). Length 169-210 μm , width 68-71 μm , depth 68-71 μm . Fusiform. Rostrum 18-23 μm long, curved down; antapical seta 7-9 μm

Genus *Aculus* Keifer

long. Dorsal shield subsemicircular, 33-40 μm long, 62-63 μm wide, with a triangular anterior lobe; ornamentation weak, consisting of a few short lateral lines and a vaguely outlined central area; a few faint, large spots visible in some specimens; dorsal tubercles on rear shield margin, 34-38 μm apart; dorsal setae 7-18 μm long, directed posteriorly.

Foreleg 26-34 μm long; tibia 5-8 μm long, with a seta 6-8 μm long at about mid-length; tarsus 6-8 μm long; claw 6-8 μm long; featherclaw 4-rayed. Hind leg 25-31 μm long; tibia 4-6 μm long; tarsus 6-8 μm long; claw 6-8 μm long. Coxae lightly granulate; 1st coxal setae 9-11 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 33-36 smooth tergites and 48-54 microtuberculate sternites; microtubercles small, rounded, on rear ring margin. Lateral seta on about sternite 10, 19-25 μm long. Ventral setae: 1st on about sternite 23, 28-31 μm long; 2nd on about sternite 34, 14-16 μm long; 3rd on about 5th ring from rear, 21-28 μm long. Accessory caudal seta absent. Genitalia 20-25 μm wide, 10-14 μm long. Coverflap with longitudinal markings; genital field immediately anterior to it granulate; genital seta 12-15 μm long.

MALE. Present.

TYPE DATA. From *Wahlenbergia marginata* var. *australis* (Campanulaceae), Port Hills, Christchurch, 29 December 1954, A. J. Healy (holotype slide and 1 paratype slide, NZAC; 5 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series, plus non-type examples from *Wahlenbergia gracilis*, Port Hills, Christchurch, 1964.

- / MC.

Forming leaf and bud galls up to 4 mm in diameter.

REMARKS. *Aculops wahlenbergiae* shows some similarity to *A. haloragis*, but is much bigger, with the dorsal setae more widely spaced (34-38 μm apart, cf. 25-26 μm).

The type material examined is that mentioned by Lamb (1960, p. 123).

Aculus Keifer, 1959b: 5-6. Type-species
Phyllocoptes ligustri Keifer, 1938a.

Body fusiform, differentiated into tergites and sternites, the sternites more numerous. Rostrum short. Dorsal shield with an anterior lobe bearing 2-4 small spines that project forward from apical margin; dorsal tubercles on rear shield margin, their axes transverse, directing setae divergently to rear. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. *Aculus* is very similar to *Aculops*, and is differentiated only by the presence of apical spines on the anterior shield lobe. The three New Zealand species are all introduced and all deuterogynous. They are recognised chiefly by their prominent anterior shield lobe with two small spines projecting from the apical margin, strong tergal-sternal differentiation, and dorsal shield tubercles with transverse axes directing the setae divergently to the rear.

KEY TO SPECIES OF *ACULUS* KNOWN FROM NEW ZEALAND

- 1 Genital setae short (11-21 μm). On apple (*Malus pumila*) ... *schlechtendali*
-- Genital setae longer (21-36 μm). On species of *Prunus* 2
- 2 On peach (*Prunus persica*) only
.... *cornutus*
-- On plum (*Prunus* spp.) only *fockeui*

Aculus cornutus (Banks)

peach silver mite

Figures 205-218

Phyllocoptes cornutus Banks, 1905: 141.

Phyllocoptes paracornutus Keifer, 1943: 214.

Vasates cornutus (Banks). Keifer, 1952: 43.

Aculus cornutus (Banks). Keifer, 1959b: 5-6.

FEMALE, protogyne (description from 6 specimens). Length 187-245 μm , width 75-81 μm , depth 75-78 μm . Fusiform, brownish-yellow. Rostrum 25-27 μm long, curved down; antapical seta 5-8 μm long. Dorsal shield semicircular, 36-42 μm long, 64-68 μm wide, with a rounded anterior lobe bearing 2 apical spines; ornamentation consisting mainly of admedian lines (Figure 206); anterolateral areas granulate or with dash-like lines; dorsal tubercles on rear shield margin, 32-37 μm apart; dorsal setae 14-16 μm long, diverging posteriorly.

Foreleg 32-36 μm long; tibia 6-9 μm long, with a seta 5-6 μm long at about one-quarter; tarsus 6-7 μm long; claw 6-8 μm long, knobbed; featherclaw 4-rayed. Hind leg 31-33 μm long; tibia 5-8 μm long; tarsus 6-8 μm long; claw 6-8 μm long, knobbed. Coxae with dash-like markings; 1st coxal setae 6-10 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 30-37 tergites and 61-65 sternites; tergites with faint microtubercles, these difficult to see on some specimens; sternites clearly microtuberculate, the microtubercles small, rounded, on rear ring margin. Lateral seta on about sternite 7, 22-28 μm long. Ventral setae: 1st on about sternite 21, 39-58 μm long; 2nd on about sternite 38, 16-21 μm long; 3rd on about 5th ring from rear, 24-31 μm long. Accessory caudal seta 2-3 μm long. Genitalia 19-24 μm wide, 13-15 μm long. Coverflap with longitudinal markings; genital seta 21-36 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 135-153 μm , width 69 μm , depth 66-75 μm . Fusiform, orange-brown or reddish-brown. Rostrum 21-23 μm long, curved down; antapical seta 6-8 μm long. Dorsal shield subsemicircular, 32-34 μm long, 53-64 μm wide, with a triangular anterior lobe; ornamentation indistinct - traces of median and admedian lines basally, and a rather irregular pattern of short lines anteriorly; dorsal tubercles on rear shield margin, 34 μm apart; dorsal setae 15-22 μm long, diverging posteriorly.

Foreleg 31-34 μm long; tibia 7-9 μm long, with a seta 5-6 μm long at about one-quarter; tarsus 6-7 μm long; claw 6-8 μm long, knobbed; featherclaw 4-rayed. Hind

leg 30-32 μm long; tibia 6-7 μm long; tarsus 6 μm long; claw 7-9 μm long. Coxae unornamented; 1st coxal setae 7-9 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 40-45 tergites and 48-53 sternites; tergites usually with faint, rounded microtubercles; sternites microtuberculate, the microtubercles usually weaker than in the protogyne. Lateral seta on about sternite 8, 25-28 μm long. Ventral setae: 1st on about sternite 20, 43-58 μm long; 2nd on about sternite 35, 15-19 μm long; 3rd on about 5th ring from rear, 29-34 μm long. Accessory caudal seta 2-3 μm long. Genitalia 23-29 μm wide, 10 μm long. Coverflap with longitudinal markings; genital seta 28-38 μm long.

MALE. Present.

TYPE DATA. Described from *Prunus persica* (peach; Rosaceae), Washington, D.C., U.S.A. (type material possibly in collection of U.S. Department of Agriculture, Washington, D.C.).

MATERIAL EXAMINED. Non-type examples from *Prunus persica* (Hastings, 25 Aug 1970, on seedlings; Alexandra, 15 and 16 Dec 1976) and *P. persica* var. *nucipersica* (nectarine), Alexandra, 28 Sep 1976.

AK, HB / CO.

Attacking the leaves, causing a silvery sheen on older leaves and mottling, yellow spotting, or longitudinal rolling of younger leaves.

REMARKS. *Aculus cornutus* and *A. fockeui* are almost identical, the only obvious difference being the host plants, *cornutus* occurring only on peach and *fockeui* only on plum. Deutogynes can be distinguished from protogynes by their lack of apical spines on the anterior shield lobe and lack of coxal ornamentation. Also, the body microtubercles are more suppressed in the deutogyne.

This species was first recorded in New Zealand at Alexandra, Central Otago (Kemp 1959), and has subsequently been identified from Auckland (Owairaka, May 1963). It is also known from Australia, Taiwan, Egypt, South Africa, and the U.S.A.

***Aculus fockeui* (Nalepa & Trouessart)**

plum rust mite

Figures 219-231

Phyllocoptes fockeui Nalepa & Trouessart.
Trouessart, 1891: 26.

Vasates fockeui (Nalepa). Keifer, 1946a:
42.

Vasates fockeui (Nalepa & Trouessart).
Roivanen, 1950: 22.

Aculus fockeui (Nalepa). Keifer, 1959b:
5-6.

FEMALE, protogyne (description from 6 specimens). Length 138-215 μm , width 68-70 μm , depth 62-73 μm . Fusiform, yellowish. Rostrum 24-26 μm long, curved down; ant-apical seta 5-8 μm long. Dorsal shield semicircular, 36-42 μm long, 57-65 μm wide, with a prominent, rounded anterior lobe bearing 2 small but distinct spines that project from apex; ornamentation usually consisting of admedians (Figure 220), these converging anteriorly (in some specimens it is difficult to detect any clear pattern); dorsal tubercles almost at rear shield margin, 32-35 μm apart; dorsal setae 14-20 μm long, diverging posteriorly.

Foreleg 31-35 μm long; tibia 6-9 μm long, with a seta 5-6 μm long at about one-quarter; tarsus 5-7 μm long; claw 6-7 μm long, knobbed; featherclaw 4-rayed. Hind leg 28-32 μm long; tibia 5-8 μm long; tarsus 6-7 μm long; claw 6 μm long, knobbed. Coxae with ornamentation mainly comprising dash-like lines; 1st coxal setae 5-7 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 30-35 tergites and 53-68 sternites; tergites with faint, elongate microtubercles; sternites microtuberculate, the microtubercles small, rounded, on hind margin of rings. Lateral seta on about sternite 10, 15-30 μm long. Ventral setae: 1st on about sternite 23, 31-52 μm long; 2nd on about sternite 40, 16-20 μm long; 3rd on about 5th ring from rear, 27-33 μm long. Accessory caudal seta 2-4 μm long. Genitalia 22-23 μm wide, 14-15 μm long; coverflap with longitudinal markings.

FEMALE, deutogyne (description from 4 specimens). Length 126-156 μm , width 70 μm ,

depth 64-68 μm . Fusiform, pale brown. Rostrum 21-24 μm long, curved down; ant-apical seta 5-6 μm long. Dorsal shield subsemicircular, 30-34 μm long, 60 μm wide, with a prominent anterior lobe bearing no apical spines; ornamentation consisting of a short, basal median line and admedians; dorsal tubercles on rear shield margin, 32 μm apart; dorsal setae 15-18 μm long, directed posteriorly.

Foreleg 30-32 μm long; tibia 6-7 μm long, with a seta 4-5 μm long at about one-quarter; tarsus 6-8 μm long; claw 6 μm long, knobbed; featherclaw 4-rayed. Hind leg 29-30 μm long; tibia 5-6 μm long; tarsus 6 μm long; claw 6-8 μm long. Coxae virtually unornamented; 1st coxal setae 6-7 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 39-45 tergites and 45-53 sternites; tergites with faint, rounded microtubercles, these sometimes difficult to see; sternites with obscure, rounded microtubercles on the rings. Lateral seta on about ring 7, 17-24 μm long. Ventral setae: 1st on about ring 16, 30-46 μm long; 2nd on about sternite 30, 17-18 μm long; 3rd on about 4th or 5th ring from rear, 26-28 μm long. Accessory caudal seta 2-3 μm long. Genitalia 19-22 μm wide, 12-15 μm long. Coverflap with longitudinal markings; genital seta 22-25 μm long.

MALE. Present.

TYPE DATA. Described probably from *Prunus domestica* (plum; Rosaceae), Austria. No other data; type material unknown.

MATERIAL EXAMINED. Non-type examples from *Prunus* sp. (plum) (Alexandra, 15 and 16 Dec 1976; Roxburgh, 16 Dec 1976 (protogynes) and *P. institia* (damson), Helensville, 11 Feb 1964 (deutogynes).

AK / CO.

Relation to host: see Remarks.

REMARKS. *Aculus fockeui* is a sister species of *A. cornutus* (see Remarks under *cornutus*). However, *A. fockeui* occurs on the leaf undersurface of plum only, and *A. cornutus* occurs on both leaf surfaces of peach only. The deutogynes can be distinguished from the protogynes by their lack of apical

spines on the anterior shield lobe, almost complete lack of coxal ornamentation, and in having more tergites and fewer sternites (usually only slightly more sternites than tergites, cf. the almost 2:1 ratio in the protogyne). Also, the microtubercles on the tergites and sternites are more suppressed in the deutogyne.

Lamb (1950) states that as a result of the feeding activity of these mites, leaves become crinkled and rolled downwards in a manner somewhat suggestive of aphid attack. Affected trees have drooping, curled leaves and a generally unthrifty appearance. He also states that the mites may injure the terminal growth and cause dwarfing and stunting of the foliage, which in turn reduces the yield of fruit. Jeppson *et al.* (1975) state that this mite produces a condition on plum leaves which has been called 'asteroid spot' or 'chlorotic fleck'. Spots occur in spring, and consist of circular yellow areas ranging in size from pinpoint to 1-2 mm diameter. Jeppson *et al.* also state that heavy infestations of *A. fockeui* may rosette shoots and keep leaves from expanding to normal size. There may also be bronzing or rusting of affected leaves.

Lamb (1950) reported this species to have caused extreme leaf deformation on plum trees in Central Otago in February 1950, but since that time there have been no reports of economically significant damage. *A. fockeui* is also known from Europe, Canada, and the U.S.A.

***Aculus schlechtendali* (Nalepa)**

apple rust mite

Figures 232-244

Phyllocoptes schlechtendali Nalepa, 1890: 99: 62.

Vasates schlechtendali (Nalepa). Keifer, 1946b: 567.

Vasates malivagrans Keifer, 1946a: 41.

Aculus malivagrans (Keifer). Keifer, 1959b: 5-6.

Aculus schlechtendali (Nalepa). Jeppson, Keifer, & Baker, 1975: 504.

FEMALE, protogyne (description from 8 specimens). Length 138-190 μm , width 64-75 μm , depth 61-73 μm . Fusiform, yellowish.

Rostrum 23 μm long, curved down; antapical seta 5-9 μm long. Dorsal shield subsemicircular, 36-41 μm long, 57-66 μm wide, with a rounded anterior lobe bearing 2 spines that project from apex; ornamentation a faint 'U'-shaped marking; dorsal tubercles on rear shield margin, 33-35 μm apart; dorsal setae 12-20 μm long, diverging posteriorly.

Foreleg 31-37 μm long; tibia 7-10 μm long, with a seta 3-5 μm long at about one-quarter; tarsus 6-8 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed. Hind leg 28-35 μm long; tibia 6 μm long; tarsus 5-7 μm long; claw 5-6 μm long, knobbed. Coxae ornamented with irregular lines; 1st coxal setae 8-9 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are just ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 27-34 tergites bearing obscure, elongate-rounded microtubercles, and 58-65 microtuberculate sternites. Lateral seta on about sternite 6, 17-31 μm long. Ventral setae: 1st on about sternite 18, 29-53 μm long; 2nd on about sternite 33, 14-17 μm long; 3rd on about 5th ring from rear, 19-28 μm long. Accessory caudal seta 2-3 μm long. Genitalia 20-23 μm wide, 12-15 μm long. Coverflap with longitudinal markings; genital seta 11-21 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 115-180 μm , width 72-74 μm , depth 66-74 μm . Fusiform, yellowish. Rostrum 23-25 μm long, curved down; antapical seta 5 μm long. Dorsal shield subsemicircular, 31-35 μm long, 62-67 μm wide, with a distinct, rounded anterior lobe bearing no apical spines; ornamentation a faint 'U'-shaped marking; dorsal tubercles on rear shield margin, 32-38 μm apart; dorsal setae 6-15 μm long, diverging posteriorly.

Foreleg 31-35 μm long; tibia 6-9 μm long, with a seta 4 μm long at about one-quarter; tarsus 6-7 μm long; claw 6 μm long, knobbed; featherclaw 4-rayed. Hind leg 28-32 μm long; tibia 5-7 μm long; tarsus 6-8 μm long; claw 6 μm long, knobbed. Coxae unornamented; 1st coxal setae 5-8 μm long, well behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 32-38 tergites and 44-51 sternites; tergites without micro-tubercles; sternites with faint micro-tubercles, mainly in mid-ventral area, but disappearing after about two-thirds of body length. Lateral seta on about sternite 6, 15-25 μm long. Ventral setae: 1st on about sternite 18, 17-35 μm long; 2nd on about sternite 31, 14-18 μm long; 3rd on about 5th ring from rear, 21-24 μm long. Accessory caudal seta 1-3 μm long, visible only on some specimens. Genitalia 22-25 μm wide, 10-13 μm long. Coverflap with faint longitudinal markings; genital seta 12-22 μm long.

MALE. Present.

TYPE DATA. Described from *Malus pumila* (apple; Rosaceae), Europe. No other data; type material unknown, possibly lost.

MATERIAL EXAMINED. Non-type examples from *Malus pumila* (Kohimarama, Auckland, 14 Jan 1977; Tauranga, 20 Jan 1977; Levin, 14 Feb 1977; Christchurch, 13 Dec 1979; Cromwell, 17 Dec 1976; Alexandra, 1 Mar 1976, 28 Sep 1976, and 16 Dec 1976; Roxburgh, 16 Dec 1976).

AK, BP, WN / MC, CO.

Found on leaf undersurface, sometimes causing a leaf rust.

REMARKS. The presence of two small but distinct apical spines projecting from the anterior shield lobe and the typical host plant (apple) should together ensure discrimination of *Aculus schlechtendali* from the closely allied species *A. cornutus* and *A. fockeui*.

The economic status of *A. schlechtendali* has not yet been assessed in New Zealand. Keifer (in Jeppson *et al.* 1975) states: "This species is a widespread pest of apples. In heavy infestations this mite damages terminal growth; the leaves curl lengthwise and become rusty brown, which gives the tree the appearance of being affected by drought. In the northwestern United States, apple damage is most common on young trees that do not receive a standard spray program."

A. schlechtendali was first discovered in New Zealand at Alexandra, Central Otago, by Mr W. P. Thomas in March 1976. It has since been found in association with *Calepitrimerus baileyi*, also known as a

rust mite, at Auckland, Tauranga, and Levin. This species is also known from Australia, Europe, and North America.

Arectus new genus

Type-species *Arectus bidwillius* new species.

(The name *Arectus* is a construction without formal etymological roots; gender masculine.)

Body fusiform; rings microtuberculate for about two-thirds of body length, slightly differentiated over this length, the micro-tubercles rather more numerous on sternites. Rostrum of moderate length. Dorsal shield with a subrectangular anterior 'flap'; dorsal tubercles ahead of rear shield margin, their axes perpendicular to body length; dorsal setae directed upwards and medially. Legs with the normal segmentation; fore-femur without a seta. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. *Arectus* is close to *Phyllocoptes*, but is distinguished by the presence of an anterior subrectangular 'flap' on the dorsal shield and the lack of a forefemoral seta.

Arectus bidwillius new species

Figures 245-252

FEMALE (description from 5 specimens). Length 158-207 μm , width 59-61 μm , depth 54 μm . Fusiform. Rostrum 28-34 μm long, curved down; antapical seta 6-9 μm long. Dorsal shield subrectangular, 30-34 μm long, 44-50 μm wide, with a subrectangular anterior flap; ornamentation consisting of 10 or 11 longitudinal rows of large, faintly impressed granules on anterior half of the shield and some small granules on anterolateral areas; dorsal tubercles ahead of rear shield margin, 25-26 μm apart; dorsal setae 10-11 μm long, directed upwards and medially.

Foreleg 29-31 μm long; femoral seta absent; tibia 6-8 μm long, with a seta 4-6 μm long at about one-quarter; tarsus 6 μm long; claw 6 μm long; featherclaw 6-rayed.

Hind leg 25-29 μm long; tibia 5-6 μm long; tarsus 5-6 μm long; claw 5-6 μm long. Hind coxae and area posterior to the 2nd coxal tubercles lightly granulate; 1st coxal seta 6 μm long; 1st setiferous coxal tubercles much further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line absent.

Abdomen with about 52-58 tergites and 60-68 sternites; rings fully microtuberculate as far as about 4th ring past 2nd ventral seta, where microtubercles begin to disappear from tergites, until posterior 6 rings unornamented; microtubercles oval, on rear ring margin. Lateral seta on about ring 7, 24-30 μm long. Ventral setae: 1st on about sternite 20, 39-46 μm long; 2nd on about sternite 35, 20-34 μm long; 3rd on about 6th ring from rear, 14-16 μm long. Accessory caudal seta 2-3 μm long. Genitalia 21-25 μm wide, 14-16 μm long. Coverflap with longitudinal markings, and anteriorly with dash-like markings; genital seta 5-7 μm long.

MALE. Not seen.

TYPE DATA. From *Libocedrus bidwillii* (Cupressaceae), Fletchers Creek, Inangahua West State Forest, 9 November 1971, J. S. Dugdale (holotype slide and 1 paratype slide, NZAC; 3 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series only.

- / NN-BR.

Associated with leaf galls about 1 mm in diameter.

REMARKS. The unusual flap-like 'anterior lobe' on the dorsal shield, the lack of a forefemoral seta, and the lack of dorsal microtubercles on about the posterior quarter of the abdomen readily distinguish this distinctive species. The wide spacing of the first coxal tubercles and setae is worth noting also. Freshly mounted specimens of *A. bidwillii* frequently have the microtubercles on the tergites overlain by darkish pigmentation which, over a period of time, tends to completely disappear.

Genus *Calacarus* Keifer

Calacarus Keifer, 1940b: 163. Type-species *Calacarus pulviferus* Keifer, 1940.

Body thick, robust, fusiform; rings differentiated into tergites and sternites, the latter slightly more numerous; abdomen with at least 1 longitudinal mid-dorsal and 2 longitudinal subdorsal wax-bearing ridges. Rostrum long, abruptly bent down. Dorsal shield usually with dorsal tubercles, but setae minute or absent. Legs with the normal segmentation; hind leg with no genual seta; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. The most distinctive characters are the wax-bearing abdominal ridges, almost complete absence of dorsal setae, and lack of a seta on the hind genu. The only species known in New Zealand, *Calacarus carinatus*, has obviously been introduced.

Calacarus carinatus (Green)

purple mite

Figures 253-260

Typhlodromus carinatus Green, 1890: 35-40.

Epitrimerus adornatus Keifer, 1940a: 32.

Calacarus adornatus (Keifer). Keifer, 1940b: 164.

Calacarus carinatus (Green). Keifer, 1955: 115.

FEMALE (description from 6 specimens). Length 177-240 μm , width 87-99 μm , depth 75-99 μm . Robust fusiform; deep purple, with longitudinal white wax stripes. Rostrum 44-51 μm long, strongly curved down; antapical seta 11-15 μm long. Dorsal shield subsemicircular, 43-50 μm long, 81-89 μm wide, with an anterior lobe; ornamentation characteristically a central dumbbell-shaped figure, outlined by admedians, and antero-lateral cell-like areas; dorsal tubercles and setae absent.

Foreleg 39-40 μm long; tibia 10-11 μm long, with a seta 7-8 μm long at about mid-length; tarsus 9 μm long; claw 7-8 μm long,

Genus *Calepitrimerus* Keifer

knobbed; featherclaw 5-rayed. Hind leg 34-35 μm long; tibia 8-9 μm long; tarsus 8-9 μm long; claw 7-8 μm long, knobbed; genual seta absent. Coxae unornamented; 1st coxal seta 11-16 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles.

Abdomen with 58-64 tergites, 65-70 microtuberculate sternites, and 5 longitudinal wax-bearing ridges. Lateral seta on about sternite 10, 23-30 μm long. Ventral setae: 1st on about sternite 26, 51-65 μm long; 2nd on about sternite 45, 28-31 μm long; 3rd on about 7th ring from rear, 21-25 μm long. Accessory caudal seta absent. Genitalia 34-38 μm wide, 20-22 μm long. Cover-flap with faint longitudinal lines, in 2 rows; genital seta 16-24 μm long.

MALE. Not seen.

TYPE DATA. Described from *Thea sinensis* (tea; Camelliaceae), ? Sri Lanka (Ceylon). No other data; type material probably lost.

MATERIAL EXAMINED. Non-type examples from *Camellia* sp. (Te Awamutu, 8 Nov 1968; Gisborne, Apr 1958, in quarantine area, and 8 Aug 1974).

WO, GB / - .

Vagrants on both leaf surfaces. On camellia there is some surface browning and considerable debris in the form of white, waxy shed skins.

REMARKS. The purple colour and longitudinal white wax stripes are strikingly distinctive. Morphologically the distinctive shield design, lack of dorsal setae, and absence of the hind patellar seta are characteristic.

C. carinatus was first recorded in New Zealand by Manson (1959). It is also known from Australia, Indonesia, Japan, China, India, Sri Lanka, the U.S.S.R., and the U.S.A. *Camellia* is the only host plant it has been found on here, but overseas it has been recorded from tea, in which growth is impaired, and snowbush (*Viburnum opulus*).

Calepitrimerus Keifer, 1938b: 310. Type-species *Calepitrimerus cariniferus* Keifer, 1938b.

Body fusiform; rings differentiated into tergites and sternites; abdomen with a central, longitudinal, mid-dorsal ridge and subdorsal or lateral ridges, the mid-dorsal ridge ending before the lateral ridges. Rostrum short. Dorsal shield with a prominent anterior lobe; dorsal tubercles ahead of rear shield margin, directing setae upwards, anteriorly, or medially. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. The principal distinguishing characters are the presence of a mid-dorsal longitudinal ridge and subdorsal or lateral ridges on the abdomen, with the mid-dorsal ridge ending before the lateral ridges. *Calepitrimerus* is very closely related to *Epitrimerus*. Two species are known from New Zealand, and can be separated as follows.

KEY TO SPECIES OF *CALEPITRIMERUS* KNOWN FROM NEW ZEALAND

Mid-dorsal abdominal ridge only about half as long as abdomen. On apple .. *baileyi*
Mid-dorsal abdominal ridge extending almost full length of abdomen. On grape *vitis*

Calepitrimerus baileyi Keifer

Bailey's apple rust mite

Figures 261-272

Calepitrimerus baileyi Keifer, 1938b: 310.

Phyllocoptes aphrastus Keifer, 1940a: 29 (deutogyne).

FEMALE, protogyne (description from 6 specimens). Length 126-162 μm , width 54-60 μm , depth 52-54 μm . Fusiform; yellowish or pinkish. Rostrum 16-20 μm long, curved down; antapical seta 4-6 μm long. Dorsal shield subsemicircular, 32-37 μm long, 46-52 μm wide, with a triangular, sharply

pointed anterior lobe; ornamentation confined to indications of admedians (on some specimens only) and granulation on lateral shield areas; dorsal tubercles ahead of rear shield margin, 13-18 μm apart; dorsal setae 9-11 μm long, directed medially.

Foreleg 27-34 μm long; tibia 6-8 μm long, with a 4-5 μm seta at about one-third; tarsus 5-6 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed. Hind leg 27-31 μm long; tibia 5-6 μm long; tarsus 5-6 μm long; claw 6-7 μm long, knobbed. Posterior coxae ornamented with a few granules, anterior coxae with a few dash-like lines; 1st coxal setae 6-10 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line short.

Abdomen with about 60-64 tergites, 58-65 microtuberculate sternites, a longitudinal mid-dorsal ridge, and subdorsal ridges; mid-dorsal ridge extending only to about half length of abdomen, ending just before commencement of subdorsal ridges; tergites with obscure microtubercles, except on central carina, where they are prominent. Lateral seta on about sternite 10, 11-25 μm long. Ventral setae: 1st on about sternite 26, 31-56 μm long; 2nd on about sternite 40, 10-18 μm long; 3rd on about 5th ring from rear, 21-31 μm long. Accessory caudal seta 1-3 μm long. Genitalia 17-24 μm wide, 9-14 μm long. Coverflap with longitudinal markings; genital seta 15-27 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 94-132 μm , width 56-62 μm , depth 56-65 μm . Fusiform. Rostrum 15-20 μm long, curved down; antapical seta 5-6 μm long. Dorsal shield subsemicircular, 31-32 μm long, 45-50 μm wide, with a triangular anterior lobe, unornamented; dorsal tubercles ahead of rear shield margin, 17-18 μm apart; dorsal setae 7-11 μm long, directed medially.

Foreleg 28-32 μm long; tibia 7-8 μm long, with a 4-5 μm seta at about one-third; tarsus 6 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed. Hind leg 26-31 μm long; tibia 6 μm long; tarsus 5-6 μm long; claw 5-6 μm long, knobbed. Coxae unornamented; 1st coxal setae 6-9 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line

through the 3rd tubercles. Sternal line double.

Abdomen with about 44-52 rings lacking microtubercles. Lateral setae on about ring 6, 14-21 μm long. Ventral setae: 1st on about ring 17, 25-38 μm long; 2nd on about ring 30, 12-15 μm long; 3rd on about 5th ring from rear, 16-27 μm long. Accessory caudal seta 1-3 μm long. Genitalia 18-19 μm wide, 7-11 μm long. Coverflap with longitudinal markings; genital seta 17-25 μm long.

MALE. Present.

TYPE DATA. Described from *Malus pumila* (apple; Rosaceae), Davis, California. No other data; type material unknown.

MATERIAL EXAMINED. Non-type examples from *Malus pumila* (Kohimarama, Auckland, 14 Jan 1977; Tauranga, 20 Jan 1977; Levin, 1 and 2 Mar 1976 and 8 Apr 1976).

AK, BP, WN / - .

On undersurface of apple leaves, sometimes causing a browning or rusting of the leaves.

REMARKS. *Calepitrimerus baileyi* can be separated from *C. vitis*, the only other species of this genus in New Zealand, by the key characters.

This is believed to be the first record of *C. baileyi* in New Zealand, and indeed the first record from anywhere other than California.

Calepitrimerus vitis (Nalepa)

grape rust mite

Figures 273-279

Phyllocoptes vitis Nalepa, 1905a: 268 (deutogyne).

Epitrimerus vitis Nalepa, 1905b: 445.

Calepitrimerus vitis (Nalepa). Keifer, 1942: 122.

FEMALE, protogyne (description from 9 specimens). Length 125-150 μm , width 45-55 μm , depth 48-54 μm . Fusiform; whitish or tawny. Rostrum 14-20 μm long, curved down; antapical seta 4-6 μm long. Dorsal shield subsemicircular, 31-35 μm long, 42-47 μm wide, with a triangular anterior lobe; or-

mentation usually consisting of admedian and submedian lines and lateral dash-like lines; dorsal tubercles ahead of rear shield margin, 13-17 μm apart; dorsal setae 7-14 μm long, directed medially.

Foreleg 26-31 μm long; tibia 6-7 μm long, with a 4-6 μm seta at about two-fifths; tarsus 5-7 μm long; claw 6-8 μm long, knobbed; featherclaw 5-rayed. Hind leg 26-30 μm long; tibia 5-7 μm long; tarsus 5-7 μm long; claw 6-8 μm long, knobbed. Coxae with some dash-like lines; 1st coxal setae 4-6 μm long, almost level with anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 60-68 tergites, 52-69 microtuberculate sternites, a central longitudinal ridge, and subdorsal ridges; all ridges extending very nearly full length of abdomen; tergites without microtubercles except on central ridge, where they are prominent. Lateral seta on about sternite 7, 12-19 μm long. Ventral setae: 1st on about sternite 23, 25-30 μm long; 2nd on about sternite 42, 12-16 μm long; 3rd on about 6th ring from rear, 15-25 μm long. Accessory caudal seta 4-5 μm long. Genitalia 15-18 μm wide, 11-13 μm long. Coverflap with longitudinal markings; genital seta 7-14 μm long.

MALE. Present.

TYPE DATA. Described from *Vitis vinifera* (grape; Vitidaceae), Austria. No other data; type material unknown.

MATERIAL EXAMINED. Non-type examples from *Vitis vinifera* (Wairoa, 3 and 24 Feb 1982; Gisborne, 9 Mar 1982).

GB / - .

On undersurface of grape leaves, causing no apparent damage.

REMARKS. *Calepitrimerus vitis* can be distinguished from *C. baileyi*, the only other species of the genus in New Zealand, by the key characters.

This is the first record of *C. vitis* from New Zealand; it has been found in small numbers only. The examples from Wairoa were in association with *Colomerus vitis*. This species has also been recorded from the U.S.A.

Genus *Epitrimerus* Nalepa

Epitrimerus Nalepa, 1898: 61. Type-species *Trimerus piri* Nalepa, 1892.

Body fusiform; rings usually differentiated into tergites and sternites; abdomen with a central longitudinal dorsal ridge and subdorsal ridges, these sometimes weak. Rostrum of moderate length. Dorsal shield with a prominent anterior lobe; dorsal tubercles ahead of rear shield margin; dorsal setae directed upwards, anteriorly, or medially. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae.

REMARKS. The most distinctive character is the central, longitudinal, abdominal ridge. Together with the presence of subdorsal ridges and the positioning of the dorsal tubercles ahead of the rear shield margin, with the setae directed upwards, anteriorly, or medially, it should suffice to distinguish this genus. *Epitrimerus* is very closely allied to *Calepitrimerus*, but the key characters should separate them. Only one species of *Epitrimerus* is known in New Zealand.

Epitrimerus pyri (Nalepa)

pear rust mite

Figures 280-292

Trimerus piri Nalepa, 1892a: 155.

Epitrimerus piri (Nalepa). Nalepa, 1898: 61.

Epitrimerus pirifoliae Keifer, 1938b: 309.

Epitrimerus pyri (Nalepa). Keifer, 1952: 55.

Epitrimerus piri (Nalepa). Keifer, 1966: 2 (note).

FEMALE, protogyne (description from 6 specimens). Length 141-180 μm , width 57-78 μm , depth 62-73 μm . Robust fusiform. Rostrum 21-24 μm long, curved down; antapical seta 6-9 μm long. Dorsal shield subsemicircular, 39-44 μm long, 57-74 μm wide, with a prominent, triangular anterior lobe; ornamentation consisting mainly of large granules with faint indications of a median line and admedians; dorsal tubercles ahead

of rear shield margin, 13-18 μm apart; dorsal setae 8-13 μm long, directed medially.

Foreleg 30-37 μm long; tibia 7-9 μm long, with a seta 5-6 μm long at about one-quarter; tarsus 6-9 μm long; claw 5-7 μm long; featherclaw 4-rayed. Hind leg 28-35 μm long; tibia 6-8 μm long; tarsus 6-8 μm long; claw 6-8 μm long. Coxae with dash-like markings; 1st coxal seta 8-9 μm long, just behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line double.

Abdomen with about 38-43 tergites, 54-64 sternites, and a narrow, central, longitudinal dorsal ridge; tergites with large, rounded, obscure microtubercles; sternites with more numerous, smaller, clearly defined circular microtubercles. Lateral seta on about sternite 11, 23-29 μm long. Ventral setae: 1st on about sternite 24, 50-77 μm long; 2nd on about sternite 41, 18-22 μm long; 3rd on about 6th ring from rear, 25-34 μm long. Accessory caudal seta 2-3 μm long. Genitalia 20-24 μm wide, 15-18 μm long. Coverflap with longitudinal markings; genital seta 22-46 μm long.

FEMALE, deutogyne (description from 6 specimens). Length 126-156 μm , width 61 μm (1 specimen only), depth 62-70 μm . Robust fusiform. Rostrum 23-25 μm long, curved down; antapical seta 7-9 μm long. Dorsal shield subsemicircular, 31-38 μm long, 53-57 μm wide, with a prominent, triangular anterior lobe; ornamentation consisting of several lightly impressed longitudinal lines, sometimes incomplete - usually a median and 2 or 3 submedians; dorsal tubercles slightly ahead of rear shield margin, each in a triangular area, 18-19 μm apart; dorsal setae 12-14 μm long, directed medially.

Foreleg 31-35 μm long, with a seta 6-7 μm long at about one-third; tarsus 6-7 μm long; claw 6-7 μm long; featherclaw 4-rayed. Hind leg 28-32 μm long; tibia 6 μm long; tarsus 6-7 μm long; claw 6-8 μm long. Coxae unornamented; 1st coxal setae 8-9 μm long, almost level with anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 44-49 smooth rings, slightly more ventrally, but not differ-

entiated into tergites and sternites. Lateral seta on about ring 8, 21-25 μm long. Ventral setae: 1st on about ring 21, 45-60 μm long; 2nd on about ring 36, 18-22 μm long; 3rd on about 6th ring from rear, 31-35 μm long. Accessory caudal seta 2-3 μm long. Genitalia 19-23 μm wide, 14 μm long. Coverflap with longitudinal markings; genital seta 26-44 μm long.

MALE. Present.

TYPE DATA. Described from *Pyrus communis* (pear; Rosaceae), Austria. No other data; type material probably lost.

MATERIAL EXAMINED. Non-type examples from *Pyrus communis*, Palmerston North, 17 Nov 1966.

WI-WN / - .

Free-living on leaves of host plant, and causing russetting of leaves and fruit if present in sufficient numbers.

REMARKS. The central longitudinal dorsal ridge on the abdomen is distinctive of *Epitrimerus pyri*.

This is the first record of *E. pyri* from New Zealand, though it is also known from Canada, the U.S.A., Europe, and Japan. The specimens were found in association with *Eriophyes pyri* on blistered leaves of Williams Bon Chrétien pear.

Litaculus new genus

TYPE-SPECIES *Litaculus khandus* new species.

(The name *Litaculus* is constructed by addition of a novel prefix to the existing genus name *Aculus*; gender masculine.)

Body fusiform, blunt anteriorly, tapering posteriorly subcircular in cross-section, without longitudinal ridges or furrows; rings differentiated into tergites and about twice as many sternites. Rostrum short. Dorsal shield subsemicircular, with a prominent anterior lobe; dorsal tubercles ahead of rear shield margin, directing setae upwards and anteriorly. Legs with the normal segmentation; hind genu without a seta; featherclaw divided. Coxae with 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length.

REMARKS. In Newkirk & Keifer's key to the Eriophyoidea (Jeppson *et al.* 1975) *Litaculus* keys out to couplet 4 (p. 576), *Acaphylla* Keifer and *Acaricalus* Keifer. However, it differs from these genera in lacking dorsal and lateral ridges and a seta on the hind genu.

Litaculus khandus new species

Figures 293-300

FEMALE (description from 6 specimens). Length 180-206 μm , width 65-71 μm , depth 69-70 μm . Fusiform, yellow. Rostrum 24 μm long, curved down; antapical seta 6-9 μm long. Dorsal shield subsemicircular, 39-46 μm long, 60-69 μm wide, with a prominent, blunt anterior lobe with a jagged anterior margin; ornamentation consisting of lightly impressed admedian lines that diverge anteriorly and posteriorly, and on anterolateral edges some superficial roughening together with a convex line that forms an outward 'bulge'; dorsal tubercles ahead of rear shield margin, 19-21 μm apart; dorsal setae 8-11 μm long, directed upwards and anteriorly.

Foreleg 25-30 μm long; tibia 3-4 μm long, with a seta 6 μm long at about two-fifths; tarsus 5-7 μm long; claw 5-6 μm long, with an elongate, pad-like knob; featherclaw divided. Hind leg 23-25 μm long; tarsus 5-6 μm long; claw 5-6 μm long. Coxae unornamented; 1st coxal seta 6 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line faintly indicated.

Abdomen with about 28-30 tergites and 53-58 microtuberculate sternites; each tergite, apart from about the first 3, with a more heavily outlined rectangular or diamond-shaped area at about the midlateral position; microtubercles small, bead-like. Lateral seta on about sternite 7, 19-29 μm long, very finely tapered. Ventral setae: 1st on about sternite 21, 6-10 μm long; 2nd on about sternite 35, 6 μm long; 3rd on about 6th ring from rear, 19-21 μm long. Accessory caudal seta absent. Genitalia 21-23 μm wide, 10-15 μm long. Coverflap with longitudinal markings; anterior of genital field somewhat roughened; genital seta 6-8 μm long.

MALE. Present.

TYPE DATA. From an unidentified fern leaf (Polypodiaceae), Khandallah, Wellington, 18 November 1962, D. C. M. Manson (holotype slide and 3 paratype slides, PLNZ; 2 paratype slides, NZAC).

MATERIAL EXAMINED. Type series only.

WN / - .

A leaf undersurface vagrant.

REMARKS. The main generic characters - lack of distinct longitudinal ridges or furrows on the abdomen, and lack of a seta on the hind genu - are distinctive of *L. khandus*. The jagged anterior margin of the anterior shield lobe and the pad-like 'knob' on the claw are also worth noting.

Nothacus new genus

TYPE-SPECIES *Nothacus tuberculatus* new species.

(The name *Nothacus* is derived from the host-plant genus of the type species and a suffix that is often used for eriophyoid mites; gender masculine.)

Body robust fusiform, blunt anteriorly, tapering abruptly posteriorly; rings rather regular, but with slightly more sternites than tergites. Rostrum of moderate length. Dorsal shield subsemicircular, with a short, blunt, anterior lobe; dorsal tubercles ahead of rear shield margin; dorsal setae directed posteriorly. Legs with the normal segmentation; foreleg with no femoral seta or tibial seta; hind leg with the normal setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae; lateral and 1st ventral setae arising from tubercles, the lateral tubercles more prominent. Female genitalia with internal apodeme of moderate length.

REMARKS. The typical 'plump' body shape, lack of femoral and tibial setae on the foreleg, and prominent tubercle on which the lateral seta is situated set *Nothacus* apart from any other genus.

Nothacus tuberculatus new species

Figures 301-308

FEMALE (description from 6 specimens). Length 140-169 μm , width 68-75 μm , depth 70 μm . Robust, tapering abruptly posteriorly. Rostrum 25 μm long, curved down; antapical seta absent. Dorsal shield sub-semicircular, 39-46 μm long, 58-68 μm wide, with a small, blunt anterior lobe which is more apparent in lateral view; ornamentation as follows: short, basal median line; admedians running about two-thirds length of shield, joined posteriorly by a transverse line; arising from each admedian at about one-third, a transverse line runs towards lateral margin and then posteriorly, at regular intervals intersected by lines from lateral shield margin, so that a series of about 6 'cells' is formed on either side of shield; a weak, slightly curved line running between dorsal tubercles across admedians. Dorsal tubercles ahead of rear shield margin, 39-41 μm apart; dorsal setae 13-16 μm long, directed posteriorly.

Foreleg 21-25 μm long; femur with no seta; tibia 3-4 μm long, with no seta; tarsus 5-6 μm long; claw 4-6 μm long, knobbed; featherclaw 5-rayed. Hind leg 18-25 μm long; tibia 2-3 μm long; tarsus 4-6 μm long; claw 6-8 μm long, knobbed. Coxae ornamented with some lightly impressed lines, mainly between 1st and 2nd setae; 1st coxal seta 3-9 μm long, well behind anterior coxal approximation; 1st setiferous coxal tubercles closer together than the 2nd, which are well ahead of a line through the 3rd tubercles.

Abdomen with about 39-43 tergites and 48-55 sternites, these essentially similar, with small, indistinct, rectangular micro-tubercles. Lateral seta arising from a conspicuous tubercle on about sternite 10, 13-18 μm long. Ventral setae: 1st on a smaller tubercle, on about sternite 18, 35-55 μm long, extremely finely tapered; 2nd 29-41 μm long, extremely finely tapered; 3rd on about 7th ring from rear, 13-16 μm long. Accessory caudal seta absent. Genitalia 21-22 μm wide, 13-23 μm long. Coverflap with an unusual pattern (Figure 307); genital seta 8-13 μm long.

MALE. Present.

TYPE DATA. From *Nothofagus menziesii* (silver beech; Fagaceae), Dusky State Forest,

Fiordland, 18 March 1974, G. Collet (holotype slide and 4 paratype slides, PLNZ; 1 paratype slide, NZAC). Holotype slide from leaf galls; 3 paratype slides from a leaf erineum and 2 from leaf galls.

MATERIAL EXAMINED. Type series, plus examples from *Nothofagus fusca*, Urewera Range, 8 Feb 1979 (in leaf erineum with *Aceria waltheri*).

GB / FD.

Occupying small, globular leaf galls about 1 mm in diameter, and associated with a leaf erineum.

REMARKS. The rather short, plump body, distinctive dorsal shield design, lack of a femoral seta and tibial seta on the foreleg, prominent tubercle from which the lateral seta arises, and unusual genital coverflap markings readily distinguish *N. tuberculatus*.

Parulops new genus

TYPE-SPECIES *Parulops corynocarpi* new species.

(The name *Parulops* is constructed from the Greek *para*, which invites a comparison, and the ending *-ulops* used for related genera; gender masculine.)

Body fusiform, divided laterally into tergites and sternites, the sternites more numerous. Rostrum of moderate length. Dorsal shield with an anterior lobe; dorsal tubercles on rear shield margin, with transverse axes, directing setae posteriorly. Legs with the normal segmentation and setation; featherclaw with apical rays arising from base of 2nd rays, not from main stem. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. The main distinguishing feature of *Parulops* is the unusual positioning of the apical rays of the featherclaw, which arise from the base of the second rays rather than from the main stem. Otherwise this genus is similar to *Aculops* and *Pedaculops*.

Two species are recognised.

KEY TO SPECIES OF *PARULOPS*
KNOWN FROM NEW ZEALAND

Dorsal shield with 3 large, subrectangular 'cells' on anterior half; dorsal setae short (8-11 μm). On *Corynocarpus laevigatus* *corynocarpi*

Dorsal shield without 'cells': dorsal setae longer (13-20 μm). On *Leptospermum*, *Syzygium*, and *Neopanax simplex*

.... *heatherae*

***Parulops corynocarpi* new species**

Figures 309-315

FEMALE (description from 7 specimens). Length 165-225 μm , width 71-90 μm , depth 67-76 μm . Robust fusiform; pale brown. Rostrum 25-28 μm long, curved downwards; antapical seta 5-9 μm long. Dorsal shield broadly triangular, 36-39 μm long, 63-88 μm wide, with a short, blunt anterior lobe and (viewed laterally) a small, acute, upturned apical spine; ornamentation lightly impressed, as follows: median line absent; admedians running almost full length of shield, narrowed anteriorly and broadened basally, connected by 3 transverse lines at one-fifth, mid shield, and four-fifths, the posteriormost line not quite meeting the admedians; submedian line diverging from admedians at about one-fifth, running a short distance posteriorly, then forking - interior branch subparallel to admedians, connected with them by a transverse line at mid shield, exterior branch forming a gently curved lateral line subparallel to lateral shield margin. Dorsal tubercles on rear shield margin, 39-43 μm apart; dorsal setae 8-11 μm long, diverging posteriorly.

Foreleg 35-38 μm long; tibia 8-10 μm long, with a seta 3-5 μm long at about one-third; tarsus 6-8 μm long; claw 5-6 μm long, curved, strongly knobbed; featherclaw 4-rayed, the apical pair of rays branching out from near base of 3rd rays, not from main stem. Hind leg 32-35 μm long; tibia 7-8 μm long; tarsus 7-8 μm long; claw 6-7 μm long. Coxae almost unornamented; 1st coxal setae 5-6 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line strongly marked.

Abdomen with about 27-28 broad, smooth tergites lacking microtubercles and 55-60 microtuberculate sternites, the microtubercles small, bead-like, on the rings. Lateral seta on about sternite 7, 18-30 μm long. Ventral setae: 1st on about sternite 19, 28-47 μm long; 2nd on about sternite 36, 16-20 μm long; 3rd on about 6th ring from rear, 17-22 μm long. Accessory caudal seta absent. Genitalia 20-25 μm wide, 10-13 μm long. Coverflap with longitudinal markings; genital seta 8-12 μm long.

MALE. Present.

TYPE DATA. From *Corynocarpus laevigatus* (karaka; Corynocarpaceae), Parau, Auckland, 2 December 1969 and 15 October 1971, B. Blumhardt (holotype slide and 25 paratype slides, PLNZ; 2 paratype slides, NZAC; 2 paratype slides, HKSC; dried material, PLNZ).

MATERIAL EXAMINED. Type series only.

AK / - .

Causing scarring and formation of pimple-like protrusions on both leaf surfaces.

REMARKS. The dorsal shield design, lack of coxal ornamentation, and unusual position of the apical rays of the featherclaw are distinctive of *P. corynocarpi*.

***Parulops heatherae* new species**

Figures 316-322

FEMALE (description from 6 specimens). Length 120-194 μm , width 69-72 μm , depth 55-58 μm . Robust fusiform. Rostrum 20-23 μm long, curved down; antapical seta 4-6 μm long. Dorsal shield subsemicircular, 32-36 μm long, 60-68 μm wide, with a rounded anterior lobe; ornamentation consisting of faintly impressed, incomplete longitudinal lines (representing admedians) which diverge anteriorly, and 2 submedians. Dorsal tubercles on rear shield margin, 33-37 μm apart; dorsal setae 13-20 μm long, diverging posteriorly.

Foreleg 33-40 μm long; tibia 8-11 μm long, with a 2-4 μm seta at about one-quarter; tarsus 6-7 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed, the apical rays arising from base of 3rd rays. Hind leg 30-37 μm long; tibia 6-10 μm long;

tarsus 6-7 μm long; claw 5-6 μm long. Coxae unornamented in holotype, but some paratypes with granulations on coxae; 1st coxal seta 4-8 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 25-28 smooth, broad tergites lacking microtubercles and 52-61 microtuberculate sternites; sternal microtubercles small, rounded. Lateral seta on about sternite 6, 18-41 μm long. Ventral setae: 1st on about sternite 17, 50-59 μm long; 2nd on about sternite 30, 8-22 μm long; 3rd on about 6th ring from rear, 15-23 μm long. Accessory caudal seta absent. Genitalia 21-26 μm wide, 9-14 μm long. Coverflap with longitudinal markings; some paratypes with granulations immediately anterior to coverflap.

MALE. Present.

TYPE DATA. From *Neopanax simplex* (Araliaceae) in scrub, Egmont-Stratford plateau, 14 March 1971, F. C. Duguid (holotype slide and 2 paratype slides, PLNZ), *Leptospermum scoparium* (manuka; Myrtaceae), Symonds Hill, Okiwi Bay, French Pass, 7 October 1966, J. I. Townsend (2 paratype slides, PLNZ and NZAC); and *Syzygium maire* (Myrtaceae), near Otaki Forks, 14 February 1970, F. C. Duguid (1 paratype slide, PLNZ).

MATERIAL EXAMINED. Type series only.

TK, WN / SD.

Associated with leaf rolling on *N. simplex*, from bud galls on *L. scoparium*, and on a leaf of *S. maire*.

REMARKS. *P. heatherae* is readily differentiated from *P. corynocarpi* by the key characters.

In two instances, specimens from leaf rolls of *Neopanax simplex* were associated with *Cosella simplicis*.

***Pedaculops* new genus**

TYPE-SPECIES *Pedaculops propinquae* new species.

(The name *Pedaculops* is constructed from the Latin *pes*, 'foot', alluding to the distinctive featherclaw, and the name of a closely related genus; gender masculine.)

Body fusiform, divided into tergites and sternites, the sternites considerably more numerous. Rostrum short. Dorsal shield with an anterior lobe; dorsal tubercles at rear shield margin, with transverse axes, directing setae posteriorly. Legs with the normal segmentation and setation; featherclaw with 2nd rays arising direct from tarsus, rather than from main stem of featherclaw. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length.

REMARKS. The key character of *Pedaculops* is the structure of the featherclaw, in which the second rays arise direct from the tarsus rather than from the main stem of the claw. Otherwise *Pedaculops* is similar to *Aculops* and *Parulops*.

Only the type species is recognised.

***Pedaculops propinquae* new species**

Figures 323-329

FEMALE (description from 5 specimens). Length 122-164 μm , width 54-57 μm , depth 47-56 μm . Fusiform. Rostrum 18-21 μm long, curved down; antapical seta 3-5 μm long. Dorsal shield subsemicircular, 26-29 μm long, 44-52 μm wide, with a triangular anterior lobe, unornamented except for several light, granular lines at anterolateral margins. Dorsal tubercles on rear shield margin, 24-26 μm apart; dorsal setae 16-19 μm long, directed posteriorly.

Foreleg 23-30 μm long; tibia 5-6 μm long, with a seta 2-3 μm long at about one-third; tarsus 4-5 μm long; claw 5-6 μm long; featherclaw of unusual structure, somewhat palmate, 2-rayed, with sometimes the appearance of a small 3rd ray, all rays arising direct from tarsus. Hind leg 22-28 μm long; tibia 5-6 μm long; tarsus 5-6 μm long; claw 4-6 μm long. Coxae with short, dash-like lines; 1st coxal seta 6-8 μm long, almost level with anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 28-31 smooth tergites and 43-52 microtuberculate sternites. Lateral seta on about sternite 8, 11-18 μm long. Ventral setae: 1st on about sternite 18, 38-50 μm long; 2nd on about sternite 30, 9-11 μm long; 3rd on about 6th ring from rear, 14-18 μm long. Accessory caudal seta absent. Genitalia 19-21 μm wide, 9-11 μm long. Coverflap with longitudinal markings; area immediately anterior to it with dash-like markings; genital seta 8-10 μm long.

MALE. Present.

TYPE DATA. From *Coprosma propinqua* (Rubiaceae), Dunedin, 11 July 1951, S. A. Rose (holotype slide, NZAC); and *Coprosma* sp., Canterbury, November 1948, A. Lush (1 paratype slide, PLNZ).

MATERIAL EXAMINED. Type series only.

- / ?MC, DN.

Associated with 'witches brooms'.

REMARKS. The unusually shaped featherclaw immediately distinguishes *P. propinqua*.

Genus *Phyllocoptes* Nalepa

Phyllocoptes Nalepa, 1889: 116. Type-species *Phyllocoptes carpini* Nalepa, 1889.

Body fusiform; rings similar dorsoventrally, or divided into tergites and sternites. Rostrum of moderate length. Dorsal shield with an anterior lobe; dorsal tubercles usually ahead of rear shield margin, directing the setae upwards, ahead, or medially. Legs with the normal segmentation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. One of the most distinctive features of *Phyllocoptes* is the orientation of the dorsal setae, which are usually directed upwards, ahead, or medially; also, the dorsal tubercles are usually ahead of the rear shield margin.

Three species are known in New Zealand.

KEY TO SPECIES OF *PHYLLOOPTES* KNOWN FROM NEW ZEALAND

- 1 Hind leg with no patellar seta; hind claw much longer than foreclaw. On *Coprosma robusta* *coprosmae*
-- Hind leg with a patellar seta; hind claw very little longer than foreclaw. Not on *Coprosma robusta* 2
- 2 Tergites numbering about 20-23; dorsal setae short, not meeting centrally. On *Coprosma australis* and *Neopanax simplex* *hazelae*
-- Tergites numbering about 45-51; dorsal setae quite long, overlapping centrally. On plum *abaenus*

Phyllocoptes abaenus Keifer

Figures 330-336

Phyllocoptes abaenus Keifer, 1940a: 30.

FEMALE (description from 6 specimens). Length 144-206 μm , width 66-68 μm , depth 66-75 μm . Fusiform; yellow. Rostrum 19-21 μm long, curved down; antapical seta 6-8 μm long. Dorsal shield subtriangular, 40-45 μm long, 49-54 μm wide, with an anterior lobe that is more conspicuous in lateral view; ornamentation weak - a median line on basal half, admedians usually visible, and some specimens with indications of laterals. Dorsal tubercles ahead of rear shield margin, 23-28 μm apart; dorsal setae 13-22 μm long, directed medially.

Foreleg 28-31 μm long; tibia 5-6 μm long, with a seta 5-6 μm long at about two-fifths; tarsus 7-9 μm long; claw 7-8 μm long; featherclaw 4-rayed. Hind leg 25-30 μm long; tibia 5 μm long; tarsus 6-8 μm long; claw 6-10 μm long. Coxae unornamented; 1st coxal seta 6-8 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line absent.

Abdomen with about 45-51 tergites and 48-53 microtuberculate sternites; tergites with faint microtubercles in some specimens,

others showing a slight thickening at sites of microtubercles or without microtubercles; sternal microtubercles small, oval, on rear ring margin. Lateral seta on about ring 6, 16-28 μm long. Ventral setae: 1st on about ring 14, 25-64 μm long; 2nd on about ring 28, 10-16 μm long; 3rd on about 5th ring from rear, 24-31 μm long. Accessory caudal seta absent. Genitalia 21-26 μm wide, 11-18 μm long. Coverflap with crescentic markings; genital seta 15-19 μm long.

MALE. Present.

TYPE DATA. Described from *Prunus* sp. (plum; Rosaceae), San Mateo, California, U.S.A. (holotype slide and 6 paratype slides in collection of State Department of Agriculture, Sacramento, California).

MATERIAL EXAMINED. Non-type examples from *Prunus domestica* (plum) (Horotane Valley, Christchurch, 26 Nov 1976; Alexandra, 1950, and Earnscleugh Road, 16 Dec 1976; Miller's Flat, 20 Jan 1951; Roxburgh, 30 Jan 1951) and *Prunus* sp., Hastings, 28 Jan 1965.

HB / MC, CO.

A leaf vagrant, occurring on leaf undersurfaces.

REMARKS. The four-rayed featherclaw, similar length of the fore and hind claws, and presence of a seta on the hind genu distinguish *P. abauenus* from the closely related *P. coprosmae*.

This species has also been recorded from Canada, the U.S.A., and Spain.

***Phyllocoptes coprosmae* Lamb**

Figures 337-344

Phyllocoptes coprosmae Lamb, 1952b: 357.

FEMALE (description from 5 specimens, all on holotype slide; only 1 dorsal mount). Length 134-175 μm , width 49 μm , depth 52-58 μm . Fusiform. Rostrum 19-21 μm long, curved down; antapical seta 5-10 μm long. Dorsal shield subsemicircular, 36 μm long, 46 μm wide, with a blunt anterior lobe; ornamentation varying in intensity, clearly observable on only 1 specimen, as follows: faint median line; admedians narrowed anteriorly, giving rise at about one-fifth to a lateral branch which runs towards

lateral shield margin; a faint submedian arising just anterior to dorsal tubercles; a very weak lateral line, difficult to observe. Dorsal tubercles ahead of rear shield margin, 20 μm apart; dorsal setae 12-16 μm long, directed medially.

Foreleg 25-26 μm long; tibia 4-6 μm long, with a seta 6-8 μm long at about midlength; tarsus 5-6 μm long; claw 5-6 μm long, knobbed; featherclaw 5-rayed. Hind leg 19-22 μm long; tibia 3-4 μm long; tarsus 5-6 μm long; claw 8-9 μm long, knobbed. Coxae unornamented; 1st coxal seta 6-7 μm long, ahead of anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line not visible, though seen on non-type specimens.

Abdomen with about 42-50 tergites and 46-56 sternites, all microtuberculate; tergites broader than sternites, with microtubercles larger and more widely spaced; microtubercles elongate, on rear ring margin. Lateral seta on about sternite 5, 19-24 μm long. Ventral setae: 1st on about sternite 18, 39-46 μm long; 2nd on about sternite 30, 8-11 μm long; 3rd on about 6th ring from rear, 12-14 μm long. Accessory caudal seta absent. Genitalia 19 μm wide, 13 μm long. Coverflap with dash-like markings anteriorly, several diagonal lines posteriorly; genital seta 7-10 μm long.

MALE. Present on paratype slides.

TYPE DATA. Described from *Coprosma robusta* (Rubiaceae), Titirangi, Auckland, 15 August 1949, E. Bray (holotype slide and 2 paratype slides, NZAC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Coprosma robusta* (Titirangi, Auckland, 8 Jun 1943; Riverhead, Auckland, 10 Jul 1964; Khandallah, Wellington, 9 and 30 Jan 1974).

AK, WN / - .

Causing an erineum on leaf undersurfaces.

REMARKS. The absence of a seta on the hind genu, and the long hind claw, sometimes almost twice as long as the foreclaw, should distinguish *P. coprosmae*. The tarsi appear to be two-segmented.

The holotype slide has eight specimens, two of which are *Cosella simplicis*.

Phyllocoptes hazelae new species

Figures 345-351

FEMALE (description from 6 specimens). Length 168-219 μm , width 66-70 μm , depth 54-65 μm . Robust fusiform. Rostrum 22-25 μm long, curved down; antapical seta 5-6 μm long. Dorsal shield broadly subtriangular, 45-47 μm long, 62-65 μm wide, with a bluntly pointed anterior lobe and a small apical spine, almost unornamented. Dorsal tubercles ahead of rear shield margin, 19-21 μm apart; dorsal setae 3-5 μm long, directed medially.

Foreleg 35-37 μm long; tibia 8-9 μm long, with a seta 5-7 μm long near midlength; tarsus 2-segmented, 6-7 μm long; claw 5-6 μm long, curved, knobbed; featherclaw 5-rayed. Hind leg 35-37 μm long; tibia 7-9 μm long; tarsus 6-8 μm long; claw 5-6 μm long. Coxae with lightly impressed dash-like markings; 1st coxal seta 4-7 μm long, behind anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line forked anteriorly and posteriorly.

Abdomen with about 20-23 smooth, broad tergites and 76-88 microtuberculate sternites; microtubercles small, rounded. Lateral seta on about sternite 10, 18-22 μm long. Ventral setae: 1st on about sternite 28, 47-62 μm long; 2nd on about sternite 54, 12-16 μm long; 3rd on about 6th ring from rear, 22-25 μm long. Accessory caudal seta absent. Genitalia 22-25 μm wide, 8-10 μm long. Coverflap unornamented; genital seta 8-11 μm long.

MALE. Present.

TYPE DATA. From *Coprosma australis* (Rubiaceae), Kaitoke, Upper Hutt, 23 April 1973, H. M. Barley (holotype slide and 11 paratype slides, PLNZ; 3 paratype slides, NZAC); and *Neopanax simplex* (Fagaceae), Egmont-Stratford plateau, 14 March 1971, F. C. Duguid (10 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series, plus non-type examples from *Coprosma* sp., Otaio Gorge, Pareora River, 30 Aug 1971.

TK, WN / SC.

At Kaitoke found living free on leaf undersurfaces, in association with an eri-neum but not the cause of it; on *Coprosma*

sp. associated with 'witches brooms'; and on the Egmont-Stratford plateau inside rolled leaves of *N. simplex*.

REMARKS. The lack of ornamentation on the dorsal shield and genital coverflap, the relatively few tergites, and the prominent anterior shield lobe should distinguish *P. hazelae*.

The specimens from inside rolled leaves of *Neopanax simplex* were almost exclusively males; only two females were present.

Genus *Phyllocoptruta* Keifer

Phyllocoptruta Keifer, 1938a: 193. Type-species *Phyllocoptruta oleivora* (Ashmead, 1879).

Dorsal shield with a prominent anterior lobe; dorsal tubercles ahead of rear shield margin, their axes longitudinal. Dorsal setae directed upwards or medially. Legs with the normal segmentation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length.

REMARKS. The broad longitudinal dorsal abdominal furrow of *Phyllocoptruta* is a distinguishing character.

Only one species is known in New Zealand.

Phyllocoptruta oleivora (Ashmead)

citrus rust mite

Figures 352-358

Typhlodromus oliiorus Ashmead, 1879: 160.

Phyllocoptruta oleivorus (Ashmead). Keifer, 1938a: 193.

FEMALE (description from 6 specimens). Length 122-159 μm , width 62-64 μm , depth 55-62 μm . Robust fusiform; yellowish. Rostrum 24-31 μm long, curved down; antapical seta 5-7 μm long. Dorsal shield broadly triangular, 34-40 μm long, 58-62 μm wide, with a blunt anterior lobe; ornamentation clearly outlined and quite distinctive, as follows: median line at most represented by a basal remnant; admedians complete,

widening at about one-fifth, contracting, then widening again at about mid shield; connecting transverse lines at about one-fifth, mid shield, and four-fifths form 3 cell-like structures - an anterior 'rectangle', a middle 'hexagon', and a basal 'irregular quadrant'; admedians forking at about one-third their length, the lateral branch meeting lateral shield margin; a narrow submedian line on anterior quarter meeting lateral fork of admedian. Dorsal tubercles ahead of rear shield margin, 21-23 μm apart; dorsal setae 4-6 μm long, directed medially.

Foreleg 23-27 μm long; tibia 5-6 μm long, with a seta 4-6 μm long at about midlength; tarsus 5-6 μm long; claw 5-7 μm long; featherclaw 5-rayed. Hind leg 18-25 μm long; tibia 4 μm long; tarsus 5-6 μm long; claw 5-6 μm long. Coxae unornamented except for a few irregular markings near base of 1st and 3rd setae; 1st coxal seta 5-7 μm long, about level with anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line absent.

Abdomen with about 28-31 smooth tergites and 50-57 microtuberculate sternites; tergites with a broad, longitudinal dorsal trough. Lateral seta on about sternite 5, 13-22 μm long. Ventral setae: 1st on about sternite 17, 27-52 μm long, very finely tapered; 2nd on about sternite 30, 5-6 μm long; 3rd on about 5th ring from rear, 9-15 μm long. Accessory caudal seta 1-2 μm long. Genitalia 18-22 μm wide, 13-16 μm long. Coverflap with longitudinal markings; area immediately anterior to it with roughened, dash-like markings; genital seta 26-41 μm long, very finely tapered.

MALE. Present.

TYPE DATA. Described from *Citrus sinensis* (orange; Rutaceae), Florida, U.S.A. No other data; type material unknown.

MATERIAL EXAMINED. Non-type examples from *Citrus sinensis*, Mt Albert, Auckland, 22 May 1975. Also material intercepted in quarantine while entering New Zealand: *Citrus aurantifolia* (lime), Tonga, 24 Jan 1965; and *C. sinensis*, Western Samoa, 17 Dec 1971.

AK / - .

Attacking both leaves and fruit. Injured lemons have a silver colour, and injured oranges and grapefruit a russet colour. The quality and size of fruit are greatly reduced.

REMARKS. The typical dorsal shield design and broad dorsal longitudinal trough or furrow distinguish *P. oleivora*. The drawings are of specimens intercepted on limes from Tonga (24 January 1965).

This species was first recorded in New Zealand from a collection made at 66 Mount Albert Road, Auckland (a domestic garden) in 1975. A subsequent survey of neighbouring properties has shown it to be quite common on lemons, oranges, mandarins, and grapefruit.

The species is almost worldwide, occurring wherever citrus is grown.

Rectalox new genus

TYPE-SPECIES *Rectalox falita* new species.

(The name *Rectalox* is a fanciful construction inviting comparison with the similar genus *Mesalox*; gender feminine.)

Body fusiform; rings divided into tergites and about twice as many sternites; abdomen with a broad, longitudinal dorsal trough or furrow. Rostrum of moderate length. Dorsal shield subsemicircular, with an anterior subrectangular 'flap'; dorsal tubercles on rear shield margin, directing setae posteriorly. Legs with the normal segmentation and all usual setae; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length.

REMARKS. In Newkirk & Keifer's key to the Eriophyoidea (Jeppson *et al.* 1975) *Rectalox* keys out to *Mesalox* (p. 583), from which it differs mainly in having a longitudinal dorsal trough (cf. the four ridges in *Mesalox*) and an anterior subrectangular 'flap' on the dorsal shield.

Only the type species is known.

Rectalox falita new species

Figures 359-366

FEMALE (description from 5 specimens). Length 143-185 μm , width 49-59 μm , depth 55-59 μm . Fusiform. Rostrum 26 μm long, curved down; antapical seta 4-5 μm long. Dorsal shield subsemicircular, 25-26 μm long, 40-45 μm wide, with a prominent, anterior, subrectangular 'flap', unornamented. Dorsal tubercles on rear shield margin, 19 μm apart; dorsal setae 24-26 μm long, directed posteriorly.

Foreleg 25-29 μm long; tibia 5-6 μm long, with a seta 4-6 μm long at about mid-length; tarsus 5-6 μm long; claw 5-6 μm long, curved, knobbed; featherclaw 5-rayed. Hind leg 24-26 μm long; tibia 5 μm long; tarsus 5-6 μm long; claw 6 μm long, curved, knobbed. Coxae granulose; 1st coxal seta 6-7 μm long, behind the anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with 24-26 smooth tergites, 51-56 microtuberclate sternites, and in the mid-dorsal region a longitudinal furrow; microtubercles oval, on rear ring margin. Lateral seta on about tergite 7, 13-15 μm long. Ventral setae: 1st on about tergite 19, 39-44 μm long; 2nd on about tergite 32, 13-15 μm long; 3rd on about 5th ring from rear, 15-16 μm long. Accessory caudal seta absent. Genitalia 19-20 μm wide, 14-15 μm long. Coverflap with longitudinal markings, and granules anteriorly; genital seta 6-9 μm long.

MALE. Not seen.

TYPE DATA. From *Nothofagus menziesii* (Fagaceae), Boulder Lake, Nelson, 23 October 1968, A. K. Walker (holotype slide and 1 paratype slide, NZAC; 3 paratype slides, PLNZ).

MATERIAL EXAMINED. Type series only.

- / NN.

Associated with *Aceria waltheri* on 'witches brooms'.

REMARKS. The generic characters - a subrectangular anterior shield 'flap' and a broad, longitudinal dorsal trough - are distinctive of *R. falita*.

Three of the paratype slides have one specimen of this mite and one or more specimens of *Aceria waltheri* on the same slide.

Genus *Rhombacus* Keifer

Rhombacus Keifer, 1965: 15. Type-species *Rhombacus morrиси* Keifer, 1965.

Body flattened, fusiform, broadest across rear of dorsal shield, divided into tergites and sternites, the sternites more numerous. Rostrum short. Dorsal shield subtriangular, with a strong, apically indented anterior lobe; dorsal tubercles well ahead of rear shield margin, directing setae upwards and medially. Legs with the normal setation; hind claw recurved; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Genital coverflap with diagonal markings.

REMARKS. The flattened body form (not readily apparent in Figure 367) and recurved hind claw are distinctive of *Rhombacus*. This is the first record of the genus from New Zealand.

Rhombacus chatelaini new species

Figures 367-374

FEMALE (description from 10 specimens). Length 125-162 μm , width 66-86 μm , depth 72 μm . Fusiform, dorsoventrally flattened; brownish. Rostrum 24-33 μm long, curved down; antapical seta 6-10 μm long. Dorsal shield subsemicircular, 40-50 μm long, 64-86 μm wide, with a broad, subtriangular, truncated anterior lobe that is irregularly indented apically; ornamentation consisting of a longitudinal line running posteriorly from each dorsal tubercle, the two joined by a transverse line near basal margin of shield, and sometimes a broken line running anteriorly for some distance from tubercle. Dorsal tubercles well ahead of rear shield margin, 19-24 μm apart; dorsal setae 3-4 μm long, directed upwards and medially.

Foreleg 36-42 μm long; tibia 9-12 μm long, with a seta 5 μm long at about five-sixths; tarsus 6-7 μm long; claw 5-6 μm long, knobbed; featherclaw 4-rayed. Hind leg 36-40 μm long; tibia 8-10 μm long; tarsus 6-7 μm long; claw 6 μm long, recurved. Coxal field granulate near 1st and

2nd coxal setae, with few lines near 3rd coxal setae; 1st coxal setae 5-10 μm long, almost level with anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are slightly ahead of a line through the 3rd tubercles.

Abdomen with about 17-20 tergites and 40-47 microtuberculate sternites. Lateral seta on about sternite 8, 12-21 μm long. Ventral setae: 1st on about sternite 18, 20-51 μm long; 2nd on about sternite 33, 15-20 μm long; 3rd on about 6th ring from rear, 18-25 μm long. Accessory caudal seta absent. Genitalia 17-22 μm wide, 14-17 μm long. Coverflap with diagonal lines; area immediately anterior to it with granular markings; genital seta 9-18 μm long.

MALE. Present.

TYPE DATA. From *Eucalyptus cypellocarpa* (Myrtaceae), Rotoehu State Forest, 8 June 1981, M. P. Chatelain (holotype slide and 5 paratype slides, PLNZ; 1 paratype slide, NZAC); and *Eucalyptus regnina*, same data except 21 February 1981 (1 paratype slide, PLNZ).

MATERIAL EXAMINED. Type series only.

BP / - .

A leaf vagrant, associated with brown scars on leaves.

REMARKS. The flattened body form, recurved hind claw, and host plant are distinctive of *R. chatelaini*. This species differs from *R. morrissi* in that the tergites lack microtubercles, the dorsal shield lacks granulations, and the area anterior to the genital coverflap is irregularly granulate (cf. lines of granules).

Genus *Tegolophus* Keifer

Tegolophus Keifer, 1961: 3. Type-species
Epitrimerus califraxini Keifer, 1938b.

Body robust fusiform, divided into at least twice as many sternites as tergites; abdomen with a mid-dorsal longitudinal ridge that fades posteriorly. Rostrum short. Dorsal shield subsemicircular, with an anterior lobe; dorsal tubercles on rear shield margin, directing setae posteriorly. Legs with

normal segmentation and setation; feather-claw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of moderate length.

REMARKS. The main distinguishing features of *Tegolophus* are the mid-dorsal abdominal longitudinal ridge and the location of the dorsal tubercles on the rear shield margin, with the setae directed posteriorly.

Four species are known from New Zealand.

KEY TO SPECIES OF *TEGOLOPHUS* KNOWN FROM NEW ZEALAND

- 1 Genital coverflap with a double row of longitudinal markings. On *Myoporum laetum* (ngaio) *poriruensis*
- Genital coverflap with a single row of longitudinal markings. On host plants other than ngaio 2
- 2 Dorsal shield 'pitted', with a smooth, blunt anterior lobe. On *Citrus* *australis*
- Dorsal shield without 'pits', with a roughened or acuminate anterior lobe. On host plants other than *Citrus* 3
- 3 Anterior shield lobe acuminate; dorsal shield with a median line of distinctive shape. On *Meliclytus ramiflorus* (mahoe) *meliflorus*
- Anterior shield lobe bluntly rounded; dorsal shield without a median line. On *Vitex lucens* (puriri) *alicis*

Tegolophus alicis new species

Figures 375-381

FEMALE (description from 6 specimens). Length 144-177 μm , width 61-68 μm , depth 54-68 μm . Robust fusiform; pale yellow. Rostrum 18-23 μm long, curved down; antapical seta 2-3 μm long. Dorsal shield subsemicircular, 41-43 μm long, 62-69 μm wide, with a blunt, roughened anterior lobe,

ornamented with numerous faintly impressed 'spots' (not shown in Figure 376); median and admedian lines absent; a submedian line and, occasionally, a lateral line present. Dorsal tubercles on rear shield margin, 35-38 μm apart; dorsal setae 6-9 μm long, directed posteriorly.

Foreleg 25-28 μm long; tibia 4-6 μm long, with a seta 2-4 μm long at about one-third; tarsus 5-6 μm long; claw 5-6 μm long, curved, knobbed; featherclaw 4-rayed. Hind leg 24-25 μm long; tibia 3-4 μm long; tarsus 5 μm long; claw 5-6 μm long. Coxae unornamented except for a few rather lightly impressed lines; 1st coxal seta 4-6 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are well ahead of a line through the 3rd tubercles.

Abdomen with about 26 tergites and 55-62 microtuberculate sternites, separated by an area with short, thick, transverse lines or bars; mid-dorsal ridge present. Lateral seta on about sternite 6, 23-28 μm long. Ventral setae: 1st on about sternite 23, 41-50 μm long; 2nd on about sternite 37, 8-12 μm long; 3rd on about 5th ring from rear, 13-15 μm long. Accessory caudal seta absent. Genitalia 18-21 μm wide, 10-13 μm long. Coverflap with longitudinal lines; genital seta 7-11 μm long.

MALE. Present.

TYPE DATA. From *Vitex lucens* (puriri; Verbenaceae) in mixed forest, Lady Alice Island (Motumuka), Hen and Chickens group, 17 October 1971, B. M. May (holotype slide and 9 paratype slides, PLNZ; 2 paratype slides, NZAC).

MATERIAL EXAMINED. Type series only.

ND / - .

Found on underside of leaves in association with galls of *Asetilobus hodgkinsi*.

REMARKS. *T. alicis* is very similar to *T. australis*, but can be distinguished in that the dorsal shield lacks distinctive pitting, the anterior shield lobe is characteristically roughened, and the lateral seta is much longer (23-28 μm , cf. 7-11 μm).

Tegolophus australis Keifer

brown rust mite

Figures 2 and 382-388

Tegolophus australis Keifer, 1964: 2.

FEMALE (description from 6 specimens). Length 159-180 μm , width 66-72 μm , depth 60-69 μm . Robust fusiform; brownish. Rostrum 23-26 μm long, curved down; antapical seta 5 μm long. Dorsal shield subsemicircular, 48-50 μm long, 67-73 μm wide, with a blunt anterior lobe; surface rough, ornamented with numerous irregular pits; median line absent; admedians visible on posterior two-thirds of shield, with a weak, transverse line at about one-third of their length; submedian line visible on posterior half of shield, joined basally by a transverse line; area immediately behind and between dorsal setae with short, longitudinal lines. Dorsal tubercles on rear shield margin, 35-39 μm apart; dorsal setae 3-5 μm long, directed posteriorly.

Foreleg 30-33 μm long; tibia 7-8 μm long, with a seta 2-3 μm long at about one-third; tarsus 6 μm long; claw 4-5 μm long, curved, knobbed; featherclaw 4-rayed. Hind leg 29-30 μm long; tibia 5-6 μm long; tarsus 6 μm long; claw 4-5 μm long. Coxae unornamented except for a few light markings; 1st coxal seta 7-9 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles slightly further apart than the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line double.

Abdomen with about 26 or 27 tergites and 50-56 microtuberculate sternites, separated by an area with short, thick, transverse lines; 1st tergite broader than the rest; a longitudinal dorsal ridge between 3rd and 16th tergites. Lateral seta on about sternite 8, 7-11 μm long. Ventral setae: 1st on about sternite 18, 51-54 μm long; 2nd on about sternite 30, 2-4 μm long; 3rd on about 5th ring from rear, 15-18 μm long. Accessory caudal seta absent. Genitalia 21-26 μm wide, 12-14 μm long. Coverflap with a finely granulate area basally, longitudinal markings posteriorly; genital seta 7-8 μm long.

MALE. Not seen.

TYPE DATA. Described from *Citrus sinensis* (orange; Rutaceae), Somersby, New South Wales, Australia (holotype slide deposited with P. C. Hely, Somersby, 1 paratype slide,

Commonwealth Institute of Entomology, C/-
British Museum (Natural History), London;
1 paratype slide presumably HKSC).

MATERIAL EXAMINED. Non-type examples from
Citrus sp. (Kerikeri, 8 Dec 1966; Whangarei,
28 Oct 1966).

ND / - .

Rust mites.

REMARKS. The smooth anterior shield lobe,
'pitted' dorsal shield, and short lateral
seta distinguish *T. australis*.

This species was first recorded in New
Zealand by Manson (1972). It is otherwise
known only from New South Wales.

***Tegolophus meliflorus* new species**

Figures 389-393

FEMALE (description from 6 specimens).
Length 145-181 μm , width 58-73 μm , depth
not discernible. Robust fusiform. Rostrum
19-24 μm long, curved down; antapical seta
6 μm long. Dorsal shield subsemicircular,
38-41 μm long, 55-69 μm wide, with a short,
distinctively pointed anterior lobe; orna-
mentation consisting mainly of a broken,
sinuous median line, at base of which is a
finely granulate triangular area; a lightly
impressed submedian line also evident some-
times. Dorsal tubercles arising from rear
shield margin, 30-37 μm apart; dorsal setae
6-8 μm long, directed posteriorly.

Foreleg 29-32 μm long; tibia 6-8 μm long,
with a seta 4-6 μm long at about midlength;
tarsus 4-6 μm long; claw 5-6 μm long, curved,
knobbed; featherclaw 4-rayed. Hind
leg 27-30 μm long; tibia 5-6 μm long; tar-
sus 5-6 μm long; claw 5-6 μm long. Coxae
unornamented; 1st coxal seta 4-6 μm long,
ahead of anterior coxal approximation; 1st
setiferous coxal tubercles slightly further
apart than the 2nd, which are ahead of a
line through the 3rd tubercles. Sternal
line present.

Abdomen with about 27-29 tergites, 62-
71 microtuberculate sternites, and a longi-
tudinal dorsal ridge. Lateral seta on
about sternite 5, 11-17 μm long. Ventral
setae: 1st on about sternite 17, 35-42 μm
long; 2nd on about sternite 30, 11-15 μm
long; 3rd on about 6th ring from rear, 15-
18 μm long. Accessory caudal seta absent.
Genitalia 20-23 μm wide, 10-14 μm long.

Coverflap with longitudinal markings; geni-
tal seta 6-11 μm long.

MALE. Present.

TYPE DATA. From *Meliccytus ramiflorus*
(mahoe, whiteywood; Violaceae), Ohau, near
Levin, 8 February 1964, D. C. M. Manson
(holotype slide, PLNZ).

MATERIAL EXAMINED. Type slide only.

WN / - .

Leaf vagrant.

REMARKS. The distinctive dorsal shield
ornamentation, particularly the nature of
the median line, and the acutely pointed
anterior shield lobe separate *T. meliflorus*
from the three other species of *Tegolophus*
described here. A lateral view was not
available on the holotype slide, so could
not be drawn. The dorsal ridge sometimes
appears through optical illusion to be a
dorsal 'trough'.

***Tegolophus poriruenis* new species**

Figures 394-400

FEMALE (description from 10 specimens).
Length 158-202 μm , width 78-95 μm , depth
68-78 μm . Robust fusiform; brown. Rostrum
18-30 μm long, curved down; antapical seta
6-9 μm long. Dorsal shield subsemicircular,
42-56 μm long, 80-90 μm wide, with a blunt
anterior lobe, unornamented. Dorsal tuber-
cles on rear shield margin, 30-36 μm apart;
dorsal setae 4-5 μm long, directed poster-
iorly.

Foreleg 30-37 μm long; tibia 6-9 μm
long, with a 2-4 μm seta at about one-quarter;
tarsus 6-7 μm long; claw 5-6 μm long,
knobbed; featherclaw 4-rayed. Hind leg 26-
38 μm long; tibia 6-7 μm long; tarsus 5-7
 μm long; claw 5-6 μm long, knobbed. Coxae
unornamented; 1st coxal setae 5-6 μm long,
behind anterior coxal approximation; 1st
setiferous coxal tubercles much further
apart than the 2nd, which are ahead of a
line through the 3rd tubercles.

Abdomen with about 16-18 tergites, 47-
54 microtuberculate sternites, and a weak,
longitudinal, mid-dorsal ridge. Lateral
seta on about sternite 7, 14-22 μm long.
Ventral setae: 1st on about sternite 16, 26-
45 μm long; 2nd on about sternite 32, 6-12

µm long; 3rd on about 5th ring from rear, 15-24 µm long. Accessory caudal seta absent. Genitalia 20-29 µm wide, 17-21 µm long. Coverflap with a double row of longitudinal markings; genital seta 9-13 µm long.

MALE. Present.

TYPE DATA. From *Myoporum laetum* (ngaio; Myoporaceae), Porirua, 26 October 1982, L. S. Alexander (holotype slide and 2 paratype slides, PLNZ; 1 paratype slide, NZAC).

MATERIAL EXAMINED. Type series only.

WN / - .

Rust mites.

REMARKS. The distinctively shaped anterior shield lobe (when viewed laterally) and double row of longitudinal markings on the genital coverflap separate *T. poriruensis* from the other three species of *Tegolophus* recorded here.

Genus *Tetra* Keifer

Tetra Keifer, 1944: 27. Type-species
"*Phyllocoptruta*" *concava* Keifer, 1939d.

Body fusiform, somewhat flattened dorsoventrally, divided into tergites and sternites, the sternites more numerous; abdomen with a broad, mid-dorsal longitudinal trough. Rostrum short. Dorsal shield subtriangular, with an anterior lobe; dorsal tubercles on rear shield margin, directing setae posteriorly. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with internal apodeme of normal length; coverflap with longitudinal markings.

REMARKS. The conspicuous longitudinal mid-dorsal trough on the abdomen is a feature shared only by the genus *Rectalox* (among New Zealand taxa). I have modified Keifer's original description slightly. He describes the tergites as being irregular in height, and the dorsal shield setae as long, but several described species do not have these features.

This is the first record of genus *Tetra* from New Zealand.

Tetra martini new species

Figures 401-408

FEMALE (description from 10 specimens). Length 182-202 µm, width 66-84 µm, depth 65-77 µm. Fusiform, somewhat flattened dorsoventrally; yellowish. Rostrum 16-25 µm long, curved down; antapical seta 4-7 µm long. Dorsal shield subtriangular, 41-52 µm long, 62-81 µm wide, with a blunt anterior lobe, unornamented. Dorsal tubercles on rear shield margin, 35-37 µm apart; dorsal setae 6-8 µm long, directed posteriorly.

Foreleg 32-38 µm long; tibia 7-9 µm long, with a seta 3-8 µm long at about one-third; tarsus 6-8 µm long; claw 5-6 µm long, knobbed; featherclaw 4-rayed. Hind leg 31-36 µm long; tibia 6-8 µm long; tarsus 6-8 µm long; claw 5-6 µm long; knobbed. Coxal field weakly ornamented - usually a few longitudinal lines between 1st and 2nd coxae, and sometimes granular markings near 2nd coxae; 1st coxal setae 4-6 µm long, behind anterior coxal approximation; 1st setiferous coxal tubercles further apart than the 2nd, which are well ahead of a line through the 3rd tubercles. Sternal line present.

Abdomen with about 26-28 tergites, 58-74 microtuberculate sternites, and a broad, mid-dorsal longitudinal trough. Lateral seta on about sternite 11, 13-19 µm long. Ventral setae: 1st on about sternite 24, 24-52 µm long; 2nd on about sternite 42, 9-14 µm long; 3rd on about 6th ring from rear, 16-31 µm long. Accessory caudal seta absent. Genitalia 19-22 µm wide, 9-11 µm long. Coverflap with longitudinal markings; area immediately anterior to it with granulate markings; genital seta 9-12 µm long.

MALE. Present.

TYPE DATA. From *Solanum aviculare* (poroporo; Solanaceae): Waitara, New Plymouth, 15 October 1980 (holotype slide, NZAC; 5 paratype slides, PLNZ), 17 December 1979 (1 paratype slide, PLNZ); Tikorangi, New Plymouth, 5 May 1980 (3 paratype slides, PLNZ; 1 paratype slide, NZAC); Taranaki, March 1980 (3 paratype slides, PLNZ); all collected by N. A. Martin.

MATERIAL EXAMINED. Type series only.

TK / - .

A leaf vagrant causing gross distortion

of leaves and damage to growing tips.

REMARKS. The broad, longitudinal, mid-dorsal trough and blunt anterior shield lobe are characters of *T. martini* worth noting.

This species is of economic significance, having caused damage in an area of 30-50 hectares of poporo planted for extraction of solasodine, a steroid raw material.

Genus *Vittacus* Keifer

Vittacus Keifer, 1969: 13. Type-species
Vittacus masoni Keifer, 1969.

Body fusiform, divided into tergites and about twice as many sternites; tergites in dorsal aspect resembling thickened, transverse plates; a longitudinal band of elongate microtubercles laterally, just above sternites. Rostrum short. Dorsal shield with a blunt anterior lobe; dorsal tubercles on rear shield margin, the setae diverging posteriorly. Legs with the normal segmentation and setation; featherclaw simple. Coxae with the usual 3 pairs of setiferous tubercles. Abdomen with all standard setae. Female genitalia with the internal apodeme of normal length.

REMARKS. *Vittacus* most closely resembles *Aciota* Keifer, but it has distinctive thick, transverse tergal plates and lacks pointed tergites on the lateral abdominal ridge. Also, *Aciota* lacks a foretibial seta and a seta on the hind genu.

Vittacus masoni Keifer

Figures 409-415

Vittacus masoni Keifer, 1969: 13.

FEMALE (description from 6 specimens). Length 132-183 μm , width 46-50 μm , depth 46-50 μm . Fusiform; whitish. Rostrum 15-20 μm long, curved down; antapical seta 4-5 μm long. Dorsal shield subtriangular, 37-43 μm long, 45 μm wide, with a blunt anterior lobe, unornamented except for a lateral line and a transverse line between bases of dorsal tubercles. Dorsal tubercles on rear shield margin, 21-26 μm apart;

dorsal setae 18-20 μm long, diverging posteriorly.

Foreleg 28-33 μm long; tibia 7-8 μm long, with a seta 2-4 μm long at about one-quarter; tarsus 6-8 μm long; claw 6 μm long, knobbed; featherclaw 4-rayed. Hind leg 28-32 μm long; tibia 6-7 μm long; tarsus 6 μm long; claw 6-8 μm long. Coxae with dash-like lines; 1st coxal seta 5-7 μm long, slightly behind anterior coxal approximation; 1st setiferous coxal tubercles about as far apart as the 2nd, which are ahead of a line through the 3rd tubercles. Sternal line forked anteriorly.

Abdomen with about 26 or 27 tergites and 49-57 sternites; tergites dorsally a series of thickened, transverse plates that is slightly concave around the midline, laterally with a narrow band of elongate microtubercles; sternites with elongate, rounded microtubercles on rear ring margin. Lateral seta on about sternite 6, 9-12 μm long. Ventral setae: 1st on about sternite 20, 43-49 μm long; 2nd on about sternite 35, 8-10 μm long; 3rd on about 6th ring from rear, 17-20 μm long. Accessory caudal seta absent. Genitalia 18-21 μm wide, 7-9 μm long. Coverflap with longitudinal markings, and with granules or short lines basally; genital seta 10-13 μm long.

MALE. Not seen.

TYPE DATA. Described from *Urtica ferox* (stinging nettle; Urticaceae) in a forest remnant, Price's Valley, Banks Peninsula, 4 December 1956, A. J. Healy (holotype slide and 1 paratype slide, PLNZ; 1 paratype slide, Entomology Research Division, U.S. Department of Agriculture, Beltsville, Maryland; 5 paratype slides, HKSC).

MATERIAL EXAMINED. Type series, plus non-type examples from *Urtica ferox* (Ohau, Levin, 19 Mar 1966; Barton's Bush, Trentham, 25 Mar 1953; swamp forest, Hutt River, Trentham, 19 May 1953; Pukerua Bay, 18 Sep 1982; Stephens Island, 19 Feb 1971; Hapuku River, Kaikoura, 7 Jan 1972; type locality, second growth bush, 17 Dec 1972).

WN / SD, KA, MC.

Forming woolly, globular leaf and stem galls about 1 mm in diameter.

REMARKS. The almost flat, transverse plates on the dorsal body surface are distinctive of *V. masoni*.

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NOTE ADDED IN PRESS

The following recently published title will be of outstanding interest and value to students of the Eriophyoidea:

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APPENDIX: Host list of the Eriophyoidea of New Zealand

Host-plant species, listed in alphabetical order, and the eriophyoid species that have been recorded from each. Botanical names are taken mainly from Allan (1961).

<i>Allium ascalonicum</i> L.	<i>Carmichaelia enysii</i> Kirk
<i>Aceria tulipae</i>	<i>Aceria carmichaeliae</i>
<i>Allium sativum</i> L.	<i>Carmichaelia orbiculata</i> Col.
<i>Aceria tulipae</i>	<i>Aceria carmichaeliae</i>
apple. See <i>Malus pumila</i>	<i>Carmichaelia ovata</i> Simpson
<i>Avicennia resinifera</i> Forst. f.	<i>Aceria carmichaeliae</i>
<i>Acalitus avicenniae</i>	<i>Carmichaelia</i> sp.
black beech. See <i>Nothofagus solandri</i>	<i>Aceria carmichaeliae</i>
blackberry. See <i>Rubus</i> sp. hybrid	<i>Carmichaelia subulata</i> Kirk
black currant. See <i>Ribes nigrum</i>	<i>Aceria carmichaeliae</i>
boysenberry. See <i>Rubus</i> hybrid cv. Boysen	<i>Carmichaelia violacea</i> Kirk
broadleaf. See <i>Griselinia littoralis</i>	<i>Aceria carmichaeliae</i>
bush lawyer. See <i>Rubus</i> sp.	<i>Carpodetus serratus</i> J.R. et G. Forst.
<i>Calystegia sepium</i> (L.) R. Br.	<i>Acalitus carpatus</i>
<i>Aceria calystegiae</i>	<i>Aculops serrati</i>
<i>Calystegia soldanella</i> (L.) R. Br.	<i>Lambella cerina</i>
<i>Aceria calystegiae</i>	<i>Cassinia fulvida</i> Hook f.
<i>Calystegia</i> sp.	<i>Eriophyes leptophyllae</i>
<i>Aceria calystegiae</i>	<i>Cassinia leptophylla</i> (Forst. f.) R. Br.
<i>Calystegia tuguriorum</i> (Forst. f.)	<i>Eriophyes leptophyllae</i>
<i>Aceria calystegiae</i>	<i>Cassinia retorta</i> A. Cunn. ex DC.
<i>Camellia</i> sp.	<i>Eriophyes leptophyllae</i>
<i>Calacarus carinatus</i>	<i>Cassinia vauvilliersii</i> (Homb. et Jacq.)
<i>Cosetacus camelliae</i>	Hook. f.
cape gooseberry. See <i>Physalis peruviana</i>	<i>Eriophyes leptophyllae</i>
<i>Carmichaelia aligera</i> Simpson	<i>Citrus limon</i> (L.) Burm. f.
<i>Aceria carmichaeliae</i>	<i>Aceria sheldoni</i>
<i>Carmichaelia angustata</i> Kirk	<i>Citrus sinensis</i> (L.) Osbeck
<i>Aceria carmichaeliae</i>	<i>Phyllocoptruta oleivora</i>
<i>Carmichaelia australis</i> R. Br.	<i>Citrus</i> sp.
<i>Aceria carmichaeliae</i>	<i>Aceria sheldoni</i>
<i>Carmichaelia cunninghamii</i> Raoul	<i>Tegolophus australis</i>
<i>Aceria carmichaeliae</i>	<i>Clianthus puniceus</i> (G. Don) Sol. ex Lindl.
<i>Carmichaelia egmontiana</i> (Ckn. et Allan)	<i>Aceria clianthi</i>
Simpson	<i>Clianthus</i> sp.
<i>Aceria carmichaeliae</i>	<i>Aceria clianthi</i>

Convolvulus sp.
 Aceria calystegiae
Coprosma acerosa A. Cunn.
 Acalitus intertextus
Coprosma australis (A. Rich.) Robinson
 Lambella cerina
 Phyllocoptes hazelae
Coprosma cuneata Hook. f.
 Acalitus cottieri
Coprosma foetidissima Forst.
 Acalitus dissimus
Coprosma intertexta Molloy
 Acalitus intertextus
Coprosma linariifolia x *parviflora*
 Acalitus cottieri
Coprosma lucida J.R. et G. Forst.
 Acalitus dissimus
Coprosma parviflora Hook. f.
 Acalitus cottieri
Coprosma propinqua A. Cunn.
 Acalitus cotteri
 Pedaculops propinquae
Coprosma pseudocuneata W.R.B. Oliver
 Acalitus cottieri
Coprosma robusta Raoul
 Acalitus cottieri
 Acalitus dissimus
 Cosella simplicis
 Lambella cerina
 Phyllocoptes coprosmae
Coprosma spp.
 Acalitus cottieri
 Acalitus dissimus
 Lambella cerina
 Pedaculops propinquae
 Phyllocoptes hazelae
Coprosma tenuicaulis Hook. f.
 Acalitus cottieri
 Acalitus taurangensis

Corylus maxima Mill.
 Phytoptus avellanae
Corylus sp.
 Phytoptus avellanae
Corynocarpus laevigatus J.R. et G. Forst.
 Parulops corynocarpi
Dicksonia squarrosa (Forst. f.) Swartz
 Aceria gersoni
Dracophyllum pronom W.R.B. Oliver
 Eriophyes dracophylli
Dracophyllum recurvum Hook. f.
 Eriophyes dracophylli
Dracophyllum sp.
 Eriophyes dracophylli
Elaeocarpus dentatus (J.R. et G. Forst.)
 Vahl.
 Aceria titirangiensis
Elaeocarpus hookerianus Raoul
 Aceria titirangiensis
 elm. See *Ulmus* sp.
Eucalyptus cypellocarpa L. Johnson
 Rhombacus chatelaini
Eucalyptus regnans F. Muell.
 Rhombacus chatelaini
 European beech. See *Fagus sylvatica*
Fagus sylvatica L.
 Aceria hagleyensis
 Rhyncaphytoptus fagacis
Gaultheria depressa Hook. f.
 Aculops gaultheriae
Gaultheria paniculata Burt et Hill
 Aculops gaultheriae
Gaultheria sp.
 Aculops gaultheriae
 garlic. See *Allium sativum*
Gleichenia circinata Swartz
 Aceria gleicheniae
Gleichenia dicarpa R. Br.
 Aceria gleicheniae

mountain beech. See *Nothofagus cliffortioides*
Muehlenbeckia australis (Forst. f.) Meissn.
 Eriophyes lambi
Muehlenbeckia axillaris (Hook. f.) Walp.
 Eriophyes lambi
Muehlenbeckia complexa (A. Cunn.) Meissn.
 Eriophyes lambi
Muehlenbeckia complexa var. *trilobata*
 (Col.) Cheesem.
 Eriophyes lambi
Myoporum laetum Forst. f.
 Aceria healyi
 Tegolophus poriruenis
 nectarine. See *Prunus persica*
 var. *nucipersica*
Neopanax colensoi (Hook. f.) Allan
 Cosella simplicis
Neopanax simplex (Forst. f.)
 Cosella simplicis
 Parulops heatherae
 Phyllocoptes hazelae
 New Zealand jasmine. See *Parsonsia heterophylla*
 ngaio. See *Myoporum laetum*
Nothofagus cliffortioides (Hook. f.) Oerst.
 Acalitus lowei
 Acalitus morrisoni
Nothofagus fusca (Hook. f.) Oerst.
 Acalitus lowei
 Acalitus morrisoni
 Acalitus spinus
 Aceria waltheri
 Nothacus tuberculatus
Nothofagus menziesii (Hook. f.) Oerst.
 Acalitus lowei
 Aceria simonensis
 Aceria waltheri
 Nothacus tuberculatus
 Phyllocoptes lambi
 Rectalox falita
Nothofagus solandri (Hook. f.) Oerst.
 Acalitus lowei
 Acalitus morrisoni
Nothofagus truncata (Col.) Ckn.
 Acalitus lowei
 Acalitus morrisoni
 oak. See *Quercus* sp.
Olearia furfuraceae (A. Rich.) Hook. f.
 Aceria mayae
 orange. See *Citrus sinensis*
Paratrophis banksi Cheesem.
 Eriophyes paratrophis
Paratrophis microphylla (Raoul) Ckn.
 Eriophyes paratrophis
Parsonsia heterophylla A. Cunn.
 Eriophyes parsonsiae
Parsonsia sp.
 Eriophyes parsonsiae
 peach. See *Prunus persica*
 pear. See *Pyrus communis*
Phebalium nudum Hook.
 Colomerus nudi
Physalis peruviana L.
 Aculops lycopersici
Pimelea arenaria A. Cunn.
 Aceria pimeliae
Pimelea prostrata (J.R. et G. Forst.) Willd.
 Aceria pimeliae
Pimelea sp.
 Aceria pimeliae
Pittosporum eugenioides A. Cunn.
 Aculops pittospori
Pittosporum tenuifolium Sol. ex Gaertn.
 Acalitus kohus
 Aceria tenuifolii
Plagianthus betulinus A. Cunn.
 Aceria plagianthi
 Eriophyes plaginus

- Planchonella novo-zelandica* (F. Muell.)
Allan
Eriophyes planchonellus
plum. See *Prunus domestica*
poataniwha. See *Melicope simplex*
?Podocarpus totara G. Benn. ex D. Don
Eriophyes totarae
Polypodiaceae
Litaculus khandus
poroporo. See *Solanum aviculare*
Prunus domestica L.
Diptacus gigantorhynchus
Phyllocoptes abaenus
Prunus institia L.
Aculus fockeui
Prunus persica (L.) Batsch
Aculus cornutus
Prunus persica var. *nucipersica* (Suckow)
C.K. Schneider
Aculus cornutus
Prunus sp.
Phyllocoptes abaenus
Diptacus gigantorhynchus
Aculus fockeui
puriri. See *Vitex lucens*
Pyrrosia serpens (Forst. f.) Ching
Acerimina pyrrosiae
Pyrus communis L.
Epitrimerus pyri
Eriophyes pyri
Quercus sp.
Brevulacus reticulatus
Chreacidus quercipodus
Quintinia serrata A. Cunn.
Aceria titirangiensis
Raoulia tenuicaulis Hook. f.
Eriophyes duguidae
red beech. See *Nothofagus fusca*
rewarewa. See *Knightia excelsa*
ribbonwood. See *Plagianthus betulinus*
Ribes grossularia L.
Cecidophyopsis ribis
Ribes nigrum L.
Cecidophyopsis ribis
Rubus hybrid cv. Boysen
Acalitus essigi
Acalitus orthomera
Rubus schmideloides A. Cunn.
Acalitus rubensis
Rubus sp.
Levonga papaitongensis
Rubus sp. hybrid
Acalitus essigi
Salicornia australis Sol. ex Benth.
Aceria rubifaciens
Salix alba L.
Aculops albensis
Salix caprea L.
Aceria capreae
Aculops albensis
shallot. See *Allium ascalonicum*
shrubby haloragis. See *Haloragis erecta*
silver beech. See *Nothofagus menziesii*
Solanum aviculare Forst. f.
Tetra martini
Sophora microphylla Ait.
Aceria microphyllae
Stellaria parviflora Banks et Sol.
ex Hook. f.
Aceria parvensis
stinging nettle. See *Urtica ferox*
Strathmore weed. See *Pimelea prostrata*
Syzygium maire (A. Cunn.)
Sykes et Garnock-Jones
Parulops heatherae
tomato. See *Lycopersicon esculentum*
totara. See ? *Podocarpus totara*
Ulmus sp.
Aceria bipedis
Abacoptes ulmivagrans

Urtica ferox Forst. f.

Vittacus mansonii

Vitex lucens Kirk.

Acalitus australis

Asetilobus hodgkinsii

Tegolophus alicis

Vitis vinifera L.

Calepitrimerus vitis

Colomerus vitis

Wahlenbergia gracilis (Forst. f.) Schrad.

Aculops wahlenbergiae

Wahlenbergia marginata (Thunb.) A. DC.

var. *australis*

Aculops wahlenbergiae

walnut. See *Juglans regia*

wharangi. See *Melicope ternata*

white willow. See *Salix alba*

whiteywood. See *Melicytus ramiflorus*

willow. See *Salix caprea*

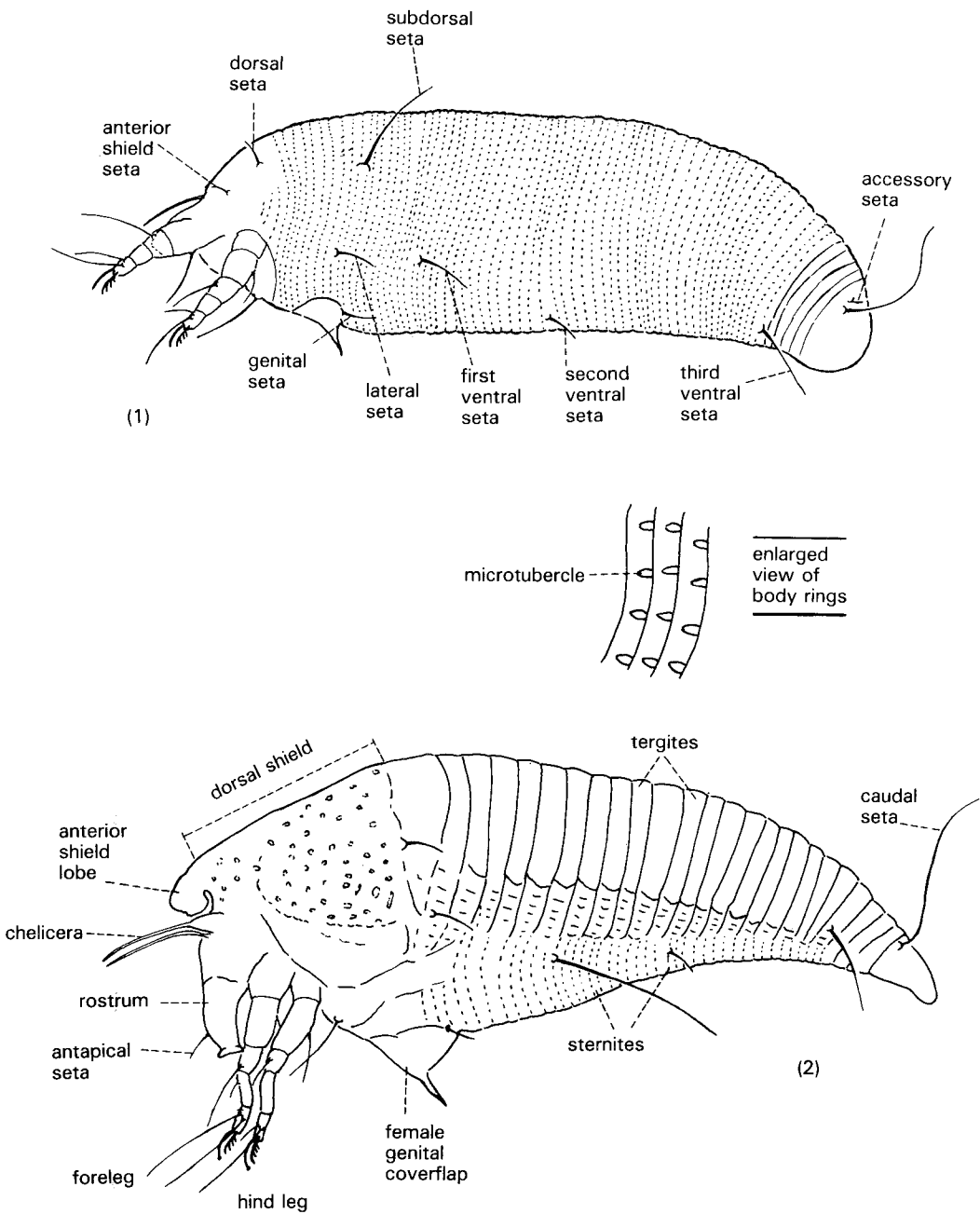
—8—

ILLUSTRATIONS

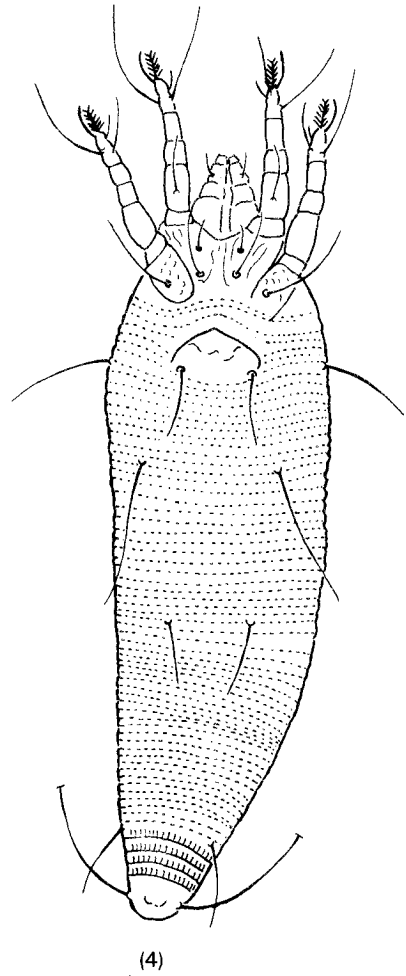
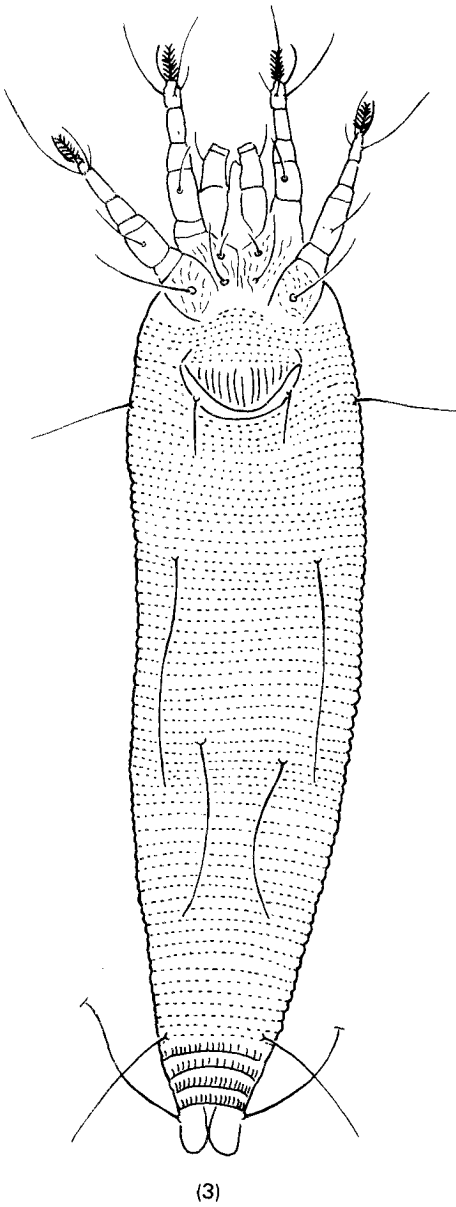
Figures 1-16 Morphological features of the Eriophyoidea, as typified by representative species (semi-diagrammatic).

Figures 17-415 Habitus drawings of New Zealand species of Eriophyoidea (excluding Eriophyinae; see *FNZ 5*), and enlargements of features that aid identification.

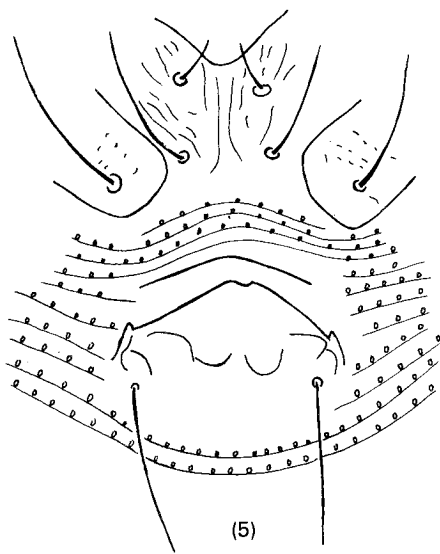
Key. **API**, internal genitalia of female, showing form of apodeme; **D**, habitus, dorsal aspect; **DA**, dorsal shield; **ES**, body rings and tubercles; **F**, featherclaw; **GFI**, genital field of female, including coxal region; **L1, 2**, foreleg and hind leg; **S**, habitus, lateral aspect; **SA**, anterior end, lateral aspect.



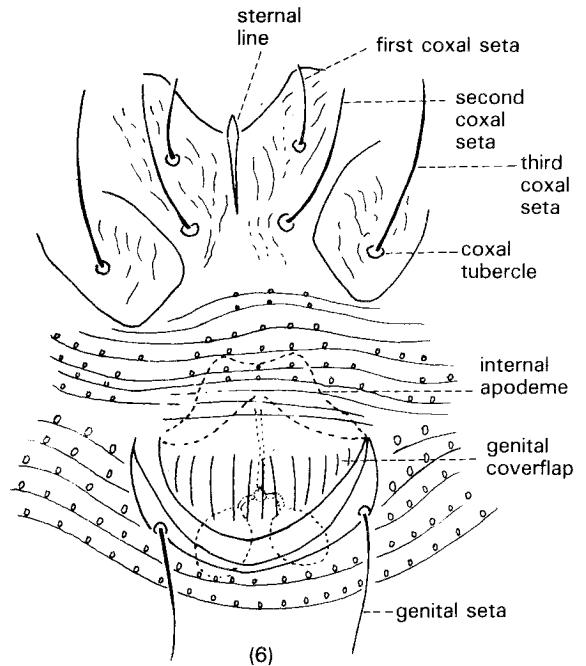
Figures 1 and 2 Habitus, lateral aspect, of (1) *Phytoptus avellanae* (Sierraphytoidae) and (2) *Tegolophus australis* (Eriophyidae).



Figures 3 and 4 Habitus, ventral aspect, of *Aceria tulipae*, showing differences between the sexes: (3) female; (4) male. See Figures 1, 2, 5, and 6 for names of structures.

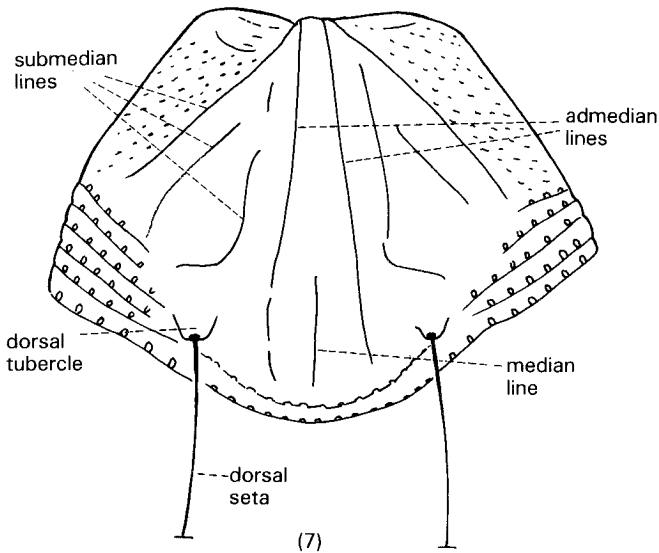


(5)



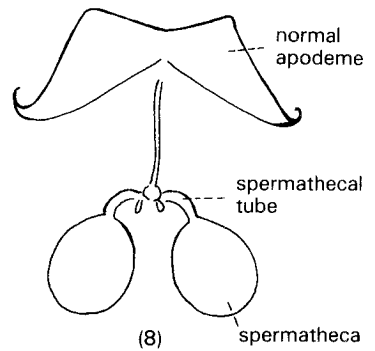
(6)

Figures 5 and 6 Coxal region and genital field, *Aceria tulipae*: (5) male; (6) female.

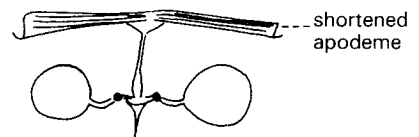


(7)

Figure 7 Dorsal shield, *Aceria tulipae*.

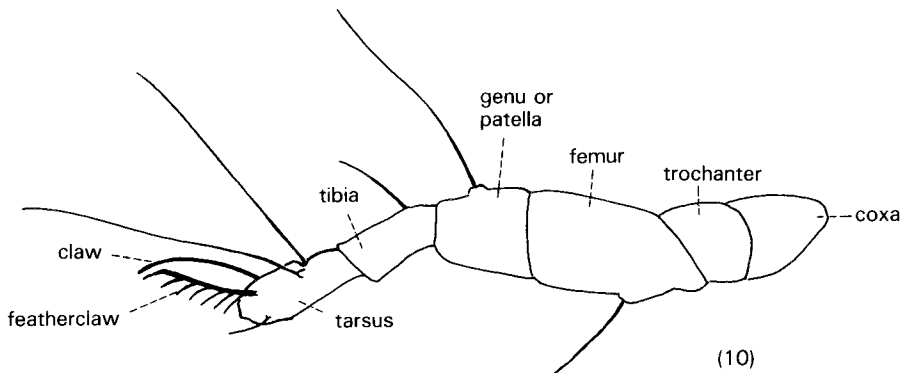


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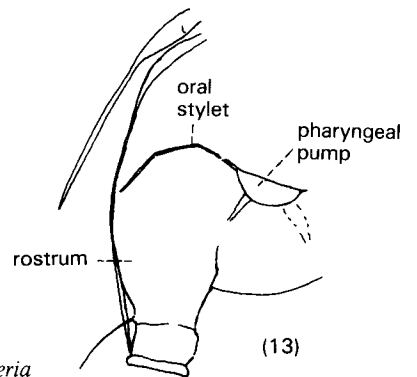
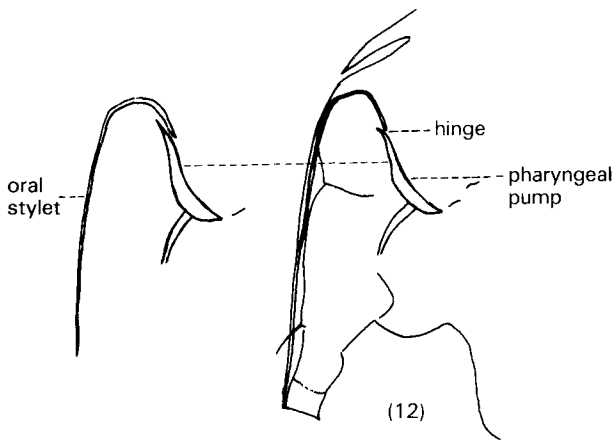
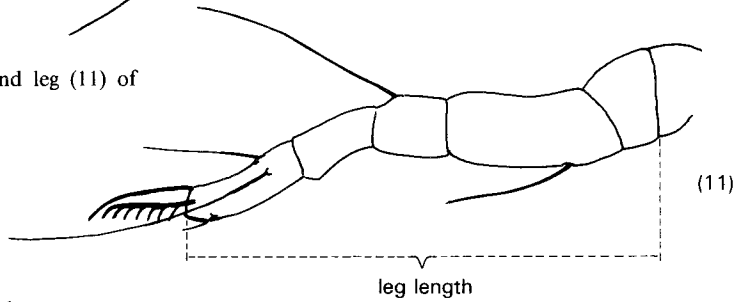


(9)

Figures 8 and 9 Female internal genitalia of (8) *Aceria tulipae* and (9) *Chrecidus quercipodus*, showing normal apodeme and shortened apodeme respectively.



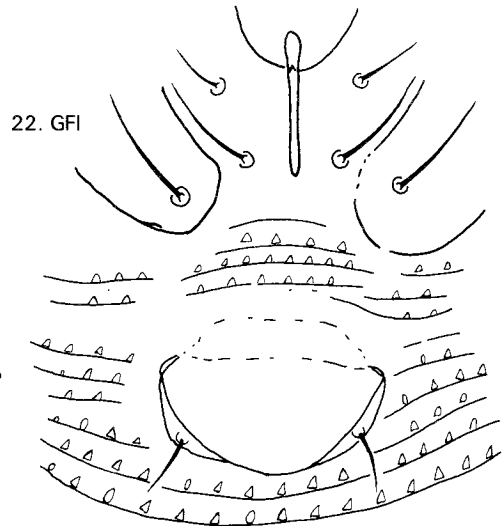
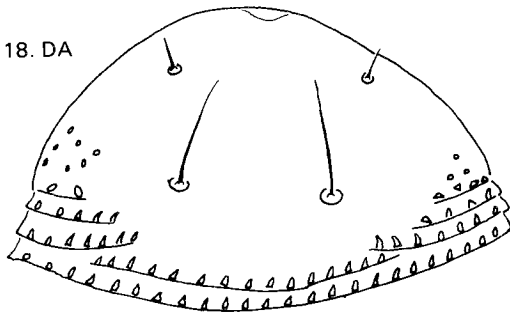
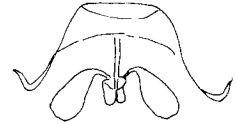
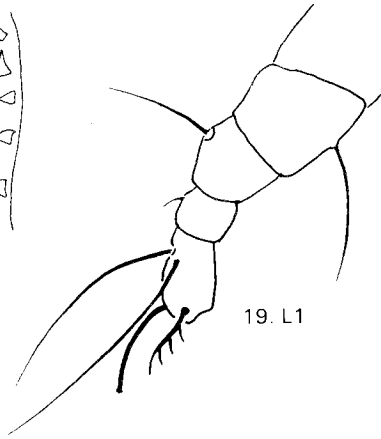
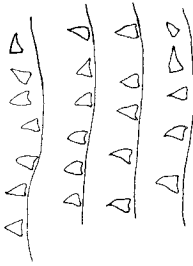
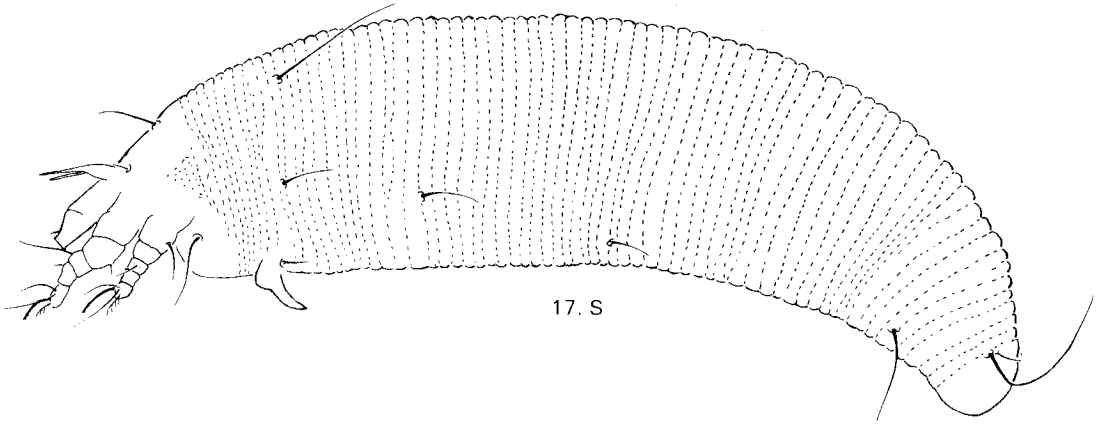
Figures 10 and 11 Foreleg (10) and hind leg (11) of *Aceria tulipae*.



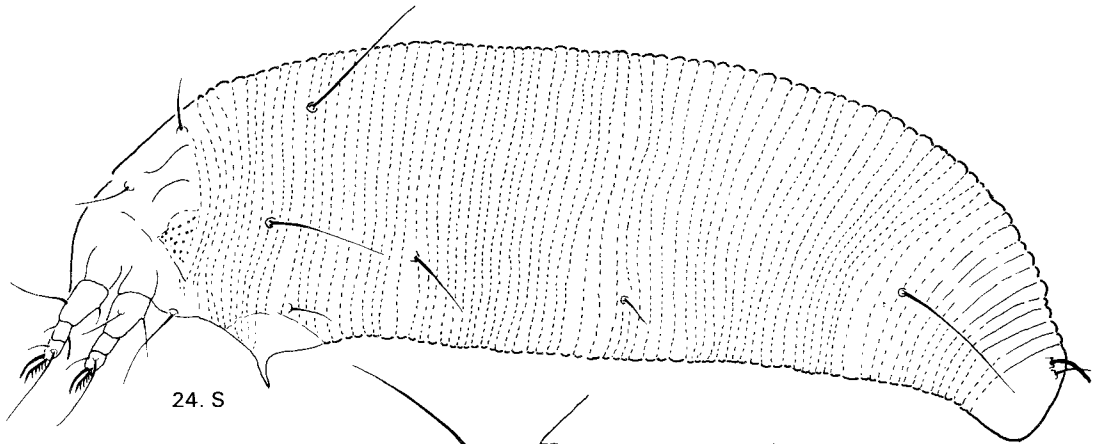
Figures 12 and 13 Rostrum of (12) *Diptacus gigantorhynchus* and (13) *Aceria tulipae*, showing long-form oral stylet and short-form oral stylet respectively.



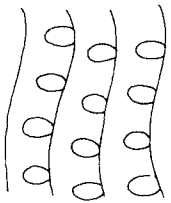
Figures 14–16 Featherclaws of (14) *Aceria tulipae*, (15) *Dacundiopus stylosus*, and (16) *Brevulacus reticulatus*, showing simple form and variants of the divided form.



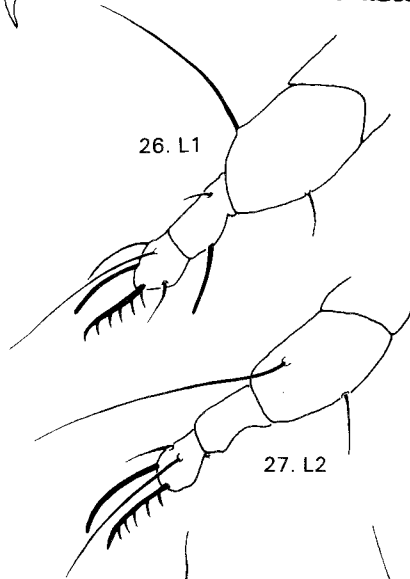
17-23. *Phytoptus avellanae*



24. S



29. ES

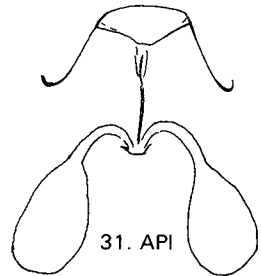


26. L1

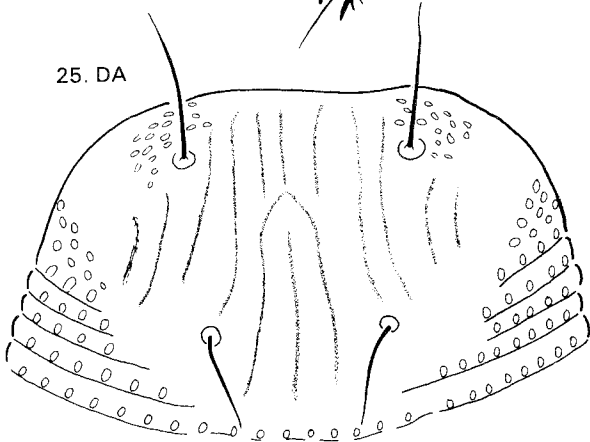
27. L2



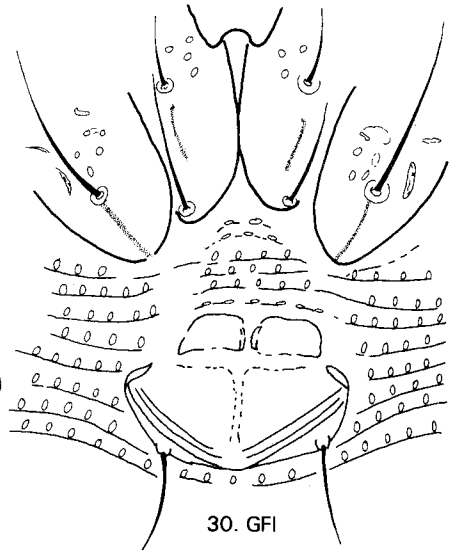
28. F



31. API

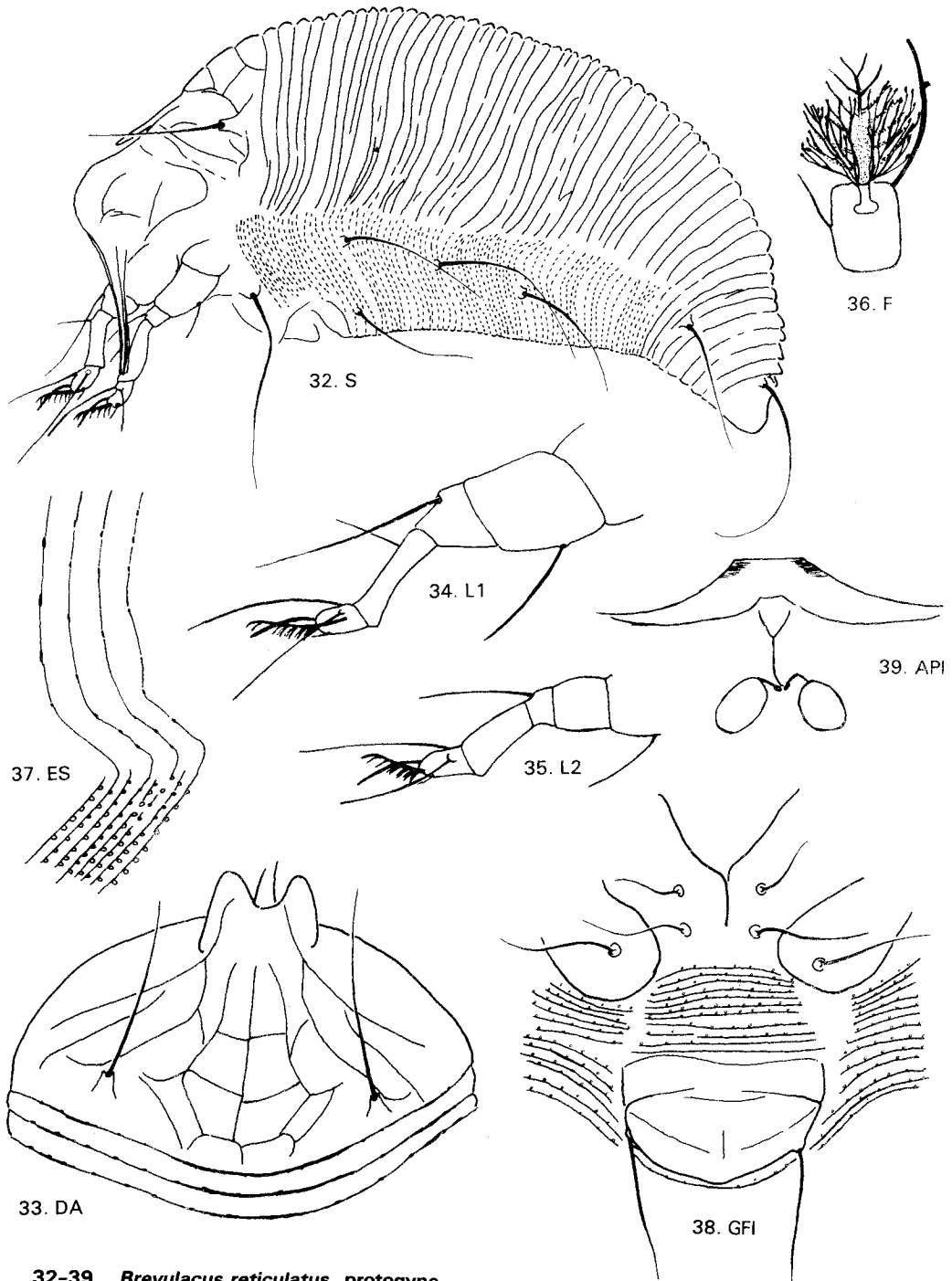


25. DA

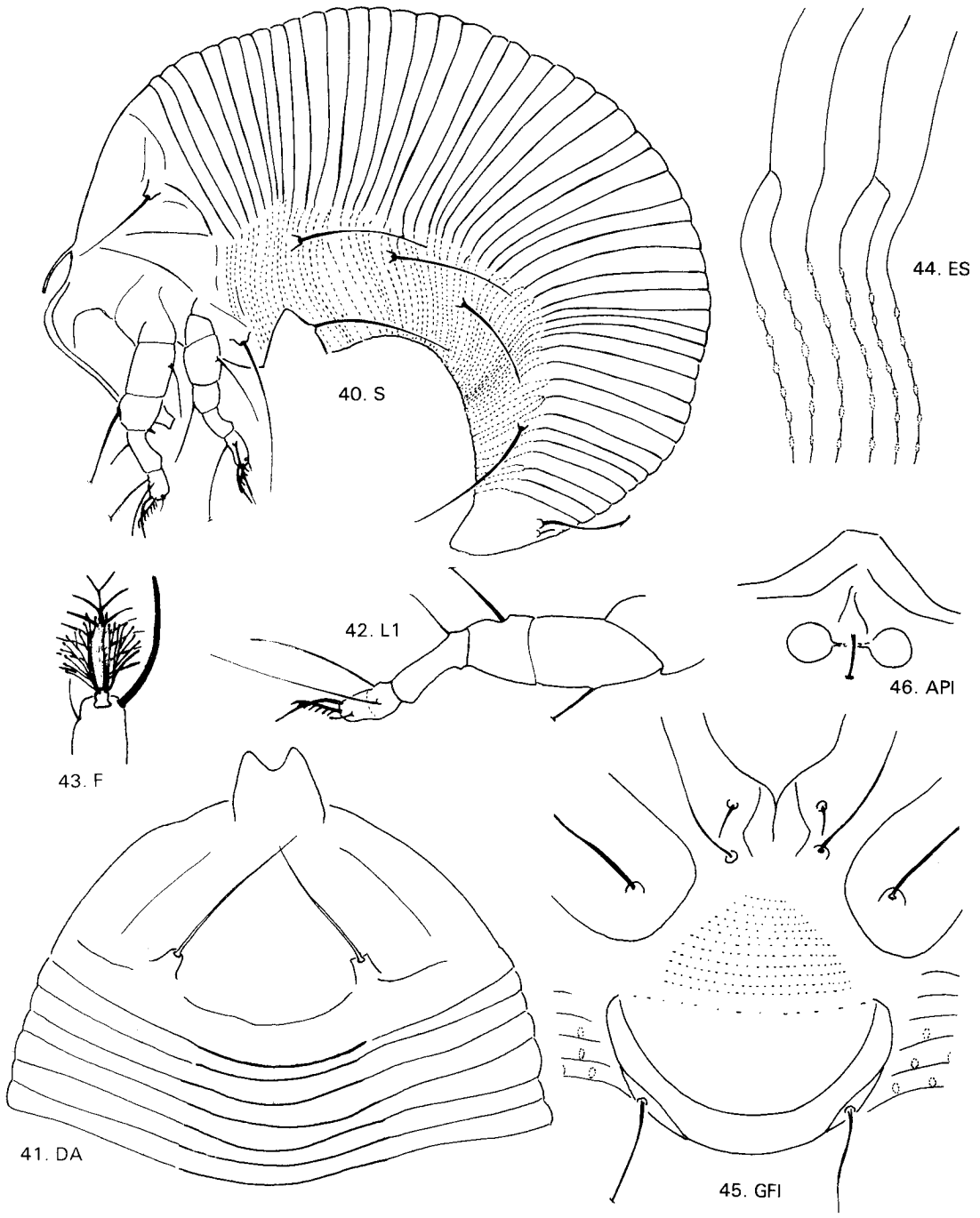


30. GFI

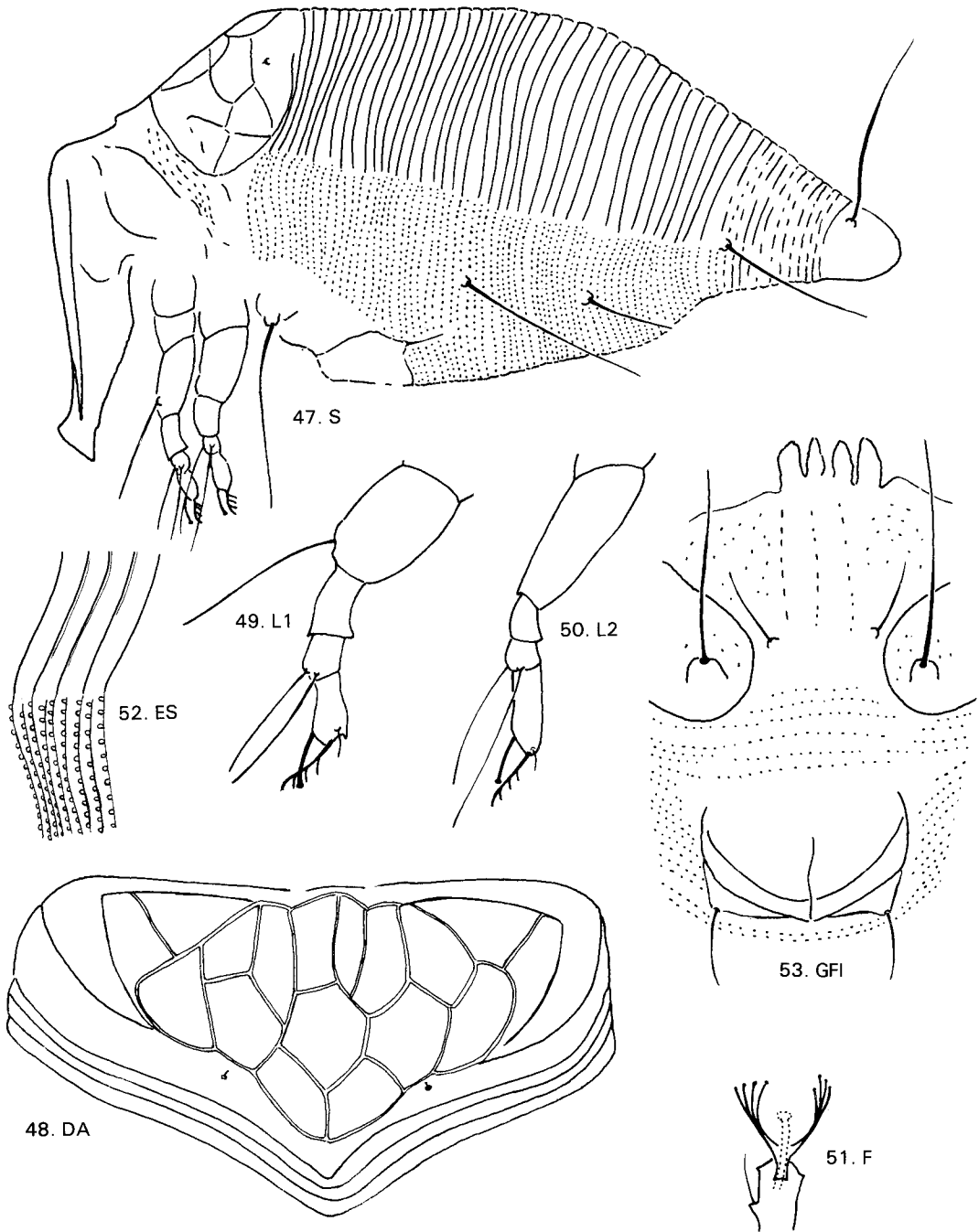
24-31. *Phytoptus rufensis*



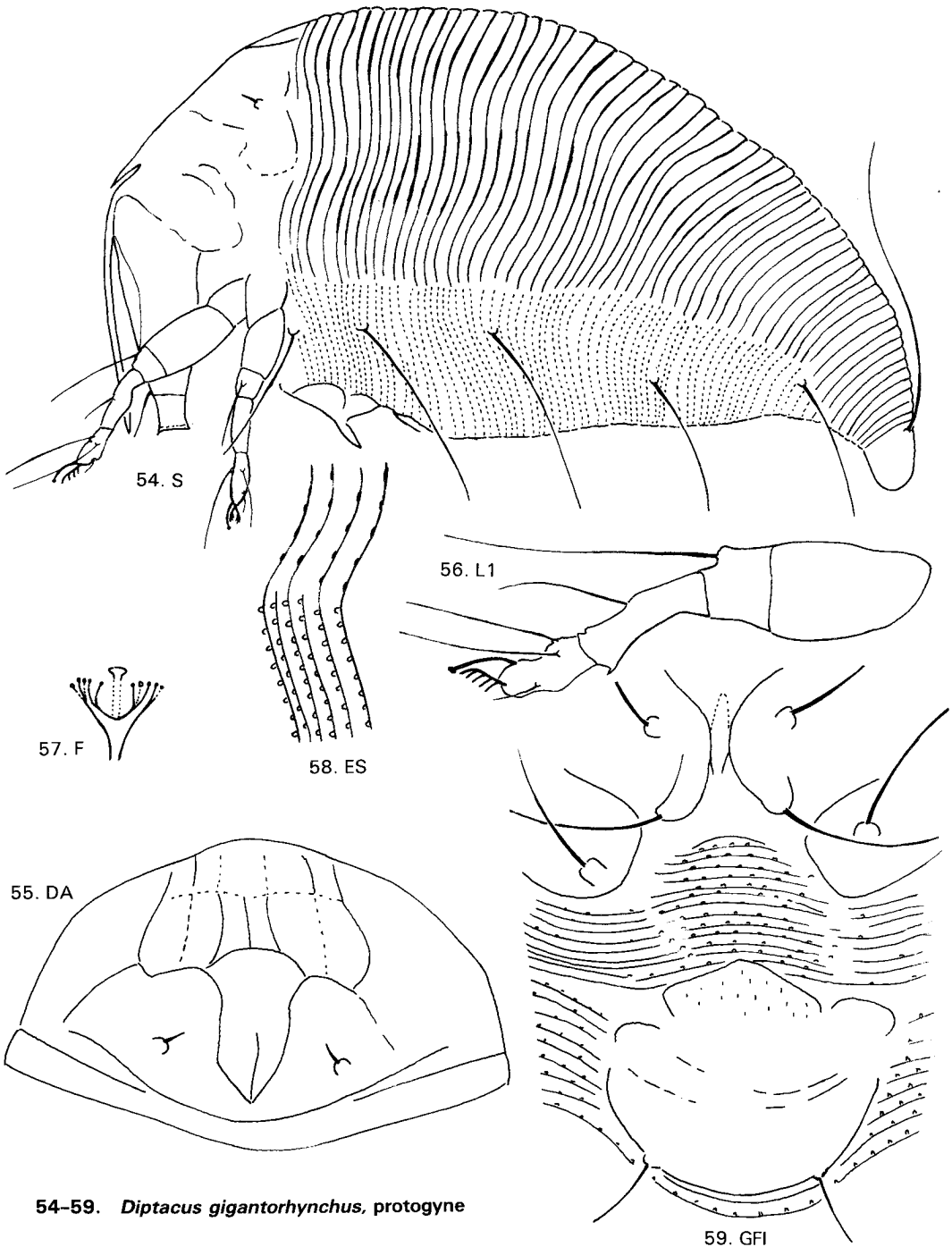
32-39. *Brevulacus reticulatus*, protozyne



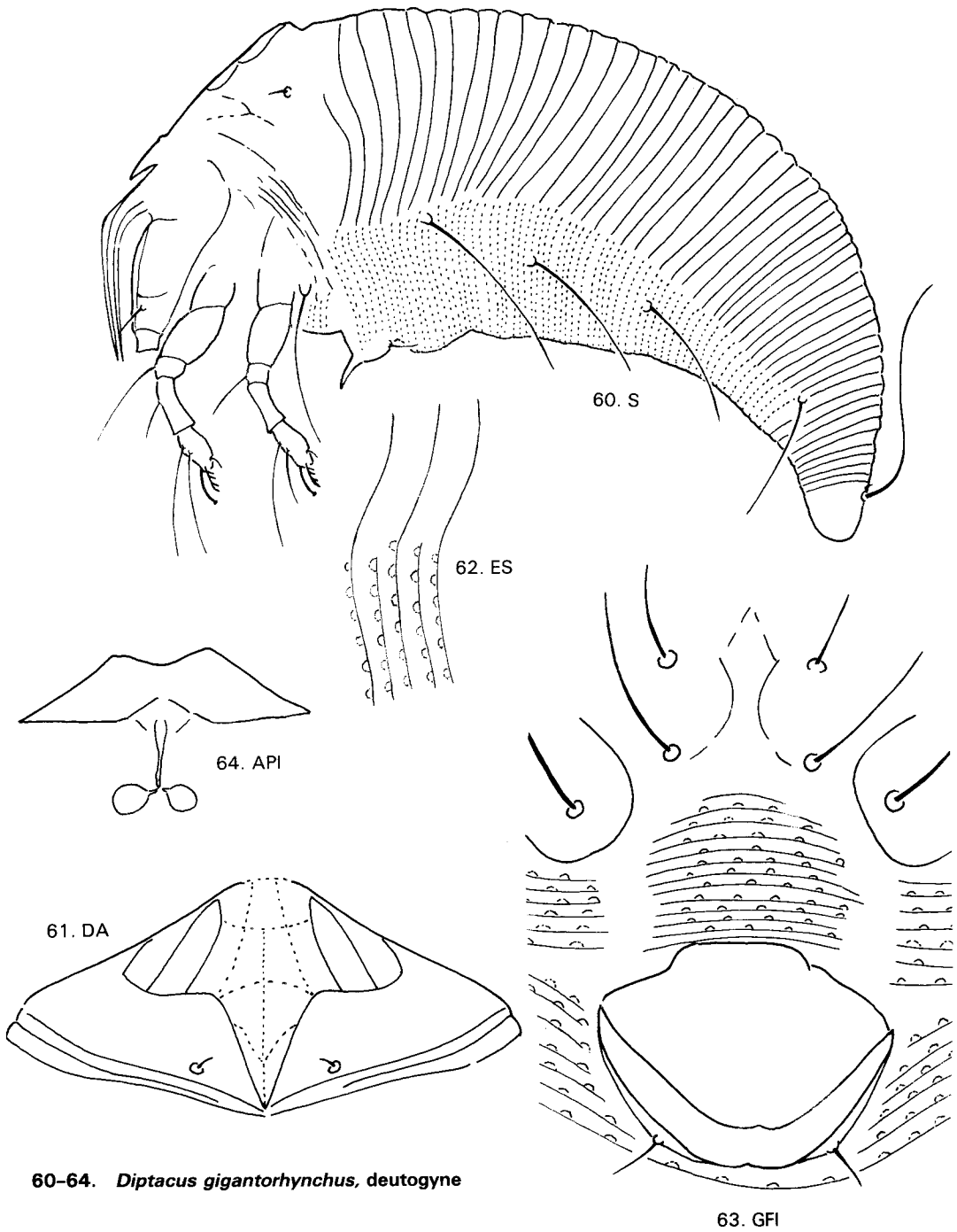
40-46. *Brevulacus reticulatus*, deutogyne



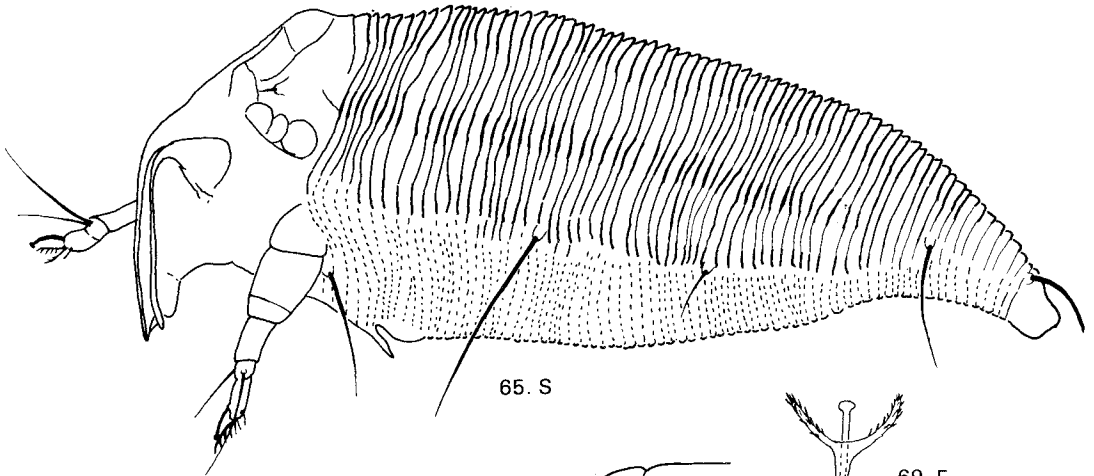
47-53. *Dacundiopus stylosus*



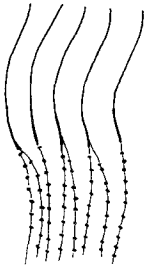
54-59. *Diptacus gigantorhynchus*, protogyne



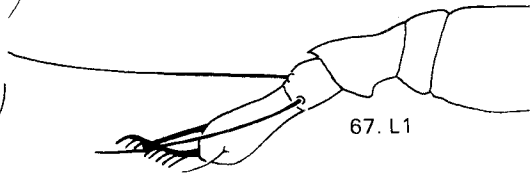
60-64. *Diptacus gigantorhynchus*, deutogyne



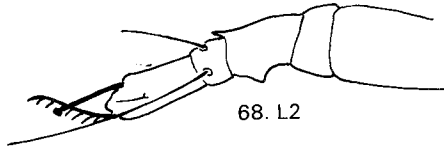
65. S



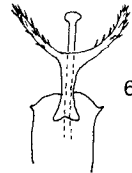
70. ES



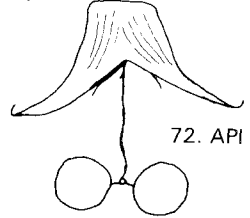
67. L1



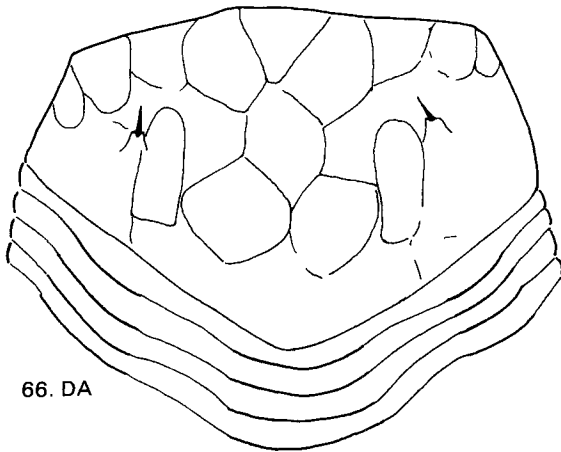
68. L2



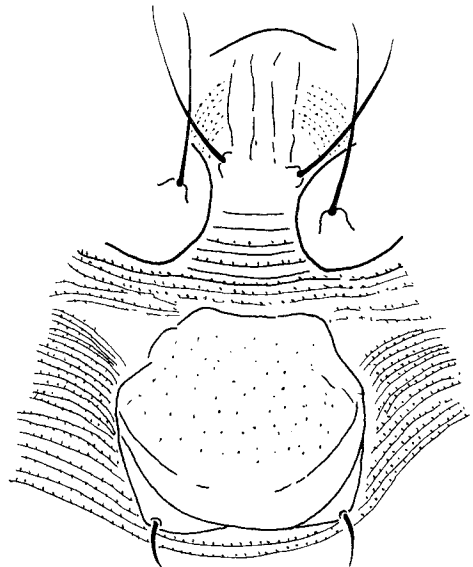
69. F



72. API

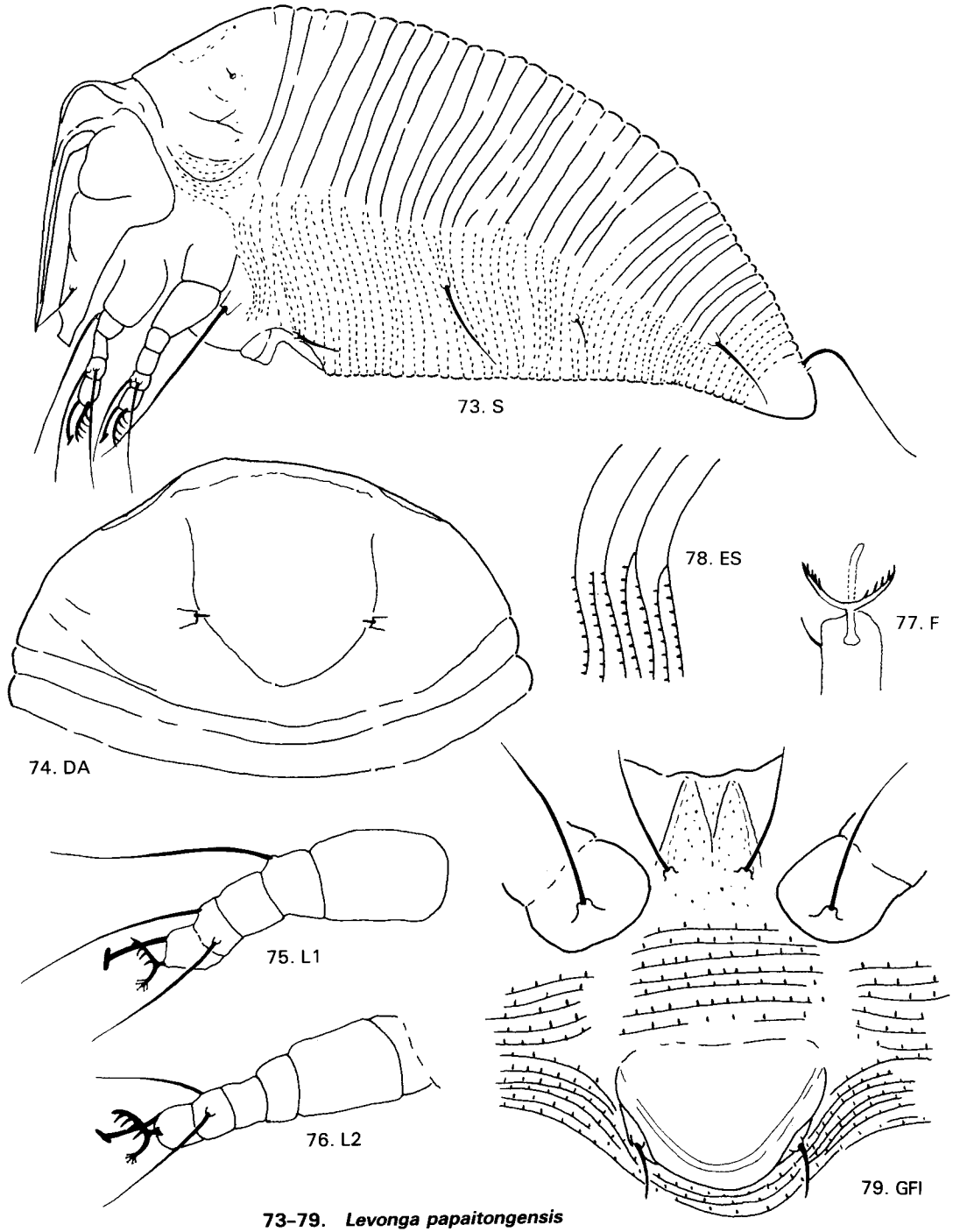


66. DA

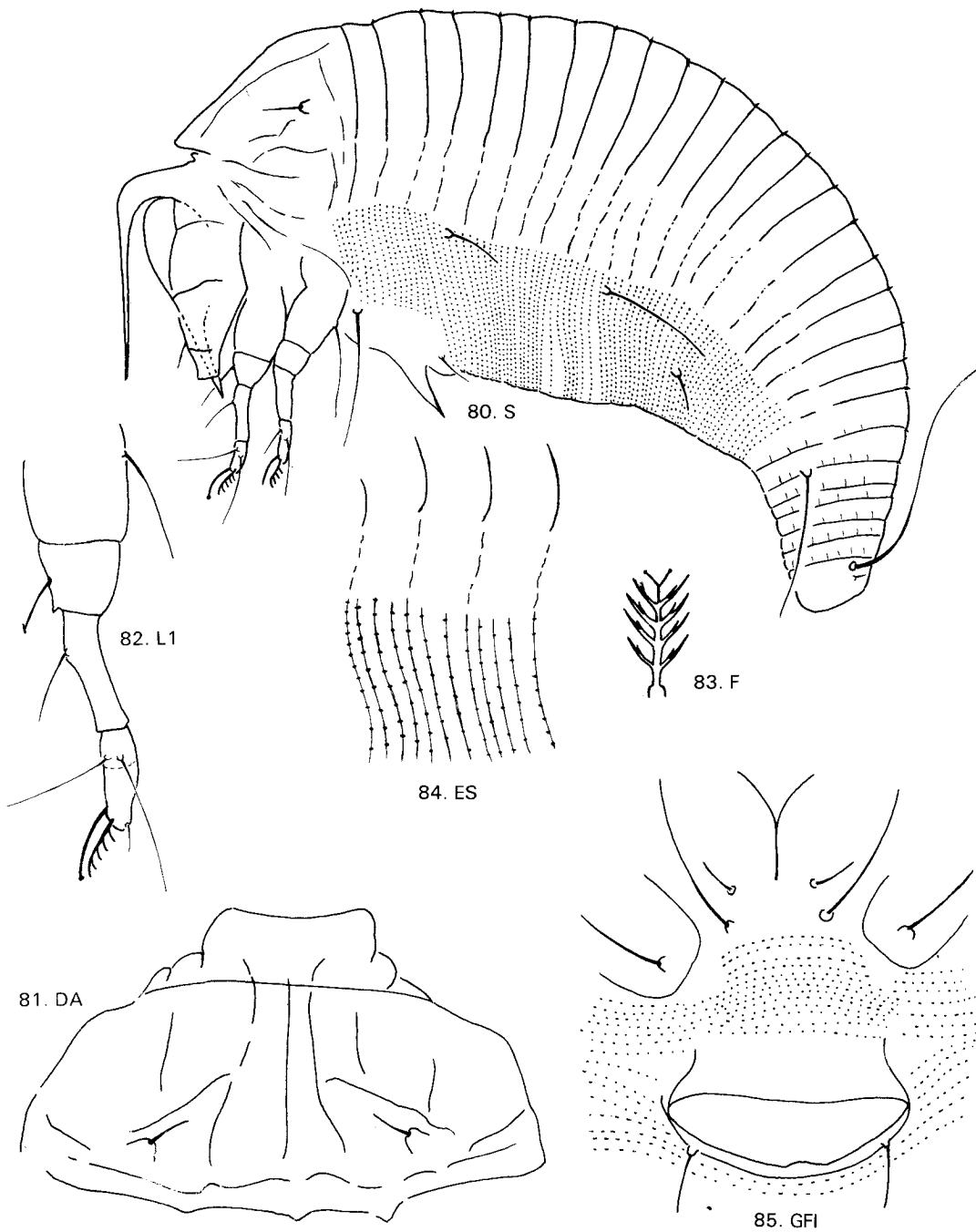


71. GFI

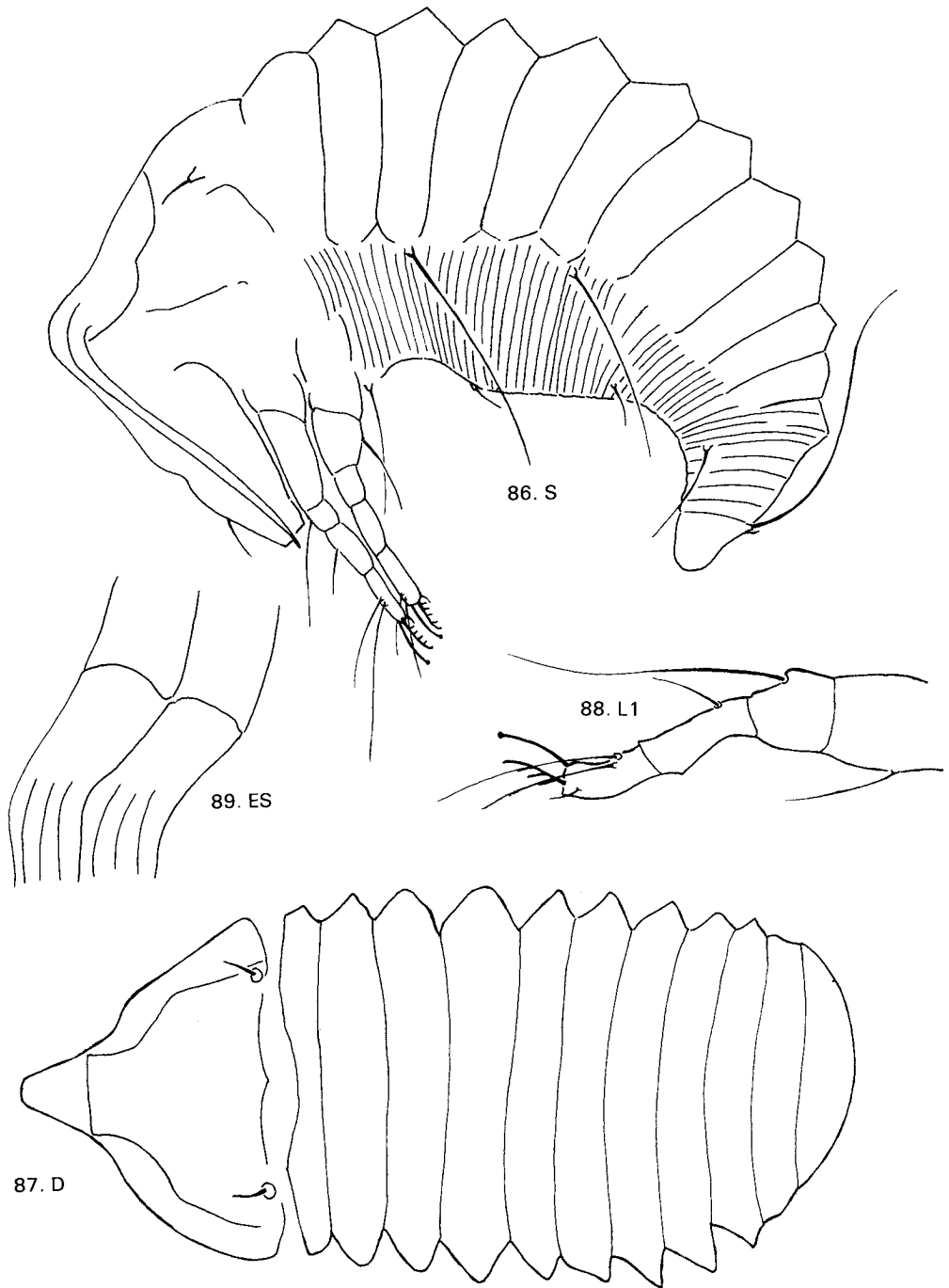
65-72. *Lambella cerina*



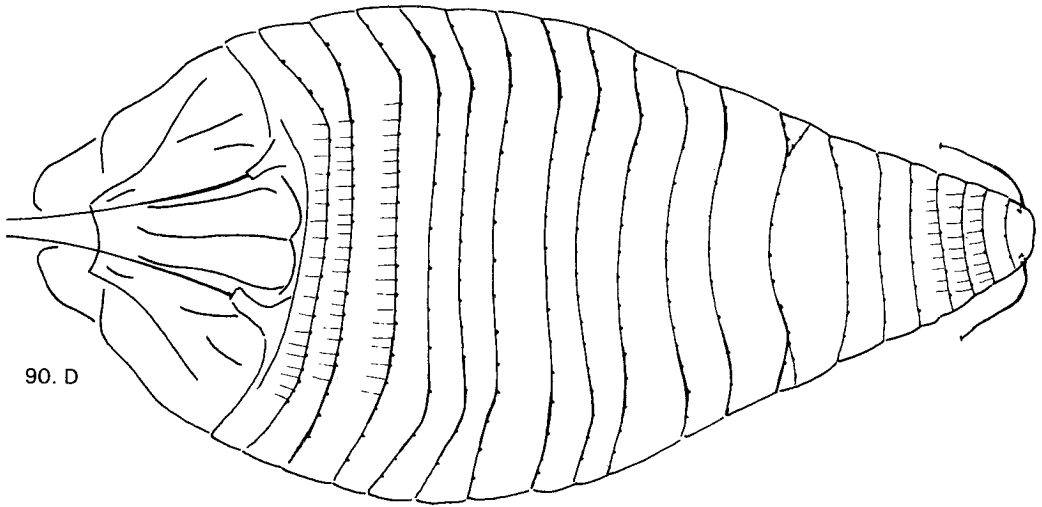
73-79. *Levonga papaitongensis*



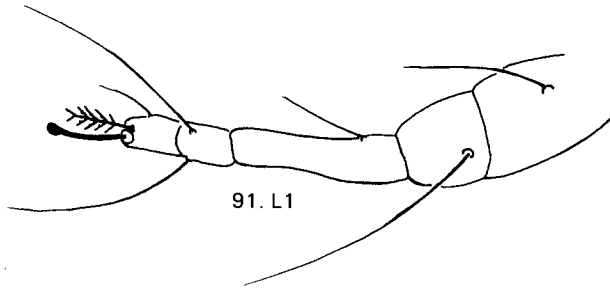
80-85. *Abacoptes ulmivagrans*, protogyne



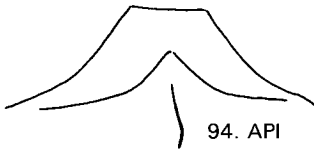
86-89. *Abacoptes ulmivagrans*, deutogyne



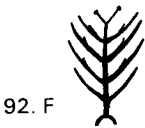
90. D



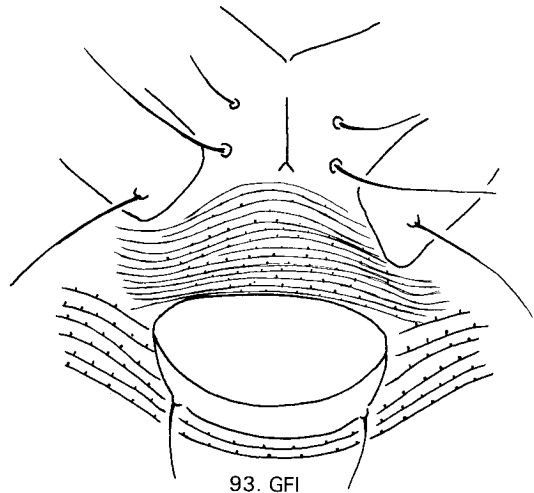
91. L1



94. API

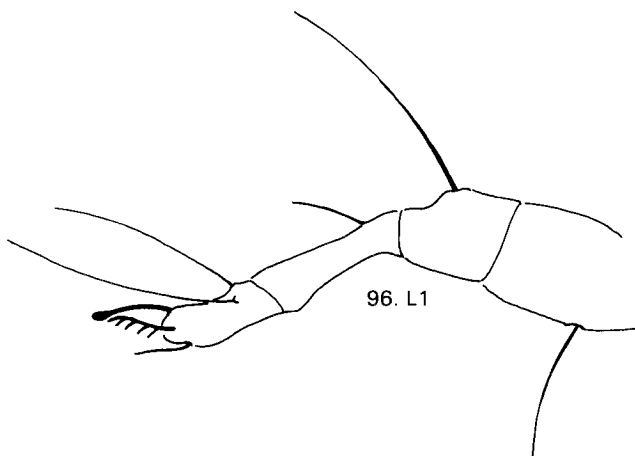
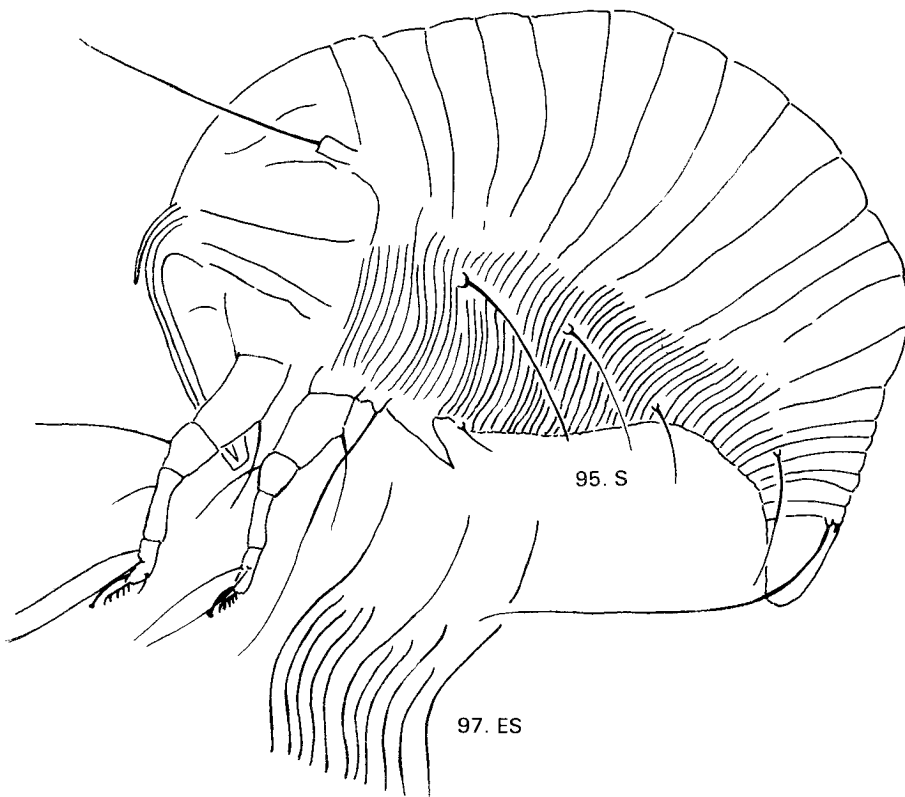


92. F

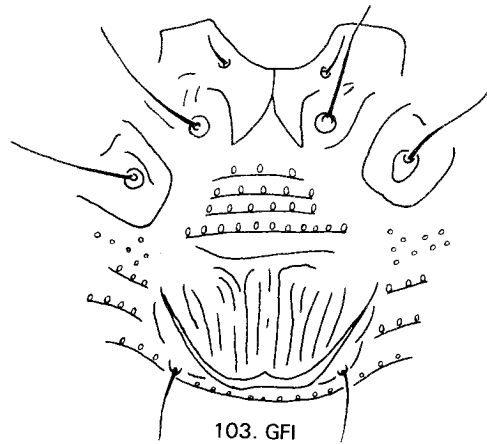
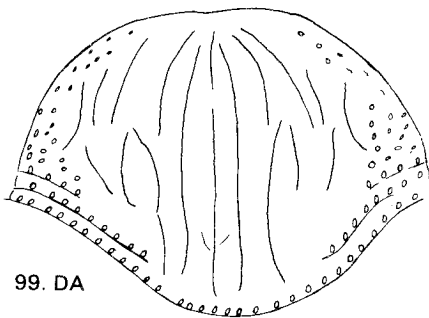
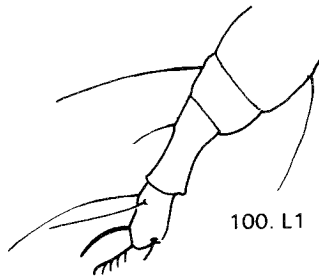
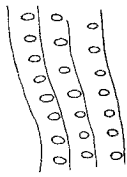
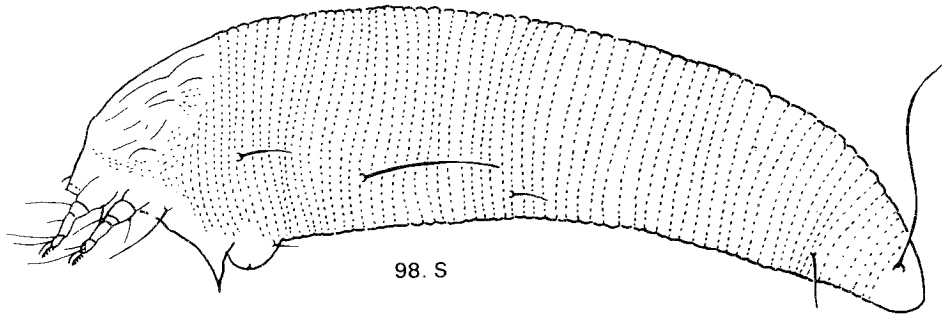


93. GFI

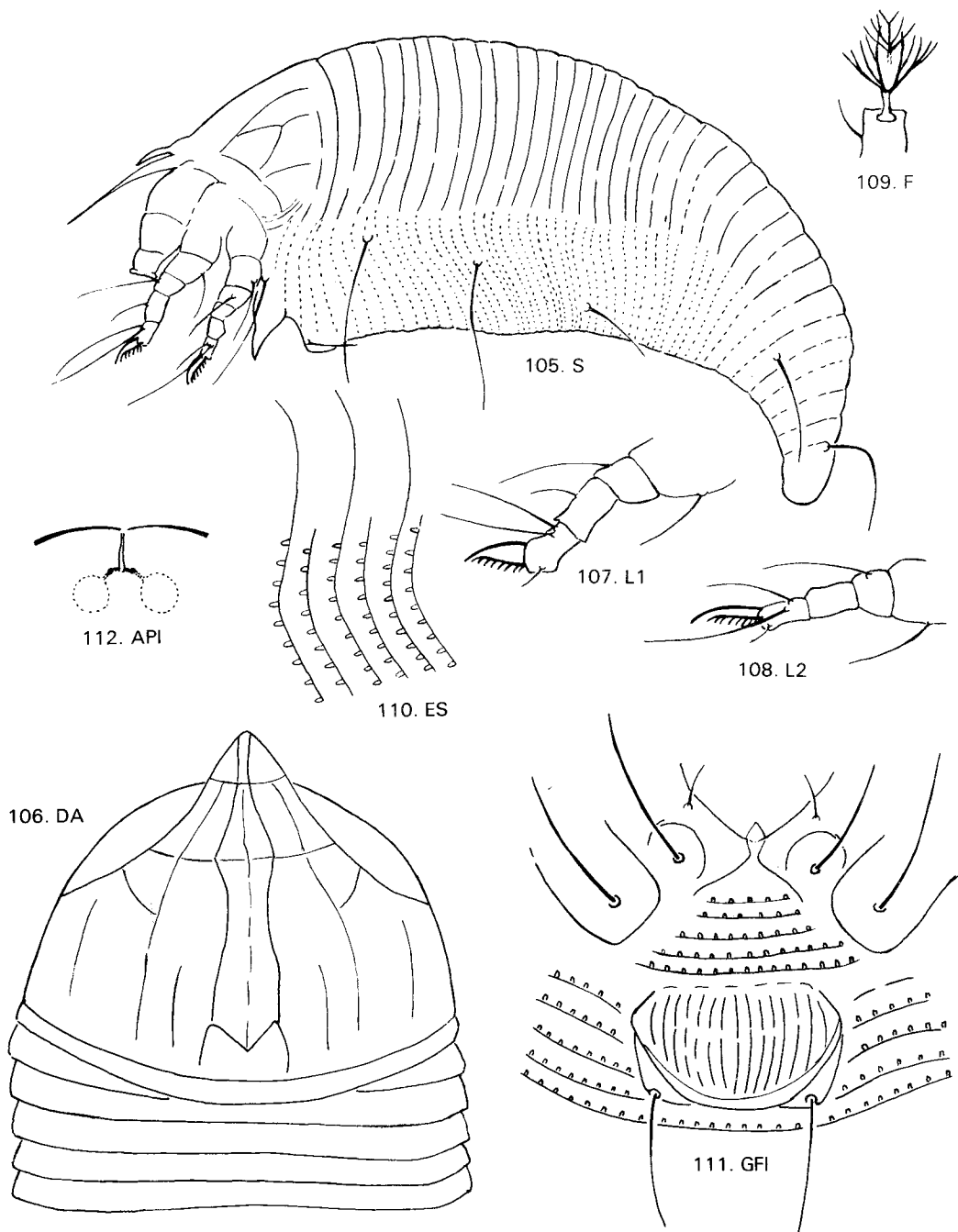
90-94. *Rhynchophytoptus fagacis*, protogyne



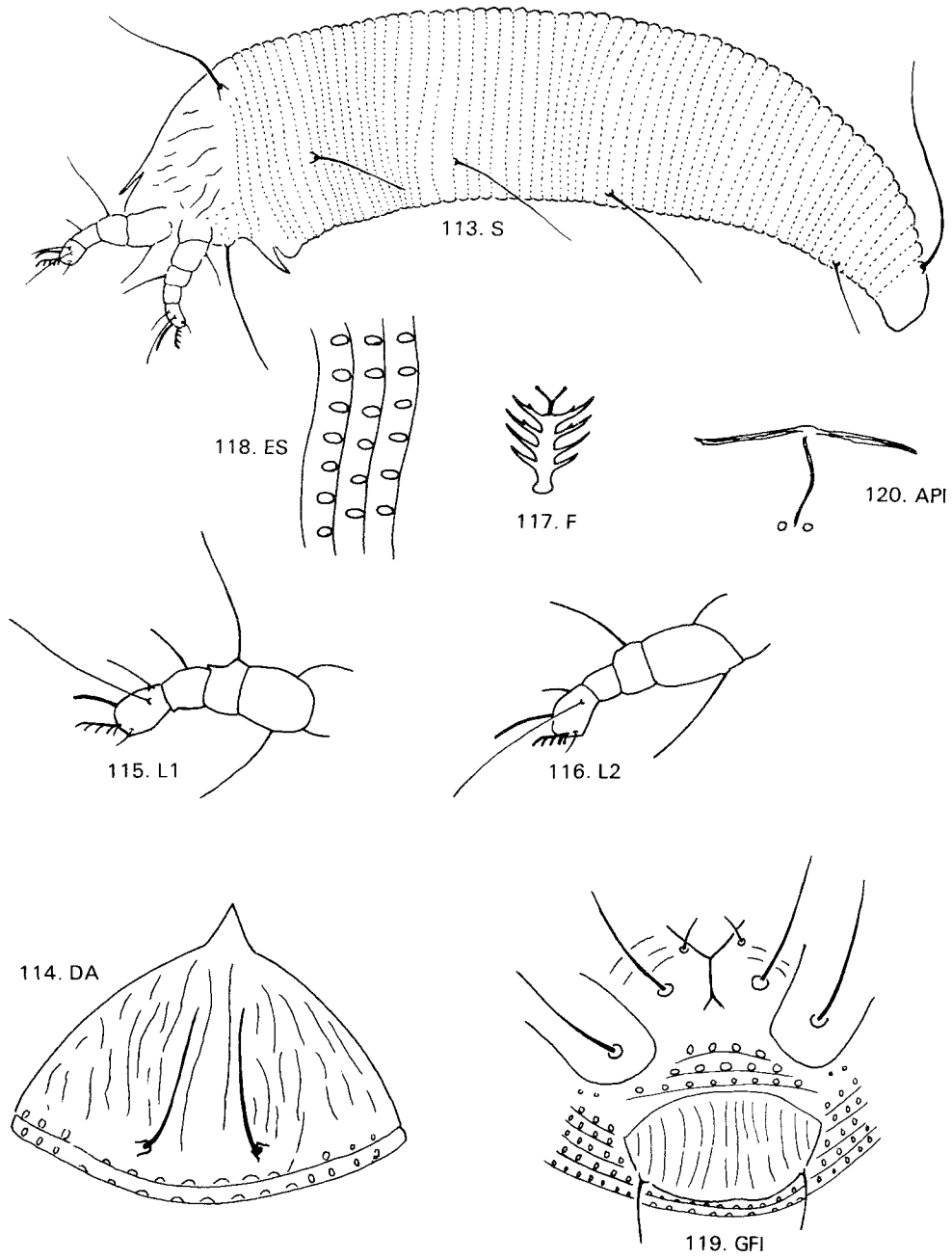
95-97. *Rhynchophytoptus fagacis*, deutogyne

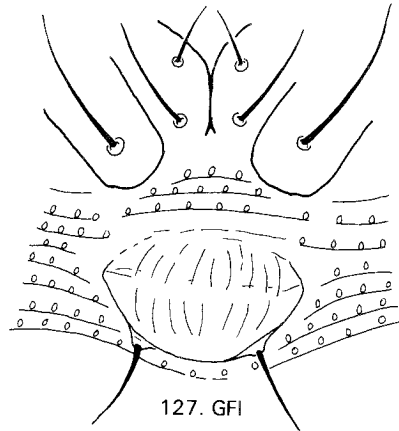
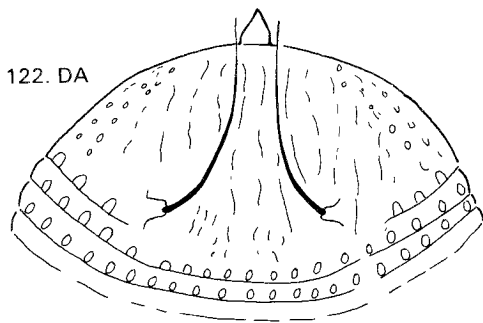
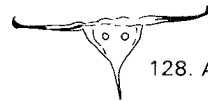
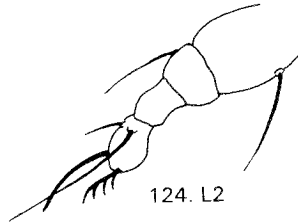
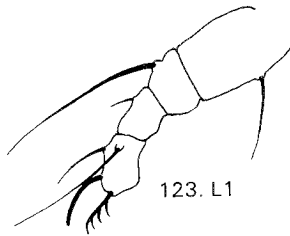
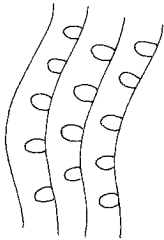
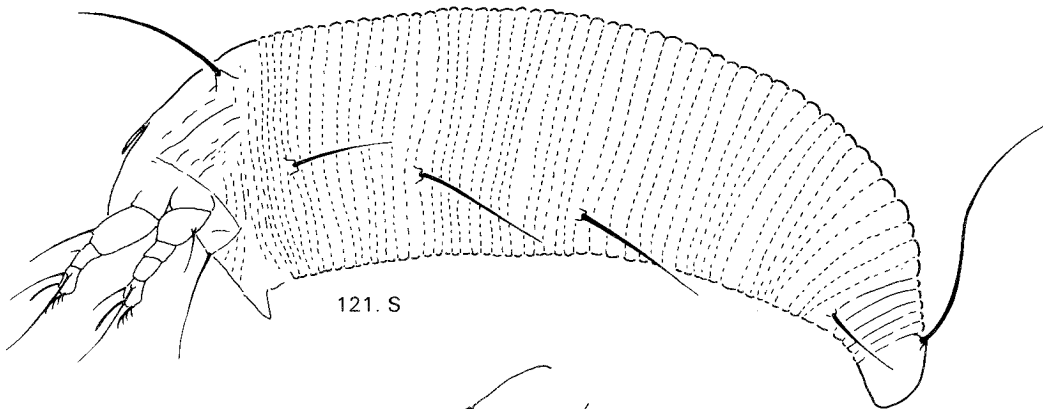


98-104. *Cecidophyopsis ribis*

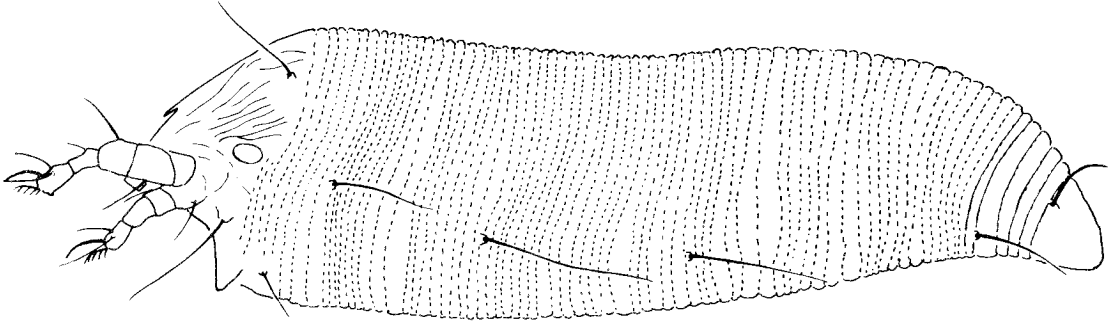


105-112. *Chrecidus quercipodus*

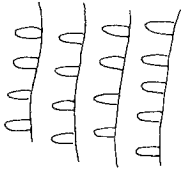




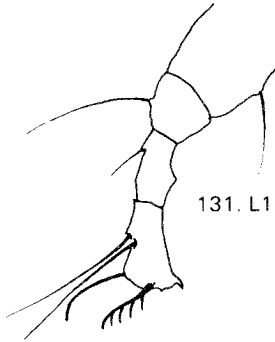
121-128. *Colomerus nudi*



129. S



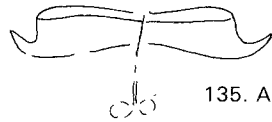
133. ES



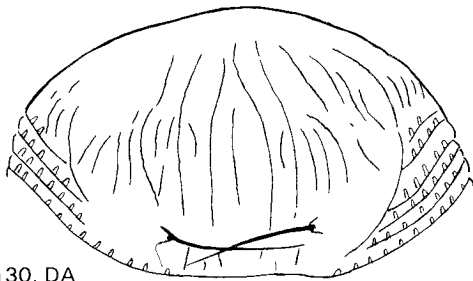
131. L1



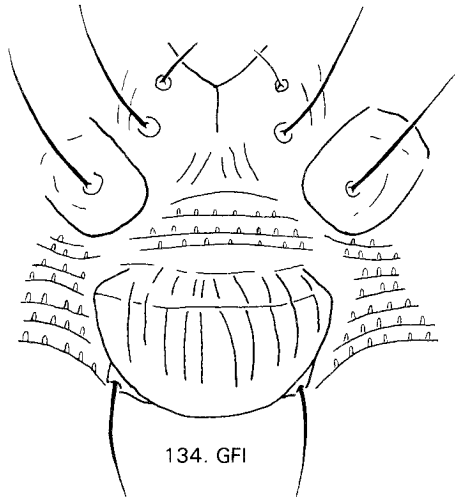
132. F



135. API

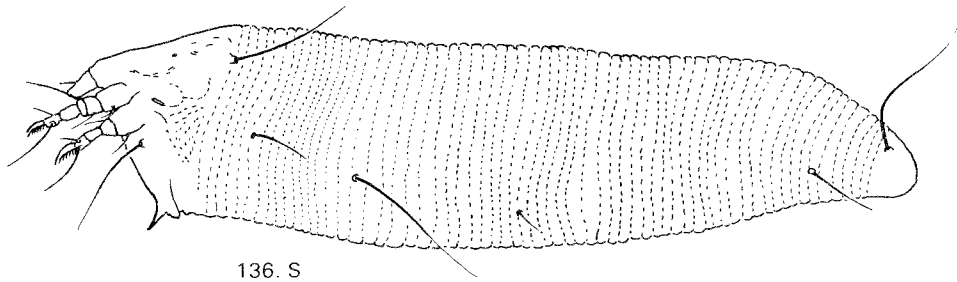


130. DA

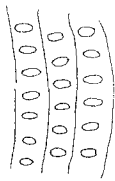


134. GFI

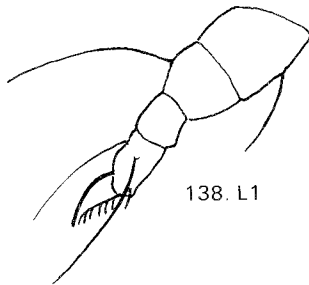
129-135. *Colomerus vitis*



136. S



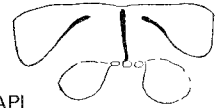
140. ES



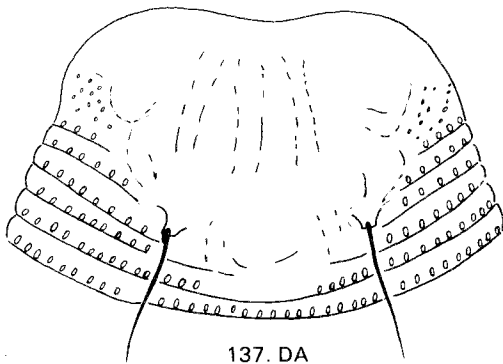
138. L1



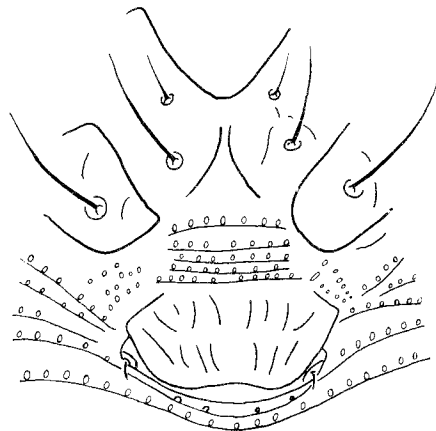
139. F



142. API

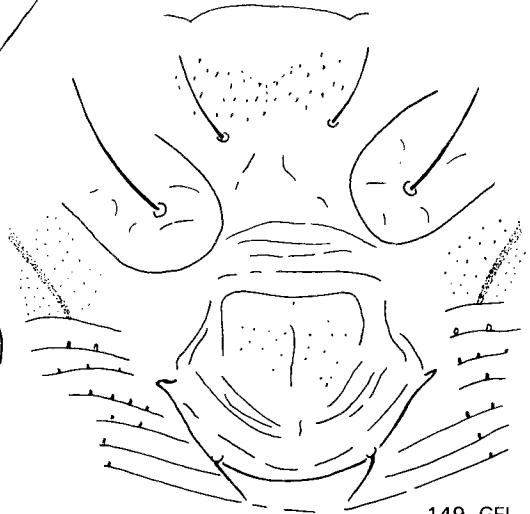
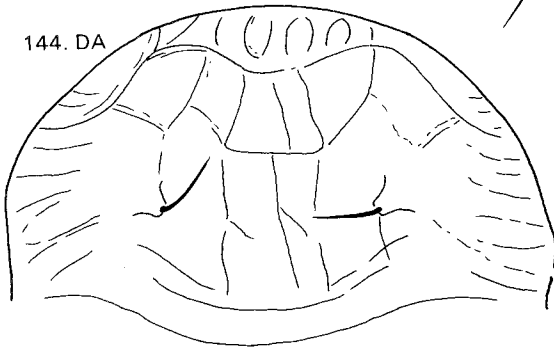
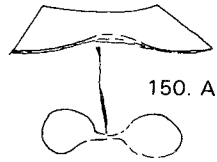
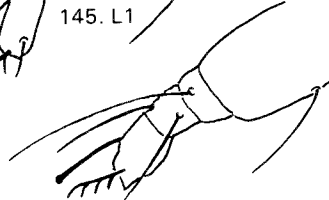
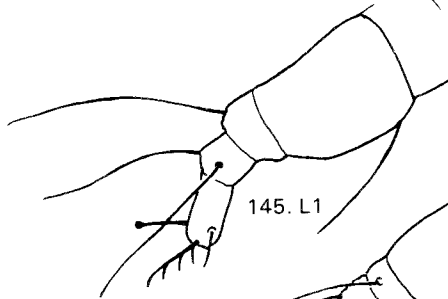
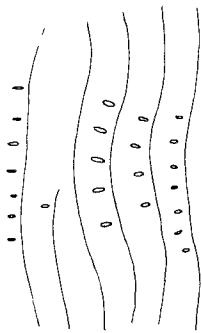
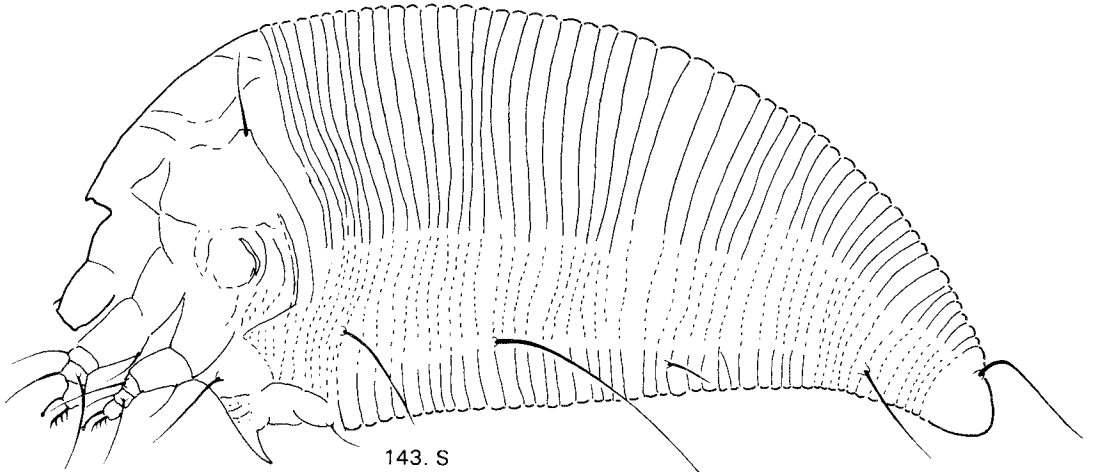


137. DA

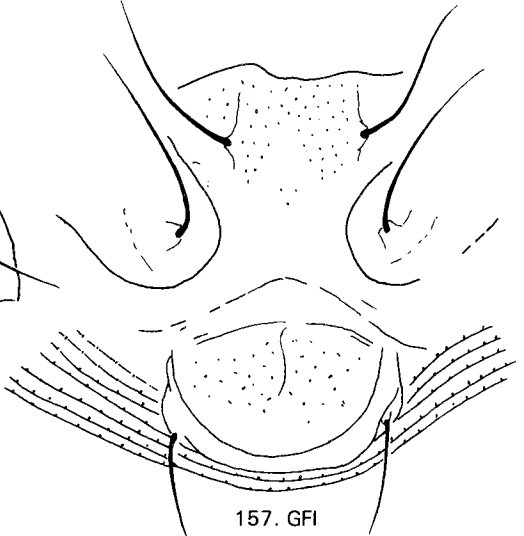
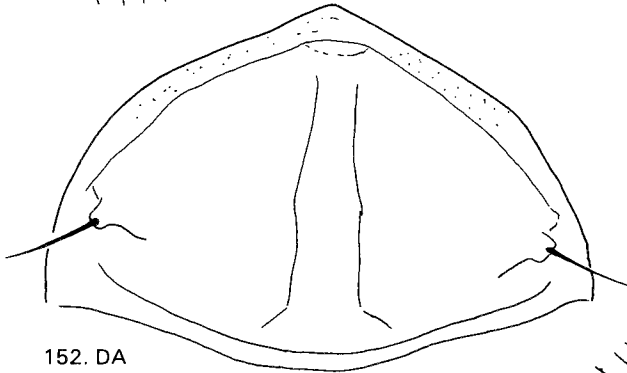
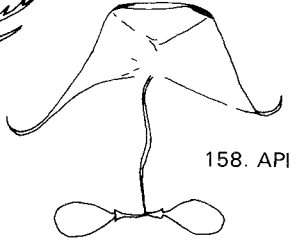
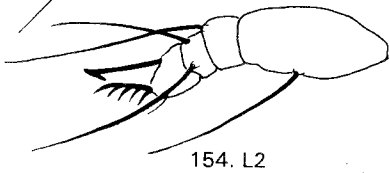
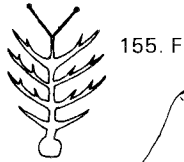
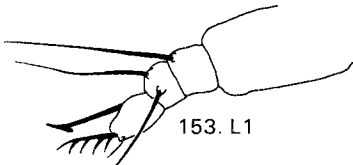
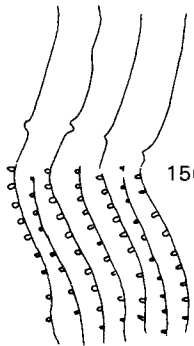
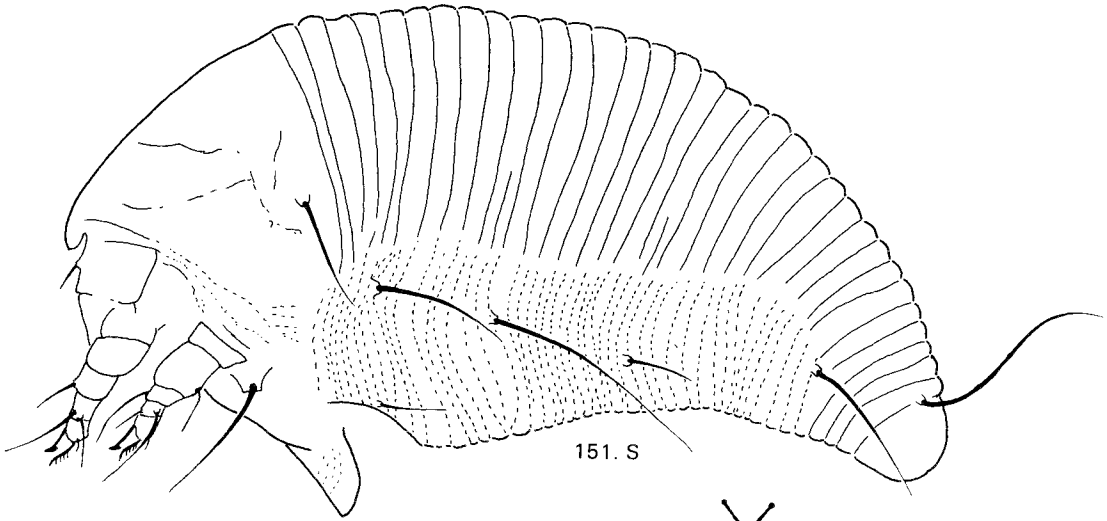


141. GFI

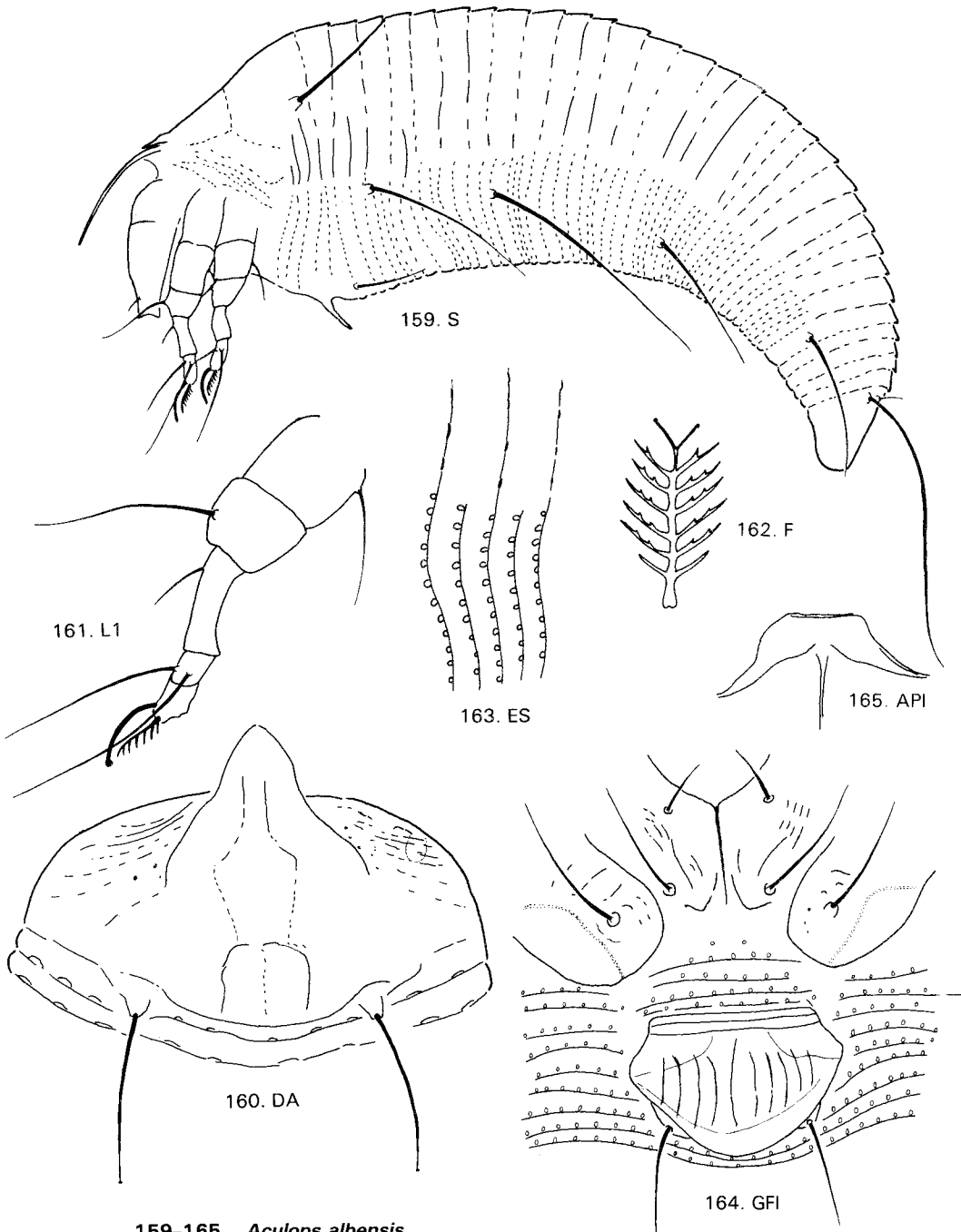
136-142. *Cosetacus camelliae*



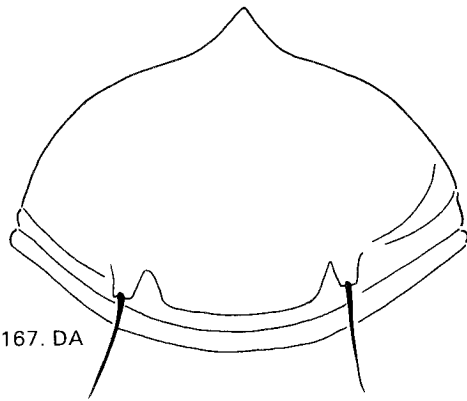
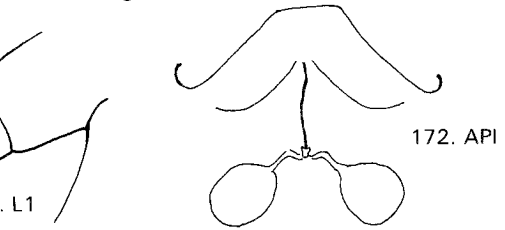
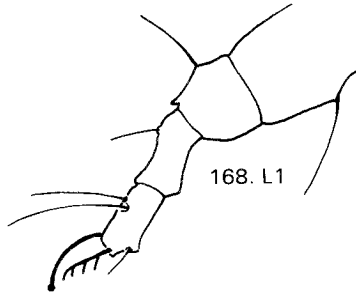
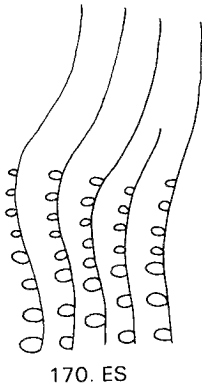
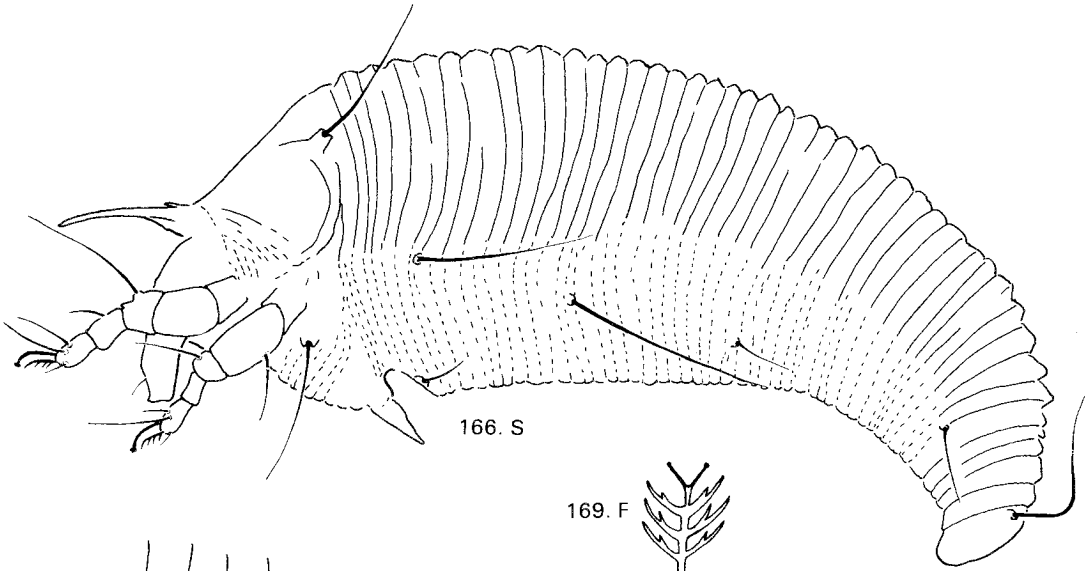
143-150. *Cosella simplicis*



151-158. *Pangacarus grimaldi*

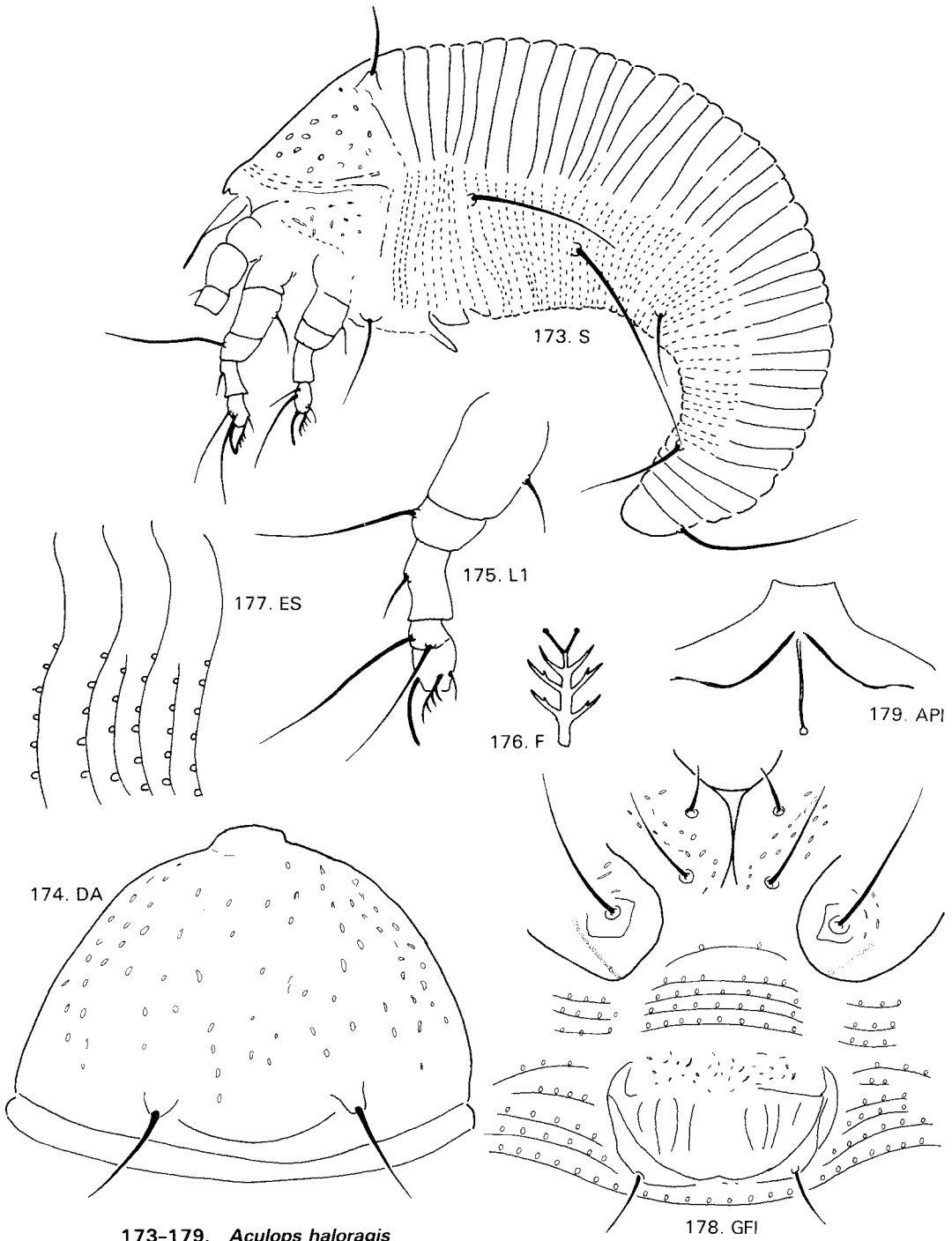


159-165. *Aculops albensis*

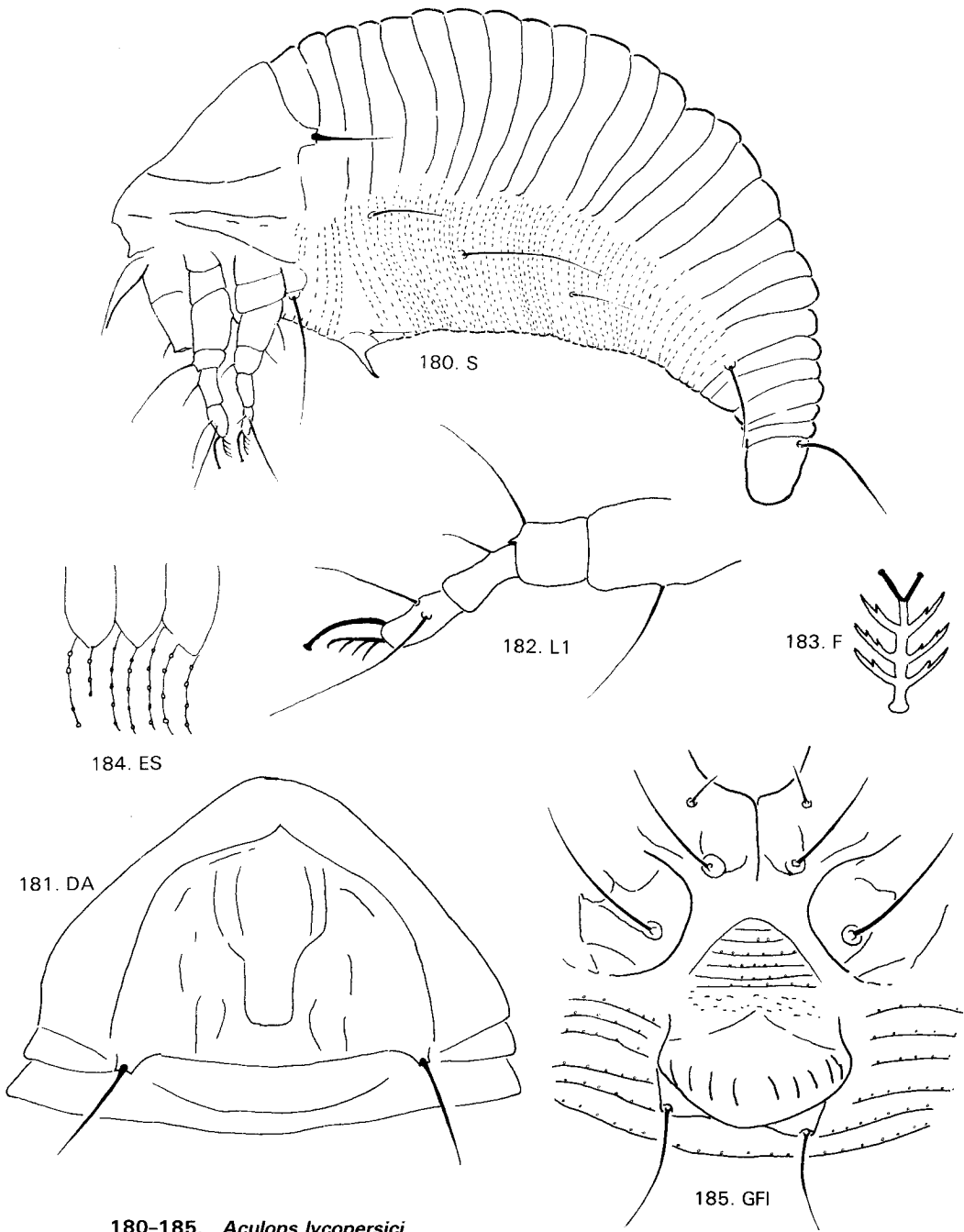


166-172. *Aculops gaultheriae*

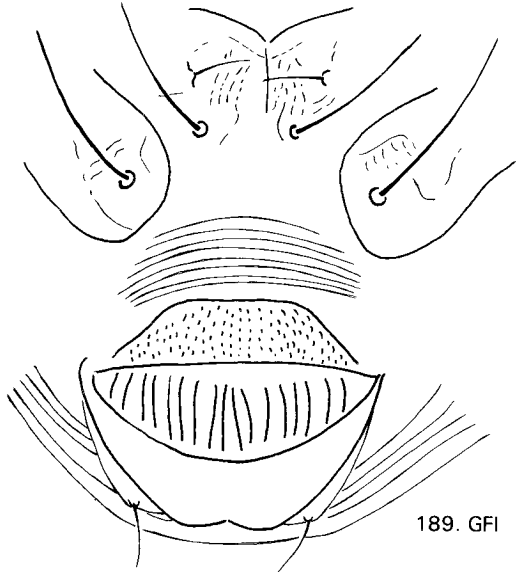
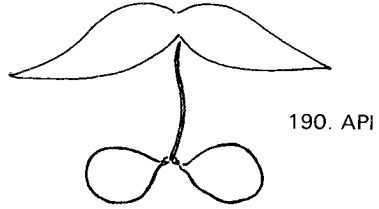
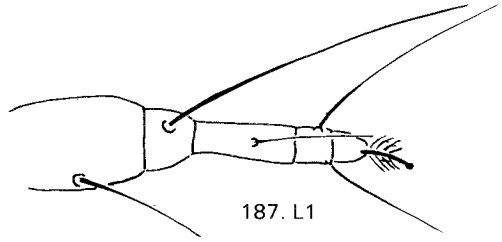
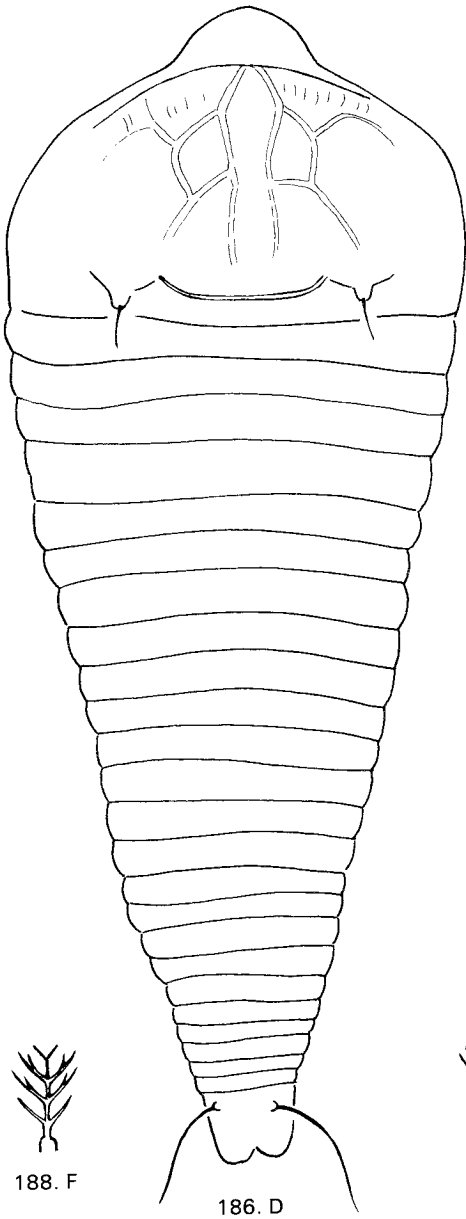
171. GFI



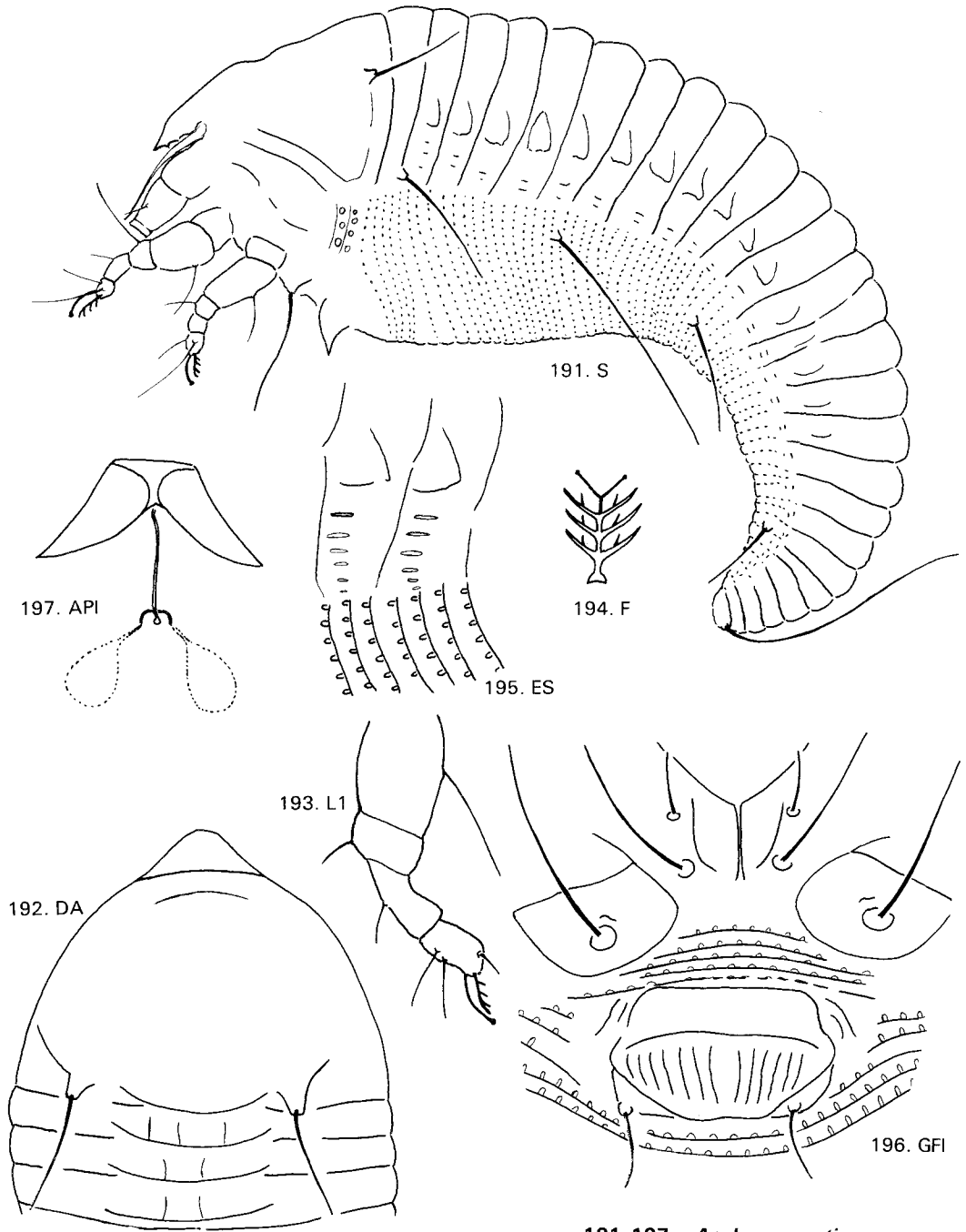
173-179. *Aculops haloragis*



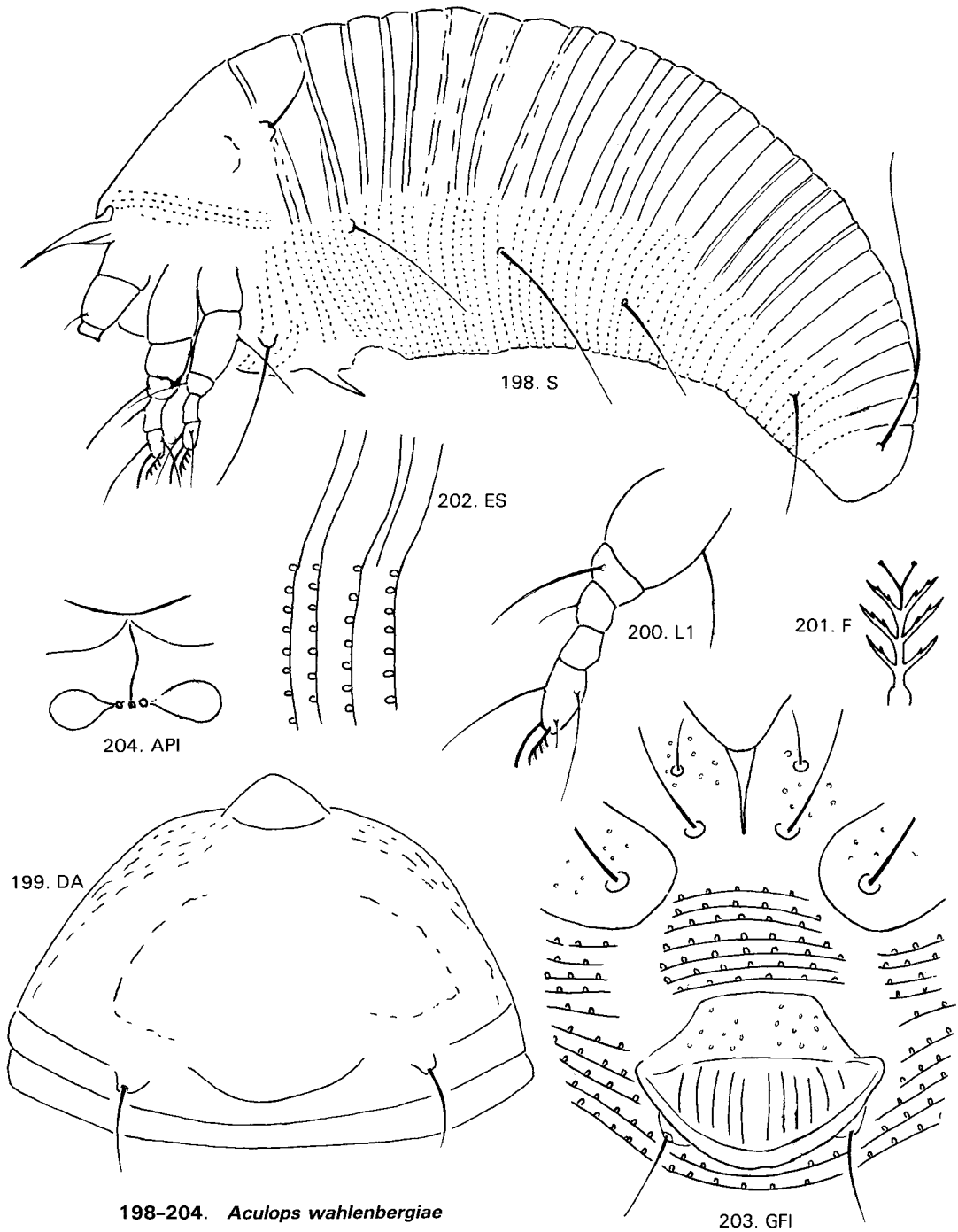
180-185. *Aculops lycopersici*

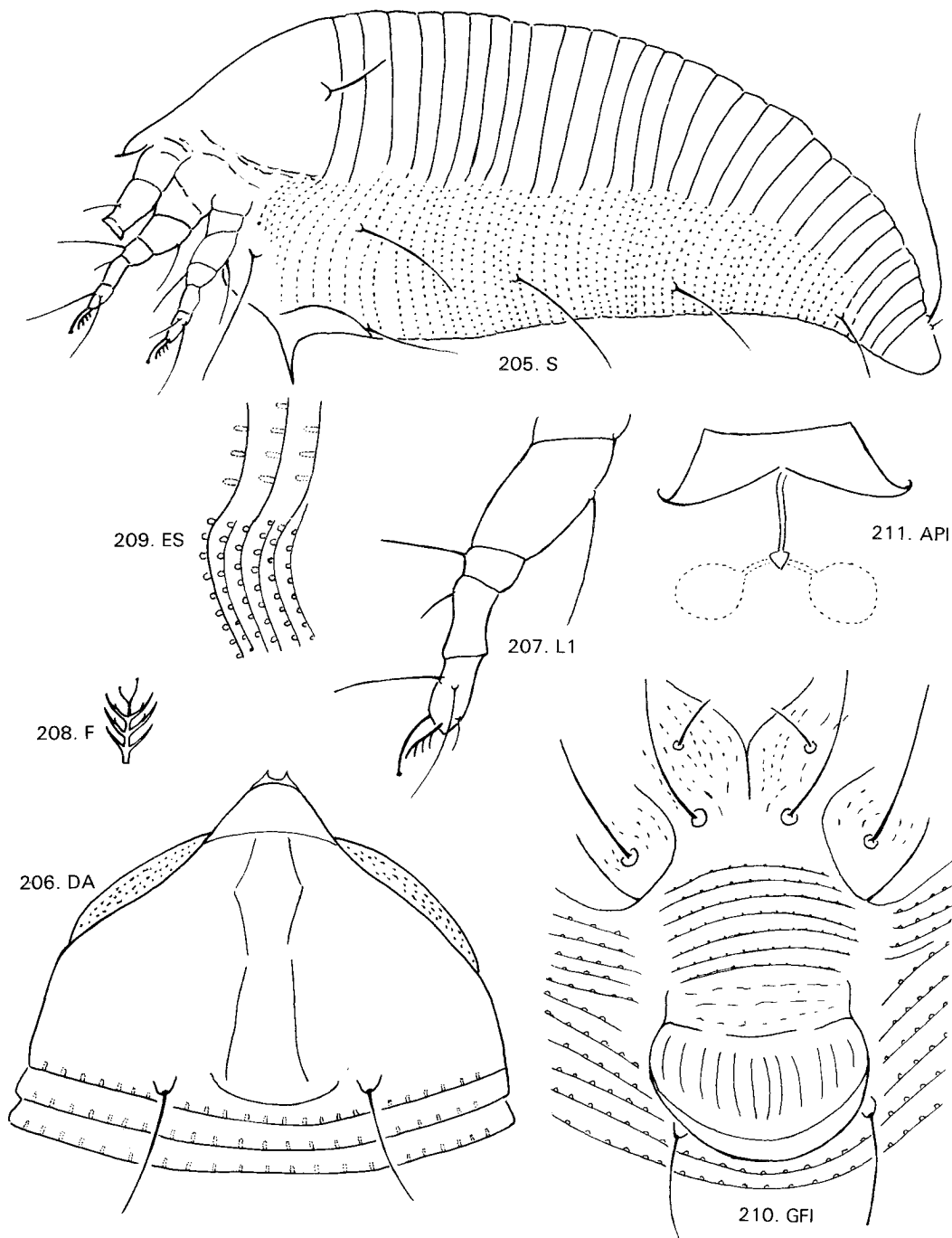


186-190. *Aculops pittospori*

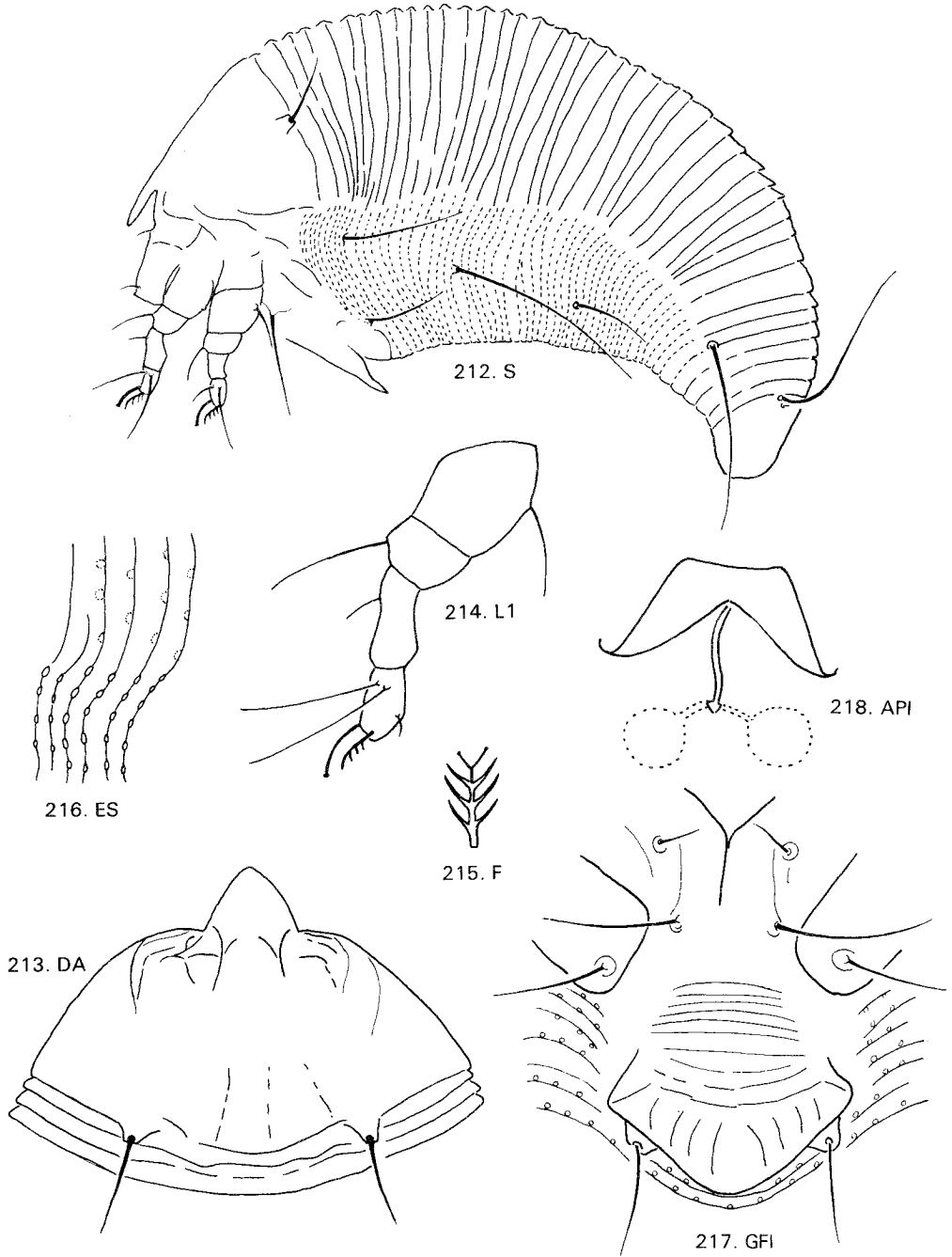


191-197. *Aculops serrati*

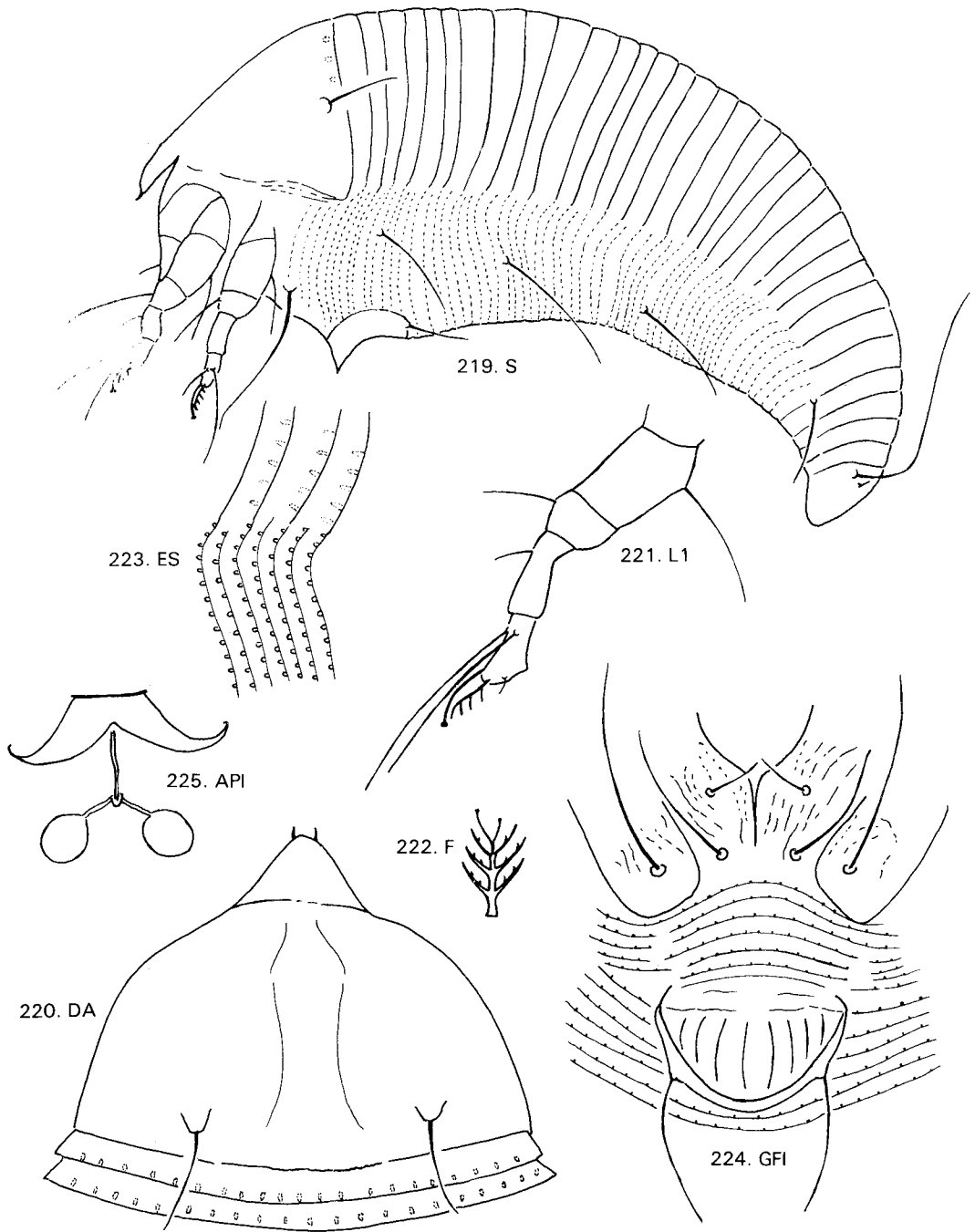




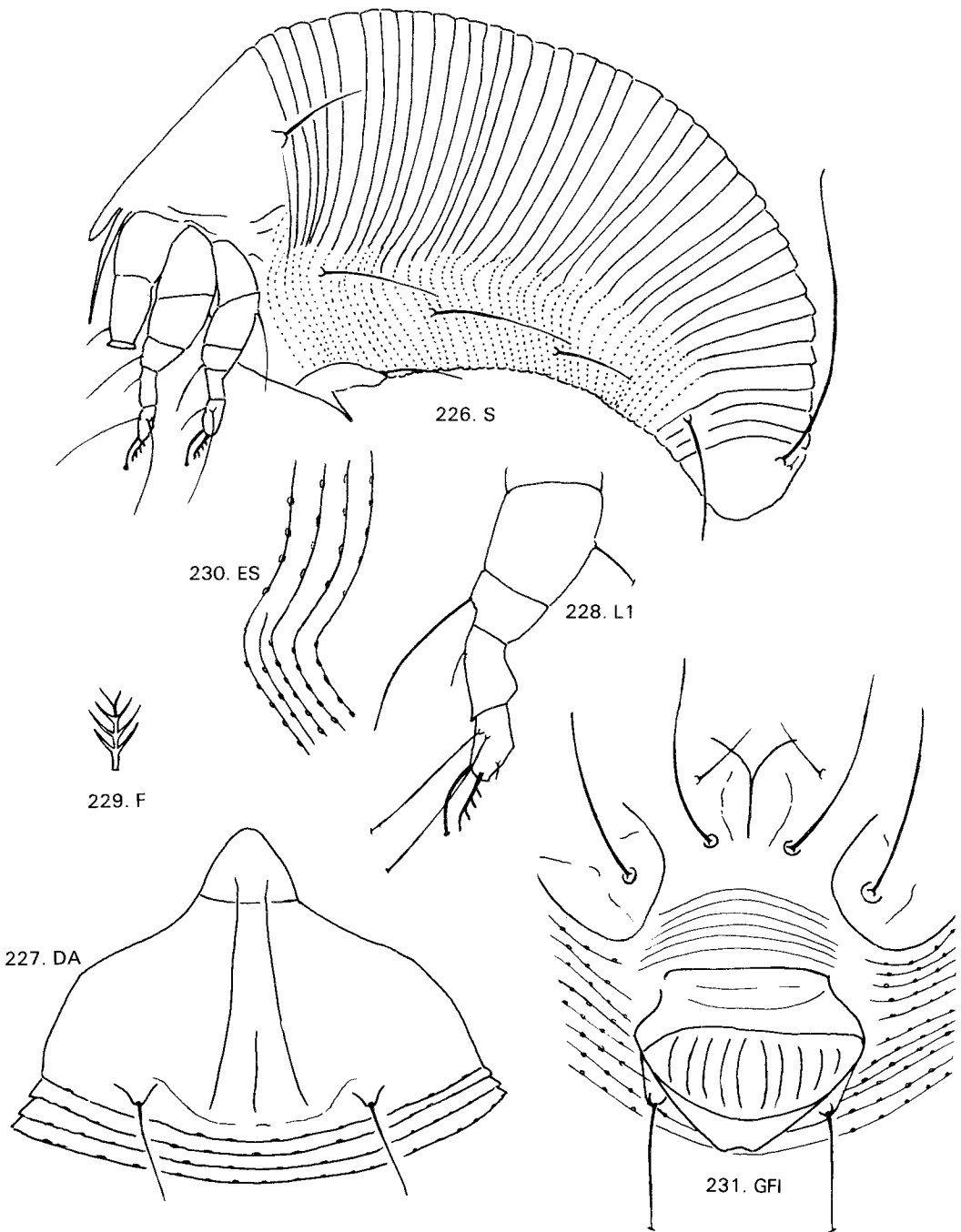
205-211. *Aculus cornutus*, protogyne



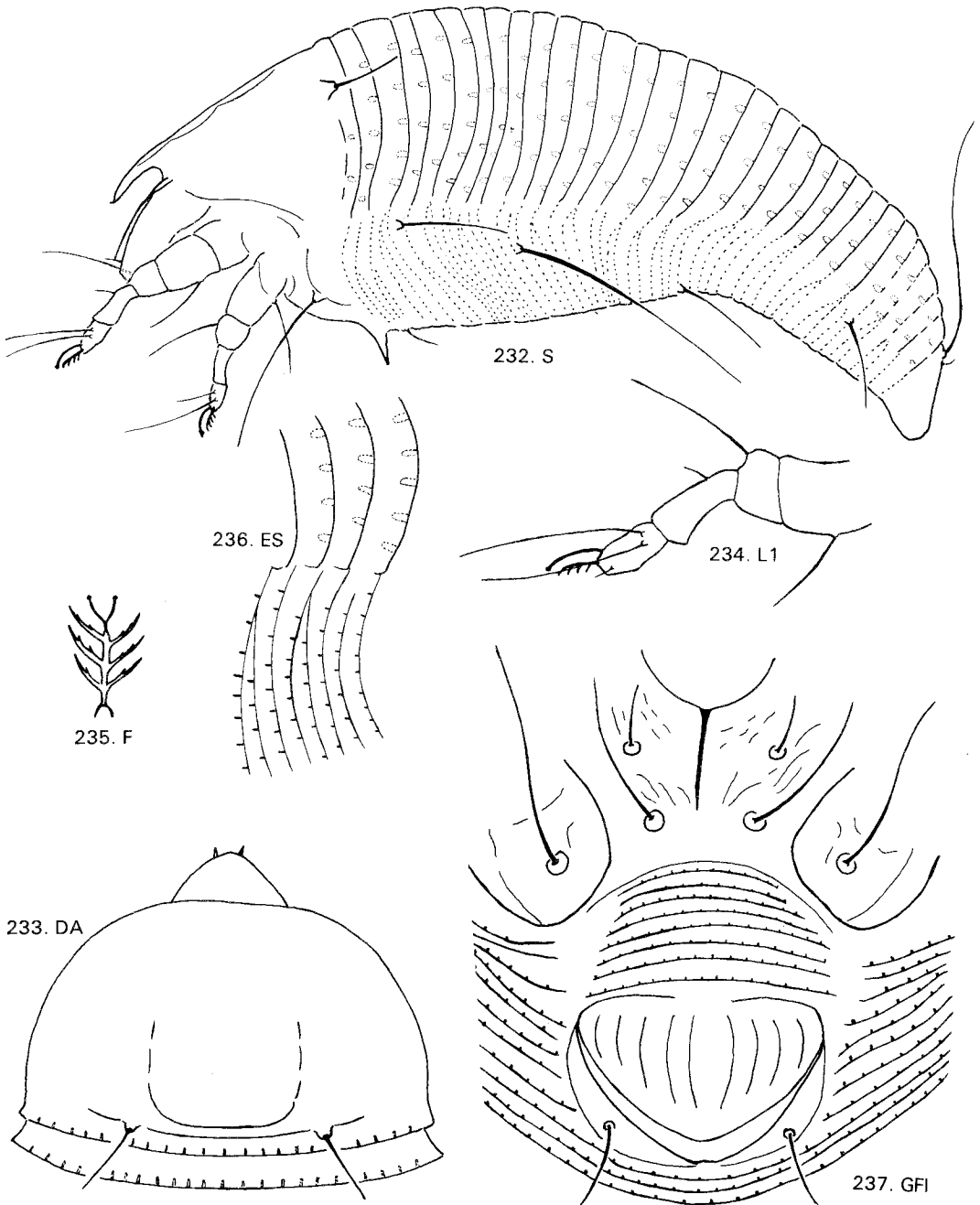
212-218. *Aculus cornutus*, deutogyne



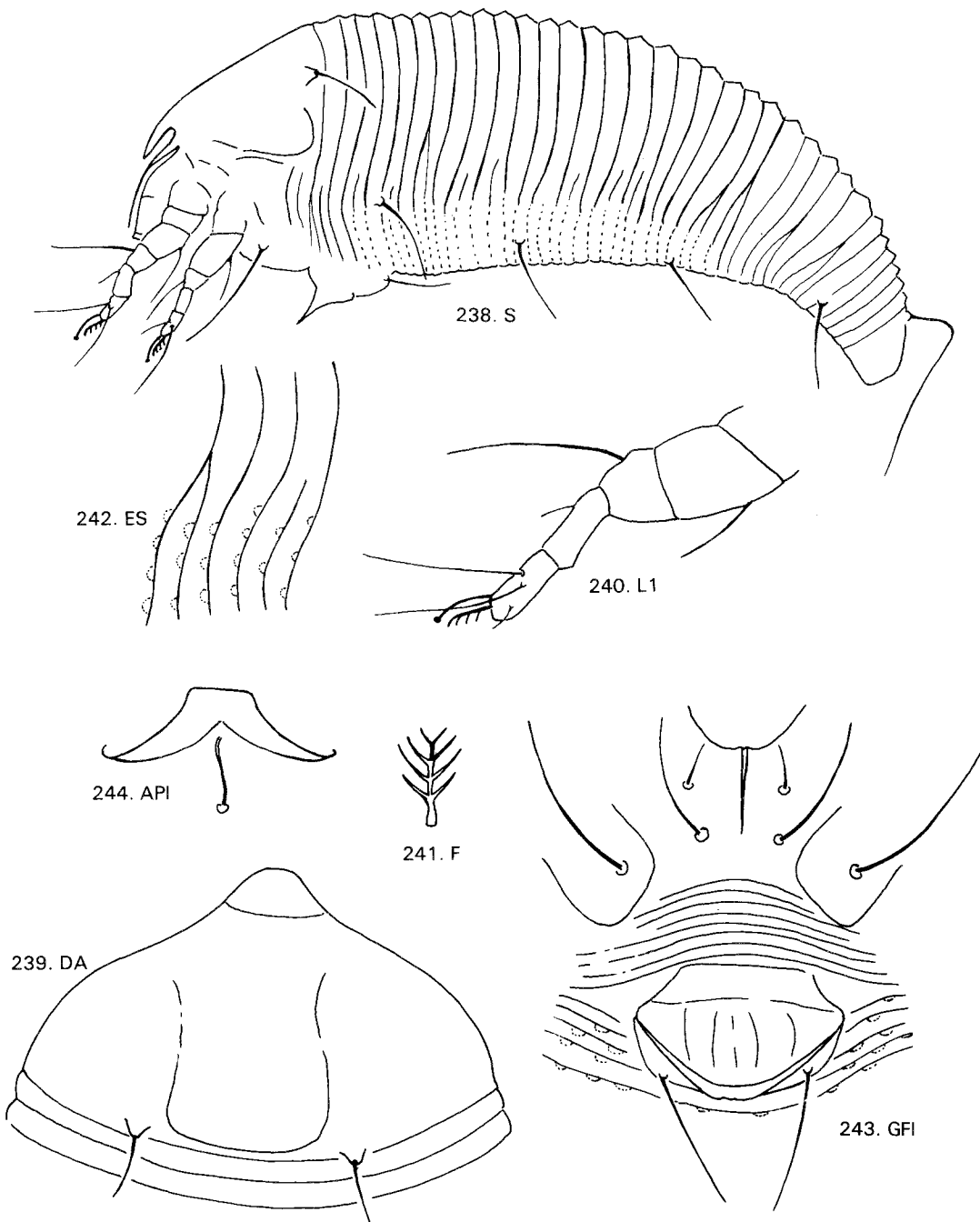
219-225. *Aculus fockeui*, protogyne



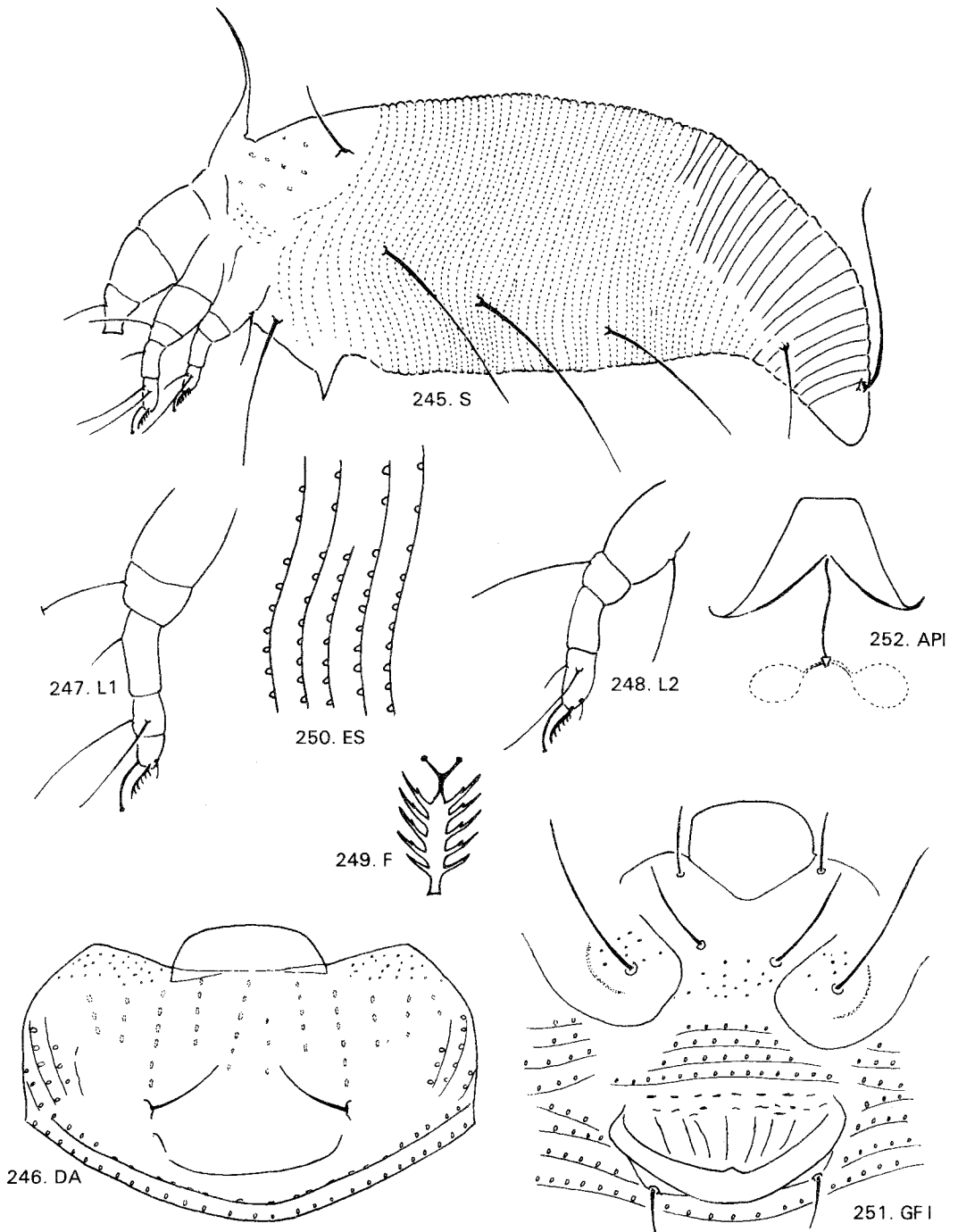
226-231. *Aculus fockeui*, deutogyne



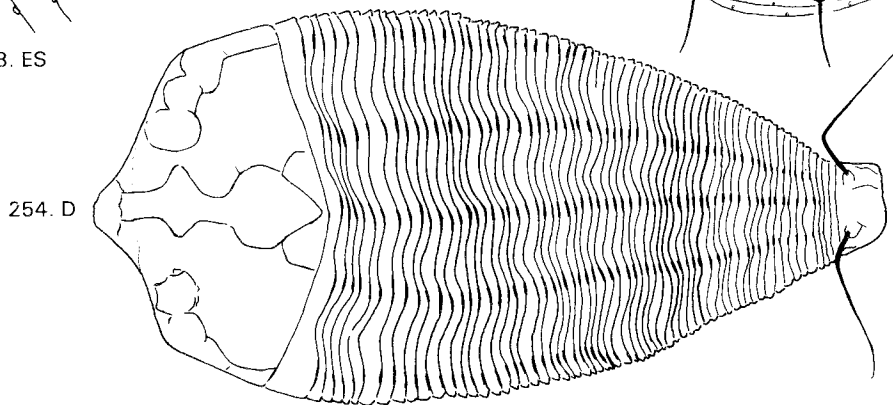
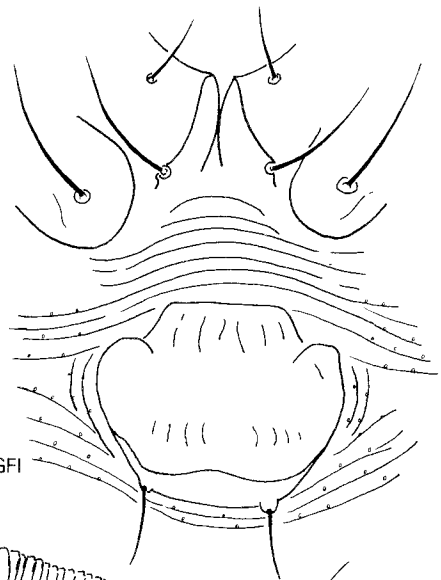
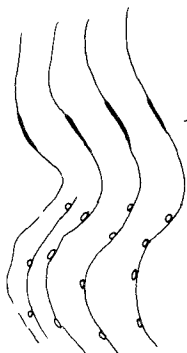
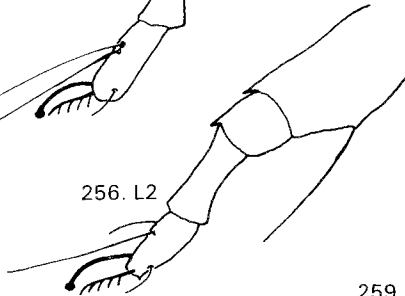
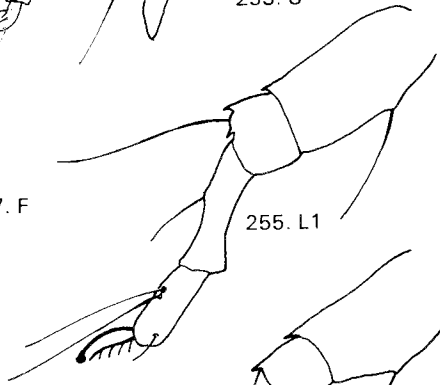
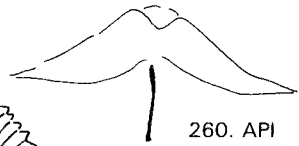
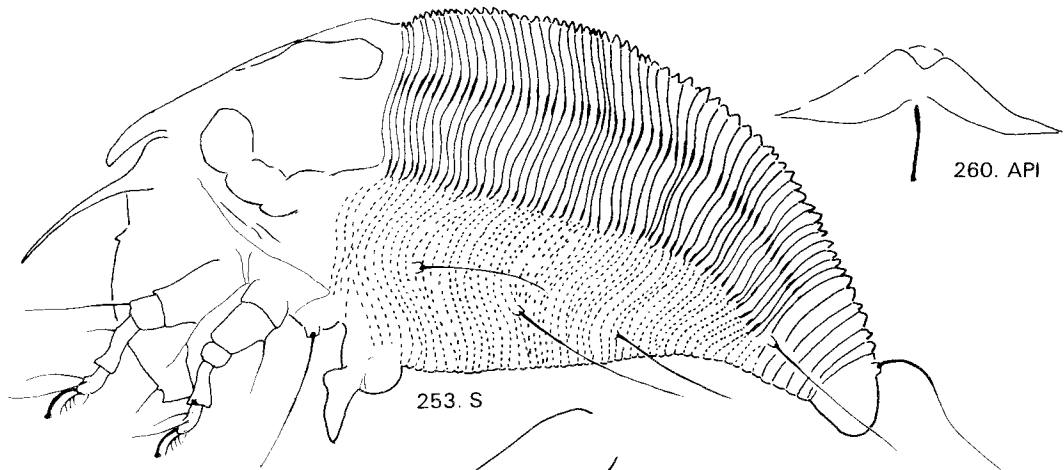
232-237. *Aculus schlehtendali*, protogyne



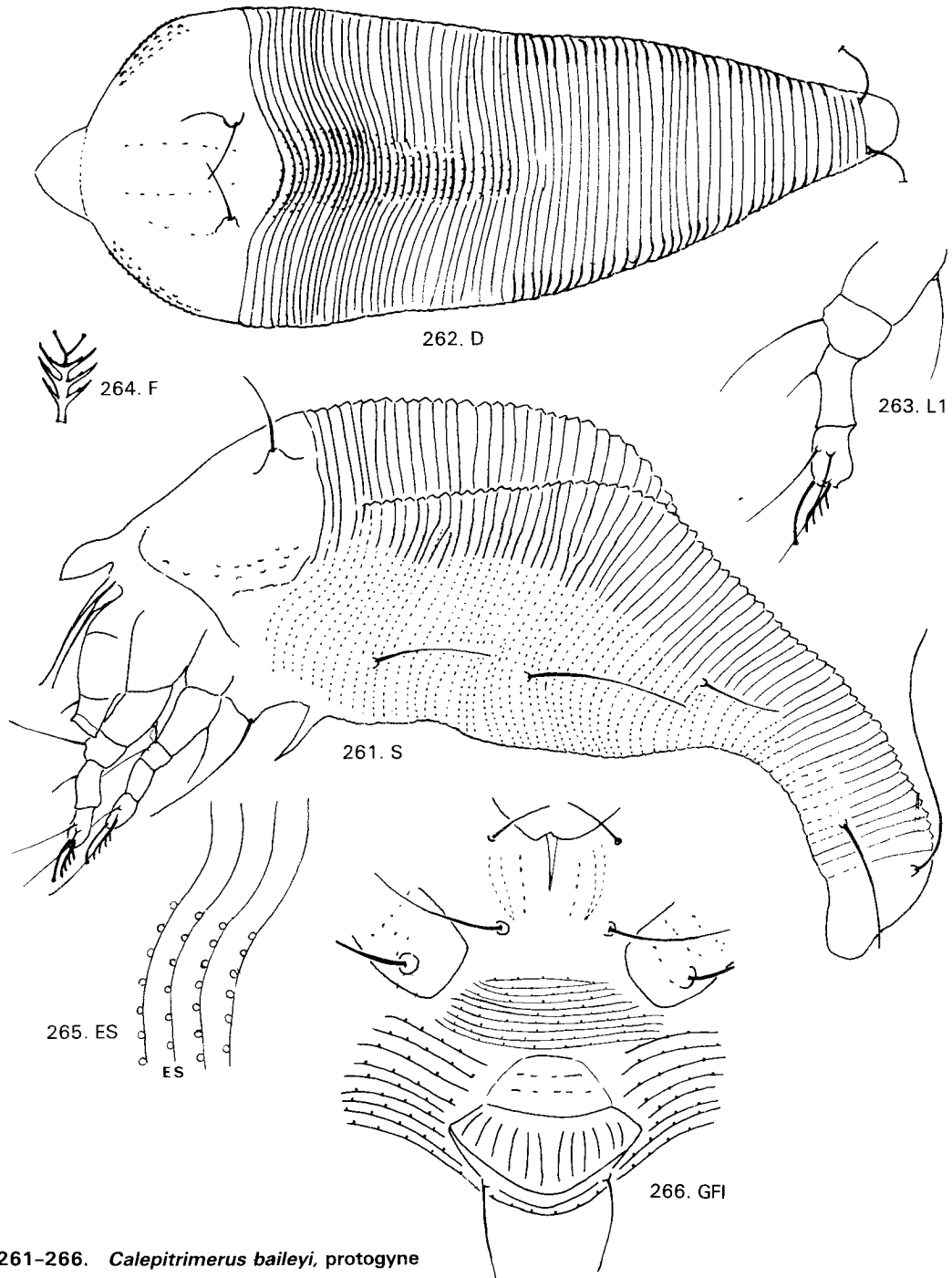
238-244. *Aculus schlehtendali*, deutogyne



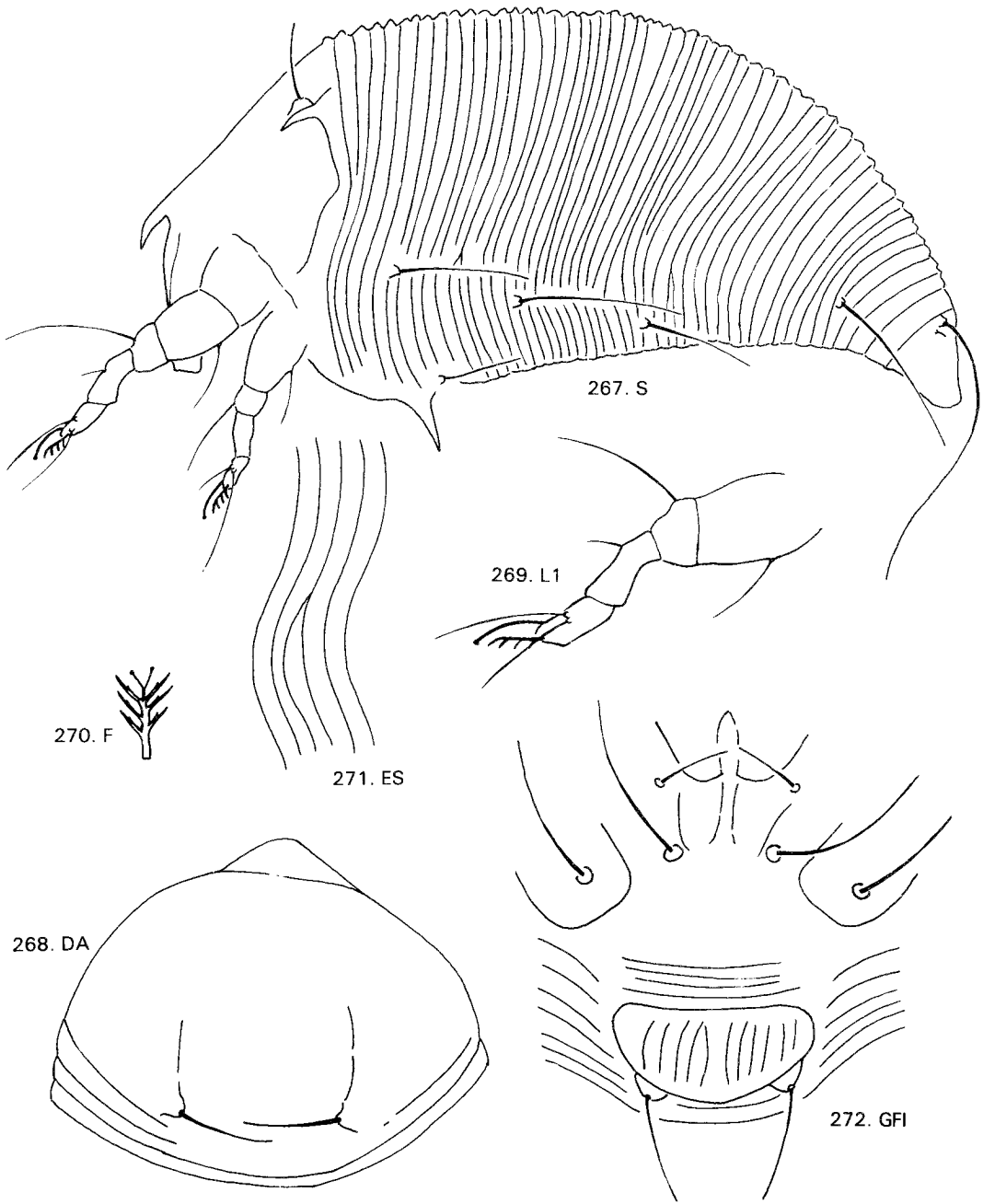
245-252. *Arectus bidwillius*



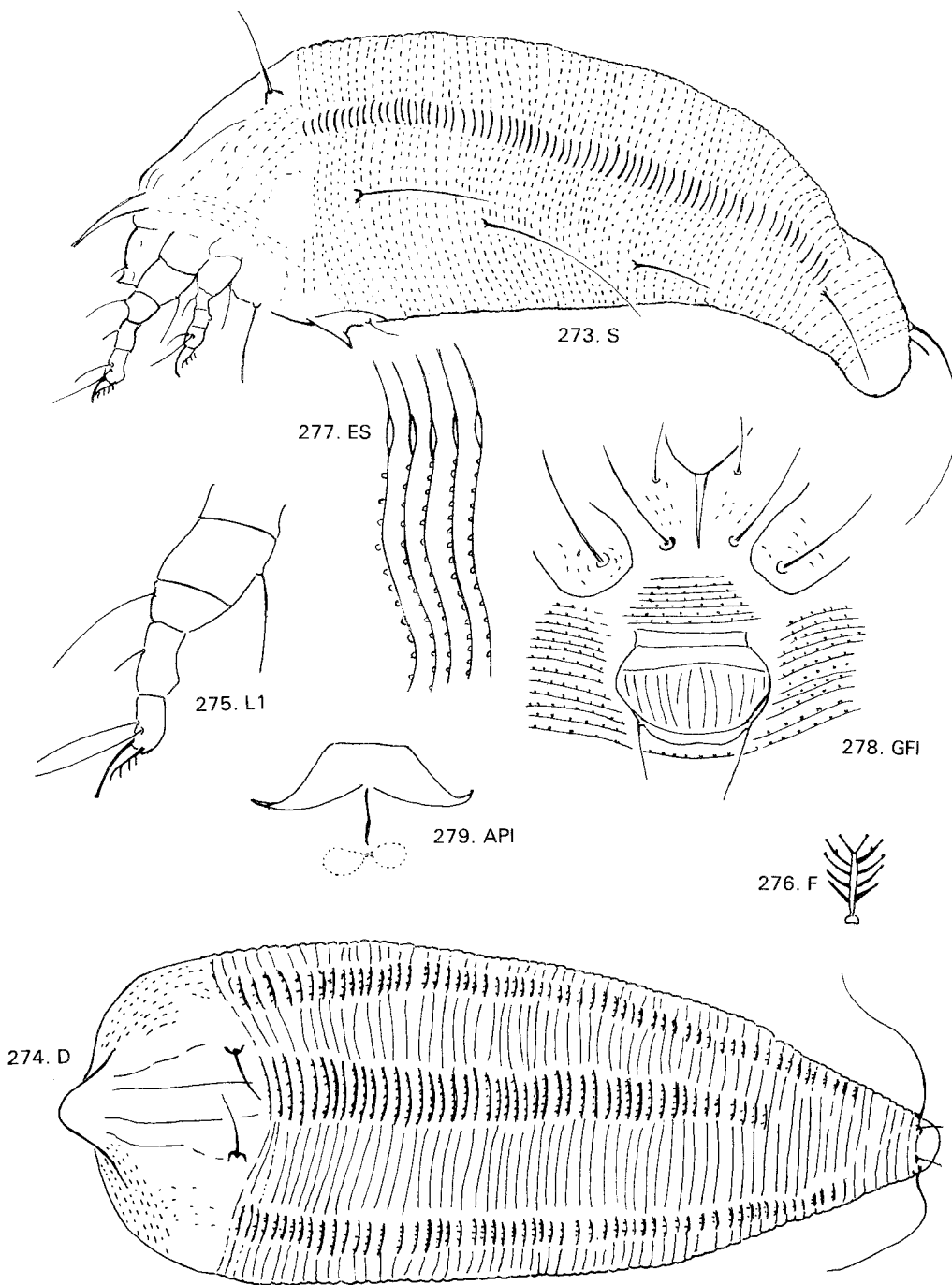
253-260. *Calacarus carinatus*



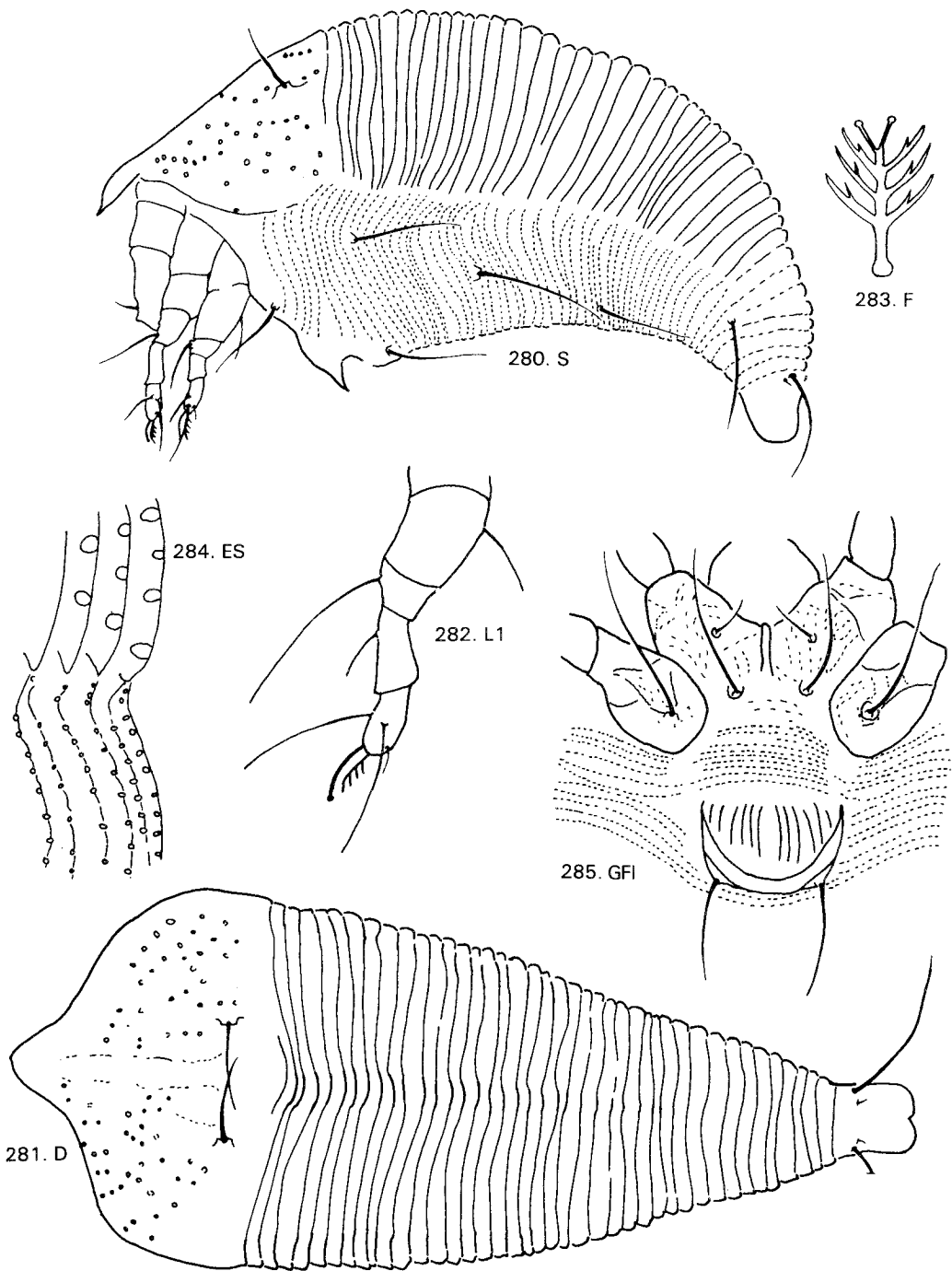
261-266. *Calepitrimerus baileyi*, protogyne



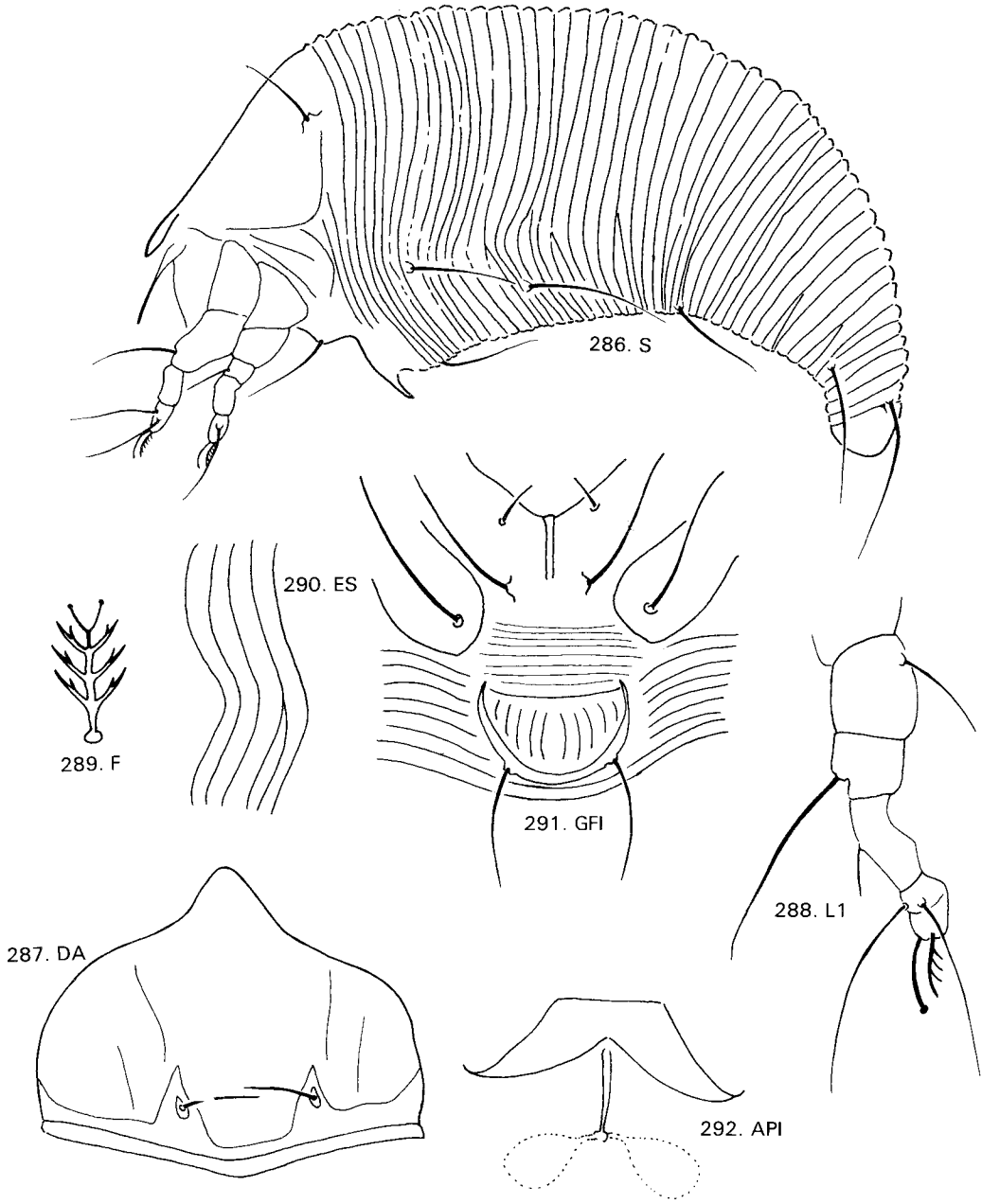
267-272. *Calepitrimerus baileyi*, deutogyne



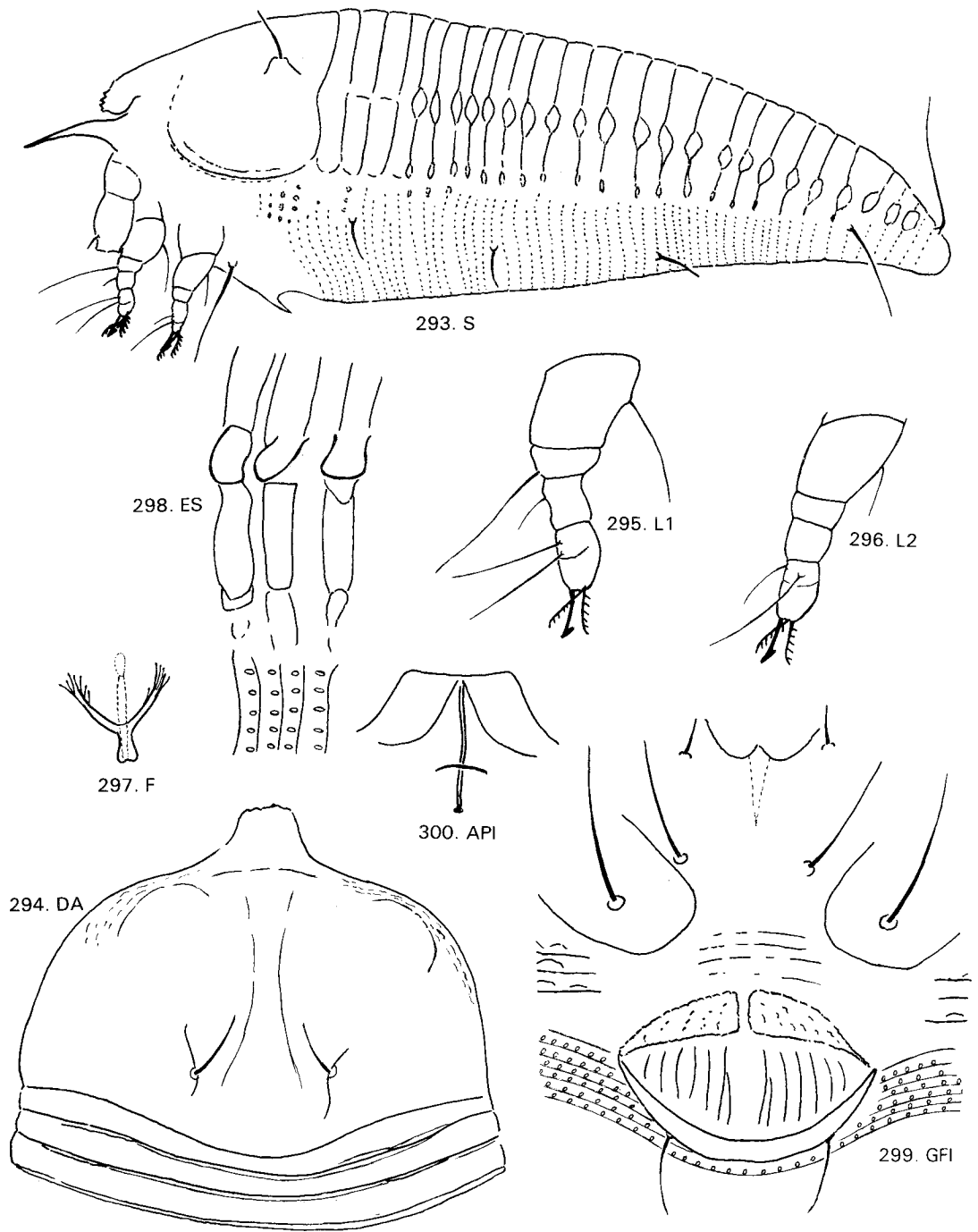
273-279. *Calepitrimerus vitis*



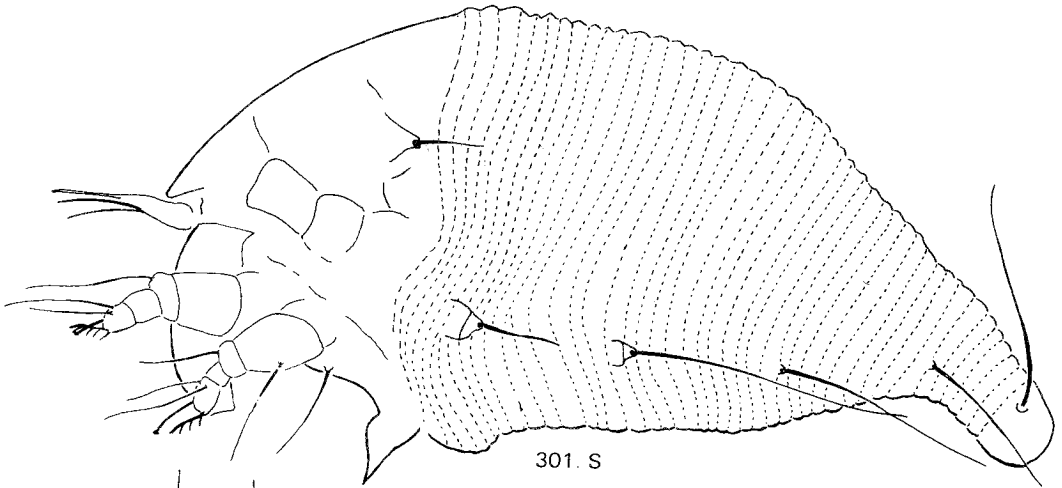
280-285. *Epitrimerus pyri*, protogyne



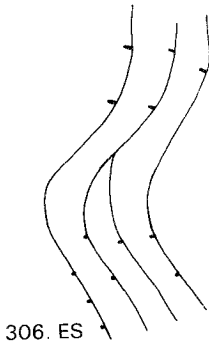
286-292. *Epitrimerus pyri*, deutogyne



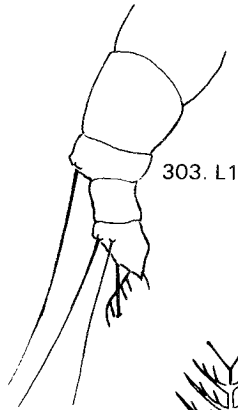
293-300. *Litaculus khandus*



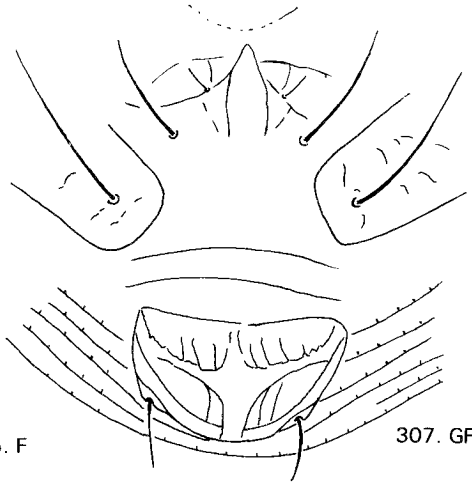
301. S



306. ES



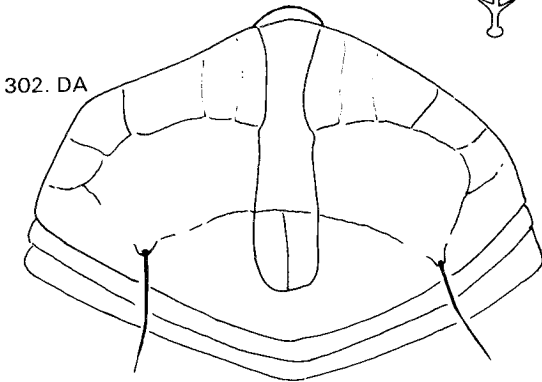
303. L1



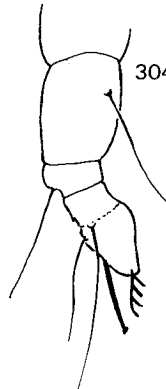
307. GFI



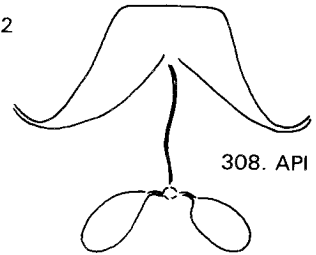
305. F



302. DA

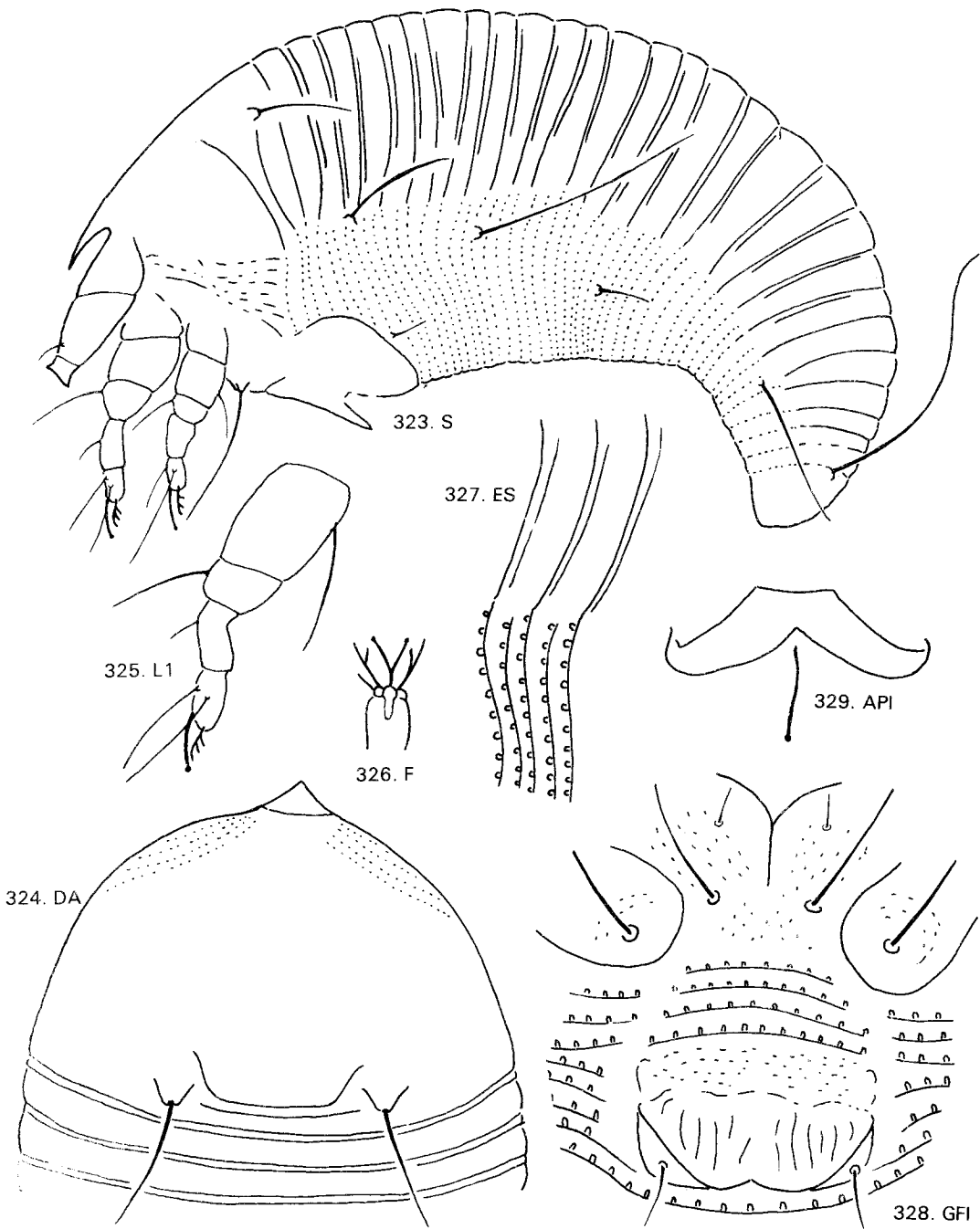


304. L2

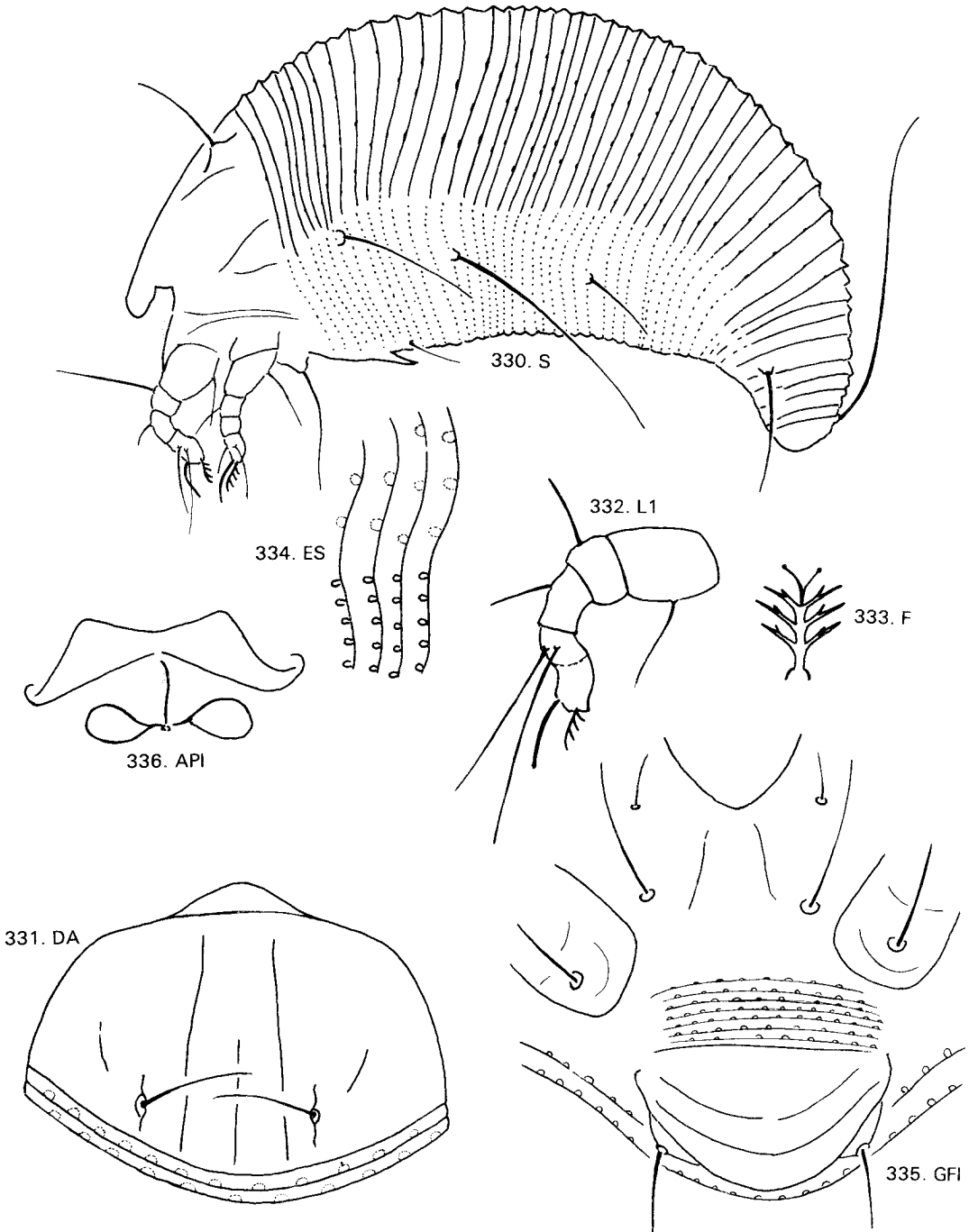


308. API

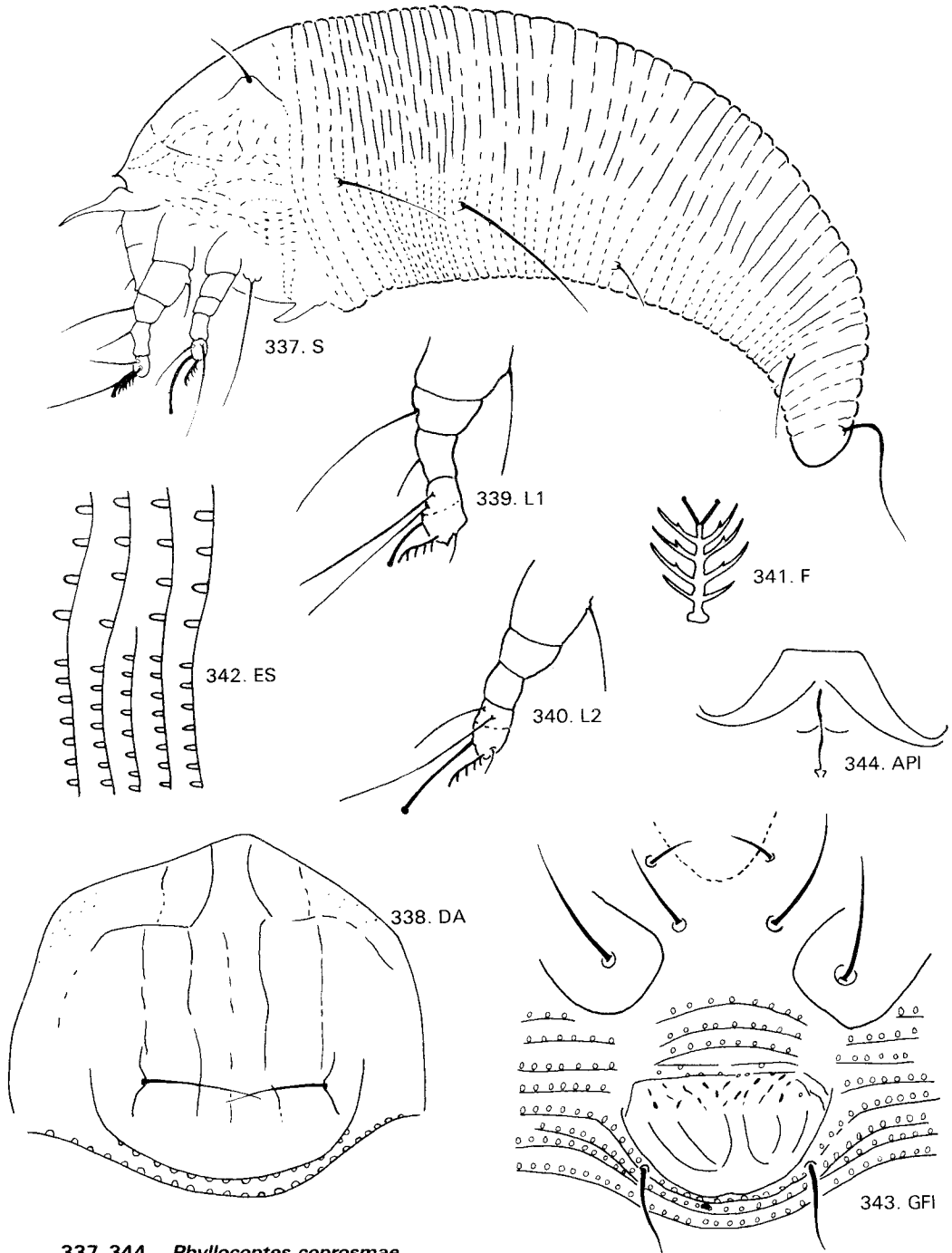
301-308. *Nothacus tuberculatus*



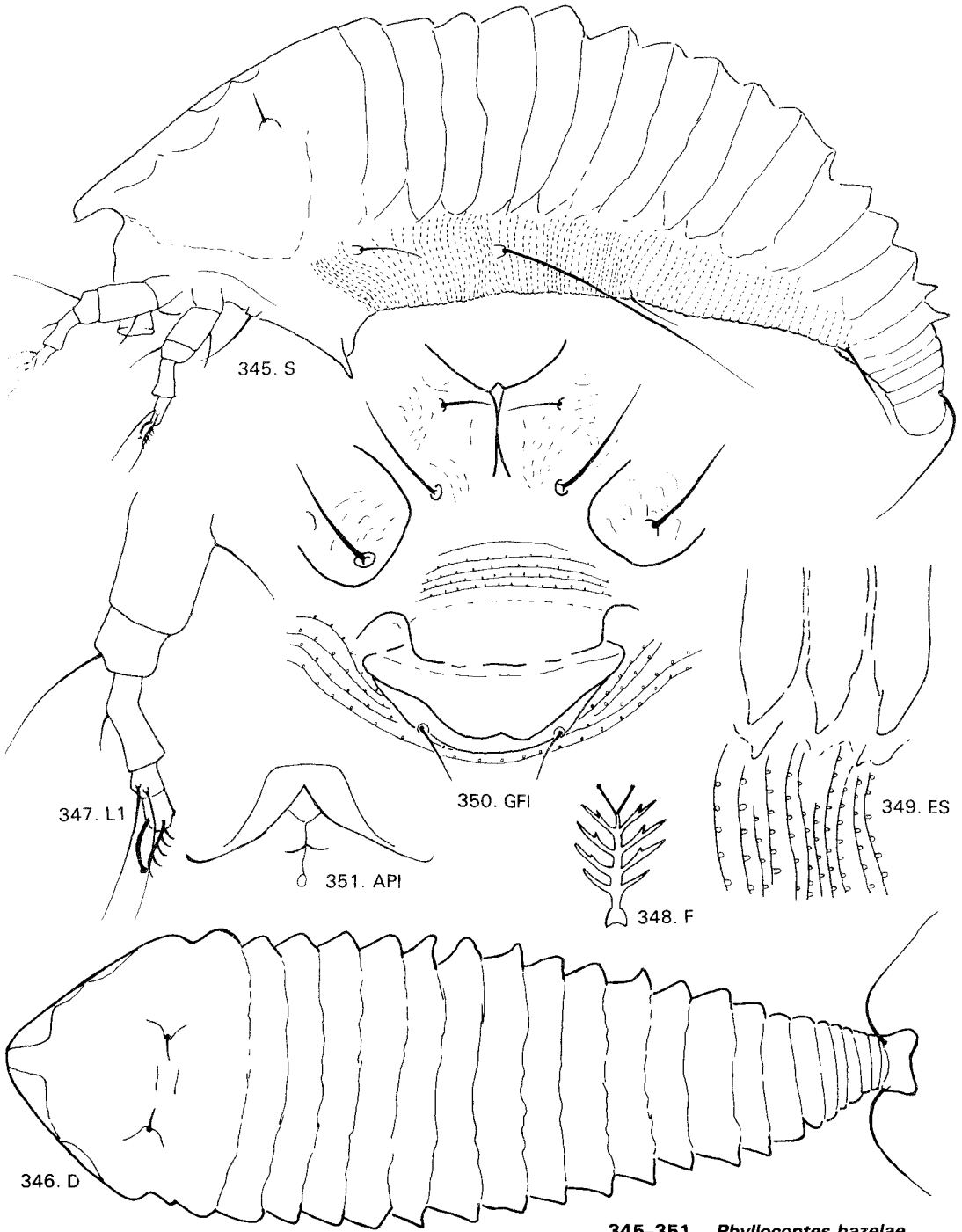
323-329. *Pedaculops propinqua*

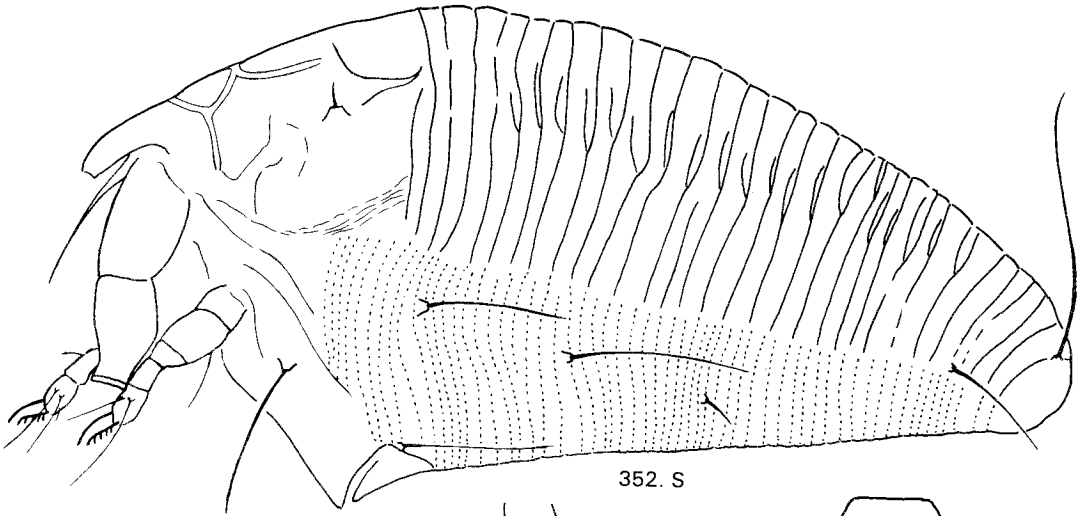


330-336. *Phyllocoptes abaenus*

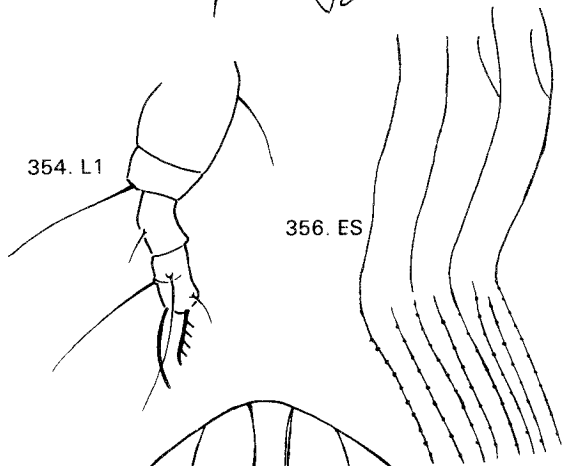


337-344. *Phyllocoptes coprosmae*





352. S

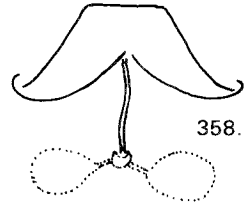


354. L1

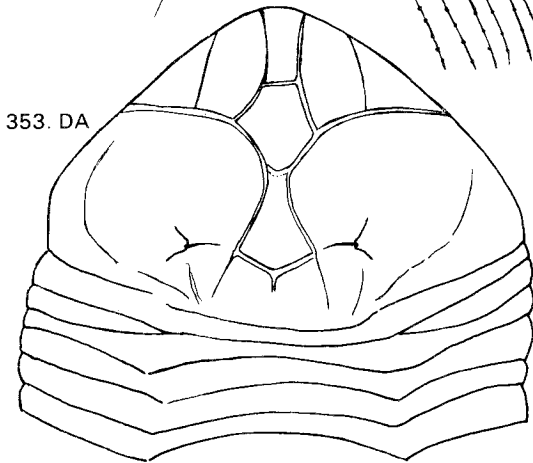
356. ES



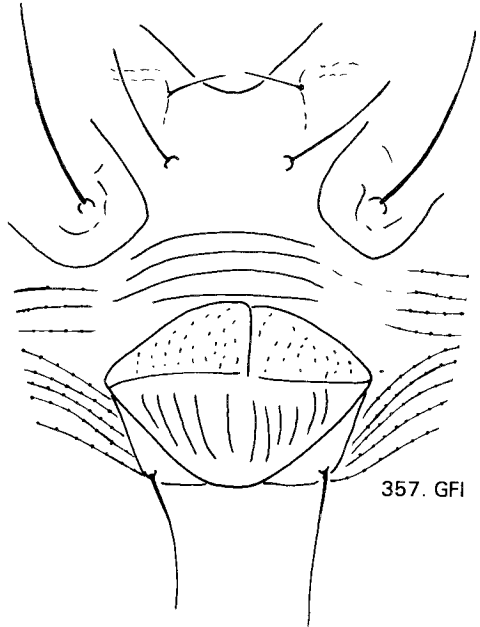
355. F



358. API

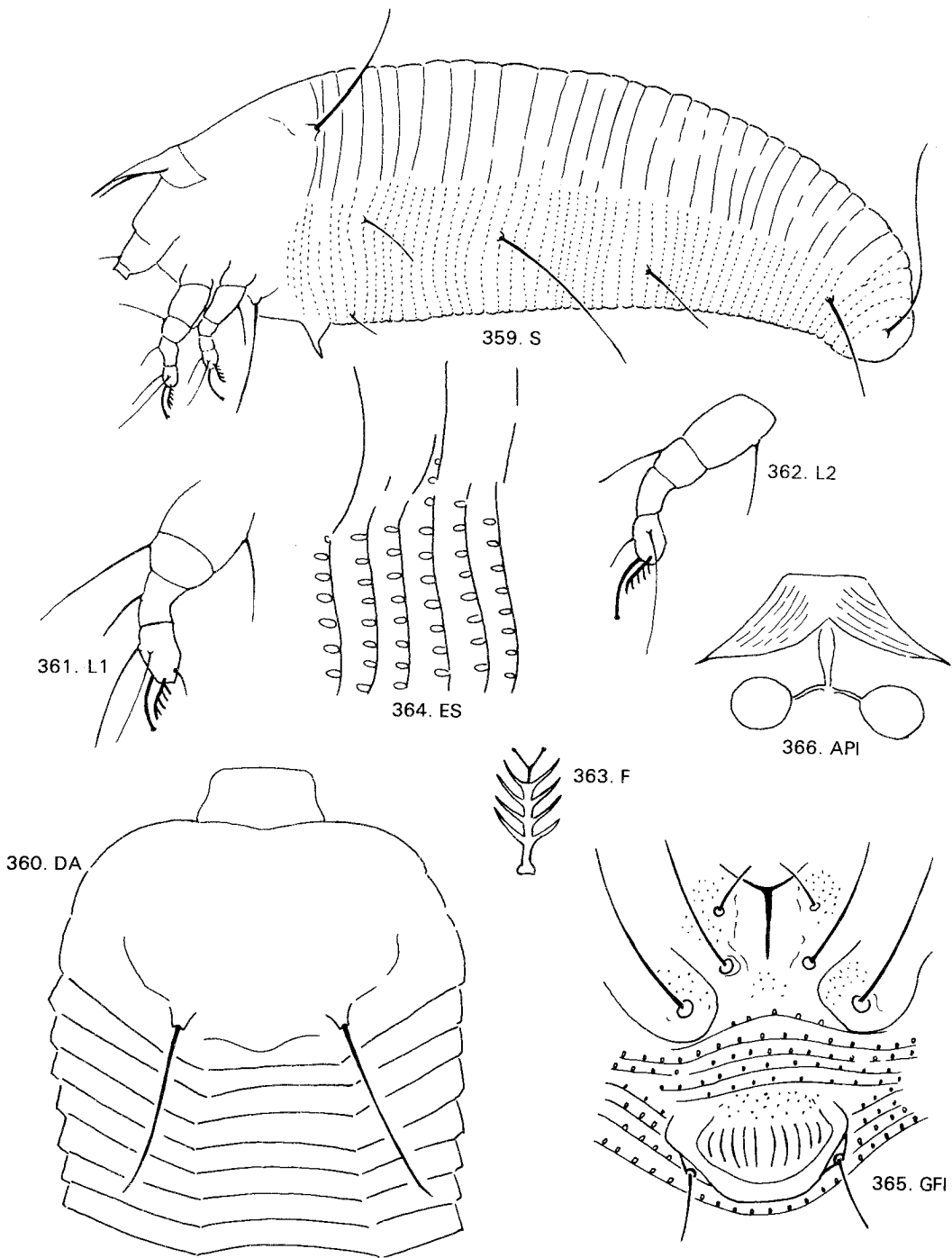


353. DA

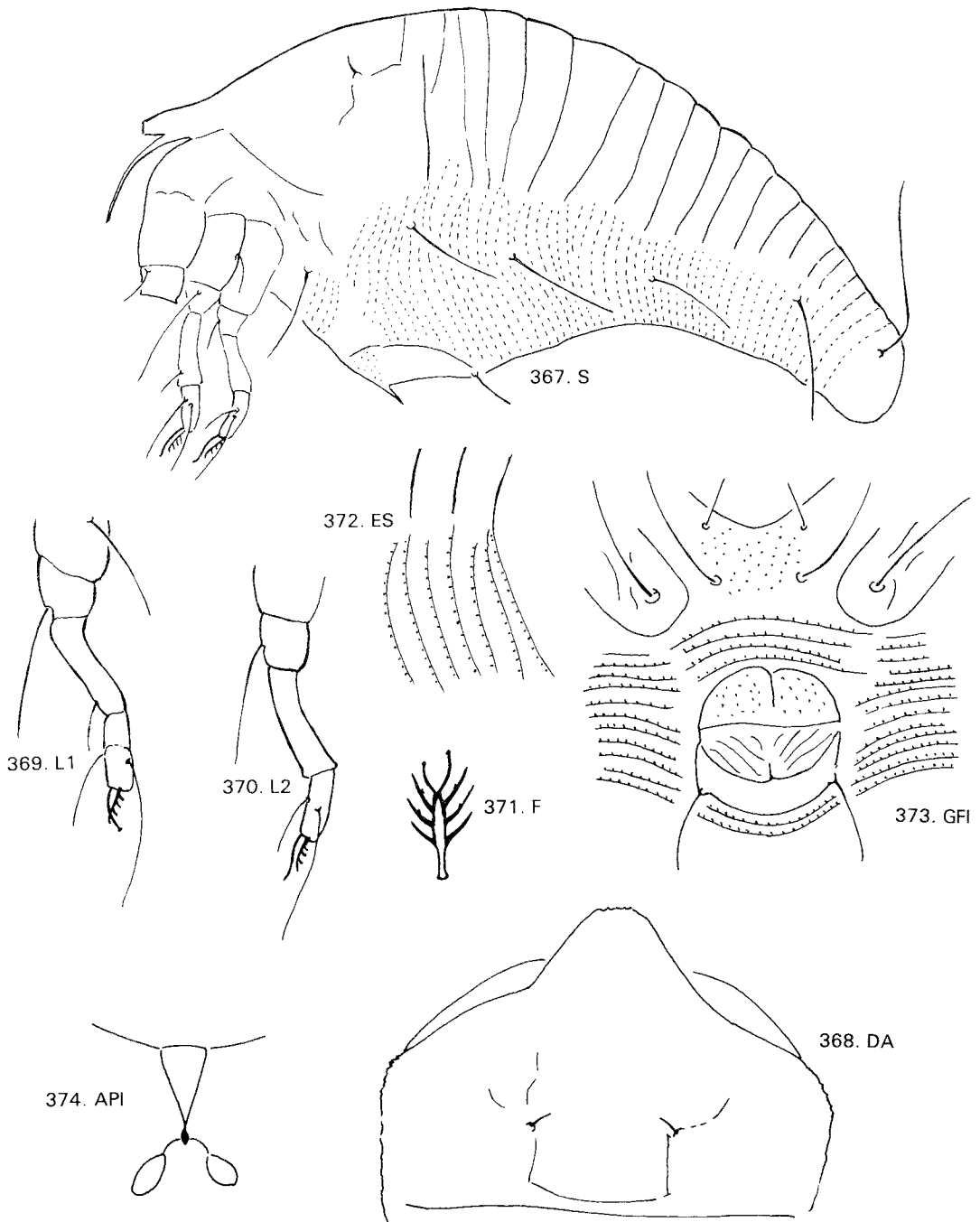


357. GFI

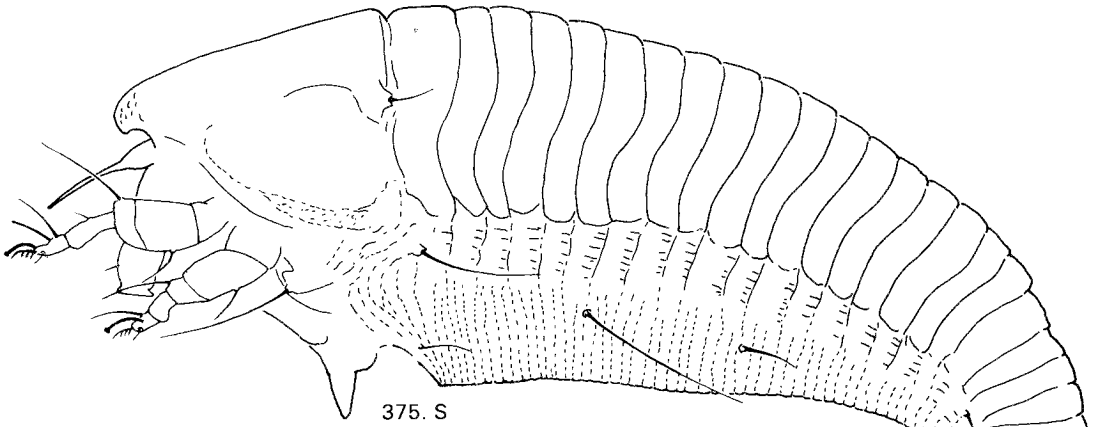
352-358. *Phyllocoptruta oleivora*



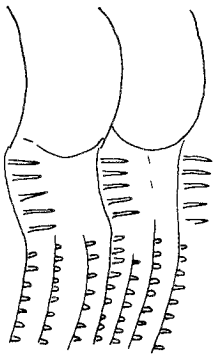
359-366. *Rectalox falita*



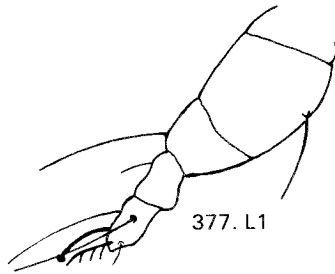
367-374. *Rhombacus chatelaini*



375. S



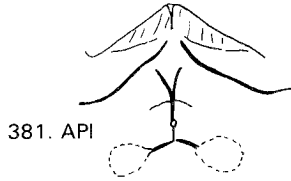
379. ES



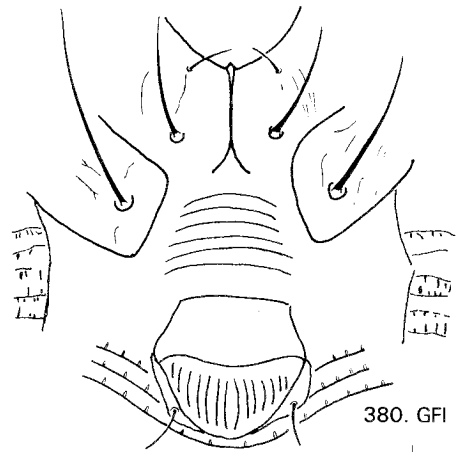
377. L1



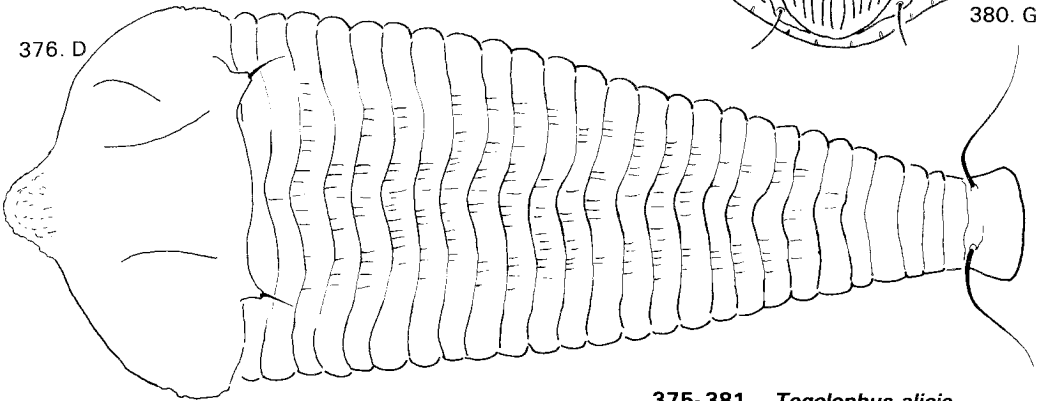
378. F



381. API

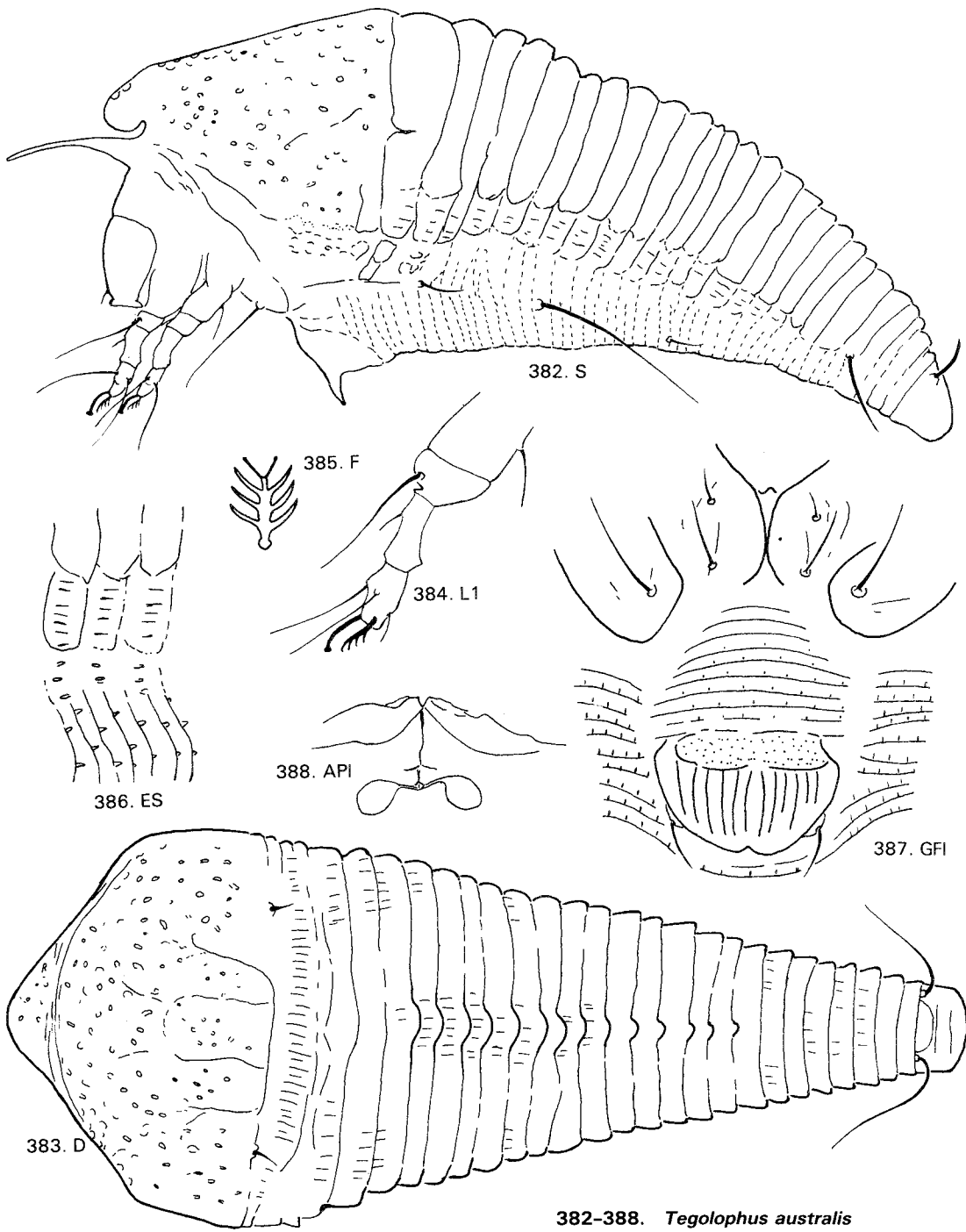


380. GF1

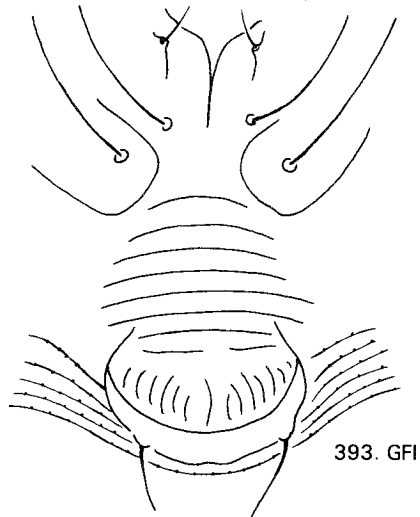
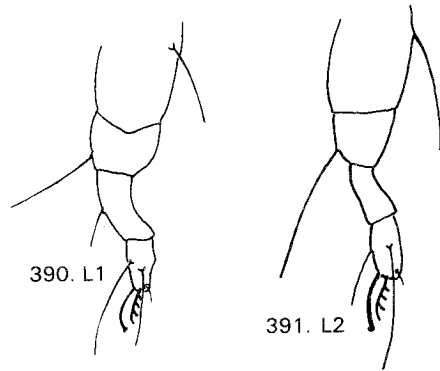
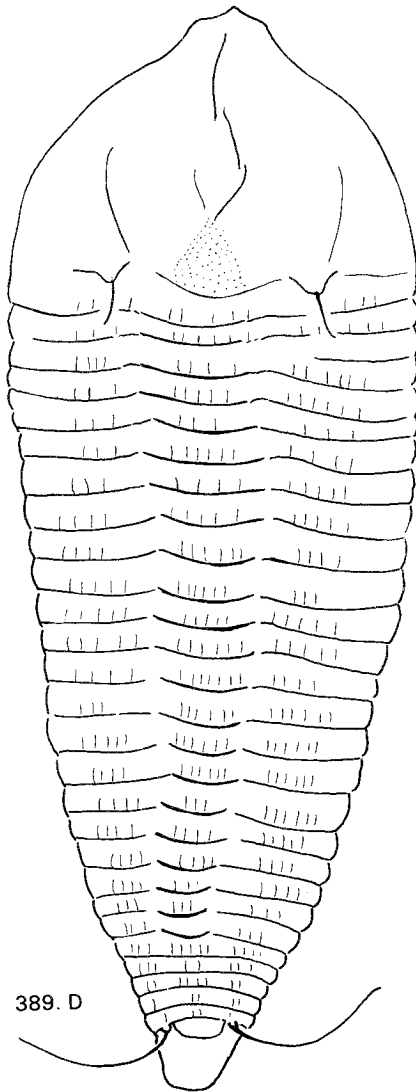


376. D

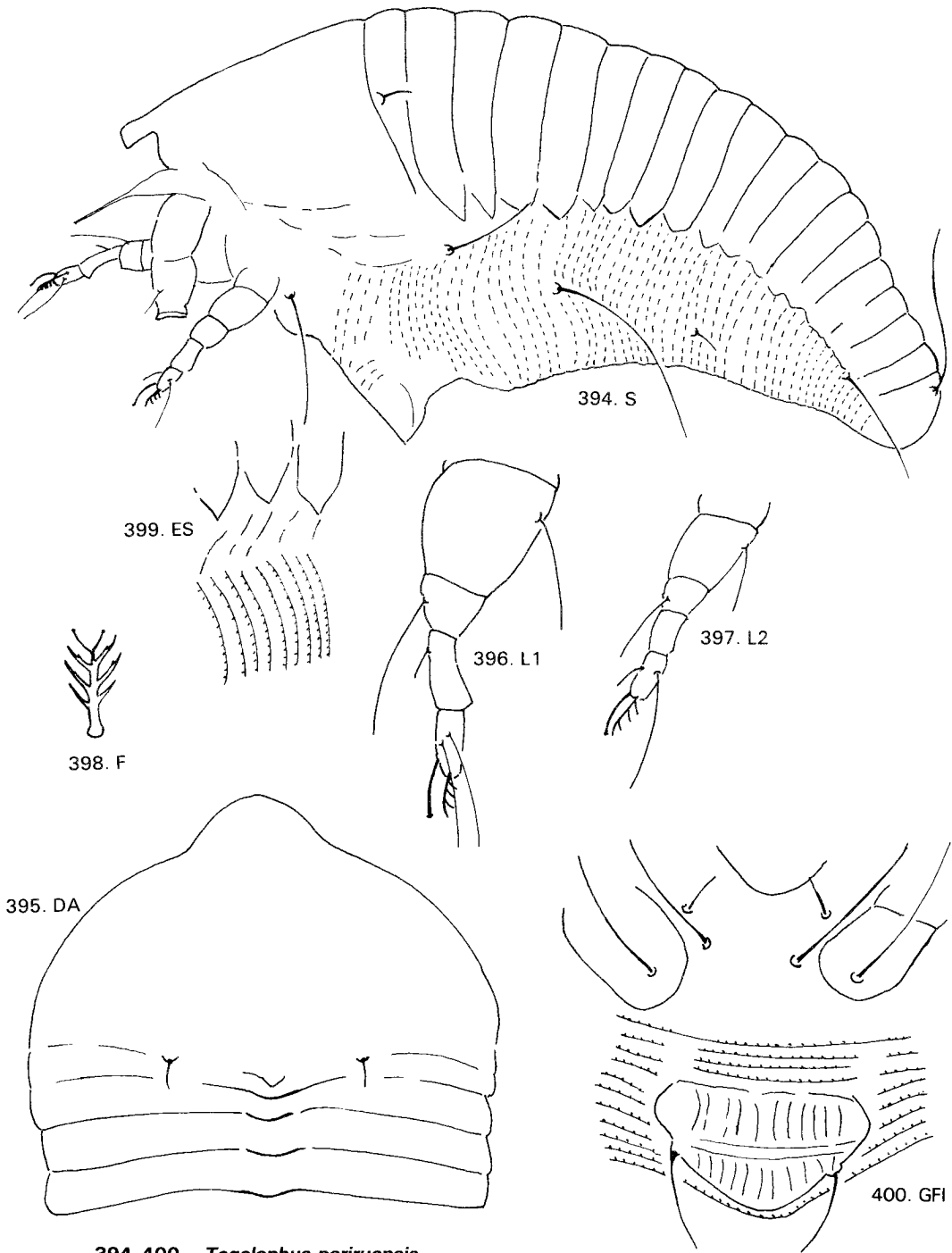
375-381. *Tegolophus alicis*



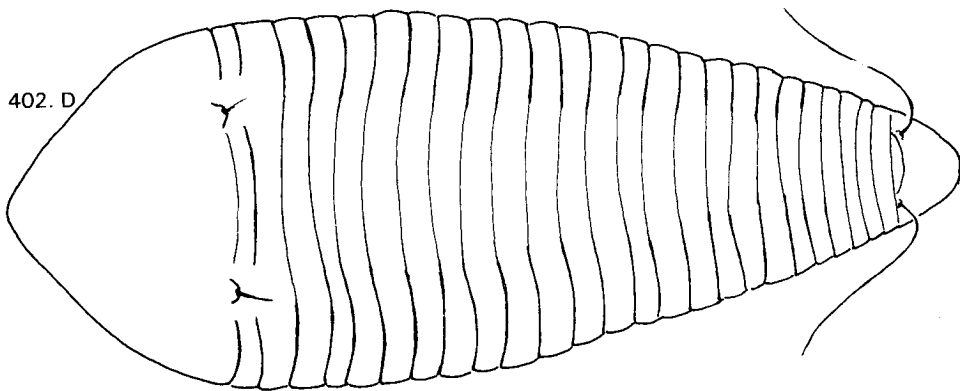
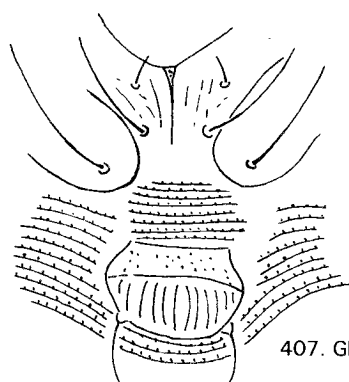
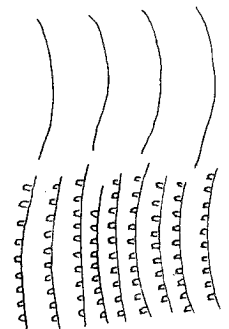
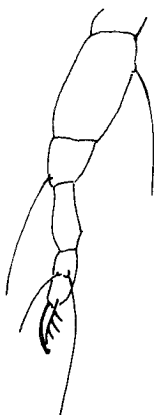
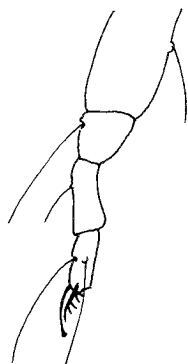
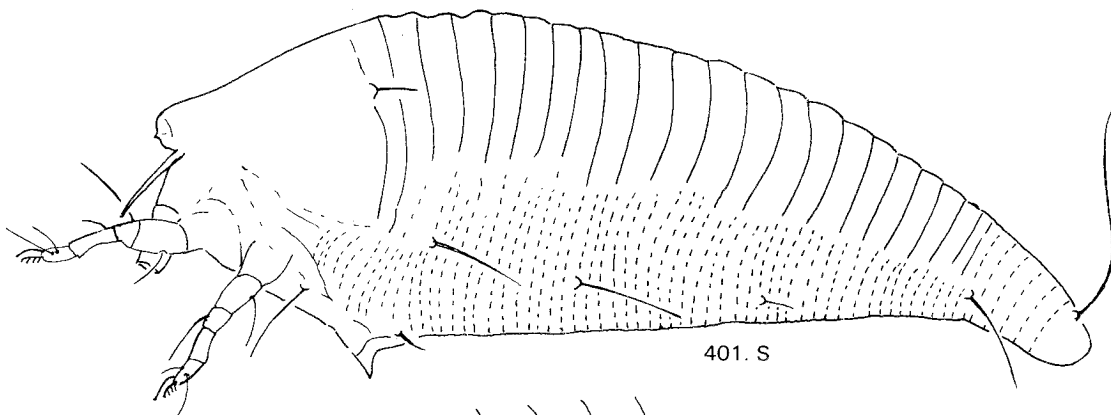
382-388. *Tegolophus australis*



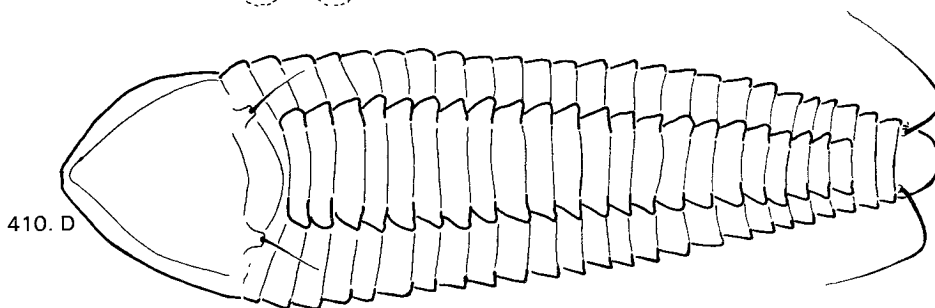
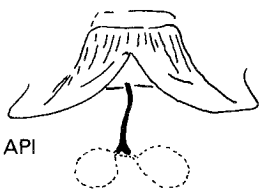
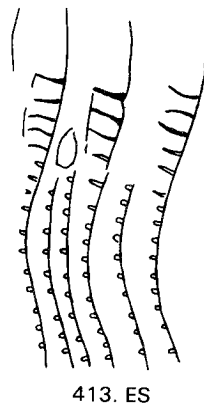
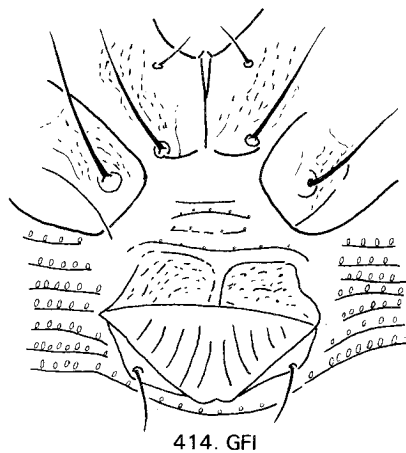
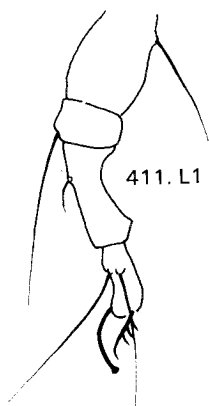
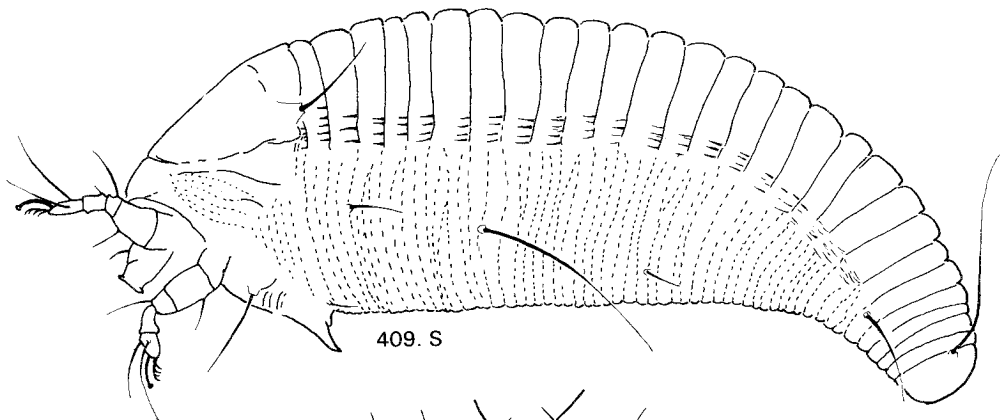
389-393. *Tegolophus meliflorus*



394-400. *Tegolophus poriruensis*



401-408. *Tetra martini*



409-415. *Vittacus mansonii*

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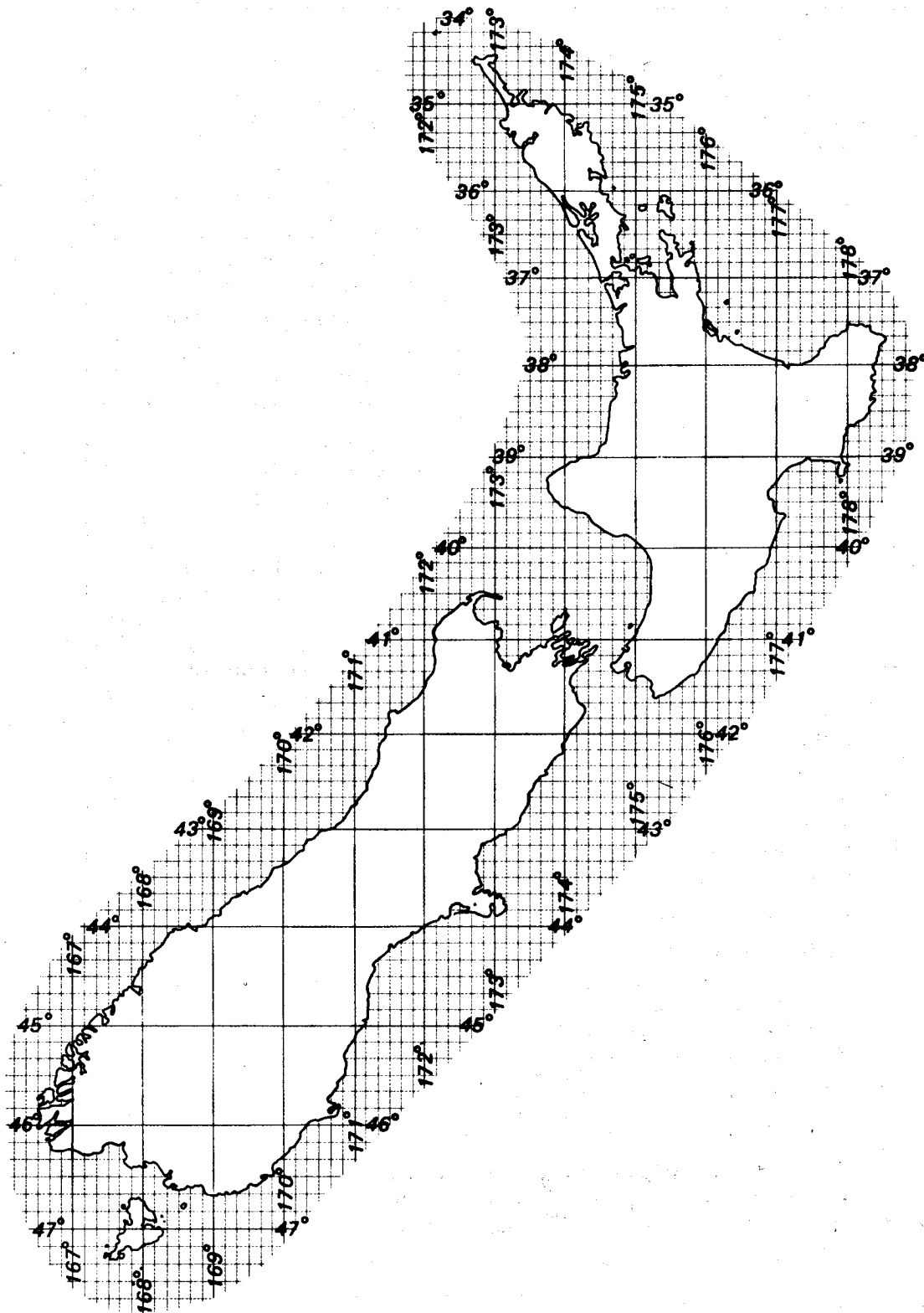
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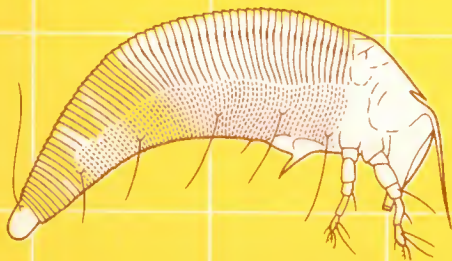
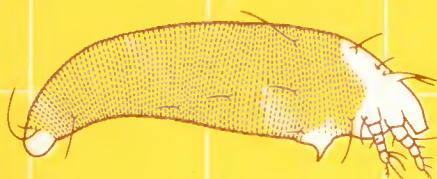
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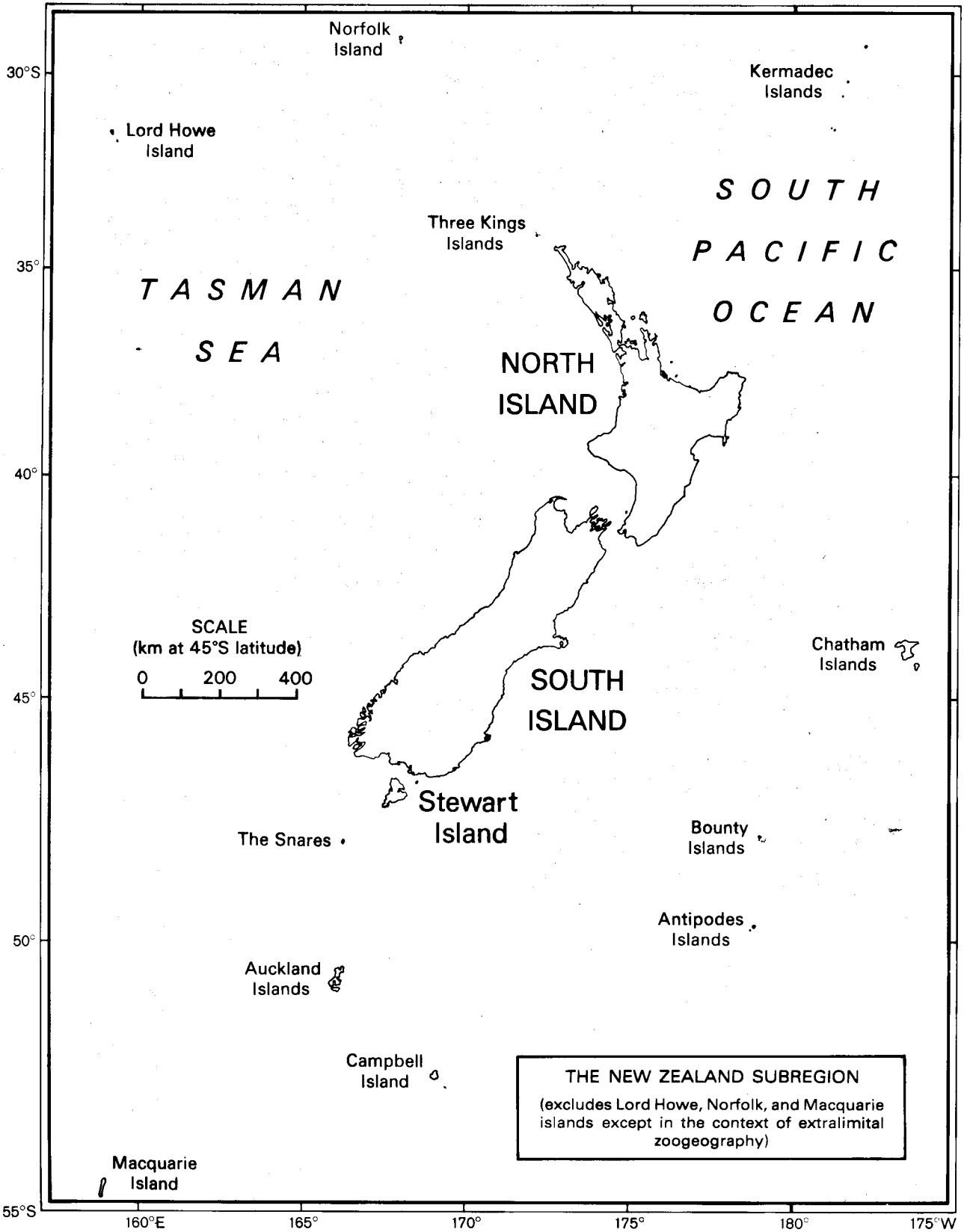
Fauna of New Zealand



Number 4

Eriophyoidea
except Eriophyinae
(Arachnida: Acari)

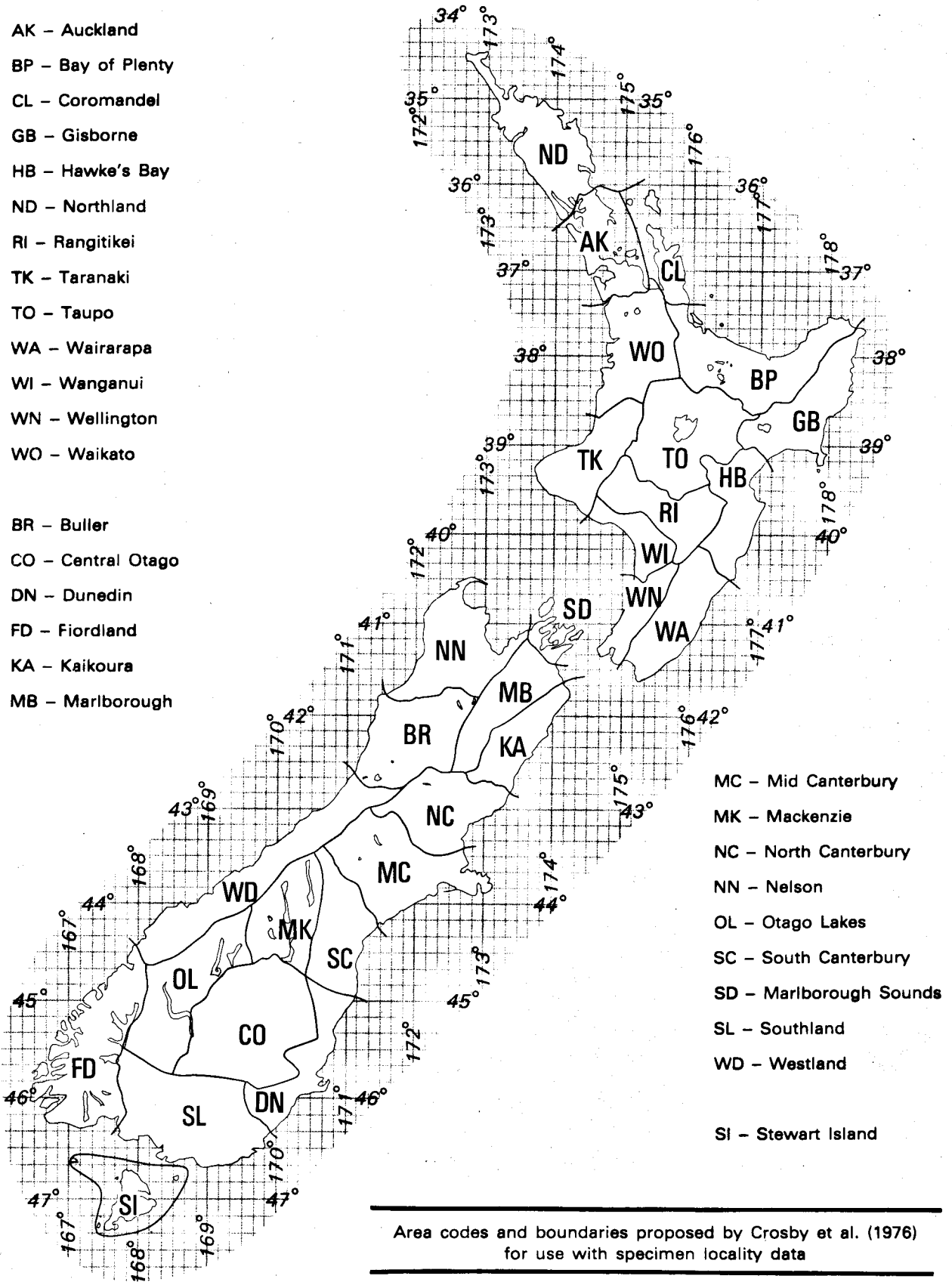
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- WI - Wanganui
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- WO - Waikato

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- KA - Kaikoura
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- SD - Marlborough Sounds
- SL - Southland
- WD - Westland
- SI - Stewart Island



Area codes and boundaries proposed by Crosby et al. (1976)
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Crustacea: Copepoda — Harpacticoida, by M. H. Lewis. Amphipoda — Talitridae, by K. W. Duncan.

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A further twenty-plus contributions had been promised up to the time this number went to press.

Mollusca: Gastropoda — Punctidae, by F. M. Climo; Introduced Pulmonata, by G. M. Barker.

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INTRODUCTION

KEY TO TAXA

DESCRIPTIONS

ILLUSTRATIONS

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