Fauna of New Zealand

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PREFACE TO THE SERIES

The idea of publishing a series of volumes on New Zealand's insects, comparable to the 'Faunas' that have long been available for many other countries, was first advanced in the early 1960s when DSIR established a Systematics Section within Entomology Division. The Section has since built up a large collection of well documented specimens from throughout New Zealand and the adjacent Pacific region. Housed at Entomology Division, the New Zealand Arthropod Collection (NZAC) to which this material belongs is the most comprehensive holding of New Zealand arthropod material in the world. This ample resource, open to study by all specialists, is complemented by other institutional collections both in New Zealand and overseas.

The invertebrate fauna of New Zealand is of major significance in that it has largely developed in isolation, in association with a unique flora. The insects alone are represented by some 20,000 species in New Zealand, and about 90 percent of these are found nowhere else.

Most insect groups, and many other invertebrate taxa, are now sufficiently well represented in NZAC and other institutional collections to allow the preparation of publications based on the 'Fauna' model. These are not merely an assemblage of descriptions and identification aids, but contain a wide range of information about the distribution, ecology, biology, and relationships of the various species. Such information is increasingly important in developing an understanding of our natural environment, and will make a significant contribution to decisions on changes to that environment. Demand for publications of this kind among both professional and amateur biologists has increased rapidly in recent years, through a growth in awareness of the unique nature of the New Zealand fauna and its role in the natural environment.

The new DSIR series *Fauna of New Zealand*, being launched with this volume and two others, will become a resource publication for biologists throughout the world. Each volume will cover a group of insects or other terrestrial (i.e., non-marine) invertebrates with sufficient explanatory text and illustrations to make it widely usable. There will also be complementary volumes filling areas of obvious need; for instance, an annotated key to the families of Coleoptera is in preparation. It is this Division's objective to provide authoritative and comprehensive guides to identification, in a medium accessible to all would-be users, and that will evolve as an accumulating descriptive index of our insects, spiders, mites, and other terrestrial invertebrates. The *Fauna* will, moreover, become a continuing stimulus for co-operative research between systematists in New Zealand and overseas.

The first three monographs in this series indicate the high scientific standards we intend to preserve. Presentation may alter slightly, however, as we move to alternative, more convenient methods of production. We intend to produce about 600 pages—six average-sized contributions—each year, and our editorial policy will be to achieve this without undue delay to any contribution.

In today's economic climate, with rising production costs, it may seem unwise to launch a new series. We are confident, from the initial response to the concept and the indications of further contributions to come, that the *Fauna* is well conceived, will make a significant contribution to biology, and indeed has a very promising future.

I hope this new occasional series will be considered a worthy companion for established 'Faunas'.

J. F. Longworth

Director
Entomology Division
DSIR

Fauna of New Zealand

Number 1

Terebrantia

(Insecta: Thysanoptera)

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Front cover: The insect depicted is *Thrips obscuratus* (Crawford)

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ABSTRACT

Fifty-one species of Terebrantia in 26 genera are recorded from the New Zealand region, including the following new taxa: *Adelphithrips dolus* new species; *Anaphrygmothrips otagoensis* new genus and species; *Dikrothrips diphyes* new genus and species; *Karphothrips dugdalei* new genus and species; *Lomatothrips paryphis* new genus and species; and *Scirtothrips pan* new species. Faunal relationships are discussed in the light of evidence for wind dispersal from Australia and introductions by man. Fifteen species are considered to have been introduced from Europe, 6 from the Old World tropics, 4 from the New World, and at least 7 from Australia. Of the 19 species known only from New Zealand, 6 show some relationship to the Australian fauna and 1 to that of New Caledonia. *Adelphithrips* with 3 species, a species-group of *Thrips* comprising 4 species, a subantarctic genus of 2 species, and 3 monobasic genera constitute the endemic fauna. *Adelphithrips* is regarded as the sister-group of the world-wide *Thrips* genus-group. *Pseudanaphothrips* from New Zealand and south-eastern Australia is regarded as the sister-group of the world-wide *Frankliniella* genus-group. The text included notes on distribution, habitat, host plants, and life history for each species, and discusses pest species, technical methods, phylogeny, and morphology. An illustrated key to taxa is given, and the descriptions are supported by some 270 line drawings. An extensive bibliography introduces the taxonomy and biology of Thysanoptera in New Zealand and world-wide.

CHECKLIST OF TAXA

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INTRODUCTION

The biota of New Zealand afford a key to our understanding of evolutionary relationships over much of the rest of the world; indeed, in a review concerning biogeography Nelson (1975) wrote: "explain New Zealand and the world falls into place around it". These generalisations apply to many groups of plants and animals, but the evolutionary significance of the New Zealand Thysanoptera fauna has become apparent only very recently. Mound (1977a, 1978) described six endemic species, and Mound & Palmer (1981a), in describing three further endemics, recognised in New Zealand the sister-groups of the two largest world-wide genus-groups of flower-living Thripidae. Moreover, further endemic taxa are described below. Hitherto the thrips fauna had been regarded

as predominantly introduced from northern temperate areas (Wise 1977).

This belated recognition of a native New Zealand thrips fauna has two main causes, both of which have also been significant in retarding the development of knowledge of Thysanoptera in many other countries. First, native thrips are generally associated with native habitats, whereas most entomologists are concerned with crops of introduced plants. Such crops are usually attacked by introduced species of insects, although one or more native species may move into the ecological vacuum and assume pest status. Second, thrips have traditionally been preserved in ethyl alcohol, despite the fact that storage in strong spirit usually renders them almost useless for accurate study within a few months owing to bleaching and erosion of surface details. These two influences are discussed more fully below.

The earliest record of thrips in New Zealand is about 100 years old, Smith (1933) noting that whilst he was on Mt Peel Station "over 50 years ago two species of thrips there infested several of the plants in the conservatory", and that the Hon. J. B. Acland, who acquired the station in 1854, "imported large consignments of economic and ornamental plants, when the thrips may have been introduced with them". Thus, the assumption that Thysanoptera were not native to New Zealand took root very early. Thomson (1922), however, noted that thrips were "found in numbers in most cultivated flowers, as well as a great many indigenous species". Even 30 years ago (Spiller 1951) there were still only 11 recorded species (including Phlaeothripidae), but this figure soon rose to 22 (Spiller 1956) and then slowly increased to 34 (Wise 1977), of which 12 may be native. The present contribution covers 51 species of Terebrantia, and there are probably an equal number of Tubulifera. The total fauna is thus likely to be of the same order as that of the British Isles (Mound et al. 1976). By comparison, the world fauna is about 4500 species (Mound et al. 1980).

This contribution is intended to introduce New Zealand students to Thysanoptera. It gives keys and illustrations to aid identification, describes techniques for collecting, mounting, and curation, and places New Zealand's Thysanoptera in the systematic context of the world fauna. Only those species placed in the terebrantian families Merothripidae, Aeolothripidae, and Thripidae are dealt with here. The Phlaeothripidae (suborder Tubulifera) will be dealt with in a separate contribution because of the relatively large number of undescribed taxa collected recently. The account that follows is based on a study of over 9000 specimens from the New Zealand region and also Macquarie Island (see map on inside front cover).

Observations on the biology of thrips in New Zealand have been limited to a very few introduced species (Yates 1952, Doull 1956b, Chapman 1976). Cumber (1958, 1959) and Cumber & Eyles (1961) simply listed species taken during fodder-crop and pasture surveys. The lack of observations is so great that only during our present

studies have eggs and larvae of *Thrips obscuratus*, the most ubiquitous New Zealand species, been recorded for the first time. On a world-wide basis the most comprehensive, modern sources of information on Thysanoptera are works by Lewis (1973; biology and ecology) and Jacot-Guillarmod (1970-78; citation-index to all described taxa).

DIAGNOSIS, SYSTEMATICS, AND PHYLOGENY

Of the 4500 described species of Thysanoptera only 2000 belong in the Terebrantia (Mound et al. 1980). These, however, are the insects most readily recognised as 'thrips' by non-specialist entomologists, being particularly common in flowers, including the inflorescences of grasses. The Tubulifera (Phlaeothripidae), in contrast, are more common on dead wood, in leaf litter, or in leaf galls.

Adult Terebrantia can be distinguished from Tubulifera by the following characters.

(1) Forewings (Figures 146-166), when present, with three longitudinal veins (costa, first vein, and second vein), each usually bearing a row of setae; wing membrane usually bearing numerous microtrichia; cilia on posterior margin wavy or straight, arising from sockets.

(2) Abdominal segment X (Figures 215-224) rarely tubular, always divided longitudinally on ventral surface, frequently with a partial longitudinal split on dorsal surface; terminal setae arising from surface of tergite.

(3) Female with four saw-like ovipositor valves (Figures 262-264); eggs inserted into plant tissue (with rare exceptions, e.g., *Merothrips*).

(4) Maxillary stylets short, restricted to mouth cone.

(5) Development from egg to adult involves two larval and two pupal instars (Figures 2-5).

Within this suborder are recognised seven families of extant species (Mound et al. 1980) - Uzelothripidae, Merothripidae, Aeolothripidae, Adiheterothripidae, Fauriellidae, Heterothripidae, and Thripidae. Only three of these are represented in New Zealand; their diversity and geographic range are discussed in detail elsewhere in this account. The four families not found in New Zealand, all containing few species, are distributed as follows: Uzelothripidae - one species (Brazil and Singapore); Adiheterothripidae - two genera (Mediterranean to India, western North America); Fauriellidae - three genera (two South Africa, one southern Europe; Heterothripidae - three genera (South, Central, and North America).

The phylogeny of Thysanoptera has been the subject of some dispute, but the group is generally assumed to have shared a common ancestor with the Psocoptera (Hennig 1969, Heming 1977). This common ancestor, and hence the earliest Thysanoptera, would have fed on detritus or fungus in leaf litter (Mound et al. 1980), not on pollen in flowers as proposed by some authors (e.g., Stannard 1968). Merothripidae, which live in litter, are now regarded as retaining the largest

number of primitive structural features, that is, characters which would have been present in the earliest Thysanoptera (Mound et al. 1980). These characters include the presence of a cephalic tentorium, a well developed abdominal sternite VIII, and a weak psocopteroid ovipositor in females (Figure 262). Aeolothripidae do not have sternite VIII, a presumably apotypic (derived) condition, and the large ovipositor of the females is probably functionally related to laying eggs in green plants, rather than on a soft fungoid substrate as in Psocoptera and Merothripidae. In contrast, many text-books suggest Aeolothripidae to be the most primitive living thrips because of their large forewings with several cross-veins. Mound & O'Neill (1974) suggest that the structure of these large wings could equally well be related functionally to the larger body size of aeolothripids.

FAUNAL RELATIONSHIPS

Of the 51 species of Terebrantia recorded from New Zealand (Table 1) less than 20 are thought to be indigenous. The largest introduced element comprises 16 species from Europe or North America; these are not usually found in native forest areas of New Zealand, but are more typical of pastures and gardens. Similarly, the six species from the Old World tropics are usually found here on non-native plants. In contrast, the three Neotropical species have been taken from both native and introduced plants.

Distinctions between the thysanopteran faunas of Australia and New Zealand are less clear, partly because the Australian fauna is poorly known, and partly because winds can apparently carry some insects from Australia to New Zealand (Fox 1978, Close et al. 1978). Seven terebrantian species have certainly been introduced from Australia, either by human agency or by the wind. Moreover, *Anaphothrips zelandicus* is known only from New Zealand (including the Chatham Islands and Antipodes Islands) but is closely related to Australian species; it may well be native to Australia and be distributed by winds, despite its lack of wings. *Dichromothrips maori*, recorded from orchids in New Zealand, may prove to be the same species as *D. spiranthidis*, which was described from Australia on the basis of two damaged females. (In this connection it is interesting to note that Moore & Edgar (1970) refer to 70 species of orchids in New Zealand, of which at least one-third also occur in Australia.) Although *Scirtothrips pan* is known only from native forests in New Zealand, it too may have come from Australia, because the most closely related species occur there and in the Philippines and Malaya (Palmer & Mound 1982).

Close et al. (1978) discuss the transport of biological material by winds from Australia to New Zealand. They point out that the New Zealand mountains produce major vortexes which would tend to deposit wind-borne biological material in the Tasman Bay area particularly, but also at the southern end of the South Island and on the west coast of both the North and South islands. Thus, the area around Nelson may be expected to have a richer Australian

Table 1. Faunal elements in New Zealand's 51 species of Terebrantia

INDIGENOUS (19)

Desmidothrips walkerae
Adelphithrips cassiniae
dolus
nothofagi
Anaphothrips zelandicus
Anaphrygmothrips otagensis
Dichromothrips maori
Dikrothrips diphyes
Karphothrips dugdalei
Lomatothrips paryphis
Physemothrips chrysodermus
hadrus
Pseudanaphothrips annettae
Scirtothrips pan
Sigmothrips aotearoana
Thrips austellus
coprosmae
obscuratus
phormiicola

AUSTRALIA (7)

Anaphothrips dubius
varii
woodi
Megalurothrips kellyanus
Pseudanaphothrips achaetus
Thrips australis
imaginis

OLD WORLD TROPICS (6)

Hercinothrips bicinctus
femoralis
Microcephalothrips abdominalis
Parthenothrips dracaenae
Thrips hawaiiensis
simplex

NEW WORLD (4)

Merothrips brunneus
floridensis
Frankliniella occidentalis
Heliothrips haemorrhoidalis

EUROPE (15)

Aeolothrips fasciatus
melaleucus
Anaphothrips obscurus
Apterothrips secticornis
Aptinothrips rufus
stylifer
Ceratothrips ericae
frici
Chirothrips manicatus
Limothrips cerealium
Scirtothrips inermis
Thrips nigropilosus
physapus
tabaci
vulgatissimus

supplement in its thrips fauna than more eastern areas.

The endemic New Zealand thrips are an interesting faunal element. The four native *Thrips* species (Table 1) form a distinctive species-group which must be of recent origin in comparison with the three species of *Adelphithrips*. This latter genus has been suggested as the sister-group of the entire *Thrips* genus-group (Mound & Palmer 1981a), and must therefore have been isolated in New Zealand for a long time. The New Zealand fauna includes several other apparently ancient, relict taxa. *Dikrothrips* is considered to be the sister-group of the widespread Old World orchid-inhabiting genus *Dichromothrips*. Similarly, the structure of *Pseudanophothrips annettae* is such that its genus has been suggested as the sister-group of the worldwide *Frankliniella* genus-group (Mound & Palmer 1981a). Moreover, *Lomatothrips* may be an early offshoot of the *Frankliniella* genus-group, and *Anaphrygmothrips* an early offshoot of the *Anaphothrips* group.

The monobasic genus *Sigmothrips* is closely related to genus *Bhattithrips*, from Australia. They both show characteristics of the hypothetical ancestor of the Phlaeothripidae, if one assumes that this family evolved from ancestors in the panchaetothripine Thripidae (Mound et al. 1980). A similar relationship with Australia is indicated by *Desmidothrips*, which has one species in New Zealand and one in New Caledonia, the most closely related group being the large Australian genus *Desmothrips*.

Genus *Physemothrips*, with two species in the subantarctic islands and extreme south of New Zealand, has no evident relationships with any other known genus.

An intriguing aspect of New Zealand's thrips fauna is the apparent absence of many Australian species that might be expected to have reached this country. For example, none of the 17 species in the endemic Australian genus *Odontothripiella* (Pitkin 1972b) are known from New Zealand, and only 4 of the 16 Australian species of *Anaphothrips* (Pitkin 1978) are recorded here. The absence of these species is probably due to the very different floras available; these two genera are primarily associated with Papilionaceae and Gramineae which are large families in Australia (Good 1964) but not in New Zealand. However, floristic differences alone would not explain all the differences in the thrips faunas of these two countries. *Thrips imaginis* occurs in vast numbers on a wide range of native and introduced plants throughout Australia, and *Thrips hawaiiensis* (= *T. florum*) is also found on a wide range of flowers, north of Sydney. Both are almost certainly swept into the air, and it is difficult to believe that they are not regularly transported by winds to New Zealand. Despite this, they have been recorded only rarely in New Zealand, where presumably the climate is not suitable for them.

MORPHOLOGICAL AND DIAGNOSTIC CHARACTERS

Accounts of thrips morphology and functional anatomy, including references to earlier work, are given by Heming (1970a,b, 1971, 1972, 1975, 1978). The notes below are a guide to structural characters of Terebrantia referred to in the descriptions and key that follow.

Morphological features of the adult are illustrated and labelled in Figure 1; the four immature stages are illustrated in Figures 2-5. Setal notation is explained in Figure 81 for the pronotum. In Figure 135 the terminology for the lateral sclerites of the thorax is explained.

HEAD (Figures 6-47)

The head is usually compressed dorsoventrally. In some species, however, it is deeper posteriorly, and its appearance can be considerably changed by coverslip pressure on slide-mounted specimens. The anterior margin may be recessed; more commonly it is weakly or strongly produced in front of the eyes. The compound eyes are often smaller ventrally than dorsally, although individual ommatidia may be larger ventrally than dorsally. A few setae arise between the ommatidia. The three dorsal ocelli found in macropterae are reduced or absent in micropterae and apterae. There are usually three pairs of setae near the ocelli. Pair I is in front of the first ocellus, but frequently absent (e.g., *Thrips* species). Pair II is lateral to the first ocellus, near the compound eyes. Pair III varies in position; it may be behind, within, or in front of the ocellar triangle. The postocular setae are arranged in a straight or irregular row, or more rarely are scattered.

From its ventral origin the mouth cone either projects backwards between the first coxae or is directed downward. In dorsal views of cleared specimens it thus appears respectively long and pointed or short and rounded. Thysanopteran mouthparts are strongly asymmetric - the right mandible

is not developed, although the left one is stout. The paired maxillary stylets are short, and are usually restricted to the mouth cone (cf. Phlaeothripidae; see Mound et al. 1980). The maxillary palps are usually of three segments, and the smaller labial palps are of two segments.

ANTENNAE (Figures 48-79)

The number of antennal segments varies between species from nine to six, as a result of progressive fusion of the distal segments. In *Thrips obscuratus*, the most abundant New Zealand thysanopteran, the antennae are either seven-segmented or eight-segmented, even on a single individual. Segment II bears a small, circular, campaniform sensillum near the apex dorsally. Segments III and IV each bear a sensory receptor which is linear and longitudinal in Aeolothripidae, linear and transverse or circular in Merothripidae, and emergent as a simple or forked trichome in Thripidae. The surface of the antennal segments either bears transverse rows of microtrichia or is smooth.

THORAX

PROTHORAX (Figures 80-100 and 135). In Thripidae and Aeolothripidae the only dorsal sclerite is the pronotum; in Merothripidae the lateral sclerites may also be visible dorsally. The pronotum bears a variable number of short discal setae. In many taxa certain marginal setae are elongate; these are usually at the posterior angles, but may also occur at the anterior or lateral margins. Ventrally, the median anterior area (basantra) is usually poorly sclerotised; behind this are two transverse sclerites (ferna) which are sometimes fused medially (Figure 135).

PTEROTHORAX (Figures 101-139). The mesonotum is roughly hexagonal in macropterae (Figure 118), and the position of its median setae (either close to the posterior margin or far in front of it) can be a useful diagnostic character, as are the position of the median metanotal setae and the chaetotaxy of the lateral pterothoracic sclerites. In apterae the pterothoracic sclerites may be reduced or partially fused, and the mesonotum and metanotum transverse. Ventrally (or internally) the mesothoracic and metathoracic endofurcae may bear a slender anterior projection or spinula (Figures 136-139). Both spinulae are usually absent in grass-inhabiting genera, but are present in leaf-feeding species that are able to jump. Species of Dendrothripini (none yet recorded from New Zealand) have the metathoracic endofurca produced into a stout, lyre-shaped structure to which are attached the large muscles used in jumping (Figure 137).

LEGS (Figures 140-145)

Tarsi are either one-segmented or two-segmented. The fore tarsi sometimes have a tooth on the inner margin (e.g., in *Aeolothrips*, *Merothrips* males) or, rarely, at the apex (e.g., in *Thrips coprosmae* -Figure 145). The inner margin of the hind tibiae usually bears a row of stout setae. The legs usually project laterally, but in grass-inhabiting species they may be exceptionally short, and some thrips that

are able to jump (e.g., *Dendrothrips* species) keep the hind legs folded under the thorax.

WINGS (Figures 146-166)
The forewings have two longitudinal veins in addition to the costa, although their position is often apparent only from the row of setae they bear. The first (upper) vein is fused to the costa or close to it in Panchaetothripinae, and the number and position of its associated setae often assist identification of families, genera, and species. Cross-veins are more evident in Aeolothripidae than in the other two families. The posterior margin of the forewing bears a double row of cilia which are usually wavy but in a few species are straight. These cilia arise from '8'-shaped sockets which allow them to adopt either of two stable positions, at right angles to the wing in flight or at a shallow angle when at rest (Ellington 1980).

Fully winged individuals (macropterae) have wings which extend beyond the apex of the abdomen. Apterae, which lack wings, and micropterae, with wings about as long as the pterothoracic width, are not uncommon in one sex or both of some species. Hemimacropterae, with wings about half full length, are rare, and it is also rare for any one species to have more than two wing morphs.

ABDOMEN (Figures 167-264)
In reference to tergal and sternal setae, the median pair is termed B_1, the submedian B_2, the next B_3, etc.

Ten tergites are usually clearly developed. These do not bear posteromarginal setae, but there are usually four pairs of discal setae and one pair of posteroangular setae per tergite. The two median discal setae arise close together in some species. In apterae the tergites are often more distinctly sculptured and have longer setae than in macropterae of the same species. Long setae occur only on the more posterior tergites, particularly IX and X; in Merothripidae and most Aeolothripidae tergite X bears in addition a pair of trichobothria near the posterior margin. Some species, particularly those associated with grasses, have the posterior margin of the tergites (and/or sternites) extended into a craspedum, which may be lobed or entire. Many Thripidae have the posterior margin of tergite VIII developed into a ctenidium of long, fine or coarse, triangular microtrichia. This comb-like structure may be involved in grooming wing cilia. Species of *Thrips*, *Frankliniella*, and a few related genera (Mound & Palmer 1980) have two rows of microtrichia laterally on tergites V-VIII; these ctenidia too may be involved in grooming or wing holding, because they are reduced in apterae and micropterae.

Pleurotergites are clearly differentiated from the tergites only in the more advanced Thripidae of subtribe Thripina; they are not developed in the Aptinothripina (Mound et al. 1980). In contrast, pleurosternites are developed in all species. Spiracles are present laterally on abdominal segments I and VIII only, and are usually surrounded by an area of complex reticulate sculpturing.

Only seven sternites are clearly defined, although in Merothripidae sternite VIII is also present (Mound et al. 1980). In the other two families the setae primitively associated with sternite VIII are sometimes retained, but in Thripidae are often either reduced to about 1 µm in length or entirely lost. Sternite I is always greatly reduced. Sternite II usually bears two pairs of posteromarginal setae, but sternites III-VII each bear three pairs of posteromarginals. The origin of the median marginal setae on sternite VII either at or in front of the posterior margin can be useful taxonomically. In some species sternal discal setae are also developed. The sternites of males (but very rarely females) of many species bear distinctive glandular areas.

The structure of male genitalia is used taxonomically in only a few terebrantian genera. Female Terebrantia have an ovipositor consisting of four saw-like valves which curve upward in Aeolothripidae (Figure 263) and downward in Thripidae (Figure 264), but are weakly developed and almost straight in *Merothrips* (Figure 262).

LIFE HISTORY

Most Terebrantia lay their eggs in the green tissues of the host plant in an incision made with the ovipositor. In Merothripidae the ovipositor is weak, and eggs are probably simply deposited on the fungal substrate on dead twigs and leaves. *Chirothrips* species apparently lay eggs on the host plant tissue, or only partly embedded in it (Lewis 1973).

First-instar larvae are protected as they emerge from the egg by a membrane, the embryonic cuticle, but they quickly break free and commence feeding.

Terebrantia have two active larval instars and two relatively inactive 'pupal' instars, although Wilson (1975) reports that the prepupae of *Caliothrips indicus* continue to ingest food. (In contrast, Phlaeothripidae have three 'pupal' instars.) The first two instars have tarsal claws, not the tarsal bladder typical of adult thrips (Heming 1972). The third instar, the prepupa, has short wing buds and compact antennae, and the fourth instar, the pupa, has long wing buds and antennae that curve back over the head. Some Terebrantia pupate on the host plant (see following section), but most pupate in the soil or in leaf litter. Aeolothripid larvae produce a silken pupal cell, and *Odontothrips* species in Europe produce a pupal cell constructed from soil particles and silk.

There have been no life history studies of any thrips native to New Zealand, but development from egg to adult can be expected to take about 3 weeks in warm weather. Cool, wet weather usually reduces thrips populations to a low level. Moreover, in New Zealand it appears that under these conditions large numbers of leaf- and flower-inhabiting thrips descend into the litter at ground level for shelter. This is the most likely explanation for the large numbers of thrips that have been extracted with Berlese funnels from litter and moss.

DISTRIBUTION, HABITAT, AND HOST PLANTS

In New Zealand, thrips have been found living on plants over a wide range of altitudes, from *Salicornia* in a seashore salt marsh to tussock plants in the alpine zone. Indeed, *Anaphothrips zelandicus* has been collected in abundance in both these habitats, and moreover is always wingless. Vagility of some thrips species appears to be independent of the presence or absence of wings. The determining factor is probably behavioural; species that habitually climb up vegetation will be dispersed by winds, but those that remain concealed or in litter probably will not (Mound 1972b). Many thrips therefore tend not to conform to the simple models of allopatric speciation that can be applied to insects and other organisms not forming part of the 'acrial plankton'.

Characteristic distribution patterns can, however, be distinguished in some species. *Physemothrips chrysodermus* and *P. hadrus* have been collected only in the extreme south of New Zealand and on the subantarctic islands; they may be constrained by some climatic factor. Moreover, some introduced species (e.g., *Aptinothrips stylifer* and *Thrips nigropilosus*) also seem to be restricted to the South Island whereas *Microcephalothrips abdominalis* is probably confined to the warmer parts of the North Island. Native host-specific species such as *Adelphithrips nothofagi*, *Thrips coprosmae*, and *Thrips phormiicola* are limited in range by the distribution of their hosts. Oligophagous species such as *Scirtothrips pan*, and particularly polyphages such as *Thrips obscuratus*, are free from this constraint.

The biological significance of those thrips species that have been collected at high altitude in the New Zealand mountains has yet to be determined. Some, such as *Thrips phormiicola* on *Phormium cookianum*, *Thrips obscuratus* micropterae on *Bulbinella hookeri*, and *Adelphithrips cassiniae* on *Cassinia*, probably maintain populations at these sites by overwintering beneath the snow. The many introduced species that have been taken in summer at high altitudes - e.g., *Anaphothrips* species, *Aptinothrips* species, *Pseudanaphothrips achaetus*, *Ceratothrips frici*, *Megalurothrips kellyanus*, *Thrips tabaci* - may well have been transported there by the wind.

Several species of Thysanoptera were found in birds' nests, an association more likely to be fortuitous, due to seeking of shelter, than to any more fundamental cause. These insects typically have a pronounced thigmotactic response.

The flora associated with *Nothofagus* forest seems to support a larger thrips fauna, in terms of both species diversity and numbers of individuals, than the flora of *Podocarpus* forest. On equivalently warm, dry days we were able to collect more thrips in *Nothofagus* forest, even as far north as the Kaimanawa Forest near Lake Taupo, than in the *Podocarpus*-dominated forests of the Coromandel Peninsula, the Rotorua area, or Auckland's Waitakere Range.

As with other insects in New Zealand (Watt 1979a), there is a sharp discontinuity between the thrips fauna associated

with the native flora and that associated with such dominant exotics as *Poa annua* and *Ulex europaeus*. Of the native species, only *Thrips obscuratus* has adapted to the exotic flora of pasture, orchard, and garden, and in the flowers of such plants it is usually the dominant thrips species. In Gramineae the introduced species *Anaphothrips obscurus*, *Aptinothrips rufus*, and *Chirothrips manicatus* are abundant, and in yellow-flowered Compositae *Ceratothrips frici* is fairly common. The only introduced thysanopteran to have been taken widely in native habitats is *Thrips tabaci*.

Almost all Thripidae and Aeolothripidae are associated with green plants, whereas Merothripidae are found in leaf litter and on dead twigs or branches, the presumed original habitat of the earliest Thysanoptera (Mound et al. 1980). Aeolothripids mostly live in flowers, apparently feeding on plant tissue as well as on other arthropods, but several unrelated species in different parts of the world are found in grass tussocks, where they probably feed on mites. The Panchaetothripinae are all leaf-feeding species, and their pupae are unusual in frequently being associated with larvae and adults on the lower surface of leaves. The larvae often carry a small, dark, faecal droplet on the upturned apex of the abdomen, and attacked leaves are commonly speckled with these droplets.

The majority of thripid species are classified in subfamily Thripinae, of which the tribes Dendrothripini and Sericothripini comprise leaf-feeding species whose pupae, like those of Panchaetothripinae, can be found with adults and larvae on leaves. *Scirtothrips* and *Pseudodendrothrips* species are particularly associated with recently emerged tender foliage. All Chirothripini are associated with grass flowers, which have a short season, so *Chirothrips manicatus* and *Limothrips cerealium* tend to be univoltine. In contrast, Thripini such as *Aptinothrips* and *Anaphothrips* species are often multivoltine. Of the two subtribes of Thripini, the Aptinothripina are mostly leaf-feeding species and the Thripina are mostly flower-inhabiting species. However, there are many exceptions, particularly among the more advanced Thripina such as *Taeniothrips* and *Mycterothrips* species, which all feed on leaves.

The method of feeding in thrips has been the subject of some discussion, but Mound (1971) and Heming (1978) have demonstrated that the maxillary stylets are so adapted as to fit together, forming a feeding tube similar to that of Hemiptera. Most Terebrantia feed on the mesophyll tissue of green leaves and flowers, but *Scolothrips* species are probably all predators of mites. The larvae of *Thrips tabaci*, as well as many Aeolothripidae, may also feed on small mites. Mound (1972a) suggested that the colour polymorphism of an Australian aeolothripid in *Eucalyptus* flowers might be dependent on diet.

Flower-inhabiting thripids are commonly assumed to feed on pollen, but this requires further investigation. Many thrips species can be collected in leaf litter at soil

level, but most thripids and aeolothripids in this situation are probably sheltering or emerging from pupation in the soil. Amongst the Terebrantia only Merothripidae feed on fungal hyphae or hyphal breakdown products in leaf litter and on dead twigs, although probably the majority of phlaeothripid (i.e., tubuliferan) species have this habit.

PEST SPECIES

Thysanoptera are not usually pests in New Zealand because the prolonged warm, dry weather they require to produce large populations is generally infrequent. Grass and cereal crops sometimes suffer yield loss due to *Chirothrips manicatus* (Doull 1956b), and may also be expected to support large populations of *Anaphothrips obscurus*, *Aptinothrips rufus*, or *Limothrips cerealium* under suitable conditions. *Apterothrips secticornis* is a potential pest of lucerne, although serious damage has yet to be recorded. The greenhouse thrips, *Heliothrips haemorrhoidalis*, is sometimes reported by the Forest Research Institute as damaging the foliage of *Pinus nigra*, but populations are likely to be reduced heavily in cool, showery weather. Several other species usually found under glass in the north temperate region, such as *Hercinothrips bicinctus*, *H. femoralis*, and *Parthenothrips dracaenae*, can also live outside in New Zealand, and are potential horticultural pests. *Thrips simplex*, the gladiolus thrips, can maintain populations on wild montbretia as well as on cultivated *Gladiolus* under New Zealand conditions.

In Kenya *Thrips nigropilosus* has been regarded as a pest of *Pyrethrum*, and in India *Microcephalothrips abdominalis* is a minor pest of sunflower; however, neither seems to cause problems in New Zealand. *Thrips imaginis*, the highly polyphagous 'plague thrips' of Australia, is a pest of apple blossom in south-eastern Australia, and *Thrips hawaiiensis* (= *T. florum*) is a pest of bananas in Queensland, yet neither is significant in New Zealand. Another pest species widespread in Australia but unrecorded in New Zealand is *Frankliniella schultzei*, one of the four known vectors of tomato spotted wilt virus (Mound 1973). However, two vector species of this virus - *F. occidentalis* and *Thrips tabaci* - are widespread in New Zealand, and moreover both are known to cause feeding damage to certain of their numerous host plants. All the above species are introduced.

The only native species with any potential as pests are *Thrips obscuratus*, with its very wide host range, and *Thrips phormiicola*, which was first discovered (but not described) around 1950 during investigations into the future of *Phormium* as a fibre crop (Cumber 1954).

NATURAL ENEMIES

Lewis (1973) extensively reviews the published information on predators and parasites of thrips. He points out that chrysopid and coniopterygid larvae are probably the most voracious of thrips predators, but these lacewings have not been recorded as attacking thrips in New Zealand. There appear to be three

(unnamed) species of *Spilomena* (Hymenoptera: Crabronidae) here which collect thrips adults and larvae to provision their nests. The adult *Spilomena* approaches a thrips from behind, grasps it behind the head in its mandibles, then stings it on the ventral surface. The wasps, which nest in abandoned tunnels of the wood-boring beetle *Anobium*, stack the thrips parallel to each other, and up to 21 *Thrips obscuratus* macropterae have been found in a single nest. Gourlay (1964) records *Spilomena* collecting *Heliothrips haemorrhoidalis* at Nelson. Various bugs (particularly anthocorids), some fly larvae, some vertebrates, and even a few thrips have also been recorded as predators of one or more species of Thysanoptera.

At least some Aeolothripidae are probably predatory on other thrips - *Desmidothrips walkerae* has been collected on *Hebe* flowers in circumstances which suggested it to be preying on *Thrips obscuratus*. Some ectoparasitic mites are known to attack thrips (Lewis 1973), and an unidentified phlaeothripid that we collected near Auckland bore many specimens of *Adactylidium* sp. (Pyemotidae). Chalcid internal parasitoids (Hymenoptera) are also known from various thrips, and species of both *Ceranisus* (= *Thripoctenus*) (Eulophidae; larval parasites) and *Megaphragma* (Trichogrammatidae; egg parasites) have been recorded from New Zealand. That thrips are sometimes attacked by fungi is indicated by a specimen of *Thrips obscuratus* from Invercargill infested with *Entomophthora* sp.

COLLECTING, PREPARATION, AND CURATION

Experimental entomologists know that they must replicate observations on living insects to avoid individual or population variation, but often fail to appreciate that taxonomic studies are subject to the same constraints. Sound taxonomic work on thrips requires that numerous specimens be mounted on to microscope slides according to a standard method. Attempts to avoid the tedium of this approach have led (and continue to lead) to erroneous descriptions and the erection of spurious taxa. An experienced taxonomist working on a known fauna can often identify a damaged or distorted specimen, but many comparisons are impossible when specimens are crushed, distorted, or mounted laterally. For example, during morphometric analysis of a group of specimens, Mound & Palmer (1981a) recognised two subgroups which subsequent examination proved to represent merely 'specimens mounted in balsam' and 'specimens mounted in Berlese'. Thus, we cannot emphasise too strongly the importance to serious taxonomic work of standardisation and care in the collection, preparation, and preservation of specimens for microscopy (Mount & Pitkin 1972, Walker & Crosby 1979).

COLLECTING

There are two approaches to collecting. First, one can survey an area by means of Malaise traps, water traps, aerial suction traps, and nets and using Berlese funnels to extract from leaf litter and moss. Second, one can inspect and beat over a suitable tray individual plants, flowers, and dead twigs. The second method provides

precise biological information on host associations, whereas the first provides specimens from a wider area. Some species may have to be collected individually because they occupy particularly sheltered positions on their hosts - e.g., *Thrips phormiicola* at the base of *Phormium* leaves.

The most effective beating tray for thrips collecting is made of plastic, to which thrips will conveniently adhere for a short time. A domestic washing-up bowl with the sides cut down and a correspondence in-tray with a solid plastic bottom have proved equally effective. A cloth beating-sheet is useful in wet weather, when a plastic tray tends to fill with water. A narrow-bladed heavy trowel makes a precise and effective beating instrument.

Specimens should be collected into small vials containing A.G.A. (60% ethanol, glycerol, and acetic acid in the ratio 10:1:1); if this is not available, 60% ethanol should be used. Stronger alcohols should be avoided because they usually decolorise specimens and make them too rigid to manipulate satisfactorily during slide mounting. Host, date, and locality data should be placed in each vial, but cotton wool should never be included with thrips. Specimens are usually conveniently transferred from beating tray to collecting vial with a grass stem, but a small brush may be useful sometimes. Thrips collected with a sweep net and pooter are usually severely damaged.

SLIDE PREPARATION

When preparing a slide, the objective is to place each specimen by itself centrally with wings, legs, and antennae spread so that structures can most readily be compared. Most specimens must be cleared so that surface detail is not obscured by iridescence of the body contents, but a few should be retained in their natural colour (treated as in paragraphs 1 and 4-7 below). For serious study specimens must be mounted permanently in Canada balsam. Rapid identifications for ecological surveys are possible in temporary mountants such as glycerine, Berlese, or Hoyer's, but these usually cause distortions. Specimens for permanent preparations should be treated as follows.

1. Soak for 24 hours in clean 60% ethyl alcohol to remove collecting fluid; this and subsequent treatment is best carried out, 10 specimens at a time, in a square watchglass. Excess fluids are removed with a pipette.
2. Macerate in cold 5% sodium hydroxide solution for from 30 minutes to 4 hours (dark specimens require longer treatment).
3. Wash briefly in 50% alcohol, then soak in 60% alcohol for 24 hours.
4. Dehydrate through a series of ethyl alcohol concentrations: 70% - 1 hour; 80% - 20 minutes; 85% - 10 minutes; 100% - 5 minutes (twice); clove oil - until clear (30 seconds to 10 minutes). Appendages should be spread carefully at each stage; dehydration and clearing may be facilitated by one or two fine puncture holes made with a needle in thoracic and abdominal membranes.
5. Mount ventral side uppermost on a 13 mm coverslip in Canada balsam; the slide

should then be lowered on to the coverslip. This procedure is easier to control than the traditional method of lowering a coverslip on to a slide with forceps.

6. Label the slide as follows: right-hand label - host plant at top, followed by country (capital letters), locality, altitude, date, and collector; left-hand label - identification and sex.
7. Place the slides in a drying oven at 40°C within a few minutes of preparation; dry them fully (up to 6 weeks).

CURATION

Microscope slides are usually stored flat, but with very large collections this is inefficient for data retrieval and wasteful of space. At the British Museum (Natural History) slides of Thysanoptera (also Sternorrhyncha, Phthiraptera, and some Diptera) are stored on edge in 4-cm-deep drawers. These slides are treated essentially as a card file system, by incorporating on tab cards information on nomenclature, distribution, host plants, and seasonality. The collection is thus self-indexing, and facilitates storage and retrieval of both data and specimens. This system has two prerequisites. First, the mountant must be dried hard (some white brands of balsam do not harden sufficiently); second, the specimens must be protected from impact damage by using thick (drawing card) labels affixed with PVA glue.

Specimens which are not mounted into Canada balsam soon after collecting are often of limited value for subsequent studies, particularly if stored at more than about 20°C in 80% ethyl alcohol. This type of storage appears to dissolve the surface of the cuticle but fixes the body contents into an inert, gelatinous mass; moreover, such specimens rapidly lose their colour. In contrast, specimens mounted dry on to cards with glue more than 100 years ago have recently been remounted on to microscope slides perfectly. Perhaps excess material not immediately required on slides should be stored dry in this way.

TEXT CONVENTIONS

The descriptive text which follows is based on the formal style of data presentation widely accepted in taxonomic entomology. The key to taxa attempts to bring out major systematic groups in sequence, although this is not always possible. Within the key several unnumbered figures have been included to aid in the interpretation of particular characters. The figures relevant to each species are listed under each species heading; this numbered sequence is not intended to illustrate each species fully, but rather to supplement the descriptive text in emphasising diagnostic characters. An asterisk indicates those figures based on holotype specimens.

Taxa from family to subtribe are presented in systematic sequence. Within these higher taxonomic groupings genera and species are in alphabetical order (the Checklist follows the same sequence, and with the page numbers added serves as a Contents list also). For each major taxonomic grouping from family to genus the text includes an indication of its size,

geographical range, biology, and diagnostic characters. Species descriptions supplement the generic definitions with details on colour and structure, together with notes on wing morphs and sexes. Descriptions are more extensive for new taxa than for those previously described, but for all species are intended to be comparative and brief rather than fully inclusive.

The type-species for each genus is indicated, and for each previously described species the synonymy includes the original combination together with information on the type series. Synonyms are given only when these have occurred in New Zealand literature; full synonymies are available in Jacot-Guillarmod (1970-78).

For each species, locality records are summarised using the area codes proposed by Crosby et al. (1976) as explained on the inside back cover. Distribution maps have not been included as these are of questionable value considering the highly vagile nature of most thrips. Introduced species have their first recorded place and date noted. Where possible, plants and other substrates from which material has been collected are summarised, as are the months in which adult specimens have been collected. Additional information on plant associations, localities, dates, sexes, collectors, and repositories has been recorded, and is to be stored in a computer file on the DSIR network. Inquiries or retrieval requests should be addressed to Entomology Division, DSIR, Private Bag, Auckland. Repositories are indicated in parentheses by the following codes (after Watt 1979b).

AMNZ Auckland Institute and Museum, Auckland, N.Z.

ANIC Australian National Insect Collection, Division of Entomology, CSIRO, Canberra City, A.C.T. 2601, Australia

BMNH British Museum (Natural History), London, England

CASC California Academy of Sciences, San Francisco, Ca 94118, U.S.A.

CNCI Canadian National Collection of Insects, Biosystematics Research Institute, Agriculture Canada, Ottawa K1A 0C6, Canada

FRNZ Forest Research Institute, New Zealand Forest Service, Rotorua, N.Z.

FSAC Florida State Arthropod Collection, Gainesville, U.S.A.

LCNZ Department of Entomology, Lincoln College, Canterbury, N.Z.

NMID National Museum, Ireland, Dublin, Ireland.

NMNZ National Museum of New Zealand, Wellington, N.Z.

NZAC New Zealand Arthropod Collection, Entomology Division, Department of Scientific and Industrial Research, Auckland, N.Z.

PANZ Plant Health Diagnostic Station, Ministry of Agriculture and Fisheries, Auckland, N.Z.

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

QMBA Queensland Museum, Brisbane, Qld 4006, Australia

SMFG Senckenberg Museum, Frankfurt, West Germany

USNM United States National Museum of Natural History, Smithsonian Institution, Washington, D.C. 20560, U.S.A.

UZMF Universitets Zoologiska Museum, Entomologiska Avdelnigen, Helsingfors, Finland

KEY TO NEW ZEALAND TEREBRANTIA

This key is to adults only. In contrast to apterous adults, with which they may be confused, larvae (Figures 2 and 3) have a pair of tarsal claws, adjacent body segments not all clearly differentiated, and the chitinous integument rarely pigmented, except around some setal bases (although the internal body colour varies from white to red to purple).

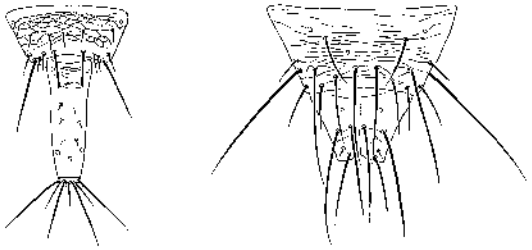
1 Abdominal segment X tubular in both sexes, without a longitudinal division of the dorsal or ventral surface; female with a membranous ovipositor which is everted ventrally between segments IX and X; forewings (when present) without longitudinal veins; wing membrane without microtrichia; 3 major setae usually present subbasally near anterior wing margin .... (TUBULIFERA) .. PHLAEOTHRIPIDAE*

-Abdominal segment X usually pointed, rarely tubular, always divided longitudinally at least on ventral surface Figures 215-224); female with a saw-like ovipositor (Figures 262-264); forewings (when present) with 3 longitudinal veins each bearing a series of major setae (Figures 146-166); wing membrane usually with numerous microtrichia .... (TEREBRANTIA) .. 2

2 (1) Forewing slender, usually acute apically, usually with only 1 cross-vein visible, or forewing absent or reduced (Figures 162b and 163); head and pronotum often with 1 pair or more of elongate setae (Figures 42 and 97); antennae 6-segmented to 9-segmented; sensoria on antennal segments III and IV small and transverse, or produced into forked or simple trichomes (Figures 49, 52, and 78b) 3

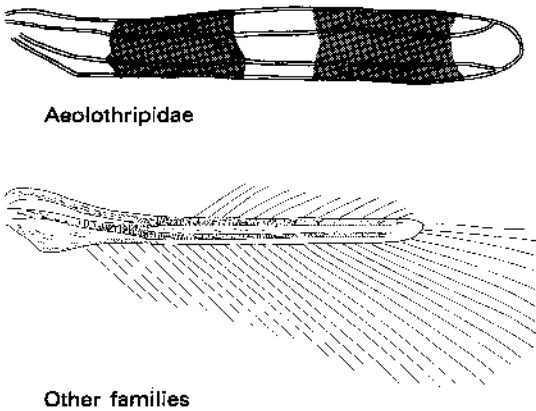
-Forewing broad, rounded at apex, with 4 cross-veins usually visible; setae on head and pronotum short (Figure 6); antennae 9-segmented; sensoria on antennal segments III and IV linear (Figures 50 and 51) .... (AEOLOTHRIPIDAE) .. 4

Couplet 1: condition of apex of abdomen



Tubulifera Terebrantia

Couplet 2: condition of forewings



Aeolothripidae

Other families

* Refer to key in Fauna contribution on Tubulifera (Mound & Walker, in preparation)

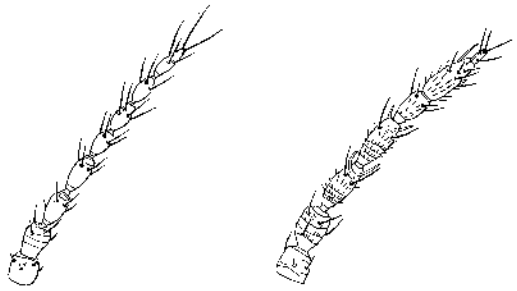
3 (2) Antennae 8-segmented; antennal segments all distinct from each other; sensoria on antennal segments III and IV transversely oval to circular and lens-like; relatively small Terebrantia feeding on fungus in leaf litter and on twigs

.... (MEROTHRIPIDAE) .. 6

-Antennae 6-segmented to 9-segmented; antennal segments VII and VIII much reduced or even fused to segment VI; sensoria on antennal segments III and IV produced into simple or forked trichomes; small to large Terebrantia inhabiting flowers, leaves, or grasses

.... (THRIPIDAE) .. 7

Couplet 3: condition of antennae



Merothripidae Thripidae

Family AEOLOTHRIPIDAE

4 (2) Forewing mainly fuscous, pale at base and apex (Figure 148); sternites III-VI each with at least 2 pairs of discal setae laterally in addition to posteromarginals; metanotum finely reticulate medially and transversely striate near anterior margin, the reticles with internal sculpturing (Figure 103)

.... *Desmidothrips walkerae*

-Forewing with 2 dark cross-bands separating 3 pale areas, the bands sometimes coalescing along posterior margin of wing; sternites III-VI with posteromarginal setae but no discal setae; metanotum broadly reticulate, the reticles without internal sculpturing (Figures 101 and 102)

.... 5

5 (4) Forewing with dark cross-bands distinctly separate (Figure 146); antennal segment III shaded at apex

.... *Aeolothrips fasciatus*

-Forewing with dark cross-bands broadly coalescent along posterior margin of wing (Figure 147); antennal segment III clear yellow

.... *Aeolothrips melaleucus*

Family MEROTHRIPIDAE

6 (3) Body mid brown; sensoria on antennal segments III and IV circular, lens-like (Figure 48); tergite IX with median setae shorter than submedian setae or absent; tergite X with sensoria no larger than the spiracle on abdominal segment VIII, and axial setae of sensoria short (35 µm) or absent (Figure 215)

.... *Merothrips brunneus*

-Body yellow to pale brown; sensoria on antennal segments III and IV transversely oval (Figure 49); tergite IX

with median setae longer than submedian setae; tergite X with sensoria twice the diameter of the spiracle on abdominal segment VIII, and axial setae of sensoria long (more than 100 µm) (Figure 216)

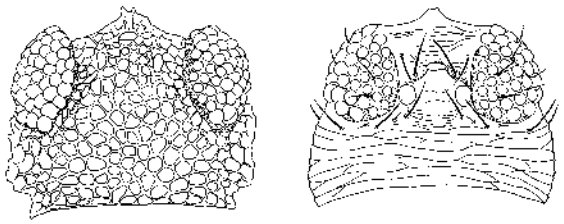
.... *Merothrips floridensis*

Family THRIPIDAE

7 (3) Head conspicuously reticulate; macropterous, forewing with 1st vein more or less fused to costa (Figures 149-153); body mainly dark brown .... (PANCHAETOTHRIPINAE) .. 8

-Head not conspicuously reticulate; forewing (when present) with 1st vein separate from costa (Figures 162a and 165); some species with the head weakly reticulate (Figure 21) are apterous or pale-coloured .... (THRIPINAE) . 12

Couplet 7: condition of head



Panchaetothripinae Thripinae

8 (7) Tarsi 2-segmented (Figure 140); forewing with complete rows of setae on costa, 1st vein, and 2nd vein (Figures 150 and 151); metathoracic furca large, 'Y'-shaped (Figure 136); sensoria on antennal segments III and IV forked (Figure 53) 9

-Tarsi 1-segmented (Figure 141); forewing with setal row on 1st vein incomplete (Figures 149, 152, and 153); metathoracic furca small, not extending to meso-metathoracic suture; sensoria on antennal segments III and IV simple (Figures 52 and 54) ... 10

9 (8) Forewing predominantly pale, with 2 dark cross-bands (Figure 150) .... *Hercinothrips bicinctus*

-Forewing with the median pale area shorter than the dark cross-bands, sometimes almost uniformly dark with only the base and apex pale (Figure 151) .... *Hercinothrips femoralis*

10 (8) Forewing exceptionally broad, its median width more than 0.1x its length; membrane with reticulate pattern (Figure 152) .... *Parthenothrips dracaenae*

-Forewing slender, its median width less than 0.07x its length; membrane without reticulate pattern (Figures 149 and 153) ... 11

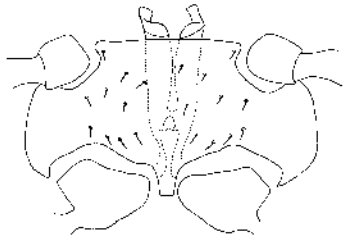
11 (10) Forewing pale with a longitudinal brown line, rounded at apex (Figure 149); tergites without sigmoid setae; legs yellow .... *Heliothrips haemorrhoidalis*

-Forewing brown with 3 irregular, transverse pale areas, curved forward at apex (Figure 153); tergites V-VII each with 1 pair of sigmoid setae (Figure 167); legs with femora brown, tarsi and hind tibiae yellow .... *Sigmothrips aotearoana*

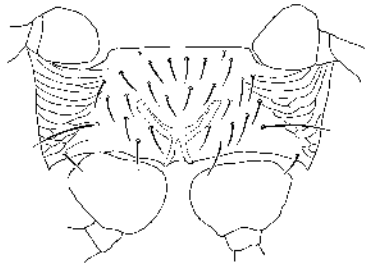
12 Internal furca of metathorax extending
(7) to mesothoracic furca, lyre-shaped; [not yet recorded in New Zealand]
.... Dendrothripini

-Internal furca of metathorax rarely extending to mesothorax and then only as a slender median spinula (Figure 138) ... 13

Couplet 12: condition of metathoracic furca



Dendrothripini

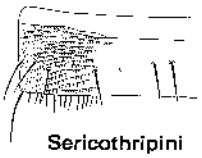


Other groups

13 Abdominal tergites with many rows of
(12) closely spaced microtrichia laterally; pronotal sculpturing transversely striate (Figure 81); head with a pair of median setae in front of median ocellus ... 14

-Abdominal tergites without microtrichia laterally, or with only a few; pronotal sculpturing not as above (Figure 97); head often without setae in front of median ocellus (Figure 42) ... 15

Couplet 13: condition of abdominal tergites



Sericothripini

Other groups

14 Ocellar setae III arising between
(13) posterior ocelli (Figure 10); metanotum with median pair of setae not at anterior margin, sculpturing transverse in anterior third (Figure 104); forewing weakly shaded, its posteromarginal cilia straight, 1st vein usually with 3+5+1+1+1 setae, 2nd vein usually with 2 setae; tergites III and IV with 4 pairs of discal setae on lateral field of microtrichia; tergite VIII with a few microtrichia posteromedially; male without drepanae
.... *Scirtothrips inermis*

-Ocellar setae III arising in front of anterior margin of posterior ocelli but close together within ocellar triangle (Figure 11); metanotum with median pair of setae at or very close to anterior margin, sculpturing weakly reticulate (Figure 105); forewing strongly shaded, its posteromarginal cilia with slightly wavy apices, 1st vein with 3+3+1+1+1 setae, 2nd vein with 3 or 4 setae (Figure 154); tergites III and IV with 3 pairs of discal setae on lateral field of microtrichia; tergites VIII and IX without microtrichia medially (Figure 195); tergite IX of male with a pair of dark drepanae (Figure 240)
.... *Scirtothrips pan*

15 Pronotum trapezoidal, with 2 pairs of
(13) major posteroangular setae; head much smaller than pronotum, projecting in front of eyes (Figure 12); antennal segment II asymmetrical, its external margin drawn out into a point (Figure 57); antennal segments III and IV with sense cones simple

.... *Chirothrips manicatus*

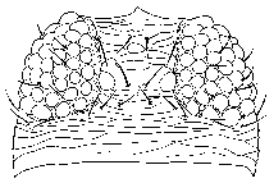
-Pronotum rectangular, or if weakly trapezoidal then either head not projecting in front of eyes or antennal segments III and IV with sense cones forked; antennal segment II not as above ... 16

16 Female macropterous, with 1 pair of
(15) black, thorn-like setae on tergite X (Figure 217); male apterous, with 2 pairs of very short, stout setae on tergite IX, 1 pair medially and 1 pair posterolaterally (Figure 241)

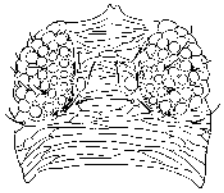
.... *Limothrips cerealium*

-Female macropterous, micropterous, or apterous, without black, thorn-like setae on tergite X; tergite IX of male not as above ... 17

Couplet 17: condition of ocellar setae pair I



Frankliniella, Pseudanaphothrips



Other groups

17 Head with a pair of setae medially in
(16) front of median ocellus and forewing with a complete row of setae on 1st and 2nd veins ... 18

-Either head without a pair of setae medially in front of median ocellus (rarely ocelli absent) or forewing without a complete row of setae on 1st and 2nd veins (forewing sometimes reduced or absent) ... 20

18 Pronotum with 2 pairs of long
(17) anteromarginal setae and 2 pairs of long posteroangular setae (Figure 91)

.... *Frankliniella occidentalis*

-Pronotum with anteromarginal setae short, posteroangular setae either long or short ... 19

19 Pronotum with no elongate setae
(18) (Figure 95); tergite VIII with a posteromarginal group of fine microtrichia medially and triangular teeth laterally (Figure 205); head broad (Figure 34)

.... *Pseudanaphothrips achaetus*

-Pronotum with 2 pairs of long posteroangular setae (Figure 96); tergite VIII without a posteromarginal comb of microtrichia (Figure 206); head relatively narrow (Figure 35)

.... *Pseudanaphothrips annettae*

20 Abdominal tergites V-VIII with a pair
(17) of ctenidia laterally which, on tergite VIII, pass posteromesad of the spiracles; head with only 2 pairs of ocellar setae, none medially anterior to median ocellus (Figures 36-47) ... 21

-Abdominal tergites without clearly defined ctenidia, but sometimes with scattered microtrichia laterally, arranged in groups; head usually with

3 pairs of ocellar setae, including a pair immediately anterior to median ocellus (Figure 34) ... 33

Couplet 20: condition of abdominal tergite VIII

Thrips, Microcephalothrips

Other groups

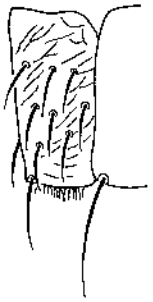
21 Sternites with no discal setae
(20) medially ... 22
-Sternites with discal setae in a transverse row medially, in addition to marginal setae (Figure 238a) ... 23

22 Abdominal pleurotergites with numerous
(21) ciliate microtrichia on lines of sculpturing (Figure 233); ocellar pigment grey; tergites IV and V with median setae not elongate; macropterous, forewing with 1st vein bearing 4 setae distally, rarely 5 or 6 (Figure 165); very variable in body size and colour .... *Thrips tabaci*
-Abdominal pleurotergites without rows of ciliate microtrichia; ocellar pigment orange-red; tergites IV and V with 2 pairs of median setae more than half as long as median length of tergite (Figure 189); usually micropterous .... *Thrips nigropilosus*

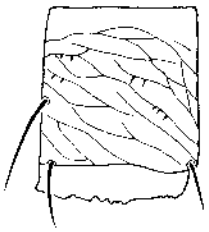
23 Abdominal tergites with a
(21) posteromarginal craspedum of large, triangular teeth (Figure 185); head unusually small; pronotum widest at posterior angles (Figure 94)
.... *Microcephalothrips abdominalis*
-Abdominal tergites without a craspedum ... 24

24 Abdominal pleurotergites with discal
(23) setae medially (Figure 229) as well as posteromarginal setae ... 25
-Abdominal pleurotergites without discal setae ... 31

Couplet 24: condition of abdominal pleurotergites



Thrips australis



Lomatothrips paryphis

25 Forewing with 1st vein bearing a
(24) series of setae in proximal half and 3 setae distally, but none medially (Figure 166) ... 26
-Forewing with a complete, or almost complete, row of setae on 1st vein (Figures 161 and 162a) ... 27

26 Metanotum with sculpturing striate
(25) medially (Figure 134); antennae 8-segmented; abdominal tergite VIII with a posteromarginal comb of microtrichia (Figure 214)
.... *Thrips vulgatissimus*
-Metanotum with sculpturing reticulate medially (Figure 127); antennae 7-segmented; abdominal tergite VIII with no posteromarginal microtrichia

medially but some laterally (Figure 208) .... *Thrips imaginis*

27 (25) Metanotum strongly and completely reticulate (Figure 124); antennae 7-segmented; antennal segment VI with margins characteristically straight and converging sharply in apical third (Figure 77) .... *Thrips australis*

-Metanotum striate at least laterally, sometimes weakly and irregularly reticulate medially (Figure 125); antennae 7-segmented or 8-segmented; antennal segment VI not angular in profile (Figure 78b) ... 28

28 (27) Fore tarsus with an apical claw (Figure 145); abdominal tergites with no sculpturing medially; metanotum with no median pores, and with median area very weakly sculptured (Figure 125); forewing with setae relatively long, arising slightly further apart than their length (Figure 161); male with 3 (? 4) sternal glandular areas; on *Coprosma* .... *Thrips coprosmae*

-Fore tarsus with no apical claw; abdominal tergites with lines of sculpturing usually extending to median setae; metanotum with median pores, sculptured medially (Figures 129 and 134); sometimes micropterous; if macropterous, forewing with setae relatively short and closely spaced (Figure 162a); male with 5 sternal glandular areas ... 29

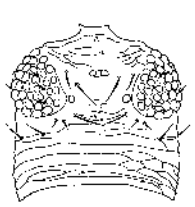
29 (28) Metanotum reticulate medially, the lines of sculpturing raised into flanges (Figure 123); ocellar setae III shorter than the distance between any 2 ocelli (Figure 36); forewing not paler at base than medially .... *Thrips austellus*

-Metanotum striate medially, closely striate in macropterae (Figure 129); ocellar setae III longer than the distance between any 2 ocelli; forewing paler at base than medially ... 30

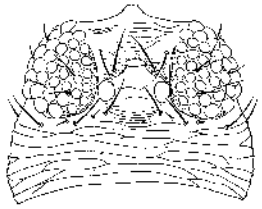
30 (29) Head produced in front of eyes; postocular region longer than dorsal length of eyes (Figure 43); tergites II-V with lines of sculpturing continuous medially, and with median setae as stout as the lateral setae (Figure 191); macropterae and micropterae on *Phormium* .... *Thrips phormiicola*

-Head not produced in front of eyes; postocular region shorter than dorsal length of eyes (Figure 42); tergites II-V with lines of sculpturing interrupted medially, and with the median pair of setae smaller than the 2 lateral pairs (Figure 190); macropterae widespread, very common on many plants; micropterae rare, in alpine areas only .... *Thrips obscuratus*

Couplet 30: condition of head



Thrips phormiicola



Thrips obscuratus

31 Metanotum reticulate medially,
(24) reticles with internal markings, median setae remote from anterior margin (Figure 132); ocellar setae III arising just inside ocellar triangle (Figure 45); forewing with 5 or more setae on distal half of 1st vein (Figure 164); on *Gladiolus*
.... *Thrips simplex*

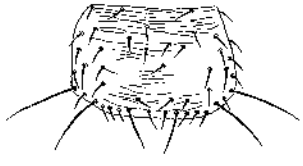
-Metanotum more or less striate medially, with median setae close to anterior margin (Figure 126); ocellar setae III arising outside ocellar triangle (Figure 39); forewing with 3 setae on distal half of 1st vein ... 32

32 Abdominal tergite II with 4 lateral
(31) marginal setae (Figure 188); tibiae mainly yellow; antennal segments IV and V brown; forewing shaded
....*Thrips hawaiiensis*

-Abdominal tergite II with 3 lateral marginal setae (Figure 193); tibiae mainly brown; antennal segments IV and V mainly yellow; forewing pale or only weakly shaded
.... *Thrips physapus*

Couplet 33: condition of pronotal posteroangular setae

Pseudanaphothrips achaetus



Megalurothrips kellyanus

33 Pronotum with no posteroangular setae
(20) elongate ... 34

-Pronotum with at least 1 pair of posteroangular setae longer than the posteromarginals (Figures 83, 84, 86, and 87) ... 41

34 Head longer than wide (Figure 21);
(33) apterous, slender, yellow Thripinae with the abdomen scarcely wider than the thorax; antennae 6-segmented or 8-segmented, sense cones on antennal segments III and IV simple (Figures 66 and 67) ... 35

-Head wider than long; if apterous, abdomen usually wider than thorax; antennae 9-segmented; sense cones usually forked, at least on antennal segment IV; antennal segment VI divided by a complete or partial suture (Figure 65) ... 36

35 Antennae 6-segmented (Figure 66);
(34) tarsi 1-segmented; tergite IX with posteromedian setae very short, not reaching posterior margin (Figure 219)
.... *Aptinothrips rufus*

-Antennae 8-segmented (Figure 67); tarsi 2-segmented; tergite IX with posteromedian setae almost as long as posterolateral setae (Figure 220)
.... *Aptinothrips stylifer*

36 Sternites with a well developed
(35) craspedum which is deeply cleft towards the origin of each posteromarginal seta (Figure 235)
.... *Apterothrips secticornis*

-Sternites not as above ... 37

37 Apterous; tergite VIII with no
(36) posteromarginal comb of microtrichia
... 38

-Macropterous or micropterous; tergite VIII with a posteromarginal comb of microtrichia (Figures 196 and 197)
... 39

38 Tergite IX with median setae at least
(37) 3.0x as long as the distance between their bases (Figure 218); tergites III-VI with median pair of pores anterior to row of setae (Figure 172); metanotum with 1 pair of setae near posterior margin (Figure 107); body yellowish white
.... *Anaphothrips woodi*

-Tergite IX with median setae less than 1.5x as long as the distance between their bases; tergites III-VI with median pair of pores posterior to row of setae or in line with it (Figure 173); metanotum with 3 or 4 pairs of setae near posterior margin (Figure 108); body usually brown
.... *Anaphothrips zelandicus*

39 Macropterous; forewing with 2nd vein
(37) bearing 3 or 4 setae at base, proximal to cross-vein (Figure 156); male with tergite IX bearing a pair of stout setae medially and a pair of very long, recurved setae laterally (Figure 242); also with 'C'-shaped sternal glandular areas (Figure 250)
.... *Anaphothrips dubius*

-Micropterous or macropterous; forewing (when present) with no setae on 2nd vein proximal to cross-vein; male unknown ... 40

40 Diameter of spiracle on tergite VIII
(39) almost 0.4-0.5x the length of the tergite (Figure 197); antennal segment III with sense cone simple (Figure 61) .... *Anaphothrips varii*

-Diameter of spiracle on tergite VIII about 0.2x the length of the tergite; antennal segment III with sense cone forked (Figure 60)
.... *Anaphothrips obscurus*

41 Pronotum with only 1 pair of postero-
(33) marginal setae (Figure 84); head projecting strongly in front of compound eyes (Figure 23) ... 42

-Pronotum with 2 or more pairs of posteromarginal setae (Figures 83 and 87); head not projecting anteriorly
... 43

42 Antennal segment III more than 3.0x
(41) as long as wide (Figure 70); tergite IX of female with median setae at least 105 µm long; tergite IX of male with dorsolateral setae extending beyond apices of both pairs of median thorn-like setae
.... *Physemothrips hadrus*

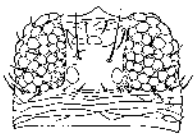
-Antennal segment III less than 2.5x as long as wide (Figure 69); tergite IX of female with median setae less than 95 µm long; tergite IX of male with dorsolateral setae extending scarcely to mid-length of median thorn-like setae .... *Physemothrips chrysodermus*

43 Ocellar setae I absent, i.e., only 2
(41) pairs of ocellar setae present; tergite VIII with a well developed posteromarginal comb of microtrichia (Figure 200) ... 44

-Ocellar setae I present but sometimes weak; tergite VIII with or without a posteromarginal comb of microtrichia ... 47

Couplet 43: condition of ocellar setae I

Dichromothrips maori



Ceratothrips frici

44 (43) Metathoracic endofurca with a well developed spinula (Figure 138); ocellar setae III anterolateral to ocellar triangle (Figure 28); male micropterous, with sternites III-VII bearing paired, oval glandular areas (Figure 255) .... *Dichromothrips maori*

-Metathoracic endofurca with spinula not well developed; ocellar setae III on posterior margin of ocellar triangle (Figures 24 and 25); male macropterous, with sternal glandular areas never paired, one such area present on one or more of sternites III-VII ... 45

45 (44) Tergites IV and V with median setae separated by less than their length (Figure 176); pronotum with inner posteroangular setae less than twice as long as the discal setae (Figure 85); male with a glandular area on each of sternites III-V .... *Adelphithrips cassiniae*

-Tergites IV and V with median setae separated by more than their length (Figure 178); pronotum with inner posteroangular setae more than 3x as long as the discal setae (Figure 86); male with glandular areas not as above ... 46

46 (45) Tergite II with 3 lateral marginal setae (Figure 179); forewing with 1st vein bearing 1 seta or none medially and 2 distally; pronotum with few lines of sculpturing, and with posteroangular setae less than 60 µm long (Figure 87); sternites III and IV of male each with a glandular area .... *Adelphithrips nothofagi*

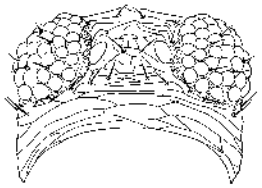
-Tergite II with 4 lateral marginal setae (Figure 177); forewing with 1st vein bearing 4 (or 3, rarely 2) setae medially and 3 (rarely 2) distally (Figure 159); pronotum with many lines of sculpturing, and with posteroangular setae more than 70 µm long (Figure 86); sternites III-VI of male each with a glandular area .... *Adelphithrips dolus*

47 (43) Head longer than wide; postocular region longer than dorsal length of compound eye; ocellar setae III anterolateral to 1st ocellus (Figure 22); antennal segments III and IV with sense cones simple (Figure 68) .... *Karphothrips dugdalei*

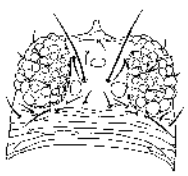
-Head wider than long; postocular region shorter than dorsal length of compound eye; ocellar setae III not as above (Figure 19); antennal segments III and IV with sense cones forked ... 48

48 Ocellar setae III arising between or
(47) behind posterior ocelli ... 49
-Ocellar setae III arising in anterior half of ocellar triangle or antero-lateral to triangle (Figures 26 and 27) ... 51

Couplet 48: condition of ocellar setae III



Dikrothrips diphyes



Megalurothrips kellyanus

49 Ocellar setae III long, arising
(48) posterior to ocellar triangle (Figure 19); tergite VIII of female with no posteromarginal comb of microtrichia
.... *Anaphrygmothrips otagensis*
-Ocellar setae III short, arising between posterior ocelli (Figure 31); tergite VIII of female with a posteromarginal comb of long microtrichia ... 50

50 Tergite VIII of female with postero-
(49) marginal comb interrupted medially by a small craspedum (Figure 203); sternites II-VI with a narrow craspedum; antennae 7-segmented (Figure 74); male unknown
.... *Lomatothrips paryphis*
-Tergite VIII of female with posteromarginal comb complete (Figure 201); sternites without a craspedum; antennae 8-segmented (Figure 73); tergite VIII of male with posterior margin bearing 2 small to greatly enlarged tubercles (Figure 247)
.... *Dikrothrips diphyes*

51 Forewing with 1st vein bearing 2 setae
(48) distally but none medially; ocellar setae III arising just within ocellar triangle (Figure 32); sternites II-VII of male each with numerous small glandular areas (Figure 256); a large, dark thripid with antennal segments III and IV abruptly whitish distally
.... *Megalurothrips kellyanus*
-Forewing with 1st vein bearing 2-4 setae distally and 1-3 medially (rarely apterous); ocellar setae III arising anterolateral to ocellar triangle (Figures 26 and 27); sternites of male not as above (Figures 253 and 254); small, brown thripids with antennal segments III and IV yellow or brown but not bicoloured ... 52

52 Antennal segments III-V yellow,
(51) segment VI yellow in proximal half; ocellar setae III about as long as distance between any 2 ocelli (Figure 27); male macropterous, with sternites III-VII each bearing a small, oval glandular area (Figure 254); in yellow flowers of Compositae
.... *Ceratothrips frici*
-Antennal segments all dark brown; ocellar setae III longer than distance between any 2 ocelli (Figure 26); male apterous, with sternites III-VIII each bearing 1 long and 2 short glandular areas (Figure 253); in *Erica* and *Calluna* flowers
.... *Ceratothrips ericae*

DESCRIPTIONS

Family MEROTHRIPIDAE

Of the three genera of extant species included in this family two are monobasic, but *Merothrips* itself includes 12 species. The family was revised by Mound & O'Neill (1974), who considered these thrips to be morphologically the most primitive among living Thysanoptera. The most significant character is their retention of sternite VIII as two lobes attached to the posterior margin of sternite VII (Figure 262). These lobes each bear two pairs of setae, and apparently homologous setae occur on the hind margin of sternite VII in many species of the other families of Thysanoptera. If the Merothripidae are accepted as primitive then it follows that the Thysanoptera originally evolved (together with the Psocoptera) as an element of the leaf litter fauna which only later colonised aerial parts of plants.

Genus *Merothrips* Hood

Merothrips Hood, 1912: 132. Type-species *Merothrips morgani* Hood, by monotypy.

Mound & O'Neill (1974) suggest that the 12 species included in this genus are Neotropical in origin, but that several have been distributed around the world by man's trading. However, there are usually small structural differences between individuals from different populations, and for lack of evidence from experimental rearing or from long series of specimens these differences will continue to be interpreted by some taxonomists as indicating specific difference and by others as intraspecific variation of widespread species. Two species of *Merothrips* are known from New Zealand: *brunneus* is not known with certainty from elsewhere, but *floridensis* is a 'tramp' species of world-wide occurrence.

Members of this genus have the following characters. Very small, usually apterous species. Head smaller than pronotum, with 1 pair of long ocellar setae; vertex weakly sclerotised in the male. Antennae 8-segmented, almost moniliform; segments III and IV with sensoria circular, transversely linear, or inflated. Pronotum trapezoidal, with a pair of longitudinal sutures laterally and 1 pair of postero-angular setae. Fore tibia frequently with a hook-like process at inner apex. Fore-wing (when present) narrow, with 2 longitudinal veins, the 2nd usually developed proximal to the cross-vein and bearing 1 or 2 setae. Abdomen rounded apically in both sexes. Tergite X usually with a pair of large sensoria, each bearing a long axial seta. Female with ovipositor valves only partially serrate.

Merothrips brunneus Ward

Figures 48 and 215

Merothrips brunneus Ward, 1969: 362-364. Holotype female, NEW ZEALAND, Whakarewarewa (NZAC) [examined].

COLOUR. Body and antennae mid brown, tarsi and antennal segment II paler; forelegs sometimes partly yellow.

STRUCTURE. Apterous female. Antennae, Figure 48; sensoria small and circular, but lens-shaped in profile. Mesonotum, metanotum, and tergites without lines of sculpturing. Tergite IX with median setae shorter than submedian setae or absent; tergite X with sensoria smaller than the spiracle on tergite VIII, and with axial setae short or absent (Figure 215).

Apterous male. Similar to female, but forelegs of large males enlarged, with a tubercle on inner femoral margin and a pointed tubercle on inner apex of tibiae. Mesonotum, metanotum, and tergites with several lines of sculpturing.

MATERIAL EXAMINED. 44 female apterae, 29 male apterae, 4 instar II (BMNH, FRNZ, NZAC).

Three Kings Islands / AK, WO, BP, GB, HB / NN, SD, BR, MC.

From native forest litter, dying *Pseudopanax arboreus*, birds' nests, *Actinidia chinensis* fruit, twigs, and leaves, pine litter, spruce, and various dead twigs and branches.

Adults have been collected in all months.

REMARKS. No macropterae of *M. brunneus* are known. The taxonomic status of this species is difficult to assess. Mound & O'Neill (1974) indicated that the few specimens from New Zealand studied thus far were variable in the colour of antennal segment II, the placement of setae on the metanotum, and the occurrence and size of the sensoria on tergite X, and stated that the males were heavily sculptured but the females weakly sculptured. However, a single male from Australia has been studied which is very similar to *brunneus* but lacks sculpturing, and in one series from Auckland some of the males even have the pronotum sculptured. Several apterous females from southern Brazil are similar to New Zealand *brunneus* but lack sensoria on tergite X, and a single female from Peru is similar but sculptured. These specimens probably all represent variants of a single South American species introduced to New Zealand, where it is now widespread in both native and modified habitats. Strassen (1981) records apterae of *brunneus* from the Amsterdam and St Paul islands in the southern Indian Ocean.

Merothrips floridensis Watson

Figures 49, 216 and 262

Merothrips floridensis Watson, 1927: 60-61. Lectotype male, U.S.A., Florida (FSAC) [examined].

Merothrips zondagi Ward, 1969: 359-362. Holotype female, NEW ZEALAND, Whakarewarewa (NZAC) [examined].

COLOUR. Pale brown; antennal segment II and frequently legs yellow.

STRUCTURE. Apterous female. Antennae, Figure 49; segments III and IV each with a (usually) transversely oval sensorium. Posterior margin of pronotum, also mesonotum, metanotum, and tergites with faint lines of sculpturing. Tergite IX with median setae longer than submedian setae; tergite X with sensoria larger than the spiracles on tergite VIII, and with axial setae almost as long as the surrounding setae (Figure 216). Ovipositor, Figure 262.

Macropterous female. Eyes large, multifacetted. Forewing long, narrow; 2nd vein extending basad from crossvein.

Apterous male. Antennal segments III and IV with sensoria smaller than in the female. Forelegs frequently enlarged, with a stout, pointed tubercle on inner apex of tibia and a smaller median tubercle on femur. Sculpturing similar to that of female.

MATERIAL EXAMINED. 80 female apterae, 1 female macroptera, 30 male apterae (AMNZ, BMNH, FRNZ, NMNZ, NZAC).

Three Kings Islands / ND, AK, CL, BP / NN, SD, BR.

From native forest litter, dying *Pseudopanax arboreus*, birds' nests, fumagine fungi, lichen, rotten wood, liverwort, *Leptospermum ericoides* bark, and sedge litter.

Adults have been collected in all months.

REMARKS. Mound & O'Neill (1974) listed five nominal species as synonyms of *floridensis*, including *zondagi* Ward (1969) which was described from New Zealand. The others were described from South America, South Africa, and southern France, and *floridensis* has been collected in many parts of the tropics and the warm temperate regions. It is variable in colour, sculpturing, detailed chaetotaxy of parts of the body, and the length and shape of the antennal segments and their sensoria. Several macropterous females have been studied, although only one has been collected in New Zealand. Large and small males differ considerably from each other in appearance, owing to allometric growth.

Family AEOLOTHRIPIDAE

This family contains about 200 species in 33 genera. Most occur in the Holarctic region, although 24 species in 9 genera are recorded from Australia (Mound 1972a). Of the three species known from New Zealand, only *Desmidothrips walkerae* is endemic; *Aeolothrips fasciatus* and *A. melaleucus* are introduced. Most aeolothripids live in flowers, where they probably feed on other arthropods as well as plant tissues, but some live at the base of grasses. Probably all Aeolothripidae pupate in the soil in silken cells. Traditionally this family has been regarded as the most primitive in the Thysanoptera, mainly because of the broad wings with at least four cross-veins (Figures 146-148). However, all Aeolothripidae have two pairs of accessory setae on sternite VII of the females which appear to be homologous with the setae of sternite VIII in Merothripidae (Mound & O'Neill 1974). This suggests that the Aeolothripidae are of more recent origin, a view further supported by their prevalence in the Holarctic region (Mound et al. 1980). The broad wings are probably a functional necessity associated with the large body size of these thrips.

Genus *Aeolothrips* Haliday

Aeolothrips Haliday, 1836: 451. Type-species *Aeolothrips albicinctus* Haliday, by monotypy of nominate subgenus.

Of the 80 species in this genus over half are from the Palearctic region (including North Africa); most of the rest are from the Nearctic. Five species are recorded from the Afrotropical region, and five from the Neotropics (including Mexico). None appear to be native to the Oriental, Australian, or Pacific regions. Two introduced species have been found in New Zealand, one of which also occurs in Australia.

Members of this genus have the following characteristics. Head strongly asymmetrical ventrally. Eyes elongate ventrally (Figure 6). Antennae 9-segmented; segments III and IV with linear sensoria; segments V-IX connate. Pronotum without long setae. Metanotum broadly reticulate, the reticles without internal markings; median pair of setae near posterior margin. Fore tarsus 2-segmented, with a recurved tooth on inner margin of distal segment. Forewing broad, rounded apically, with 4 cross-veins; costal setae short. Abdomen of female vespiform. Sternites III-VI usually with postero-marginal setae only; sternite VII with 2 pairs of discal setae. Ovipositor (Figure 263) broad, upcurved.

Aeolothrips fasciatus (Linnaeus)

banded thrips
Figures 6, 50, 101, 146, 239 and 263

Thrips fasciata Linnaeus, 1758: 457.
Type material unknown.

COLOUR. Body and legs brown; tarsi and median abdominal segments sometimes paler. Antennal segment III yellow, narrowly dark at apex. Forewing (Figure 146) with 2 dark cross-bands alternating with clear areas. Male sometimes with femora and pronotum paler than in female.

STRUCTURE. Macropterous. Head (Figure 6) about as wide as long. Antennae (Figure 50) 9-segmented; segments III and IV each with a sensorium half as long as its segment. Metanotum (Figure 101) reticulate. Forewing (Figure 146) broad, nearly parallel-sided. Ovipositor, Figure 263.

Male. Macropterous. Abdomen small, slender. Tergite I with 2 longitudinal ridges; tergites IV and V each with a pair of small, irregular tubercles; tergite IX (Figure 239) with a pair of heavily sclerotised claspers, and posteroangular setae longer than the claspers.

MATERIAL EXAMINED. 103 females, 8 males (BMNH, LCNZ, NZAC, PANZ, PLNZ).

ND, AK, WO, BP, GB, TO, TK, WI, WN / NN, MB, BR, MC, MK, CO.

From a wide range of introduced plants, including vegetables, pasture and orchard species, and ornamental flowers. We collected many from *Medicago sativa* in the Wairau Valley (MB) in February.

Collected from October to March.

REMARKS. The first published record of *A. fasciatus* is that of Cottier (1931), who collected more than 20 specimens (including 2 males) at Palmerston North from potato foliage in February 1930. Spiller (1956) notes it in his checklist, and Doull (1956a) mentions it in connection with his cocksfoot survey. Cumber (1959) records specimens as having been found in samples from paddocks and roadsides; his records have been added to our locality data, although only a few voucher specimens have been located. Cumber & Eyles (1961) note an apparent preference for lucerne during their fodder crop survey of the North Island, and also record it from maize and chou moellier.

Mound et al. (1976) regarded *Aeolothrips fasciatus* as a nomen dubium on the grounds that several similar species exist in Sweden, where Linnaeus worked, but no males of the *fasciatus*-type (Priesner 1964, figure 29) were known from northern Europe. Subsequently, however, L.A.M. has been able to study a single male from Stockholm which agrees with Priesner's (1964) interpretation of *fasciatus*, as well as one male from the Canary Islands, three from California, and six from New Zealand (Palmerston North, Lincoln, and Te Aroha). (Two further males from New Zealand - Blenheim and Palmerston North - are probably also this species, but have the abdomen damaged.) Thus, *fasciatus* L. is here accepted as a valid species in the sense of Priesner (1964), although females cannot be distinguished satisfactorily from the common European species *A. intermedius* (Bagnall). Females of this group are not uncommon in western North America as well as New Zealand, and have also been recorded from Australia (Mound 1972a).

Aeolothrips melaleucus Haliday

Figures 102 and 147

Aeolothrips (*Coleothrips*) *melaleuca* Haliday, 1852: 1117. Type material unknown.

COLOUR. Body and legs brown; fore tarsi and apex of fore tibiae paler. Antennal segment III and base of IV clear yellow. Forewing (Figure 147) with 2 transverse dark bands broadly coalescent along hind margin.

STRUCTURE. Female similar to that of *fasciatus*. Metanotum, Figure 102.

MATERIAL EXAMINED. 7 females from *Sparmannia africana* leaves in an Auckland garden, December 1978 and 1979 (BMNH, NZAC).

REMARKS. In Europe this species is widespread but uncommon on various trees and in *Sambucus* flowers, where it is probably predatory on mites and other thrips species. Males are referred to by Schliephake & Klimt (1979), presumably from central Europe, but have not been recorded from Britain (Mound et al. 1976) or North America (Stannard 1968).

Genus *Desmidothrips* Mound

Desmidothrips Mound, 1977a: 149-150. Type-species *Desmidothrips walkerae* Mound, by original designation.

This genus was erected for *walkerae* from New Zealand and *inauditus* (Bianchi) from New Caledonia. The apex of the forewing is pale, much as in *Aeolothrips* species but unlike species of the closely related Australian genus *Desmothrips*. In contrast to *Aeolothrips*, both *Desmothrips* and *Desmidothrips* have several pairs of discal setae laterally on the abdominal sternites in both sexes, and the males do not have claspers or median abdominal tubercles; these characters may be of tribal significance. The only other close relatives of *Desmidothrips* come from North and South America (Mound 1977a).

Desmidothrips walkerae Mound

Figures 51, 103, and 148

Desmidothrips walkerae Mound, 1977a: 151. Holotype female, NEW ZEALAND, Mercury Islands (NZAC) [examined].

COLOUR. Body and legs mainly brown. Abdomen sometimes paler medially. Antennal segment III with proximal half yellow. Forewing (Figure 148) fuscous, colourless in distal fifth and proximal quarter.

STRUCTURE. Head slightly longer than wide, similar to that of *Aeolothrips*. Antennae (Figure 51) 9-segmented; segments III and IV each with a narrow sensorium half as long as its segment and curving around apex, with internal discoidal markings. Pronotum similar to that of *Aeolothrips*, but 1 pair of posteroangular setae usually slightly stouter than the discal setae. Metanotum (Figure 103) reticulate, the reticles with internal markings. Forewings and abdomen similar to those of *Aeolothrips* in structure, but sternites with at least 2 pairs of accessory setae laterally.

Male. Abdomen slender, without terminal claspers or dorsal tubercles.

MATERIAL EXAMINED. 77 female macropterae, 22 male macropterae (BMNH, NMNZ, NZAC).

Three Kings Islands / ND, AK, CL, BP, GB, TO / NN, SD.

Three series of specimens were collected from *Hebe stricta* flowers at sites near Taupo, along with large numbers of *Thrips obscuratus*, on which they were probably feeding. Others were extracted from native leaf litter and beaten from *Muehlenbeckia*, *Coprosma*, *Leptospermum ericoides*, and *L. scoparium*. One specimen was found on a bellbird, *Anthornis melanura obscura*.

Collected from August to February.

REMARKS. Mound (1977a) excluded certain specimens from the type series because of differences in pigmentation of the wings and antennal segment III and shorter sensoria on antennal segments III and IV. These specimens have been included in our locality data, although they may represent a further, undescribed, species.

Family THRIPIDAE

About 1500 species have been described in this family, and 46 are here recorded from New Zealand. Thripidae are found all over the world, but appear to be most common in the northern temperate and subtropical regions. Only two subfamilies are recognised: the Panchaetothripinae, more primitive forms which appear to feed on leaves; and a much larger group of more advanced species, the Thripinae, many of which inhabit flowers. In most species the antennae are of seven or eight segments. The forewings are usually slender, with two longitudinal veins each bearing a series of setae, but micropterae and apterae frequently occur also.

Subfamily PANCHAETOTHRIPINAE

This group has also been known as the Heliothripinae. Wilson (1975), in a full revision, recognises 110 species in 33 genera. In most species the body surface is strongly sculptured and reticulate, the maxillary palps are two-segmented, and the first vein of the forewing is often fused to the costa. All are leaf-feeders, and most of them apparently pupate on the host plant, not in the soil. Most panchaetothripines occur only in the tropics and subtropics, but a few have been recorded from glasshouses in temperate regions. One monobasic genus is endemic to New Zealand, but the other four species recorded from this area are probably introduced. In addition, *Caliothrips fasciatus* (Pergande) was intercepted in Wellington during 1981 on shipments of oranges and lemons from California. However, the consignments were fumigated, and there is no record of *fasciatus* having been established in New Zealand. *Caliothrips* species are similar in colour and general appearance to *Hercinothrips* species, but have one-segmented tarsi and an incomplete row of setae on the first vein of the forewing.

Genus *Heliothrips* Haliday

Heliothrips Haliday, 1836: 443. Type-species *Heliothrips adonidum* Haliday (a synonym of *Thrips haemorrhoidalis* Bouché), by monotypy.

Only two species are now placed in this genus, the cosmopolitan *haemorrhoidalis*, which probably originated in the Neotropics, and a little-known species from South Africa, *sylvanus* Faure. These are readily distinguished from other Thysanoptera by their apically rounded forewings (Figure 149).

Heliothrips haemorrhoidalis (Bouché)

greenhouse thrips
Figures 7, 52, and 149

Thrips haemorrhoidalis Bouché, 1833: 42. Type material unknown.

COLOUR. Dark brown; apex of abdomen paler. Legs and antennal segments II-V, VII, and VIII yellow. Wings clear with a longitudinal brown line medially. Teneral specimens with abdomen orange.

STRUCTURE. Macropterous. Body surface, including legs, strongly reticulate. Head (Figure 7) sharply constricted at base. Antennae (Figure 52) 8-segmented; segments III and IV each with a simple sense cone; segment VIII long, slender. Metascutum triangular, strongly reticulate, with a posterior projection of variable length. Tarsi 1-segmented. Forewings (Figure 149) rounded apically, parallel-sided but swollen at base; major setae less than 10 µm long. Tergites weakly sculptured medially, with 1 pair of setae arising close together medially, shorter than tergite X. Sternal marginal setae minute.

Males unknown in New Zealand.

MATERIAL EXAMINED. 300 females, 20 instar II and IV (BMNH, NZAC, PANZ).

All North Island areas except TO and WA / SD, NN.

Adults have been collected in all months.

REMARKS. The first recorded specimens of *H. haemorrhoidalis* was collected at Palmerston North (WI) from *Viburnum* and rose leaves in 1930 by W. Cottier. Muggeridge (1935) gives the first published record for New Zealand, and Spiller (1951, 1956) notes this species in his checklists. Cumber (1959) records it from samples taken in paddocks and at roadsides, and his records have been included in our locality data, although only a few voucher specimens have been found. Cumber & Eyles (1961) record it from mixed chou moellier and swede crops in the North Island. Penman (1976) recognises it as a pest of subtropical fruit, causing damage to the skin of citrus fruits. Zondag (1977) reports damage to young, lower, shaded foliage of *Pseudotsuga menziesii*, and Zondag (1973) and Kershaw (1977) record the species as attacking young *Pinus radiata*. We found large numbers on *Coriaria* leaves damaged by *Scolypopa australis* near Rotorua (BP), and it is when the host plant is under some such physiological stress that *haemorrhoidalis* is liable to become a pest. Population increase of thrips is apparently related to an increase in available soluble nitrogen in the leaves of stressed plants, as shown by Fennah (1965) for the cacao thrips, *Selenothrips rubrocinctus* (Giard).

H. haemorrhoidalis is a slow-moving, leaf-feeding species which sometimes occurs in dense colonies. The larvae have a tubular last abdominal segment and, when disturbed, they raise this over the thorax and exude a droplet of faecal material. Attacked leaves often bear numerous small, brown spots of dried faecal exudate. Pupae occur on the leaves together with larvae and adults. This species is remarkably polyphagous, and occurs on a wide variety of plants including citrus, fruit trees, and domestic garden plants. In two instances adults have been extracted from native leaf litter (RI, SD). Data on most slides were not precise enough to indicate whether the specimens were collected in glasshouses. However, in the Auckland region *haemorrhoidalis* is a pest on many garden plants, and it occurs out-of-doors as far south as Nelson.

H. haemorrhoidalis is widespread in the tropics and subtropics, and is sometimes sufficiently abundant to be a pest on intensively cultivated crops as widely

different as *Pinus* species and *Thea*. It is parthenogenetic and thelytokous; Mound (1976a) records a total of only 21 males in museum holdings of several hundred specimens. All but one of these males were from the Americas, and most were collected in Brazil, where the species is presumed to have originated.

Genus *Hercinothrips* Bagnall

Hercinothrips Bagnall, 1932: 506. Type-species *Heliothrips bicinctus* Bagnall, by original designation.

The eight species placed in this genus are discussed by Mound (1966) and Wilson (1975). All come from the Afrotropical region, but the two recorded from New Zealand have been widely dispersed in the tropics and, under glass, in temperate areas. The adults jump actively when disturbed. Their long hind legs are held folded under the mesothorax, and the metathoracic furca (Figure 136) is well developed and Y-shaped, apparently acting as an insertion for the enlarged muscles used in jumping. *Hercinothrips* species are unusual amongst the Panchaetothripinae in having two-segmented tarsi (Figure 140).

Hercinothrips bicinctus (Bagnall)

banana-silvering thrips
Figures 8, 53, 136, 140, and 150

Heliothrips bicinctus Bagnall, 1919: 258-259. Lectotype female, BELGIUM (BMNH) [examined].

COLOUR. Brown, with yellow markings on anterior of head and on thorax and apex of abdomen. Antennal segments III-VIII yellow. Tibiae and tarsi paler than femora. Forewing (Figure 150) pale, with 2 short, dark cross-bands.

STRUCTURE. Body surface reticulate. Head (Figure 8) narrowly constricted at base. Antennae (Figure 53) 8-segmented; segments III and IV vasiform, each with a forked sense cone; segment VIII long, slender. Metascutum with a pair of stout setae medially; metasternum, Figure 136. Tarsi (Figure 140) 2-segmented. Forewing (Figure 150) acute apically; costa, 1st vein, and 2nd vein each with a complete row of long setae; 1st vein fused to costa. Tergite II with numerous microtrichia laterally.

Male. Tergite IX with 3 pairs of stout, thorn-like setae dorsally. Sternites III-VII with a minute (4 µm) glandular area near anterior margin.

MATERIAL EXAMINED. 59 female macropterae, 10 male macropterae (AMNZ, BMNH, NZAC).

Three Kings Islands / ND, AK, CL, TK.

From a wide variety of introduced plants, including *Solanum nigrum*, *Cucurbita* spp., and *Zantedeschia aethiopica*, and on *Coprosma robusta*. At Waitara (TK) it was found damaging the midrib area on the underside of *Solanum aviculare* leaves.

Collected from November to April.

REMARKS. The first recorded specimen of *H. bicinctus* was collected at Auckland (AK) on tomato in 1945. Atkinson et al. (1949) record it as causing damage to tomato fruit in the field, and large numbers were collected near Auckland in 1946 breeding on *Escallonia macrantha*. Spiller (1956) notes it in his checklist.

Although described from a glasshouse in Europe, *H. bicinctus* has been recorded from many tropical and subtropical countries. This leaf-feeding species is sometimes regarded as a pest of bananas, on which it damages the young fruit (Anon. 1971).

Hercinothrips femoralis (Reuter)

banded greenhouse thrips
Figure 151

Heliothrips femoralis Reuter, 1891: 166. Lectotype female, FINLAND (UZMF) [not examined].

This species is similar to *H. bicinctus* in structure, but has the forewing differently coloured: the median pale area is shorter than the dark areas, and is sometimes indistinct or even absent, so that the forewing is dark with a pale base and apex (Figure 151). *H. femoralis* is polyphagous, but is not usually regarded as a pest. It has been found in glasshouses in many parts

of the world. Seven females in the BMNH collections were taken at Christchurch, New Zealand, in 1934 in a potting shed at the botanical garden.

Genus *Parthenothrips* Uzel

Parthenothrips Uzel, 1895: 170-171. Type-species *Heliothrips dracaenae* Heeger, by monotypy.

Wilson (1975) suggests that this monobasic genus originated in Africa, a conjecture based on the distribution of *Dracaena*. However, *Parthenothrips dracaenae* has a wide range of host plants, and its forewing structure (Figure 152) is unlike that of any other species. It could equally well have originated in Australia, or even New Zealand.

Parthenothrips dracaenae (Heeger)

palm thrips
Figures 54, 141, and 152

Heliothrips dracaenae Heeger, 1854: 365. Syntype females, AUSTRIA (lost).

COLOUR. Pale brown; median abdominal segments darker. Tibiae, tarsi, and antennal segments III-V yellow. Forewing pale, with a dark, transverse band sub-basally and an area of variable shading subapically (Figure 152).

STRUCTURE. Macropterous. Surface of body and legs reticulate. Head sharply constricted to base, with 2 pairs of stout setae on dorsal surface; ventral surface strongly asymmetrical. Antennae (Figure 54) 7-segmented; segments III and IV each with a simple sense cone; segment VII long, slender. Pronotum with 1 pair of large posteroangular setae. Tarsi (Figure 141) 1-segmented. Forewing (Figure 152) exceptionally broad; membrane reticulate; costa, 1st vein, and 2nd vein with well developed setae; 1st vein fused to costa. Abdomen weakly sculptured.

Male with a large glandular area on sternites IV-VII and with the dorsal setae on tergite IX slender.

MATERIAL EXAMINED. 22 females, 2 males (BMNH, NZAC, PLNZ).

AK, BP, WN / NN.

Collected in January, April, June, July, and September.

REMARKS. The first recorded specimen of *P. dracaenae* was collected at Tauranga (BP) from passionfruit foliage in June 1935 by W. Cottier. Spiller (1951, 1956) records it in his checklists, and Wise (1959) records one specimen from rolled leaves of *Citrus* in Auckland in February 1957. In New Zealand it has been recorded only from introduced plants. Most of the specimens examined were collected from indoor plants; one infestation in Nelson (NN) was causing damage to a potted palm. *Passiflora edulis* is another favoured host plant, but records do not indicate whether in glasshouses or outside.

This polyphagous, leaf-feeding species is found widely in the tropics and subtropics.

Genus *Sigmothrips* Ward

Sigmothrips Ward, 1970: 88. Type-species *Sigmothrips aotearoana* Ward, by monotypy.

This monobasic genus is known only from New Zealand. However, it is closely related to *Bhattithrips* Mound (1970), which comprises three Australian species. The pair of sigmoid setae on tergites V, VI, and VII is highly distinctive.

Sigmothrips aotearoana Ward

Figures 9, 55, 153, and 167

Sigmothrips aotearoana Ward, 1970: 88-90. Holotype female, NEW ZEALAND, Levin (NZAC) [examined].

COLOUR. Body brown; distal abdominal segments paler medially. Antennal segments III-V, tarsi, and hind tibiae yellow. Forewing (Figure 153) brown, with 3 irregular transverse pale areas situated sub-basally, medially, and apically.

STRUCTURE. Macropterous. Head (Figure 9) transverse; cheeks angulate and strongly protruding; dorsal surface strongly reticulate. Antennae (Figure 55) 8-segmented; segments III and IV each with a simple sense cone; segments VI-VIII closely joined. Pronotum without major setae, its surface reticulate except medially. Mesonotum with a longitudinal groove. Legs reticulate; tarsi 1-segmented. Forewings (Figure 153) curved forward apically; 1st vein fused to costa; major setae not elongate. Tergites strongly sculptured laterally, the antecostal ridge forming a series of pronounced small scallops; tergites V-VII each with a pair of sigmoid setae (Figure 167); tergite IX with lateral setae elongate; tergite X longer than IX, with a complete dorsal split.

Male unknown.

MATERIAL EXAMINED. 138 females, 25 instar II (AMNZ, BMNH, FRNZ, NMNZ, NZAC, PLNZ).

Three Kings Islands / ND, AK, CL, WO, BP, GB, TO, HB, WN / SD, NN, BR, SL.

From seedlings of *Coprosma*, *Geniostoma*, *Griselinia*, *Hedycarya*, *Fuchsia excorticata*, and a composite weed. Found on taller plants of *Coprosma* only in dense native forest with little air movement. Adults and larvae have been collected together at several sites, in association with visible damage.

Adults have been collected in all months.

REMARKS. We found no pupae; they may occur in the soil, since many adults were taken from native leaf litter. Wilson (1975), in redescribing *S. aotearoana*, wrongly cites the type locality as Nelson.

Subfamily THRIPINAE

This subfamily of about 1400 species in some 150 genera is usually divided into 4 reasonably discrete tribes. However, this tribal and subtribal classification may at least in part reflect the present-day host-plant associations of the species rather than their phylogeny. The Chirothripini are all associated with Gramineae, whereas most Dendrothripini and Sericothripini are leaf-feeding species not found on grasses. Similarly, the more primitive Thripini, which are included in subtribe Aptinothripina, are leaf-feeding species usually with short major setae on the pronotum, whereas the most advanced species (Thripina) are flower-inhabiting and usually have long major setae. Flower-inhabiting species seem to be most numerous in temperate regions. This may reflect either more active collecting or a faster rate of speciation, due to closer synchrony of the life cycle between the thrips and their hosts, in areas subject to pronounced and regular seasonal changes.

Tribe Dendrothripini

No representative of this tribe has yet been recorded from New Zealand, although species (e.g., of *Ensiferothrips*) are known from Australia and New Caledonia. In view of the strong Australian element already established in New Zealand's thrips fauna, it seems only a matter of time before a dendrothripine must be added. Dendrothripines usually have complex body sculpture, a large, lyre-shaped metafurca (Figure 137), and powerful hind legs which are held folded under the body. All are leaf-feeders inhabiting shrubs and trees.

Tribe Sericothripini

There are two large, widespread genera in this tribe, *Sericothrips* and *Scirtothrips*, and a number of smaller genera. Sericothripines have numerous microtrichia on the abdominal tergites. They are all leaf-feeding species, sometimes to the extent of being pests, and most jump actively. *Sericothrips* species are often dark or bicoloured, and although several species are known from Australia, none have yet been found in New Zealand. Bhatti (1973) divided *Sericothrips* into several small genera. *Scirtothrips* species are usually small, pale, and so active as to be difficult to collect except when populations increase to pest proportions.

Genus *Scirtothrips* Shull

Scirtothrips Shull, 1909: 222. Type-species *Scirtothrips ruthveni* Shull, by monotypy.

This genus is widespread in warmer regions of the world, although only *inermis* Priesner and *longipennis* (Bagnall) have been recorded from more than one continent. Several species are recognised as pests, on citrus trees, coffee, and tea (Mound 1968a). Useful identification keys are provided by Bailey (1964), Titschack (1964), and Mound & Palmer (1981b). Of the two species found in New Zealand, one (*pan*) is probably native; the other (*inermis*) is widely dispersed and of uncertain origin.

Scirtothrips inermis Priesner

Figures 10, 80, 104, 168 and 194.

Scirtothrips inermis Priesner, 1933: 186-188. Syntypes (both sexes), CANARY ISLANDS (SMFG) [examined].

COLOUR. Yellowish-white with dark setae. Median abdominal tergites with a dark transverse line near anterior border. Antennal segments II-VIII pale brown, segments III and IV yellow at base. Forewings weakly shaded, particularly in proximal half.

STRUCTURE. Macropterous. Head (Figure 10) and pronotum with numerous fine, transverse lines of sculpturing; interocellar setae as long as any one side of ocellar triangle, arising between posterior ocelli. Antennae 8-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 80) with 1 pair of posteroangular setae about 0.7x as long as the pronotal midlength. Metanotum (Figure 104) with median setae arising almost at anterior margin, more than 0.4x as long as the sclerite. Forewing slender, pointed; 1st vein with about 8 setae medially and 2 at apex; 2nd vein with 2 setae; posterior fringe cilia straight. Tergites II-VIII with numerous microtrichia in rows and 4 pairs of discal setae laterally (Figure 168); tergite VIII (Figure 194) with discal microtrichia anteromedially, and median discal setae as long as the tergal midlength, but posteromarginal comb long and fine, with these marginal microtrichia relatively widely spaced; tergite IX with a few microtrichia posteromedially. Sternites with microtrichia laterally, not medially.

Male smaller than female, without a pair of dark processes posterolaterally on tergite IX.

MATERIAL EXAMINED. 34 females, 1 male, 4 instar II (BMNH, NZAC, PLNZ).

AK, CL, WN /SD.

Adults have been collected in November, February, March, and May.

REMARKS. The first recorded specimen of *S. inermis* was collected at Auckland (AK) from lemon in May 1951 by E. Bray. Females were found in considerable numbers, together with larvae, on citrus leaves at Henderson (AK) in May 1951, and a few were collected from *Begonia* in a glasshouse at Northcote (AK) in February 1963. One specimen from Levin (WN) was collected from *Prunus* (peach) trees. Four females were taken from leaf litter on The Aldermen islands (CL) in November 1972, and one male from litter on Stephens Island (SD) in February 1971; the composition of the litter in both areas included the native shrubs *Macropiper* and *Melicytus*. If this species is established in New Zealand, then it is difficult to understand why it has not been collected more frequently. Feeding is likely to cause obvious leaf deformation when this species is present in large numbers.

S. inermis was described from the Canary Islands, where it appears to be quite common on several plants, including *Rumex* (Strassen 1969). However, it has been collected several times in New Zealand, and in 1972 caused leaf damage to *Liquidamber* trees used for street planting at several sites in southern California. The country of origin is therefore uncertain. Bailey (1964) suggested that *S. imermis* might be related to *S. citri* (Moulton), a pest species common in California. However, in *citri* the interocellar setae are shorter and arise near the anterior margins of the ocellar triangle, the metanotal setae are shorter, the forewing cilia are wavy, and abdominal tergite IX bears many microtrichia medially.

***Scirtothrips pan* new species**

Figures *11, *56, *81, *105, *154, 169, *195, and 240

FEMALE MACROPTERA. Body when fresh mainly yellow, with dark forewings and cuticular markings. Cleared specimens: antennal segment I pale, segment II variable from pale brown to dark, segments III-VIII mainly dark brown; head faintly shaded in front of ocelli; thorax with variable pale markings; tergites II-VIII with dark antecostal ridge variably shaded both in front and behind, and with a dark area laterally; sternites III-VII with a dark transverse line and a variable dark mark laterally; legs yellow with brown markings; forewing moderately to strongly shaded; all major setae dark.

Head (Figure 11) broad; vertex with transverse lines; ocellar setae III close together, just in front of posterior ocelli; mouth cone long but rounded. Antennae, Figure 56; segment II with 1 dorsal seta exceptionally stout; segments III and IV each with a long, forked sense cone. Pronotum (Figure 81) with striae not close together; posteromarginal setae independently variable, B_1 24-36 µm, B_2 42-60 µm, B_3 24-40 µm. Metanotum (Figure 105) weakly reticulate medially, with median setae close to anterior margin. Forewing (Figure 154) with apices of posteromarginal cilia slightly wavy; 1st vein usually with 3+3+1+1+1 setae; 2nd vein usually with 4 widely spaced setae; wing scale with 4 marginal setae and 1 discal seta. Tergites II-VII each with 3 pairs of discal setae on field of microtrichia anterior to posteroangular seta (Figure 169) and with discal pores well developed; tergites VIII and IX without microtrichia medially (Figure 195). Sternites with microtrichia laterally, but scarcely any mesad of marginal setae B_2.

Dimensions of holotype female (µm). Body length 1050. Head - dorsal length 60, ventral length to tip of mouth cone 180, width 140; ocellar setae III length 18; postocellar setae length 22. Pronotum length 90, width 165; posteromarginal setae length - B_1 (median) 30, B_2 54, B_3 24. Metanotal median setae length 27. Forewing length 850. Antennal segments II-VIII length 33, 48, 45, 40, 45, 7, and 12 respectively.

MALE MACROPTERA. Similar to female in colour and structure, but smaller. Tergite IX (Figure 240) with 4 pairs of dorsal setae arranged in a curved, transverse row, the drepanae extending to body apex.

Dimensions of male collected with holotype (µm). Body length 900. Head width 135. Pronotal setae length - B_1 18, B_2 40, B_3 18. Forewing length 700. Tergite IX setae length, B_1 to B_4 - 45, 42, 30, and 24 respectively. Antennal segments II-VIII length - 30, 48, 45, 36, 45, 9, and 12 respectively.

TYPE DATA. Holotype: female, NEW ZEALAND, South Island, NN, Whangamoa Saddle (16 km NE of Nelson), on *Weinmannia racemosa* leaves, 27 January 1979, L. A. Mound No. 1356 (NZAC). Paratypes (142 females and 54 males). North Island. AK - Huia (16 km SW of Auckland), 6 females and 1 male on *Leptospermum scoparium*, 1 female on grass, 24 Jan 1979, L.A.M. CL - Kirikiri Saddle (11 km E of Thames), 9 females and 5 males on *Rubus cissoides*, 7 females and 1 male on *Weinmannia silvicola*, 12 Feb 1979, L.A.M.; Coroglen Saddle (16 km N of Thames), 14 females and 9 males on *Rubus cissoides*, 13 Feb 1979, L.A.M. BP - Rotorua, 1 female and 1 male on *Weinmannia racemosa*, 15 Feb 1979, L.A.M.; Te Aroha, 3 females and 3 males on *Weinmannia silvicola*, 14 Feb 1979, L.A.M. GB - Lake Waikaremoana, 1 female in litter, 17 Jan 1972, G. W. Ramsay. TO - 32 km S of Turangi, 6 females and 1 male on *Nothofagus menziesii*, 20 Feb 1979, L.A.M.; 32 km SE of Taupo, 7 females and 5 males on *Aristotelia serrata*, 4 females and 3 males on *Rubus cissoides*, 3 females and 1 male on *Coprosma colensoi*, 28 Feb 1979, L.A.M. RI - Totara Reserve, Pohangina Valley, 4 females and 1 male in litter, 4 Jan 1975, J. C. Watt. South Island. NN - 20 females and 2 males, same data as holotype; 18 females and 4 males, same data except L.A.M. No. 1362; type locality, 4 females and 1 male from *Nothofagus*, A. K. Walker; Dun Mountain (8 km SE of Nelson), 8 females and 1 male on *Weinmannia racemosa*, 2 females on grasses, 29 Jan 1979, L.A.M. & A.K.W.; upper Riwaka Valley 40 km NW of Nelson, 1 female and 3 males on *Coprosma rotundifolia*, 5 females and 6 males on *Rubus cissoides*, 1 female on *Fuchsia excorticata*, 30 Jan 1979, L.A.M. & A.K.W.; Canaan Saddle, 1 female on *Nothofagus menziesii*, 30 Jan 1979, A.K.W. SD - Tennyson Inlet (40 km NE

of Nelson), 1 female and 1 male beaten from foliage, 29 Jan 1979, A.K.W. BR - Capleston (160 km SW of Nelson), 15 females and 5 males on *Rubus cissoides*, 6 Feb 1979, A.K.W. (BMNH, NZAC).

OTHER MATERIAL EXAMINED (excluded from type series). South Island. NN - Cobb Reservoir, 24 females and 1 male on *Rubus cissoides*, 2 females on *Nothofagus menziesii*, 31 Jan 1979, L.A.M. Nos 1382 and 1383. BR - Maruia Saddle, 13 females and 7 males on *Rubus cissoides*, 6 Feb 1979, A.K.W. No. 50.

AK, CL, BP, GB, TO, RI / NN, SD, BR.

REMARKS. As is normal for *Scirtothrips* species, most individuals are found on tender young leaves. Although oligophagous *S. pan* has been collected only from native plants. The preferred hosts appear to be the straggling, vine-like bush lawyer (*Rubus cissoides* and *R. australis*) and the two understorey tree species of the genus *Weinmannia*.

The female specimens from Cobb Reservoir (NN) and Maruia Saddle (BR) excluded from the type series differ from typical specimens in having the pronotal striae and abdominal microtrichia more widely spaced (microtrichia 3-6 µm apart, cf. the usual 2-3 µm). Also, the number of rows of microtrichia appears to be slightly less. The specimens taken on Te Aroha (BP) are intermediate in structure. These variants are interpreted as a high-altitude form of *pan*.

Pronotal setae B_2 of most described *Scirtothrips* species are less than 50 µm long; the only species likely to be confused with *pan* are those discussed below. *S. inermis* can be distinguished from *pan* by means of the characters in the key. *S. manihoti* (Bondar), from cassava in South America, has only three setae on the forewing scale. *S. longipennis*, which used to be widespread under glass, has ocellar setae III wide apart on the anterolateral margins of the ocellar triangle. *S. spinosus* Faure from South Africa resembles *pan* in metanotal sculpturing and setal position, the position of ocellar setae III, and the absence of microtrichia from the median area of tergites VIII and IX. However, in *spinosus* the forewings and antennal segment II are pale, pronotal setae B_2 and B_3 are subequal in length, and the tergites bear more than four discal setae on each lateral field of microtrichia. *S. dobroskyi* Moulton, which is known from one male and one female collected in the Philippines, has pronotal setae B_1 20 µm long and B_2 almost 50 µm long; also, the forewing cilia are all straight. Unfortunately the holotype female is poorly preserved, with the wings over the body, so the structure of the metanotum, tergites, and sternites cannot be determined. However, the ocellar setae III and forewing chaetotaxy are similar in *dobroskyi* and *pan*. Two specimens from Bogor Botanic Gardens, Java, determined as *dobroskyi* (by L. A. Mound & J. M. Palmer) after comparison with the holotype, have the metanotum and sternites essentially as in *pan*, but tergite IX bears a few microtrichia medially. These two females are smaller and paler than *pan* and lack median tergal shading, but they indicate that the two species are very similar, differing principally in the form of the forewing cilia.

Tribe Chirothripini

Basically this tribe comprises one large and widespread genus, *Chirothrips*, and one small European genus, *Limothrips*. Arrangement of these into one tribe is traditional, but there is little evidence to suggest a close relationship. The species of both genera live exclusively on Gramineae, and the structural similarities between them could be the result of convergent evolution.

Genus *Chirothrips* Haliday

Thrips (*Chirothrips*) Haliday, 1836: 444. Type-species *Thrips* (*Chirothrips*) *manicata* Haliday, by monotypy.

This genus of about 65 species is particularly common in the Holarctic, Neotropical, and Ethiopian regions (Strassen 1960). The six species recorded from Australia (Mound & Palmer 1972) are all introduced. Only *manicatus* is as yet

known from New Zealand, but *mexicanus* Crawford, which has the apex of the fore tibia extending around the external margin of the fore tarsus (Figure 143), is a widespread species occurring in Australia, and will probably be found in the North Island.

Chirothrips manicatus (Haliday)

timothy thrips
Figures 12, 57, 142, 155, and 170

Thrips (*Chirothrips*) *manicata* Haliday, 1836: 444. Syntype females(?), ENGLAND(?) (lost?).

COLOUR. Various shades of brown; tarsi and antennal segments sometimes paler. Teneral specimens with abdomen paler than thorax. Forewings shaded.

STRUCTURE. Female macropterous. Head (Figure 12) much smaller than thorax, projecting in front of eyes. Antennae (Figure 57) short, 8-segmented; segment II with external margin prolonged; segments III and IV each with a stout, simple sense cone. Pronotum (Figure 12) much broader at posterior than at anterior margin, with 2 pairs of posteroangular setae. Legs short, stout; tarsi (Figure 142) 2-segmented. Forewings (Figure 155) slender, pointed; 1st vein with a group of setae basally and 1 or 2 near apex; 2nd vein with 3-6 widely spaced setae. Tergites with transverse lines of sculpturing; posterior margin with a complete scalloped craspedum (Figure 170). Sternites with posterior margins bearing a series of small or large tubercles.

Male micropterous. Ocelli absent. Sternites III-VI or VII with a subcircular median glandular area.

MATERIAL EXAMINED. 1854 female macropterae, 120 male micropterae, 50 instar II (AMNZ, BMNH, NZAC, PLNZ).

All North Island areas except ND and TK / NN, SD, MB, KA, BR, WD, MC, SC, MK, CO, SL.

Mainly from introduced grasses, including *Dactylis glomerata*, *Agrostis tenuis*, and rushes; also (when large populations have developed) from a wide range of plants including *Trifolium*, *Nicotiana*, *Pelargonium*, *Daucus carota*, mosses, and native plants, and in leaf litter. Two specimens collected from a hedgehog (*Erinaceus europaeus*) in Auckland (AK).

Adults have been collected in all months.

REMARKS. The first recorded specimen of *C. manicatus* was collected in South Canterbury (SC) from browntop seed in 1931 by W. Cottier. The species is widespread, but despite extensive sampling by Cumber (1958, 1959) it has not been collected north of Wellsford (AK). Doull (1965a, b), Morrison (1961), and Ferro (1976) regard it as a pest of cocksfoot in the Canterbury area causing damage to the seed heads. Spiller (1951, 1956) notes it in his checklists, from the North Island.

Chirothrips species breed in the flowering heads of grasses, and some at least pupate within the glumes. As a result, pupae and adults have been distributed by man in grass seed. Doull (1956b) gives an account of the biology of *C. manicatus* in New Zealand. We do not accept his view (Doull 1956c) that there are two distinct species, one on *Alopecurus pratensis* and the other on *Dactylis glomerata*.

C. manicatus is widespread and common in Europe, and has been introduced to many temperate parts of the world. It varies considerably in size, such that large and small individuals have been described as different species. Specimens and published data from New Zealand referring to '*Chirothrips pallidicornis*' (Doull 1956c, Cumber 1959, Morrison, 1961, Kelsey 1968, Helson 1974, Ferro 1976) are now regarded as representing a structural variant of *manicatus*, although *pallidicornis* Priesner is possibly a valid species in northern Europe. A widespread species such as *manicatus* in an area as diverse as Europe can be expected to have produced peripheral populations differing both structurally and genetically. Disturbance and redistribution of these populations by agricultural practices, including the marketing and transport of seeds in which *Chirothrips* species pupate, may underlie the taxonomic problems experienced with this group.

Genus *Limothrips* Haliday

Thrips (*Limothrips*) Haliday, 1836: 444. Type-species *Thrips* (*Limothrips*) *cerealium* Haliday, by subsequent designation of Westwood, 1840.

This genus probably includes only four valid species, and these appear to have evolved in the western Palearctic region. Only *L. cerealium* has been recorded from New Zealand, although *angulicornis* Jablonowski and *denticornis* Haliday occur in Australia, and may yet be introduced. Mound et al. (1976) provide a key to these species.

Limothrips cerealium (Haliday)

cereal thrips
Figures 13, 58, 217, 241, and 249

Thrips (*Limothrips*) *cerealium* Haliday 1836: 445. Syntype females(?), ENGLAND(?) (lost?).

COLOUR. Brown to dark brown; antennal segment III paler. Tarsi and apices of fore tibiae yellow. Wings shaded. A pair of black, thorn-like setae subapically on abdomen of female.

STRUCTURE. Female macropterous (but see Remarks). Head (Figure 13) longer than wide; cheeks parallel or slightly diverging to posterior. Antennae (Figure 58) 8-segmented; segments III and IV each with a stout sense cone. Pronotum with 1 pair of posteroangular setae. Tarsi 1-segmented. Forewings slender, pointed; 1st vein with a wide interval in setal row; 2nd vein with about 8 widely spaced setae. Tergites with weak reticulate sculpturing; tergite IX (Figure 217) with a pair of stout, thorn-like setae.

Male apterous, paler than female. Tergite IX (Figure 241) with a pair of short, stout setae medially and a pair posterolaterally on obliquely truncate tubercles. Sternites III-VI or VII with a small, oval glandular area (Figure 249).

MATERIAL EXAMINED. 95 females, 11 males (BMNH, LCNZ, NZAC, PANZ, PLNZ).

AK, WI / NN, MB, MC, CO, DN, SL.

From a wide variety of plants, including *Nicotiana*, *Solanum tuberosum*, *Medicago sativa*, and *Ulex europaeus*. One specimen collected on the Pisa Range (CO) at 1554 m in native *Scleranthus* mat plant was probably blown there from the fields below.

Collected from August to March.

REMARKS. The first recorded specimen of *L. cerealium* was collected at Palmerston North (WI) from potato foliage in 1930. Doull (1956a) records females as being found throughout the winter in Canterbury, under bark and inside dead twigs and dead stalks of cereals and grasses. He further indicates that females appeared on grasses in September or October, and grasses close to shelter belts often carried large populations. Spiller (1956) mentions this species as being found on *Nicotiana tabacum*. It is widespread in the South Island but less common in the North Island.

Females are macropterous except in Corsica (see Mound & Palmer 1974a). *L. cerealium* breeds particularly on cereal crops, and in western Europe it sometimes exists in enormous numbers. In Britain it is often referred to as the 'thunder fly' because of mass migrations which occur in warm summer weather. This species has been the subject of much ecological study (Lewis 1973).

L. cerealium almost certainly evolved in Europe, although it is now found on grasses and cereals in many temperate parts of the world. Individuals vary considerably in size, and, as in *Chirothrips manicatus*, peripheral populations sometimes differ from the typical forms (Mound & Palmer 1974a).

Tribe Thripini

This, the largest tribe in the Terebrantia, includes the most highly evolved species. It can be divided into two subtribes, the Aptinothripina and the Thripina, but these are ill defined; genera such as *Dichromothrips* and *Pseudanaphothrips* include species which have been placed in both. The subtribe Aptinothripina includes

mainly leaf-feeding species with short setae on the head, pronotum, and forewing. In contrast, the subtribe Thripina includes mainly flower-living species with elongate setae on the head, pronotum, and forewings. The four species - *Thrips tabaci* Lindemann, *Frankliniella fusca* (Hinds), *F. occidentalis* (Pergande), and *F. schultzei* (Trybom) - which are known to be virus vectors (Mound 1973) belong to the Thripina, as do the predatory species of the genus *Scolothrips*, none of which have yet been recorded from New Zealand.

Subtribe Aptinothripina

Twelve species of this group are recorded from New Zealand. Three are probably introduced from Australia, five are apparently native to New Zealand (including the surrounding islands), and four are introduced from other parts of the world. Moreover, the bicoloured and widespread tropical species *Anaphothrips sudanensis* Trybom (Pitkin 1978) will probably be found in the North Island on Gramineae.

Genus *Anaphothrips* Uzel

Anaphothrips Uzel, 1895: 142-143. Type-species *Anaphothrips virgo* Uzel (a synonym of *Thrips obscura* Müller), by subsequent designation of Hood, 1914.

Othinanaphothrips Crawford, 1943: 151. Type-species *Othinanaphothrips spilleri* Crawford (a synonym of *Heterothrips dubius* Girault), by original designation.

About 80 species, almost certainly a polyphyletic assemblage, have been placed in this genus. A recent reclassification of the group by Bhatti (1978) cannot be made to accommodate the New Zealand and Australian species satisfactorily. As a result, *Anaphothrips* is used here in its traditional broad sense for a group of species with eight- or nine-segmented antennae, forked sense cones on antennal segments III and IV (rarely simple on III), short pronotal posteroangular setae, two-segmented tarsi, and wings present or absent. Five species are recorded from New Zealand, but only one of these is unknown from elsewhere.

Anaphothrips dubius (Girault)

Figures 14, 59, 156, 171, 196, 242, and 250

Heterothrips dubius Girault, 1926: 2. Syntype females, AUSTRALIA (QMBA) [examined].

Othinanaphothrips spilleri Crawford, 1943: 152. Holotype female, NEW ZEALAND (USNM) [examined].

COLOUR. Mainly yellow; pterothorax orange. Head with occipital ridge sometimes dark. Tergites II-VII with a large brown area medially and a pair of small brown spots laterally (Figure 171). Antennal segments II and IV-IX brown. Forewing shaded.

STRUCTURE. Head (Figure 14) wider than long, finely reticulate on vertex; ocellar setae arising just inside ocellar triangle. Antennae (Figure 59) 9-segmented; segments III and IV each with a forked sense cone; segment VI divided by a complete, almost transverse suture. Pronotal and head setae a little stouter than in *obscurus*. Metanotum similar to that of *obscurus*. Forewing (Figure 156) more slender than in *obscurus*; 2nd vein with up to 20 setae, at least 5 of them arising proximal to cross-vein. Abdominal tergites V-VIII with median area unsculptured (Figure 171); tergite VIII (Figure 196) with posteromarginal comb long and fine, spiracle small.

Male similar to female but paler. Tergite IX (Figure 242) with a pair of stout, thorn-like setae medially and a pair of long, recurved setae posterolaterally. Sternites III-VII with a large, C-shaped glandular area (Figure 250).

MATERIAL EXAMINED. 12 females, 4 males (BMNH - including 1 female and 1 male paratype of *spilleri*; NZAC - including 1 female paratype of *spilleri*; PLNZ).

AK, WI / NN.

From the introduced plants *Althaea rosa*, *Physalis peruviana*, *Anemone*, and *Solanum nigrum*.

Collected in December, January, February, July, and September.

REMARKS. The first recorded specimen of *A. dubius* was collected at Auckland (AK) from *Nicotiana tabacum* in July 1941 by D. Spiller (Spiller 1951, 1956). Few specimens have been collected subsequently.

Crawford (1943) described *Othinanaphothrips spilleri* from Spiller's material. Pitkin (1978) has pointed out that both *O. spilleri* and *Hemianaphothrips tersus* Morison, described from South Australia, are the same species as *Heterothrips dubius* Girault, which was described from Queensland, Australia.

A. dubius is similar in structure to the common species *obscurus*; however, it has a shorter head, and the second vein of the forewing bears several setae proximal to the cross-vein. Moreover, in contrast to *obscurus*, *dubius* is known only from macropterae, and males have been collected in both Australia and New Zealand.

This species is probably native to Australia, where it is widespread, feeding on the leaves of several species of dicotyledons.

Anaphothrips obscurus (Müller)

American grass thrips
Figures 15, 60, 106, and 157

Thrips obscura Müller, 1776: 96.
Syntype females, DENMARK (lost?).

COLOUR. Mainly yellow, but with variable amounts of brown shading; occipital ridge and mouth cone brown. Pterothorax and median area of tergites frequently brown in macropterae. Distal antennal segments dark brown. Forewings uniformly but weakly shaded. Terminal setae on abdomen dark.

STRUCTURE. Head (Figure 15) slightly longer than wide, its surface finely reticulate; ocellar setae arising just outside ocellar triangle. Antennae (Figure 60) 9-segmented; segments III and IV each with a forked sense cone; morphological segment VI divided by a nearly complete but oblique suture. Pronotum with no long setae. Metanotum (Figure 106) reticulate, with a pair of fine median setae. Forewing (Figure 157) relatively broad; 1st vein with a wide interval in seta row; 2nd vein with about 8 setae, none of which arise proximal to cross-vein; micropterae with wing lobe about half as long as pterothorax width. Tergite VIII with posteromarginal comb variable, the teeth usually slender but sometimes with broad bases, and with spiracle not enlarged.

Male unknown.

MATERIAL EXAMINED. 432 female macropterae, 37 female micropterae (BMNH, NZAC, PLNZ).

All North Island areas / NN, SD, MB, BR, MC, CO, DN, SL / Chatham Islands.

Mostly swept from pasture; in one sample (Woodhill (AK), sweeping pasture, 6 Jan 1977) 95 macropterae and 12 micropterae were counted. Also from *Zea mays*, sedges, *Solanum nigrum*, and *Brassica* (swede), and beaten from native *Ripogonum scandens* and *Coprosma robusta* foliage. Of two specimens collected on the Black Birch Range (MB), the first at 1200 m was micropterous and the second, at 1400 m in moss and mat plants, was macropterous. Another macroptera was found in moss on the Dunstan Range (CO) at 1560 m.

Collected from November to April.

REMARKS. The first recorded specimen of *A. obscurus* was collected at Christchurch (MC) from swede in 1952 by K. P. Lamb. Doull (1956a) records it in connection with his cocksfoot survey, and Spiller (1956) mentions it in his checklist. Cumber (1959) mentions it as being found in paddocks and roadside samples from January to early April in the North Island; his records are included in our locality data, although only a few voucher specimens have been found. Cumber & Eyles (1961) record it from chou moellier, lucerne, maize, turnips, and mixed chou moellier/swede. Lewis (1973) summarises the information on crop loss due to attacks on cereals by this species.

A. obscurus is widespread in Europe and North America, and specimens from Peru and Australia have been studied. It feeds on the leaves of grasses and cereals rather than the inflorescences, and is sometimes responsible for linear brown markings which probably result from feeding damage to the young leaves before they have fully

expanded. In addition, specimens have recently been collected in England from green shoots on tissue cultures of oil palm (*Elaeis* sp). No males are known from any part of the distribution of the species, and in field identifications it is important to recognise the existence of the two female morphs, micropterae and macropterae. The species most closely related to *obscurus* are *cameroni* Bagnall from North America and *badius* Williams from Britain. The country of origin is therefore probably somewhere in the Holarctic region.

Anaphothrips varii Moulton

Figures 16, 61, and 197

Anaphothrips (*Anaphothrips*) *varii* Moulton, 1935: 98. Holotype female, AUSTRALIA (CASC) [examined].

COLOUR. Similar to *obscurus*, but a little darker.

STRUCTURE. Head (Figure 16) with ocellar setae arising within ocellar triangle. Antennae (Figure 61) 9-segmented; sense cone on segment III simple, that on IV forked; segment VI divided by a complete transverse suture. Forewing similar to that of *obscurus*. Tergite VIII (Figure 197) with a complete but irregular posteromarginal comb of microtrichia; spiracle diameter more than half the tergal midlength.

Male unknown.

MATERIAL EXAMINED. 2 females: Palmerston North (WI), potato leaves, February 1930 (BMNH); Spirits Bay (ND), rushes, December 1977 (NZAC).

ND, WI.

REMARKS. *A. varii* is almost certainly a grass-feeding species and, unless examined carefully, is easily mistaken for *obscurus*. However, it is probably not closely related to that species in view of the structure of the antennae and the enlarged abdominal spiracles. Pitkin (1978) records *varii* from Tasmania as well as eastern and western Australia.

Anaphothrips woodi Pitkin

Figures 17, 62, 107, 172, and 218

Anaphothrips woodi Pitkin, 1978: 367-368. Holotype female, AUSTRALIA (ANIC) [examined].

COLOUR. Pale yellow. Antennal segments III-V increasingly brown, VI-IX brown. Setae on tergites IX and X brown.

STRUCTURE. Apterous. Head (Figure 17) without ocelli; posterior margin with faint anastomosing lines of sculpturing. Antennae (Figure 62) 9-segmented; sense cone on segment III simple, directed laterally, that on segment IV forked or simple; segment VI divided by a complete transverse suture. Pronotum very weakly sculptured; posterior margin with 5 pairs of short setae. Metanotum (Figure 107) with 1 pair of posteromarginal setae. Tarsi 2-segmented. Tergites II-VII with faint lines of sculpturing medially, and median pores just anterior to setae (Figure 172); tergite VIII with a weakly developed craspedum; tergites IX and X with median setae exceptionally stout (Figure 218).

Male unknown.

MATERIAL EXAMINED. 54 females (BMNH, NZAC).

TK / NN, MB, BR, MC, WD, OL, CO, FD.

From alpine grasslands of the South Island, usually in swards, moss, and litter; also at 1400 m on the Pouakai Range (TK) in the North Island.

Collected from November to March.

REMARKS. *A. woodi* was described from females collected in the Australian Alps (Pitkin 1978). The original description refers to a male specimen from New Zealand, but this is now accepted as being a misidentification of *A. zelandicus* Mound, with which *woodi* apparently co-exists in New Zealand (Mound 1978). The most closely related species are *cucurbiti* Pitkin, from New South Wales, and *zelandicus*. The possibility of trans-Tasman wind dispersal of these minute insects is discussed on pages 12 and 18, and in the remarks about *zelandicus* (below). The host plant is probably a species of *Poa* or even *Galium* (not *Eucalyptus*, as given in the key to species by Pitkin (1978)).

Anaphothrips zelandicus Mound

Figures 18, 63, 108, 173, 243, and 251

Anaphothrips zelandicus Mound, 1978: 616-617. Holotype female, NEW ZEALAND, Mount Altimarlock (NZAC) [examined].

COLOUR. Variable. Some specimens yellow, with abdominal segments IX and X and antennal segments II-IX brown; most specimens dark brown, with apices of tibiae and extreme base of antennal segment III paler. Terminal setae of abdomen very dark.

STRUCTURE. Apterous. Head (Figure 18) reticulate, without ocelli. Antennae (Figure 63) 9-segmented; sense cone on segment IV forked, that on segment III forked or simple; segment VI divided by a complete transverse suture. Pronotum weakly sculptured; all setae small. Metanotum (Figure 108) with 2-5 pairs of posteromarginal setae. Tarsi 2-segmented. Tergites with 3 pairs of setae forming a median transverse line with submedian pores, and posterior margin with a very short (2 µm), broadly lobed craspedum (Figure 173); tergite IX with median dorsal setae stout.

Male apterous, similar to female but with 2 pairs of thorn-like setae on tergite IX (Figure 243) and a transversely oval glandular area on sternites III-VII (Figure 251).

MATERIAL EXAMINED. 160 females, 38 males, 1 larva (BMNH, NZAC).

TK / NN, MB, MK, CO, OL / Chatham Islands, Antipodes Islands.

Most of the available specimens were collected from leaf litter, apart from the series recorded below from *Salicornia* at Nelson.

Adults have been collected from November to February.

REMARKS. The pale-coloured specimens referred to in the original description of *A. zelandicus* are almost certainly teneral; mature individuals are dark brown. The species was based on material from subalpine areas of the South Island, and from the Antipodes and Chatham islands. Two further series have now been studied, one from litter at 1200 m on Mt Egmont (TK), the other - most surprisingly - from *Salicornia* on tidal mud flats near the harbour at Nelson (NN). The latter series comprises both sexes collected together with a larva. Mound (1978) suggested that the host plant might be a member of the Gramineae or Rubiaceae in the subalpine zone, but this extension of the range to a halophytic plant at sea level indicates that the species must be polyphagous and adaptable in its biology. The nearest relative of this wingless thrips is the Australian species *woodi* (discussed above), and it seems likely that both species have been introduced naturally by winds from Australia. Close et al. (1978) indicate that an important vortex, causing deposition of biological material from winds emanating from Australia, occurs in Tasman Bay between the North and South islands. This could explain the populations of *zelandicus* at both Nelson and Mount Egmont.

Anaphrygmothrips new genus

Type-species *Anaphrygmothrips otagensis* new species.

Small, dark, micropterous Thripini. Head broad, with 3 pairs of ocellar setae; eyes large; maxillary palps 3-segmented. Antennae 8-segmented; sense cones on segments III and IV forked. Pronotum with 2 pairs of posteroangular setae; ferna undivided; pterothorax reduced; metepisternum without setae; pre-episternum with 1 seta; metepimeron with 1 median seta and 1 posteroangular seta; metanotum transverse, usually bearing only 1 pair of setae, which arise medially. Tarsi 2-segmented. Tergites with median setae wide apart, and bearing 1-3 pairs of long discal setae; posterior margins with a short, weakly lobed craspedum; tergites III-VII without ctenidia or microtrichia; tergite VIII with about 4 microtrichia lateral to spiracle; tergite X with incomplete longitudinal division. Abdominal pleurosternites distinct; pleurotergites not developed on segments V-VII, very small on segments III and IV (Figures 225 and 226). Sternites without discal setae; posterior margins with a short, lobed craspedum interrupted at marginal setae; sternite VII with median setae arising just in front of posterior margin.

REMARKS. In general appearance the type-species of this new monobasic genus appears to be a typical member of the subtribe Thripina. The chaetotaxy of the pronotum, the form of the antennae, and the long interocellar setae all suggest that this is an advanced member of the Thripidae. However, the lack of pleurotergites on most abdominal segments is more typical of less advanced thripids of the subtribe Aptinothripina (Mound et al. 1980). Moreover, the presence of three pairs of ocellar setae and the median position of the metanotal setae are also plesiotypic character states within the Thripini (Mound & Palmer 1981a), and the few microtrichia on tergite VIII represent a character state unusual in the Thripina.

The inadequacy of the present subtribal classification, based largely on the relative lengths of pronotal setae, has been discussed by Mound & Palmer (1981a). Thus, despite the long pronotal setae, *Anaphrygmothrips* is here suggested to be related to *Anaphothrips* in the Aptinothripina. Under this interpretation *Anaphrygmothrips* is an aberrant offshoot, or relict species, of primitive Aptinothripina isolated in New Zealand. The alternative interpretation, that it is a highly advanced but reduced member of the Thripina, makes less sense zoogeographically.

Anaphrygmothrips otagensis new species

Figures 19, 64, *82, 109, 174, 225, 226, and 234

FEMALE MICROPTERA. Brown to dark brown, including antennae and legs; tarsi and apices of tibiae paler. Major setae dark. Wing rudiment shaded.

Head (Figure 19) broad, not projecting in front of large eyes; ocelli reduced; ocellar setae III arising behind ocellar triangle; 3 pairs of small postocular setae. Antennae (Figure 64) with segments VII and VIII relatively long; segments III-VI bearing microtrichia. Pronotum (Figure 82) with anteromarginal and midlateral setae longer than discal setae; median area devoid of sculpturing. Mesonotum with 1 pair of setae laterally on posterior margin. Metanotum (Figure 109) with 1 pair of setae arising medially (one paratype has an extra pair of setae near the anterior margin). Forewing rudiment oval, bearing at least 6 long setae. Tergites with discal setae long, 1 pair on segment I, 3 pairs on segments II-VII (Figure 174), 2 pairs on segment VIII; tergite X short. Pleurotergites, Figures 225 and 226. Sternite II with 3 pairs of small setae near anterior margin and 2 pairs of posteromarginal setae; other sternites with 3 pairs of posteromarginal setae (Figure 234).

Dimensions of holotype female (µm). Body length (extended) 1300. Head length 120, width 160; ocellar setae III length 55. Pronotum length 120, width 210; posteroangular setae length 60. Metanotal median setae length 50. Forewing length 60. Tergite IX length 60; median setae length 110. Tergite X length 45; median setae length 120. Antennal segments III-VIII length 50, 40, 40, 40, 15, and 15 respectively.

TYPE DATA. Holotype: female, NEW ZEALAND, South Island, CO, Waipori (50 km W of Dunedin), 520 m, in pitfall trap amongst tussock, 2-16 January 1979, B. I. P. Barratt (NZAC). Paratypes (10 females): 5, same data as holotype; 2, similar data except 5-19 Dec 1978; 3, similar data except 19 Dec 1978 - 2 Jan 1979 (BMNH, NZAC).

OTHER MATERIAL EXAMINED (excluded from type series). South Island, MB - 1 female, Black Birch Range Exp. Stn, 1300 m, 20 Feb 1970; 1 female, Molesworth, 2000 m, 20 March 1968 (NZAC).

MB, CO.

Genus *Apterothrips* Bagnall

Apterothrips Bagnall, 1908: 185. Type-species *Apterothrips subreticulata* Bagnall (a synonym of *Thrips secticornis* Trybom), by monotypy.

This monobasic genus is distinguished from *Anaphothrips* by the possession of a well developed craspedum on the posterior margin of the tergites and sternites (Figure 235).

However, this generic placement may eventually prove unsatisfactory. *A. secticornis* is unusual in having the sternal craspeda deeply lobed between the posteromarginal setae.

Apterothrips secticornis (Trybom)

Figures 20, 65, and 235.

Thrips secticornis Trybom, 1896: 620-622. Syntypes both sexes, U.S.A. and U.S.S.R. (lost?).

COLOUR. Dark brown. Tarsi, apices of tibiae, apex of antennal segment II, and base of segment III yellowish.

STRUCTURE. Apterous. Head (Figure 20) about as long as wide, faintly reticulate dorsally. Antennae (Figure 65) 8-segmented; segments III and IV each with a simple sense cone; segment VI divided by a partial suture ventrally. Pronotum with no long setae, scarcely sculptured. Tarsi 2-segmented. Tergites reticulate; posterior margin with a broad, entire craspedum. Sternites with a broad craspedum which is deeply lobed at origin of each marginal seta (Figure 235).

Male smaller than female. Tergite IX with 2 pairs of median thorn-like setae. Sternite III anterior margin with a unique pale invagination extending into segment II.

MATERIAL EXAMINED. 254 females, 12 males, 7 instar II (BMNH, NZAC, PANZ, PLNZ).

ND, AK, CL, WO, BP, TO, HB, WI, WA, WN / NN, SD, MB, KA, BR, MC, SL / Chatham Islands.

From pasture including *Medicago sativa* and *Trifolium* spp.; also from *Ulex europaeus*, sedges and rushes, vegetables, and some garden flowers. One specimen from Rangatira Island (South East Island), in the Chathams, was found in litter from a sooty shearwater (*Puffinus griseus*) nest burrow, and another was found on a fledgling southern diving petrel (*Pelecanoides urinatrix chathamensis*).

Adults have been collected from September to April.

REMARKS. The first recorded specimen of *A. secticornis* was collected at Beachlands (AK) from gorse on 20 November 1945 by J. W. Campbell. Spiller (1951, 1956) gives the first published record, mentioning *Dahlia*, *Cucurbita pepo*, (poorman's orange) and *Citrus* as host plants. Cumber (1959) records specimens as being collected from January to April in the North Island, sometimes in considerable numbers in paddock and roadside samples. His records are included in our locality data, although only a few voucher specimens have been found. Cumber & Eyles (1961) record it from lucerne and maize during their North Island fodder crops survey, and Somerfield & Burnett (1976) report it as being widespread in lucerne stands in both the North and South Islands. Macfarlane & Pottinger (1976), however, do not mention it as being associated with seed production in lucerne. At Tuakura (WO) it has been observed to damage the growing tips of lucerne, causing leaves to curl on fresh growth after mowing; a similar report has been received from Western Australia.

This small, apterous species appears to subsist in tussocky grass. However, its frequent occurrence on other plants suggests that it is either exceptionally active or readily distributed by the wind.

A. secticornis is common in many cool temperate parts of the world, extending even to Greenland, the Falkland Islands, and the Crozet Islands. Jacot-Guillarmod (1974, p.589) states that its type locality was not specified. However, the only localities which Trybom (1896) refers to in the original description are Portland and Albany, in Oregon, U.S.A., and Ribatschi Island, near the border between Norway and Russia. The males referred to by Trybom came from Oregon, and we have studied males from California and New Zealand. Other published descriptions of the male seem to be derived from Trybom's account rather than from original observations. The area of origin of *secticornis* is thus unknown, but presumably it is the west coast of North America.

Genus *Aptinothrips* Haliday

Thrips (*Aptinothrips*) Haliday, 1836: 445. Type-species *Thrips* (*Aptinothrips*) *rufus* Haliday, by subsequent designation of Mound & Palmer, 1974b.

All four species in this genus are probably native to the Holarctic region, Europe being the centre of distribution. They live in grasses, apparently showing some degree of host specificity (Palmer 1975). *A. rufus* has been introduced throughout the temperate areas of the world.

Aptinothrips rufus (Haliday)

grass thrips
Figures 21, 66, 219, and 244

Thrips (*Aptinothrips*) *rufa* Haliday, 1836: 445-446. Lectotype female, BRITAIN(?) (NMID).

COLOUR. Yellow; apex of antennae and apex of abdomen shaded brown.

STRUCTURE. Apterous. Head (Figure 21) longer than wide; dorsal surface faintly reticulate. Antennae (Figure 66) 6-segmented; segments III and IV each with a simple sense cone. Pronotum with no long setae. Tarsi 1-segmented. Tergites II-VIII with 0-20 discal setae; tergite IX (Figure 219) with posteromedian setae very small, not reaching posterior margin.

Apterous male similar to female but smaller. Tergites with a craspedum on posterior margin; tergite IX (Figure 244) with posteromedian setae stout, thorn-like.

MATERIAL EXAMINED. 682 females, 3 males, 75 instar II (AMNZ, BMNH, LCNZ, NZAC, PLNZ).

All coded areas except WD and SI / Three Kings Islands, Chatham Islands, The Snares, Antipodes Islands.

Commonly on introduced grasses; also taken in native mosses and litter, even up to high altitudes (the highest at Molesworth (MB) - 1500 m). On Rangatira Island (South East Island), in the Chathams, a specimen was found in a nest burrow of the sooty shearwater (*Puffinus griseus*) together with *Apterothrips secticornis*. Another was found in a *P. griseus* burrow on Stephens Island (SD). Specimens have also been found in song thrush (*Turdus philomelos*) nests. On The Snares specimens were found in *Poa annua* and in old feathers of *Puffinus griseus*. Specimens from the Antipodes Islands were found in a wide variety of plants as well as moss, lichen, and penguin nest debris and guano.

Adults have been collected in all months.

REMARKS. The first recorded specimen of *A. rufus* was collected at Palmerston North (WI) from cocksfoot in 1954 by M. Johnston. Doull (1956a) gives details of its biology in New Zealand in connection with his cocksfoot survey, and Spiller (1956) mentions it in his checklist. Cumber (1959) found it in paddocks and roadside samples throughout the North Island from January to early April; his records are included in our locality data, though only a few voucher specimens have been found. Cumber & Eyles (1961) recorded it from maize and mixed turnip/chou moellier during their North Island fodder crop survey.

Like its three congeners, *A. rufus* lives on the leaves of grasses rather than in the inflorescences. Lewis (1973) summarises the information available on its biology, and Palmer (1975) lists over 30 species of Gramineae from which it has been collected, together with records of its world distribution.

In Europe, when this thrips lives on halophytic plants on salt marshes it produces a dark brown form which has been referred to by the name *nitidula*. Moreover, specimens of *rufus* with both seven- and eight-segmented antennae have been collected in the Mediterranean area, but these are readily distinguished from *stylifer* Trybom by their one-segmented tarsi.

Aptinothrips stylifer Trybom

Figures 67 and 220

Aptinothrips stylifera Trybom, 1894: 43. Syntype females(?), SWEDEN (lost?).

This species is very similar to *rufus*, but has eight-segmented antennae (Figure

67), two-segmented tarsi, no tergal discal setae, and the posteromedian setae on tergite IX are almost as long as the posterolateral setae (Figure 220). Palmer (1975) refers to two rare specimens of *stylifer* with seven-segmented antennae.

MATERIAL EXAMINED. 31 females (BMNH, NZAC).

SD, MB, KA, MK, OL, CO, FD.

Largely from moss, lichen, and tussock litter in modified high-country habitats on the South Island. One specimen from native forest litter at Ship Cove (SD), and one from pasture at Cape Campbell (KA).

Collected from September to March.

REMARKS. The first recorded specimen of *A. stylifer* was collected on Mount Sebastopol (MK) by A. C. Eyles, sweeping tussock and bushes on 8 January 1966. According to Palmer (1975), although *stylifer* appears to prefer *Deschampsia* as a host it also occurs on *Dactylis*. However, in New Zealand it seems to be associated with *Festuca* tussock rather than the lowland grasses on which *rufus* is most common. The two species have been taken together in the Matukituki Valley (OL), but the males of *stylifer* are as yet unrecorded in New Zealand. This species has been found only in the South Island, and is much less common than *rufus*.

Karphothrips new genus

Type-species *Karphothrips dugdalei* new species.

Small, slender, pale thripids on Gramineae. Head (Figure 22) longer than wide; anterior margin depressed between large eyes; vertex with several pairs of scattered setae behind eyes; ocellar setae pair I present, pair III anterolateral to ocellar triangle; mouth cone short, rounded; maxillary palps small, 3-segmented. Antennae 8-segmented; segments III and IV with simple sense cones. Pronotum longer than wide, with 2 pairs of posteroangular setae elongate; prosternal ferna complete medially. Mesonotum with 1 pair of median setae and 1 pair of posteromarginal setae. Metanotum weakly reticulate, with median setae well behind anterior margin. Metepisternum without setae; metepimeron with 2 setae at posterior angle; mesothoracic and metathoracic furca without spinula. Legs short, particularly tarsi and tibiae; tarsi 2-segmented. Forewing apex acute, with a short seta; 1st vein with 6+1+1+1 setae; 2nd vein with 6 setae; marginal cilia wavy; wing scale with 3 marginal setae but no discal setae. Abdominal tergites without craspeda or ctenidia, the median pores and setae close to posterior margin (Figure 175); pleurotergites apparently not distinct from tergites; posterior tergites and ovipositor elongate; tergites IX and X bearing long setae; tergite X with complete longitudinal division. Abdominal sternites without discal setae; sternite II with 2 pairs of posteromarginal setae, sternites III-VII with 3 pairs; sternite VII with median marginal setae arising at margin.

REMARKS. Many of the characters of this genus are probably related to the grass-living habit, these characters being shared by several other grass thrips. Structural convergence appears to be relatively common among grass-inhabiting species, with the result that phylogenetic relationships are difficult to deduce. This new genus is similar in appearance to *Aptinothrips*, of which no macropterae are known (Palmer 1975), but the pronotum and posterior tergites bear long setae. Despite these long setae, *Karphothrips* probably belongs with the subtribe Aptinothripina because of the median position of the metanotal setae, presence of ocellar setae I, absence of a mesothoracic spinula, and absence of tergal/pleurotergal sutures.

Karphothrips dugdalei new species

Figures 22, 68, 83, 110, 158, and 175

FEMALE MACROPTERA. Colour mainly yellow. Antennal segments V-VIII brown; segment IV pale brown; segment III scarcely shaded. Head with a small brown spot between the ocelli. Pronotum weakly shaded in posterior half. Anterolateral pterothoracic sclerites, tergites X and XI, and femora shaded. Forewings brown. Major setae pale.

Head (Figure 22) with weak transverse reticulation; ocelli small. Antennal segments (Figure 68) with very few microtrichia; sense cones on segments III and IV small. Pronotum (Figure 83) weakly sculptured with 3 pairs of posteromarginal setae. Metanotum (Figure 110) weakly reticulate.

Forewing, Figure 158; 1st vein with 3 setae widely and evenly spaced on distal half; 2nd vein with 6 evenly spaced setae. Tergites completely but weakly reticulate (Figure 175); tergite VIII without a comb. Sternal marginal setae short.

Dimensions of holotype female (µm). Body length 1300. Head length 130, width 105; ocellar setae III length 16; maxillary palps length 25. Pronotum length 140, width 110; posteroangular setae length - inner 33, outer 28. Metanotal median setae length 12. Forewing length 550, median width 30; setae on 2nd vein length 20. Tergites VI, VII, and VIII each 70 long. Tergite IX length 85; setae B_1-B_3 length 50, 100, and 100 respectively. Tergite X length 60; setae length 85. Tergite XI length 30; setae length 35. Ovipositor total length 250. Antennal segments I-VIII length 15, 27, 33, 24, 27, 45, 9, and 15 respectively.

TYPE DATA. Holotype: female, NEW ZEALAND, North Island, AK, Huia (16 km SW of Auckland), in short grass by path, 24 January 1979, L. A. Mound No. 1352 (NZAC).

MATERIAL EXAMINED. Type series only.

AK.

REMARKS. The ocelli of the single specimen on which *K. dugdalei* is based are rather small, and the wings are slender, which suggests that wingless individuals are probably produced. Since this species appears to have no close affinities with any other thripid, no prediction can be made as to whether it is native to New Zealand or an immigrant from Australia.

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Genus *Physemothrips* Stannard

Physemothrips Stannard, 1962: 933-934.
Type-species *Physemothrips chrysodermus* Stannard, by original designation.

This genus was erected for a single species from Macquarie Island, but subsequently a second species was described from Big South Cape Island, off Stewart Island (SI). The abdominal tergal/pleurotergal sutures are not developed, and *Physemothrips* appears to be an isolated member of the Aptinothripina with no close relationship to any other genus.

Physemothrips chrysodermus Stannard

Figures 23, 69, 84, 221, 245, and 252

Physemothrips chrysodermus Stannard, 1962: 934-936. Holotype female, MACQUARIE ISLAND (ANIC) [examined].

COLOUR. Yellow. Antennal segments IV-VIII brown. Major setae pale.

STRUCTURE. Apterous. Head (Figure 23) projecting in front of eyes, without ocelli; sculpturing and setae on dorsal surface weak. Antennae (Figure 69) 8-segmented; segments III and IV each with a slender, forked sense cone. Pronotum (Figure 84) without sculpturing, wider posteriorly than at anterior margin; posterior margin with only 1 pair of submedian setae; posterior angles with 1 pair of long, stout setae and 1 pair of shorter fine setae. Mesonotum and metanotum transverse, each with 2 pairs of median setae. Tarsi 2-segmented. Tergites with about 8 transverse lines of sculpturing; tergite VIII without a comb or craspedum; tergite IX with 2 pairs of stout dorsal setae, and tergite X with longitudinal dorsal split complete (Figure 221).

Male similar to female, but tergite IX with 2 pairs of median thorn-like setae, also 1 pair of dorsolateral setae not extending beyond apices of median setae (Figure 245); sternites III-VI (or VII) each with a glandular area (Figure 252).

MATERIAL EXAMINED. 19 females, 4 males (BMNH, NZAC).

Auckland Islands and (extralimital) Macquarie Island.

REMARKS. *P. chrysodermus* was collected at Macquarie Island from several species of grasses during most months in 1961. Although more than 100 females and 200 larvae were collected, only 8 males were found. In addition, two females and one male from Macquarie Island (collected 1978) and seven females and three males from Auckland Island (collected 1973 and 1976) have been examined. The paratype females of *chrysodermus* in the BMNH collections have the major posteroangular pronotal setae variable in length (42-66 µm), and there is a second, outer pair of shorter and more slender posteroangular setae which also vary in length. One male from Macquarie Island and one from the Auckland Islands have a small glandular area on sternite VII. This species is discussed further under *hadrus*.

Physemothrips hadrus Mound

Figures 70, 222, and 246

Physemothrips hadrus Mound, 1978: 617.
Holotype female, NEW ZEALAND, Big South Cape Island (NZAC) [examined].

COLOUR. Yellow to yellowish brown. Antennal segments VI-VIII brown. Major setae pale brown.

STRUCTURE. Very similar to *chrysodermus*, but much larger, with more slender antennae (Figure 70). Tergites IX and X, Figure 222. Male with dorsolateral setae on tergite IX long, extending well beyond apices of median setae (Figure 246).

MATERIAL EXAMINED. 32 females, 18 males (BMNH, NZAC).

SI / The Snares, Auckland Islands, (?)Antipodes Islands.

REMARKS. *P. hadrus* was described from a single female collected on Big South Cape Island, south-west of Stewart Island (SI), in February 1969. In addition, 30 females and 18 males of *hadrus* have now been studied from material collected at various sites on The Snares between 1971 and 1975. A single female collected on Ewing Island (Auckland Islands) - but not with the *chrysodermus* specimens referred to above - is apparently referable to *hadrus*. Eleven females and 5 males collected at 3 sites on the Antipodes Islands in 1969 are intermediate in form between *hadrus* and *chrysodermus*. Antennal segment III of the Antipodes females is about 2.6-2.7x as long as wide, and the dorsal setae on tergite IX vary in length from 95 µm to 115 µm. Also, the males of this population have glandular areas only on sternites III-V. The differences between *hadrus* and *chrysodermus* seem not to be simply a function of body size. Since both species, as well as the intermediate population on the Antipodes Islands, have been collected several times, and at different sites, it seems reasonable to assume that separate biological entities are involved, not just one variable species. *P. chrysodermus* is found on the southern subantarctic islands, and *P. hadrus* on the northern subantarctic islands. The genus has not been recorded from the mainland of New Zealand or from the Chatham Islands.

Subtribe Thripina

Twenty-five species of this group are recorded from New Zealand, of which only 11 appear to be native. Four species have been introduced from Australia, and three come from tropical areas; the other seven species have probably been introduced from Europe or North America. This apparent lack of native flower thrips may be due to widespread destruction of the native flora in New Zealand.

Genus *Adelphithrips* Mound & Palmer

Adelphithrips Mound & Palmer, 1981a: 160.
Type-species *Adelphithrips nothofagi* Mound & Palmer, by original designation.

This genus was erected for two New Zealand species, from *Nothofagus* and *Cassinia* respectively. A third species from *Senecio* on The Snares Islands is described below. Judging from fragmentary material, at least one further undescribed species exists, probably in the flowers of *Olearia colensoi*. Two female micropterae from

The Snares probably represent yet another species. The existence of these further species vindicates the decision of Mound & Palmer (1981a) to put the very distinct species *nothofagi* and *cassiniae* into one genus. It is remarkable that each of the known species has a different arrangement of sternal glandular areas; these are present on four sternites in *dolus*, three in *cassiniae*, two in *nothofagi*, and also two (but different sternites) in the undescribed species.

Adelphithrips has been suggested as the phylogenetic sister-group of *Thrips* genus-group because, despite the lack of tergal ctenidia, the species are very similar in structure to species of *Thrips*. Mound & Palmer (1981a) point out that it is zoogeographically apt that the sister-group of *Thrips* genus-group, a worldwide group of genera whose species dominate the thysanopteran fauna of dicotyledonous plants, should be found in New Zealand, with its restricted, relict flora.

Adelphithrips species share the following characteristics. Head with 2 pairs of ocellar setae; pair I absent; pair III between or behind posterior ocelli. Antenna 8-segmented; segments III and IV with forked sense cones. Pronotum with inner pair of posteroangular setae longer than outer pair. Metanotum reticulate, with median setae near anterior margin. Forewing setal row on 1st vein interrupted. Tergites without any ctenidia; tergite VIII posteromarginal comb long, fine. Sternites and pleurotergites without discal setae.

Adelphithrips cassiniae Mound & Palmer

Figures 85, *111, and 176

Adelphithrips cassiniae Mound & Palmer, 1981a: 163-164. Holotype female, NEW ZEALAND, 50 km west of Nelson (NZAC) [examined].

COLOUR. Pale brown. Forewing shaded, pale at base. Major setae dark.

STRUCTURE. Macropterous. Head with mouth cone rounded in dorsal view. Pronotum (Figure 85) with many lines of sculpturing. Metanotum (Figure 111) reticulate. Forewing 1st vein with 2 distal and 1 (or 2) median setae. Tergites III-VI with median setae close together; posterolateral tergal margins with a short fringe of microtrichia; lateral sculpturing also bearing fine microtrichia (Figure 176).

Male paler than female. Sternites III-V with a small, oval glandular area.

MATERIAL EXAMINED. 21 females, 16 males (BMNH, NZAC).

NN, SL.

REMARKS. *A. cassiniae* was described from specimens collected in flowers of *Cassinia vauvilliersi* at the treeline in the Cobb Valley (NN), near the lower edge of the alpine zone. A further female specimen from Invercargill has now been examined.

Adelphithrips dolus new species

Figures 24, 71, 86, *112, 159, *177, and *178

FEMALE MACROPTERA. Colour brown. Tarsi, fore tibiae, and antennal segment III yellowish brown. Forewing and scale deeply shaded.

With the generic characters listed by Mound & Palmer (1981a), except setae more numerous on forewing 1st vein. Head (Figure 24) slightly wider than long; ocellar setae pair III between posterior margins of hind ocelli; mouth cone short, rounded. Antennae (Figure 71) relatively short. Pronotum (Figure 86) transverse; median area and anterior half with transverse lines of sculpturing; posteroangular setae long, the inner one about 1.5x as long as the outer; all 3 pairs of posteromarginal setae about twice as long as discal setae. Metanotum, Figure 112. Tarsi 2-segmented; pretarsus of foreleg probably without a terminal tooth. Forewing (Figure 159) long, slender; chaetotaxy variable - 1st vein with about 10 setae basally, 4 (or 3, or 2) medially, and 3 (rarely 2) distally, 2nd vein with 16-20 setae. Tergites with lines of sculpturing laterally but not medially; paired median setae separated by about 1.5x their length; posterolateral margins with

a distinct fringe of microtrichia (Figure 178); tergite VIII with posteromarginal comb long; tergite II (Figure 177) with 4 lateral marginal setae; tergites VII and VIII with a few scattered discal microtrichia laterally; tergite X with dorsal split about two-thirds as long as tergite. Sternite VII median marginal setae arising in front of margin.

Dimensions of holotype female (µm); paratype female in parentheses (holotype slightly crushed). Body length 1450. Head length 114 (110), width 150 (135); ocellar setae III length 20. Pronotum length 135 (125), width 210 (200); posteroangular setae length - outer 55, inner 75. Metanotal median setae length 30. Forewing length 900, median width 70. Median setae on tergites, length - IV 15, VIII 36, IX 75, X 80. Tergite X length 90. Antennal segments III-VIII length 42, 40, 33, 45, 8, and 12 respectively.

MALE MACROPTERA. Similar in colour and structure to female, but paler, with sternites III-VI bearing a broadly oval glandular area, and tergite IX with 4 setae in a transverse row anterior to median pores.

Dimensions of paratype male (µm). Body length 1200. Head length 108, width 130. Pronotum length 120, width 180; posteroangular setae length - outer 50, inner 75. Forewing length 850. Sternal glandular area median width 30. Antennal segments III-VIII length 42, 40, 33, 45, 8, and 12 respectively.

TYPE DATA. Holotype female, NEW ZEALAND, The Snares, Broughton Island, under bark of live *Senecio stewartiae*, 4 November 1972, C. J. Horning (NZAC). Paratypes (4 females, 3 males). The Snares: 1 female, 2 males, same data as holotype; 2 females, 1 male, south side of Ho Ho Bay, in *Senecio stewartiae* flowers, 13 Nov 1972, C.J.H.; 1 female, Penguin Creek, in nest of black tit (*Petroica macrocephala dannefaerdi*), 22 Dec 1972, C.J.H. (BMNH, NZAC).

MATERIAL EXAMINED. Type series only.

The Snares.

REMARKS. *A. dolus* is closely related to, and suitably intermediate in structure between, *nothofagi* and *cassiniae*. The most closely related known species is the undescribed species from *Olearia* referred to above. The tergites bear a distinct lateral posteromarginal fringe of microtrichia, as in *cassiniae*, but have fewer discal microtrichia. The males have more sternal glandular areas than in other species of *Adelphithrips*. The existence of this species on The Snares, some 200 km south of the South Island, is of interest in that *Adelphithrips* has not been recorded from any of the more distant offshore islands.

Adelphithrips nothofagi Mound & Palmer

Figures *25, 87, *113, *144, *179, *180, and *198

Adelphithrips nothofagi Mound & Palmer, 1981a: 161-163. Holotype female, NEW ZEALAND, 50 km west of Nelson (NZAC) [examined].

COLOUR. Uniformly brown, or with head, thorax, and legs more or less yellow. Antennae with apex of segment II and base of segment III pale. Forewing weakly shaded, pale at base. Major setae dark.

STRUCTURE. Head (Figure 25) with mouth cone long, extending between fore coxae. Pronotum (Figure 87) almost unsculptured. Metanotum, Figure 113. Fore tarsi (Figure 144) with a minute terminal claw. Forewing 1st vein with 2 distal and 1 (or 0) median setae. Tergites with posterolateral margins bearing a few irregular microtrichia (Figure 180); tergite II (Figure 179) with 3 lateral marginal setae; tergite VIII (Figure 198) with posteromarginal comb long.

Male with a small, circular glandular area on sternites III and IV.

MATERIAL EXAMINED. 194 females, 74 males (BMNH, NZAC).

GB, TO, HB / NN, SD, BR, WD, MC, FD, SL.

From *Nothofagus menziesii* and *N. solandri*.

Collected in all months except May and June.

REMARKS. *A. nothofagi* appears to feed on young foliage. Pupation probably occurs in the soil, because larvae and adults have

been collected from beneath *Nothofagus* trees. This thrips is widespread in New Zealand, probably occurring throughout the range of *Nothofagus*, from Lake Taupo in the North Island to Invercargill in the South Island. It differs from other *Adelphithrips* species in its long mouth cone, the three lateral marginal setae on tergite II (Figure 179), and the minute pretarsal claw on the fore tarsi (Figure 280).

Genus *Ceratothrips* Reuter

Ceratothrips Reuter, 1899: 65. Type-species *Ceratothrips trybomi* Reuter (a synonym of *Thrips ericae* Haliday), by monotypy.

This genus is used for a small group of Palearctic species which live in the flowers of Compositae and Ericaceae. These species resemble *Frankliniella* species in the following characters: median pair of metanotal setae close to the anterior margin; antennae eight-segmented; and ocellar setae pair I present. They differ in forewing chaetotaxy and in lacking abdominal ctenidia. These species were placed in the genus *Taeniothrips* at one time, and the species on *Erica* are sometimes placed in a separate genus, *Amblythrips*, because the males are wingless. Mound & Palmer (1981a) refer *Ceratothrips* to their *Megalurothrips* genus-group.

The two species introduced into New Zealand share the following characters. Head wider than long; ocellar setae pair I present, pair III on anterolateral margins of ocellar triangle. Antennae 8-segmented; segments III and IV with forked sense cones. Pronotum with 2 pairs of long posteroangular setae and 4 pairs of posteromarginal setae. Metanotum with median setae at anterior margin. Tarsi 2-segmented. Forewing with a long interval in setal row on 1st vein. Sternites without discal setae. Males with sternal glandular areas.

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Ceratothrips ericae (Haliday)

Figures 26, 88, 114, and 253

Thrips ericae Haliday, 1836: 448. Syntype females, BRITAIN (lost?).

COLOUR. Body and antennae brown; tibiae and tarsi paler. Forewings shaded. Major setae dark. Male pale brown, with antennal segments III-VIII dark.

STRUCTURE. Head (Figure 26) relatively small; ocellar setae III long. Pronotum (Figure 88) wider posteriorly than at anterior margin. Metanotum (Figure 114) reticulate. Forewing 1st vein usually with 1 median seta and 2 distal setae. Tergites VII and VIII with several lines of sculpturing between median setae. Tergite VIII without a posteromarginal comb, but with a few discal microtrichia near the spiracles.

Male apterous, without ocelli. Pteronota and tergites with closely spaced, fine, transverse lines of sculpturing, and tergites with 2 pairs of major discal setae. Sternites III-VIII with 1 long and 2 short transverse glandular areas (Figure 253).

MATERIAL EXAMINED. 16 females, 5 males (BMNH, NZAC).

TO

Collected in large numbers from *Erica tetralix* at a site near the western margin of Lake Taupo (TO) in February 1979, and from *Calluna vulgaris* flowers in the Tongariro National Park (TO). Two specimens were taken just south of Turangi (TO), at 750 m and 900 m.

REMARKS. This common European species is here recorded from New Zealand for the first time.

Ceratothrips frici (Uzel)

Figures 27, 89, 115, 181, 199, and 254

Physopus frici Uzel, 1895: 126-127. Syntype females, BOHEMIA (lost?).

COLOUR. Brown. Tarsi and margins of fore tibiae yellow. Antennal segments III-V yellow, with apices variably shaded brown; segment VI brown, with base variably yellow. Forewings uniformly shaded. Major setae dark.

STRUCTURE. Head (Figure 27) broad; ocellar setae III short. Antennae 8-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 89) with transverse lines of sculpturing dorsally. Metanotum (Figure 115) with characteristic, almost concentric, lines of sculpturing near posterior margin. Forewing 1st vein with 1-3 median and 2-4 distal setae. Tergites VII and VIII without sculpturing between median setae (Figure 181); tergite VIII (Figure 199) with posterior margin bearing a comb of broadly based microtrichia laterally, also a few discal microtrichia near spiracle.

Male similar to female, but tergite VIII without a posteromarginal comb, and sternites III-VII each with an oval glandular area (Figure 254).

MATERIAL EXAMINED. 103 females, 52 males (BMNH, NZAC, PLNZ).

ND, AK, BP, TO, WN / NN, MB, KA, BR, CO / Chatham Islands.

Largely from introduced species of Compositae with yellow flowers, but many specimens obtained by sweeping pasture, and others from *Nicotiana*, *Prunus* (peach) trees, and *Erythrina* flowers. One specimen was collected in a blackbird (*Turdus merula*) nest, and another in a New Zealand pipit (*Anthus novaeseelandiae*) nest on one of The Sisters islands (Chatham Islands). Occasionally in native habitats - for example, one female at 1200 m in moss on Wards Pass (MB).

Collected in all months except August and September.

REMARKS. The first known specimen of *C. frici* was collected at Owairaka (AK) from *Escallonia macrantha* in February 1946 by M. W. Carter. It was first recorded in New Zealand by Spiller (1956), as *Taeniothrips brevicornis*, having been described from Australia by Bagnall in 1916 as *Physothrips brevicornis*. It is sometimes abundant in Australia, but has evidently been introduced from Europe, where it is particularly common in the Mediterranean area.

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Genus *Dichromothrips* Priesner

Dichromothrips Priesner, 1932: 10. Type-species *Dichromothrips orchidis* Priesner, by monotypy.

Fourteen species are recognised in this genus (Mound 1976b); all are apparently specific to Orchidaceae in the Old World tropics. The Australian species *Physothrips spiranthidis* Bagnall should also be placed in the genus *Dichromothrips*. Unfortunately this species - *Dichromothrips spiranthidis* (Bagnall) new combination - is known only from two damaged females which at present cannot be distinguished satisfactorily from females of the New Zealand species *D. maori*. The genus has previously been placed in the Aptinothripina, because the type-species has short pronotal posteroangular setae. Mound & Palmer (1981a), however, regard *orchidis* as an aberrant species, and place *Dichromothrips* in their *Mycterothrips* genus-group of the Thripina.

Dichromothrips maori Mound

Figures 28, 72, 138, 200, and 255

Dichromothrips maori Mound, 1976b: 256-258. Holotype female, NEW ZEALAND, Orewa (NZAC) [examined].

COLOUR. Brown. Tarsi and apices of tibiae yellow. Antennal segments III-V with a subbasal pale ring. Forewing clear basally, shaded over distal three-quarters.

STRUCTURE. Head (Figure 28) about as long as wide, with a median longitudinal row of small tubercles in front of fore ocellus; ocellar setae just outside ocellar triangle. Antennae (Figure 72) 8-segmented; segments III and IV elongate at apex, each with a long, forked sense cone. Pronotum with 2 pairs of posteroangular setae, the external ones half as long as the internal. Metathoracic furca with a longitudinal spinula (Figure 138). Tarsi 2-segmented. Forewing 1st vein with setal row variable - 1 or 2 setae medially, and 3-6 distally. Tergite VIII (Figure 200) with a posteromarginal comb of long, fine microtrichia; tergite X without a longitudinal split dorsally.

Male micropterous, bicoloured, with abdominal segments III-VII yellow. Tergites III-VII with a posterior fringe of laterally

directed teeth. Sternites III-VII each with a pair of oval glandular areas (Figure 255).

MATERIAL EXAMINED. 21 females, 6 males, 8 instar II (BMNH, NZAC).

AK / NN.

Adults have been collected in November, January, and February.

REMARKS. The first recorded specimen of *D. maori* was collected at Orewa (AK) on the native orchid *Microtus unifolia* in November 1950 by E. Bray. Orchid-inhabiting species are collected infrequently, so *maori* may be more common and widespread than our records suggest. Specimens have been collected from introduced grasses at two separate localities in Nelson (NN). This suggests that *maori* may be established, or even endemic, on native Orchidaceae.

Dikrothrips new genus

Type-species *Dikrothrips diphyes* new species.

Thripini exhibiting sexual dimorphism and male allometry. Head with 3 pairs of ocellar setae, the postoculars uniseriate; mouth cone pointed; maxillary palps 3-segmented. Antennae 8-segmented; segments III and IV with forked sense cones. Pronotum broad, with 2 pairs of short posteroangular setae and 4 (or 3) pairs of posteromarginals; prosternal ferna entire. Mesonotal median setae far ahead of posterior margin; anepisternum strongly sculptured, bearing several setae; katepimeron with 2 setae; anepimeron with microtrichia-like sculpturing; furca with spinula. Metanotal median setae not at anterior margin; pre-episternum with 1 seta; episternum without setae; epimeron with 1 median seta and 1 posteroangular; spinula sometimes indicated by faint shading. Tarsi 2-segmented; pretarsi of foreleg with a small terminal claw. Forewing 1st vein with a wide interval in setal row; 2nd vein with setal row complete. Tergites with median setae small, not closely placed; posterolateral margins with a very narrow craspedum composed of minute triangular lobes; tergite VIII with marginal comb complete but slightly irregular, and no microtrichia associated with spiracle; tergite X with median split not quite complete. Pleurotergites separated from tergites by a clear suture. Sternite I with 1 or 2 minute anterior setae; sternite II with 3 pairs of minute anterior setae and 2 pairs of major posteromarginal setae; sternites III-VII with 3 pairs of posteromarginal setae arising at margin.

Male macropterous or micropterous. Tergite VIII with a stout, Y-shaped tubercle medially, which in small males is reduced to 2 small tubercles joined by a ridge. Sternite III with a small, oval glandular area.

REMARKS. Females of the type-species bear a strong resemblance to females of *Dichromothrips* from orchid flowers (Mound 1976), both in structural details and in general appearance when alive. Females of these genera can be distinguished only by the presence in *Dikrothrips* of ocellar setae I and the longitudinal split on tergite X, and the marginal position of the median setae on sternite VII. However, the males of *Dikrothrips* are unique among Thysanoptera in the form of tergite VIII, and they differ from males of *Dichromothrips* in having only a single glandular area instead of five pairs, and in lacking a posteromarginal comb on tergite VIII. *Dichromothrips* species are also sexually dimorphic (notably *D. maori* from New Zealand), and in view of this and the many structural similarities of the females, *Dikrothrips* is here interpreted as the sister-genus of *Dichromothrips*. These two genera belong in the *Mycterothrips* genus-group (Mound & Palmer 1981a).

Dikrothrips diphyes new species

Figures *29, *73, *90, *116, 182, *201, and 247

FEMALE MACROPTERA. Colour brown. Tarsi and bases and apices of tibiae yellow. Antennal segments III-V with pedicels yellow. Forewing clear at base and apex, brown medially. Major setae dark.

Head (Figure 29) strongly sculptured; ocellar setae III small, arising between

posterior ocelli. Antennae, Figure 73; segments III and IV each with a short apical neck, a long forked sense cone, and median transverse rings without microtrichia; segment V with few microtrichia. Pronotum (Figure 90) broad, reticulate. Metanotum (Figure 116) reticulate; median setae short. Forewing 1st vein with 4+4+2 setae; 2nd vein with 12 setae; scale with 5 or 6 marginal setae. Tergite I fully sculptured; tergites II-VII sculptured laterally (Figure 182) and in front of median setae and pores, the lateral sculpturing often bearing broad-based microtrichia; tergite VIII (Figure 201) with posteromarginal comb complete but slightly irregular.

Dimensions of holotype female (µm). Body length 1300. Head dorsal length (tilted) 75, width 140; ocellar setae III length 12. Pronotum length 125, width 200; posteromarginal setae length - inner 27, outer 22. Metanotal median setae length 18. Forewing length 650, median width 40. Tergite median setae length - V 12, VIII 27, IX 75, X 75. Antennal segments I-VIII length 24, 33, 45, 48, 39, 57, 12, and 15 respectively.

MALE MACROPTERA. Head and thorax similar in structure and sculpture to female, but smaller and paler. Tergite VIII with a pair of tubercles or a large, Y-shaped median tubercle, depending on body size (Figure 247a-c), the submedian tergal setae arising near tips of 'horns'; tergite IX very large, with a pair of small tubercles mediolaterally each bearing a small seta. Genitalia unusually large.

Dimensions of largest (and smallest) paratype male macroptera. Body length (contracted) 900 (800). Head length 100 (95), width 135 (120). Pronotum length 120 (90), width 200 (160); posteroangular setae length 30 (18). Forewing length 650 (500). Tergite VIII processes inner length 90 (20). Sternite III glandular area width 30 (18). Antennal segments III-VIII length 48, 48, 36, 52, 12, and 15 (44, 40, 33, 48, 12, and 15) respectively.

MALE MICROPTERA (after several years in alcohol). Colour of antennae, thorax, and median parts of tergites pale brown; rest of body yellowish. Forked process on tergite VIII darker than tergite IX. Sculpturing reduced or absent. Head relatively longer than in macropterae; ocelli absent. Antennal segments III and IV with apical neck and sensoria shorter than in macropterae. Mesonotum and metanotum transverse. Forewing remnant narrow. Tergites with median setae relatively longer; forked process on tergite VIII often extending beyond apex of tergite IX (Figure 247d).

Dimensions of paratype male microptera. Body length (contracted) 850. Head length 110, width 135. Pronotum length 120, width 180; posteroangular setae length - inner 35, outer 48. Forewing length 105. Tergite V median setae length 30. Tergite VIII process inner length 110. Sternite III glandular area width 12.

TYPE DATA. Holotype: female. NEW ZEALAND, North Island, AK, Waitakere Range, Kauri Knoll, from dead wood, 22 January 1979, L. A. Mound No. 1347 (NZAC). Paratypes (10 females, 19 males). AK - 1 female, collected with holotype; 1 female, Auckland, Mt Albert, on branches and lichen, 20 Jan 1979, L.A.M. TO - 3 females, 5 male macropterae, 12 male micropterae, Kaimanawa Range, Waipunga Falls, from litter, 14 Sep 1972, G. W. Ramsay. RI - 5 females, 1 male macroptera, 1 male microptera, Pohangina Valley, Totara Reserve, from litter, 4 Jan 1975, J. C. Watt. (BMNH, NZAC).

MATERIAL EXAMINED. Type series only.

AK, TO, RI.

REMARKS. *D. diphyes* was twice collected live by L.A.M., who noted in the field a resemblance to *Dichromothrips*, the orchid thrips. On the second occasion the only plant in flower in the immediate vicinity happened to be a white-flowered aerial orchid, although no thrips were obtained from this plant. Most of the type series was taken from leaf litter by extraction with a Berlese funnel. One paratype female is teneral, which suggests that the species pupates at soil level.

D. diphyes is particularly remarkable for the allometry shown by males (Figure 247). This type of growth pattern is less common in Thripidae than in Phlaeothripidae, where it is often associated with gall-inhabiting or fungus-feeding species.

Genus *Frankliniella* Karny

Frankliniella Karny, 1910: 46. Type-species *Thrips intonsa* Trybom, by subsequent designation of Hood, 1914.

This genus includes about 150 species, mostly from the Neotropics, though a few, including the type-species, are apparently native to Europe and the Oriental region. The only species recorded in New Zealand, *occidentalis*, is widespread and abundant in western North America. However, the tropical 'tramp' species *schultzei* Trybom, which is common in Australia, may yet be found in the North Island. It can be recognised by the lack of a posteromarginal comb on tergite VIII. The genus can be distinguished by the presence of three pairs of ocellar setae, complete rows of setae on both the first and the second veins of the forewing, and paired ctenidia laterally on the abdominal tergites. On tergite VIII these ctenidia are anterolateral to the spiracle, in contrast to their position in the genus *Thrips*.

Frankliniella occidentalis (Pergande)

western flower thrips (U.S.A.)
Figures 30, 91, 117, 183, 202, and 259

Euthrips occidentalis Pergande, 1895: 392. Syntype females, U.S.A., California (USNM) [examined].

COLOUR. Usually bicoloured - abdomen brown, head mainly yellow, and thorax intermediate orange-brown. Legs yellow with brown markings. Antennal segment I yellow, II dark, III mainly yellow, IV and V brown with base yellow, and VI-VIII brown. Forewings pale. Major setae brown.

STRUCTURE. Head (Figure 30) slightly wider than long; ocellar setae pair I just in front of first ocellus; pair III long, just inside anterior margins of ocellar triangle; 1 pair of postocular setae long. Antennae 8-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 91) with 4 pairs of elongate setae, also 5 pairs of posteromarginal setae of which the submedian pair is longer than the rest. Metanotum (Figure 117) with elongate median setae arising at anterior margin. Tarsi 2-segmented. Forewing with 2 complete rows of setae. Tergites IV-VIII with paired ctenidia laterally (Figure 183); tergite VIII (Figure 202) with the ctenidia anterolateral to the spiracles, and posterior margin with a complete comb of fine microtrichia, each arising from a broad, triangular base.

Male similar to female, but without a comb on tergite VIII, and with a transverse glandular area on sternites III-VII (Figure 259).

MATERIAL EXAMINED. 58 females, 6 males (BMNH, NZAC, PLNZ).

AK, BP, TO, WN / NN, MC, MK, CO.

Particularly common in flowers of *Lupinus*, but also in other flowers including *Melilotus*, *Chrysanthemum maximum*, and *Prunus* (nectarine).

Collected in September, January-March, and May.

REMARKS. This is the first published record of *F. occidentalis* in New Zealand, although the species has evidently been established here for many years, the oldest available specimen being a female collected from carnations at Christchurch in 1934 by G. A. Helson.

In America, the species is recorded from the western half of the continent between British Columbia and Colombia. It is particularly abundant in California, where it is variable in colour and size and has been described under a number of different names (Bryan & Smith 1956). These authors record it from 139 different plants. Bailey (1957) records it as a pest on various crops, including peaches, plums, nectarines, grapes, and nursery stock.

Structurally *occidentalis* is very similar to the common Palearctic species *intonsa*. However, the latter has short postocular setae (see figure in Mound et al. 1976), no metanotal pores, and a paler third antennal segment.

Lomatothrips new genus

Type-species *Lomatothrips paryphis* new species.

Pale, macropterous or micropterous Thripini. Head broad, with 3 pairs of ocellar setae; mouth cone extending between fore coxae; maxillary palps 3-segmented. Antennae 7-segmented; segments III and IV with forked sense cones; segments III-VI with microtrichia on lines of sculpturing. Pronotum with 2 pairs of major posteroangular setae, the external ones shorter than the internal; prosternal ferna undivided. Mesonotal median setae arising less than their own length from posterior margin; anepisternum bearing several pairs of setae; katepimera with 2 setae; anepimeron with microtrichia-like sculpturing; spinula weak. Metanotal median setae not at anterior margin; preepisternum with 1 seta; episternum without setae; epimera with 1 median seta and 1 posteroangular; spinula not developed. Legs with 2-segmented tarsi. Forewing 1st vein with 3 widely spaced setae in distal half. Tergites faintly but completely sculptured; tergites II-VII with a broad posteromarginal craspedum; tergites V-VII with seta B_2 longer than B_1; tergites VI-VIII with B_3 short; tergite VIII with posteromarginal comb of long microtrichia interrupted medially by a small craspedum, and with paired ctenidia anterolateral to spiracles (none on preceding tergites); tergite X with dorsal split incomplete. Pleurotergites clearly differentiated. with a broad craspedum but no discal setae. Sternites without discal setae; sternite II with 3 pairs of minute anterior setae and 2 pairs of posteromarginal setae; sternites II-VI with a narrow, lobed craspedum between posteromarginal setae; sternites III-VII with 3 pairs of posteromarginal setae, B_1 and B_2 on VII arising submarginally.

REMARKS. The well developed pleurotergites suggest that the type-species is an advanced member of the subtribe Thripina (Mound et al. 1980). The paired ctenidia on tergite VIII, the seven-segmented antennae, and the interrupted setal row on the forewing first vein are also apotypic character states. The relative lengths of the setae on tergites V-VIII and the position of the ctenidia anterolateral to the spiracle on VIII are similar to the condition seen in *Frankliniella*-group species rather than *Thrips*-group species (Mound & Palmer 1981a). However, in *Frankliniella* the median metanotal setae are always at the anterior margin, and both forewing veins bear a complete row of setae. The presence of tergal, pleurotergal, and sternal craspeda and the reduction of the mesosternal spinula suggest that this new species lives on Gramineae or some similarly shaped linear plant. From this it appears that *Lomatothrips* has evolved from the precursor of the *Frankliniella*-group in New Zealand, through adaptation to monocotyledonous leaves rather than dicotyledonous flowers.

Lomatothrips paryphis new species

Figures *31, *74, *92, *118, *160, 184, *203, and 227

FEMALE MACROPTERA. Colour mainly yellow. Antennal segments II-VII brown, though segment II and pedicels of segments III-V paler than distal segments. Forewings pale grey. Major setae dark.

Head (Figure 31) with ocellar setae I small, weak; ocellar setae III arising between posterior ocelli; postocular setae uniseriate. Antennae, Figure 74; segment VI with an elongate sense cone. Pronotum (Figure 92) weakly sculptured; setae relatively stout; posterior margin with 4 pairs of setae. Mesonotum and metanotum (Figure 118) with lines of sculpturing apparently raised into weak flanges. Forewing, Figure 160; 1st vein with 4+3+1+1+1 setae; 2nd vein with 6 or 7 setae, these widely spaced distally. Tergal median setae small (Figure 184); tergite VIII (Figure 203) with posteromarginal comb unique in structure. Pleurotergites with a broad craspedum but no discal setae (Figure 227).

Dimensions of holotype female (µm). Body length 1050. Head length 70, width 126; ocellar setae III length 12. Pronotum length 110, width 160; posteroangular setae length - inner 35, outer 24. Metanotal median setae length 18. Forewing length 500, median width 30. Tergite median setae length - V 9, VIII 15, IX 60, X 65. Antennal segment I-VII length 23, 30, 36, 36, 33, 45, and 20 respectively.

FEMALE MICROPTERA. Essentially similar to macroptera in colour and structure. Pterothorax scarcely reduced; forewing rudiment with about 6 costal and 6 veinal setae, and 6 setae on scale.

Dimensions of paratype female (µm). Body length 1000. Head length 75, width 130. Pronotum length 120, width 165; posteroangular setae length - inner 36, outer 21. Median metanotal setae length 21. Forewing rudiment length 110. Tergite median setae length - V 9, VIII 18, IX 70, X 45.

TYPE DATA. Holotype: female macroptera, NEW ZEALAND, South Island, SD, Tennyson Inlet, beaten from *Carpodetus serratus*, 28 January 1979, L. A. Mound No. 1366 (NZAC). Paratypes (21 females). HB - 11 micropterae, Kaweka Range, Makohu Spur, in litter, 26 Feb 1971, A. C. Eyles. RI - 3 macropterae, Pohangina Valley, Totara Reserve, in litter, 4 Jan 1975, J. C. Watt. BR - 1 macroptera, west Inangahua, Coll Creek, in moss, 19 Sep 1972, J. S. Dugdale. CO - 6 micropterae, Rock and Pillar Range, 1000 m, in litter, 12 Nov 1969. (BMNH, NZAC).

MATERIAL EXAMINED. Type series only.

RI, HB / SD, BR, CO.

REMARKS. The structure of the posteromarginal comb on tergite VIII of *L. paryphis* (Figure 203) is apparently unique within the Thysanoptera. Judging from the presence of craspeda and the weak mesosternal spinula, this species probably lives on grasses, or on liliaceous plants of similar linear structure.

Genus *Megalurothrips* Bagnall

Megalurothrips Bagnall, 1915: 589. Type-species *Megalurothrips typicus* Bagnall, by monotypy.

This genus comprises eight species from the Old World tropics, throughout which region one or other is often found to be the dominant thrips in legume flowers. All are large and dark, with elongate antennae, and lack ocellar setae pair I. The genus is closely related to *Odontothrips* from the Palearctic (Pitkin 1972a) and *Odontothripiella* from Australia (Pitkin 1972b), both of which include species specific to legume flowers.

Megalurothrips kellyanus (Bagnall)

Figures 32, 75, 93, 119, 204, and 256

Physothrips kellyanus Bagnall, 1916: 219-220. Lectotype female, AUSTRALIA (BMNH) [examined].

COLOUR. Dark brown. Tarsi and margins of fore tibiae yellowish. Antennae brown, with apical neck of segments III and IV whitish yellow. Forewing brown, paler in basal fifth. Setae dark.

STRUCTURE. Head (Figure 32) slightly wider than long, with 3 pairs of ocellar setae; pair I very small, in front of 1st ocellus; pair III exceptionally long, on anterior margins of ocellar triangle. Antennae (Figure 75) 8-segmented; segments III and IV elongate apically, each with a forked sense cone. Pronotum (Figure 93) with 2 pairs of long posteroangular setae and 5 pairs of posteromarginal setae, of which the submedian pair is longest. Metanotum (Figure 119) weakly reticulate medially; median setae long, arising at anterior margin. Tarsi 2-segmented. Forewing with 2 distal setae on 1st vein but none medially. Tergites III-VII with lines of sculpturing not extending to submedian pores; tergite VIII (Figure 204) with 2 or more rows of microtrichia anterolateral to spiracle, and the posteromarginal comb reduced to a few small microtrichia laterally.

Male similar to female, but sternites II-VII with up to 40 small glandular areas (Figure 256).

MATERIAL EXAMINED. 81 females, 32 males (BMNH, LCNZ, NZAC).

ND, AK, GB.

Mostly from citrus leaves, flowers, and fruit in the Auckland (AK) and Gisborne (GB) areas, 1951-1953. Also from flowers of Compositae, *Lycopersicon*, *Brassica* (swede), *Acmena*, and *Camellia*, and from *Sparmannia africana* leaves.

Collected between November and May.

REMARKS. The first recorded specimen of *M. kellyanus* was collected at Auckland (AK) from *Citrus* flowers in May 1950 by K. P. Lamb. Spiller (1956) gives the first published records from *Citrus* cultivars including grapefruit.

This Australian flower-living species was described in genus *Physothrips*, but was subsequently referred to *Taeniothrips* (Mound 1968b) and then to *Megalurothrips* (Bhatti 1969). The true host plant remains undetermined.

Genus *Microcephalothrips* Bagnall

Microcephalothrips Bagnall, 1926: 113. Type-species *Thrips abdominalis* Crawford, by monotypy.

This genus includes only *abdominalis*, which differs from *Thrips* species solely in having a posteromarginal craspedum composed of large, triangular teeth on the abdominal tergites (Figure 185). Contrary to Gentile & Bailey (1968), we do not consider *Thrips sylvanus* Stannard from Illinois to be closely related to *abdominalis*.

Microcephalothrips abdominalis (Crawford)

composite thrips
Figures 33, 76, 94, 120, 185, and 236

Thrips abdominalis Crawford, 1910: 157. Syntype females, MEXICO (CNIC) [not examined].

COLOUR. Brown; tarsi and antennal segment III paler. Immature specimens have the median abdominal segments pale. Forewings shaded.

STRUCTURE. Head (Figure 33) unusually small, about as wide as long; no setae in front of 1st ocellus; ocellar setae III anterolateral to ocellar triangle. Antennae (Figure 76) short, 7-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 94) wider posteriorly than at anterior margin, with 2 pairs of major posteroangular setae and 5 pairs of posteromarginal setae. Metanotum (Figure 120) with characteristic sculpturing. Tarsi 2-segmented. Forewings slender, curving forward at apex; 1st vein with 3 setae in distal half; 2nd vein with about 6 widely spaced setae. Tergites with a posteromarginal craspedum composed of large, triangular teeth; tergites V-VIII with paired lateral ctenidia (Figure 185) which on VIII pass posteromesad of spiracle. Sternites with an irregular transverse row of discal setae (Figure 236).

Male macropterous or micropterous, smaller and paler than female. Sternites III-VII with a small, round glandular area.

MATERIAL EXAMINED. 10 females, 1 male (BMNH, NZAC).

AK, CL.

From flowers of Compositae, except 1 specimen from Little Barrier Island (CL) swept from rushes in a field.

Collected in January and February.

REMARKS. *M. abdominalis* is common in the flowers of Compositae in many parts of the tropics and subtropics.

Genus *Pseudanaphothrips* Karny

Pseudanaphothrips Karny, 1921: 216. Type-species *Pseudothrips achaetus* Bagnall, by monotypy.

This genus was erected for an Australian species in which the pronotum bears about six pairs of equally small setae around the posterior margin and posterior angles. Because of these short setae the genus has been referred to the Aptinothripina. Subsequently a further genus, *Homochaetothrips* Sakimura, was erected for a group of Australian species essentially similar to *achaetus* but with two pairs of dominant pronotal posteroangular setae, the inner pair longer than the outer. Because of these longer setae the genus was referred to the Thripina. Because of variation in the length of the pronotal setae apparent in more recent specimens, these genera have been regarded as synonymous by Mound & Palmer (1981a). *Pseudanaphothrips* has been suggested as the phylogenetic sister-group of the world-wide flower-living *Frankliniella* genus-group, in the Thripina, a relationship based particularly on the presence and position of tergal ctenidia.

The two species found in New Zealand are very different in appearance, being at opposite extremes of the range of variation in *Pseudanaphothrips*. However, they share the following characters. Head wider than long; ocellar setae pair I present; pair III between posterior ocellae. Antennae 8-segmented; segments III and IV each with a forked sense cone. Metanotal median setae at anterior margin. Tarsi 2-segmented. Forewing with first and second veins bearing complete rows of setae. Sternites without discal setae. Male with glandular areas on sternites III-VII.

Pseudanaphothrips achaetus (Bagnall)

hairless flower thrips
Figures 34, 95, 121, 186, 205, and 257

Pseudothrips achaetus Bagnall, 1916: 398-399. Syntype female, AUSTRALIA (BMNH) [examined].

COLOUR. Pale brown. Antennal segment III yellowish. Tarsi and apices of tibiae yellow. Forewings shaded. Major setae dark.

STRUCTURE. Head (Figure 34) wider than long. Antennae 8-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 95) transverse, with no long setae. Metanotum, Figure 121. Forewing 1st and 2nd veins each with a complete row of setae. Tergites VI-VIII with 2 or more rows of irregular microtrichia laterally on oblique lines of sculpturing (Figure 186); tergite VIII (Figure 205) with posteromarginal comb usually represented by a few broadly triangular teeth laterally and a small group of long, fine teeth medially.

Male similar to female, but smaller. Sternites III-VII each with a slender, transverse glandular area (Figure 257).

MATERIAL EXAMINED. 110 females, 33 males (BMNH, NZAC).

AK, CL, BP, TO / NN, MB, BR, KA, MC, CO.

Collected mostly by sweeping pasture, including *Trifolium repens*, *Dactylis glomerata*, *Medicago sativa*, and *Echium* flowers. Also collected up to 1400 m in the alpine zone from grasses and native species including mat plants, *Notothlaspi rosulatum*, *Hebe odora* flowers, and *Gentiana corymbifera*; and from *Salicornia* on tidal mud flats. On Otata Island (AK) four females and one male were collected in a moss sample.

Collected between September and March.

REMARKS. The first recorded specimen of *P. achaetus* was collected from red clover at the Cawthron Institute, Nelson (NN), in March 1941 by R. D. Dick. This small, flower-living species appears to be polyphagous, but its definitive host plants are not known. It is widespread in Australia.

Pseudanaphothrips annettae Mound & Palmer

Figures *35, *96, *122, 187, 206, 248, and 258

Pseudanaphothrips annettae Mound & Palmer, 1981a: 166. Holotype female, NEW ZEALAND, 60 km south-west of Nelson (NZAC) [examined].

COLOUR. Dark brown. Tarsi and apices of tibiae yellow; antennal segment III pale. Forewing shaded, particularly submedially and along veins. Major setae dark.

STRUCTURE. Head (Figure 35) relatively long. Pronotum (Figure 96) with only 2 pairs of posteromarginal setae; inner posteroangular setae 1.2x as long as the outer pair. Metanotum, Figure 122. Forewings rather short; setal rows irregular distally, with 12 setae on 1st vein and 7 on 2nd vein. Tergites IV-VIII with no sculpturing medially, their ctenidia almost regular (Figure 187); tergite VIII (Figure 206) with no posteromarginal comb.

Male similar to female, but tergite IX median setae thorn-like (Figure 248), and sternites III-VII each with a broadly oval glandular area (Figure 258).

MATERIAL EXAMINED. 25 females, 7 males (BMNH, NZAC).

BR, MB, CO.

REMARKS. *P. annettae* is apparently widespread in the mountains of the South Island at an altitude of about 1000 m. The host plant is unknown, but Mound & Palmer (1981a) suggest that the relatively long head may reflect a habitat in grasses or some similarly linear plant.

Genus *Thrips* Linnaeus

Thrips Linnaeus, 1758: 457. Type-species *Thrips physapus* Linnaeus, by subsequent designation of Curtis, 1839.

Twelve species which are now assigned to this genus have been collected in the New Zealand region. Eight of these are evidently introduced, four probably from Europe, two from the tropics, and two from Australia. The other four species are endemic. This endemic fauna may have been richer when the native flora was undisturbed, but the flower-feeding niche is now dominated by the polyphagous endemic species *Thrips obscuratus* Crawford. *Thrips* is one of the largest genera of flower-feeding Thysanoptera, and in the Palearctic region a considerable number of species are host-specific or have a restricted range of host plants. Less is known about the biology of tropical species, but two of the New Zealand species appear to be host-specific, on *Phormium* and *Coprosma*.

The type-species has the following characteristics: antennae 7-segmented; forewing with few setae on distal half of 1st vein; sternites with discal setae, but pleurotergites with only posteromarginal setae. Until recently the number of antennal segments - whether seven or eight- was accepted as an important generic character within the Thripini. However, *obscuratus* can have the antennae seven- or eight-segmented, even on one individual, and this is also true of several other species. The genus *Thrips* is therefore now used for species with both forms of antennae (Mound et al. 1976, Bhatti 1980). The presence or absence of sternal and pleurotergal discal setae has never been regarded as of generic significance within *Thrips*-group. However, species in which the forewing bears an uninterrupted row of setae on the first vein have been segregated to a subgenus, *Isothrips* Priesner (Sakimura 1967). Unfortunately both the type-species of this subgenus (*orientalis* Bagnall) and *obscuratus* have one or more setae sometimes missing from this setal row. Moreover, in *phormiicola* Mound from New Zealand - which is related to *obscuratus* - the setal row, although complete, is widely set. Even *Thrips minutissimus* Linnaeus, which lives in *Quercus* flowers in Europe, is structurally similar. As a result, *Isothrips* is apparently a polyphyletic assemblage, and both *Isothrips* and *Isoneurothrips* are now treated as synonyms of *Thrips* (Bhatti 1980, Mound & Palmer 1981a).

The members of this world-wide genus share the following characteristics. Head with only 2 pairs of ocellar setae (pair I absent). Antennae 7-segmented or 8-segmented; segments III and IV with forked sense cones. Pronotum with 2 pairs of major posteroangular setae. Tarsi 2-segmented. Tergites V-VIII with paired ctenidia laterally (reduced in micropterae), those on VIII posteromesad of the spiracles. Abdominal sternites and pleurotergites with or without discal setae.

Thrips austellus Mound

Figures 36, 123, and *228

Thrips austellus Mound, 1978: 618. Holotype female, NEW ZEALAND, Auckland (NZAC) [examined].

COLOUR. Body yellowish. Antennal segment II dark brown, III paler, IV-VII brown. Forewing weakly shaded. Setae dark brown.

STRUCTURE. Head (Figure 36) wider than long; lines of sculpturing on vertex with raised, transparent flanges. Antennae 7-segmented; segment VII relatively small. Pronotum with 3 pairs of posteromarginal setae; posteroangular setae short, stout. Metanotum (Figure 123) striate laterally, irregularly reticulate medially with raised flanges. Forewing with setal rows complete on 1st and 2nd veins. Tergites with lateral sculpturing similar to that on median area of metanotum, and with a posteromarginal fringe of microtrichia laterally; tergite VIII with a short comb (5 µm). Pleurotergites with 4 or 5 discal setae (Figure 228). Sternites with about 10 discal setae; sternite II with 3 pairs of posteromarginal setae.

MATERIAL EXAMINED. 6 females, 10 instar II (BMNH, NZAC).

AK, TO

REMARKS. *T. austellus* was based on a unique holotype collected from under a rotten *Acacia* stump in March 1977. J. S. Dugdale subsequently collected a series of females together with larvae from flowers of *Clematis quadribracteolata* at Pureora (TO)

in October 1979. This species shares with *phormiicola*, *obscuratus*, and *coprosmae* the following characters: forewing with a complete row of setae on first and second veins; sternites and pleurotergites with discal setae; sternite II with three (instead of two) posteromarginal setae. On the basis of these characters, this is a species-group unique to New Zealand.

Thrips australis (Bagnall)

gum tree thrips
Figures 37, 77, 124, 207, and 229

Isoneurothrips australis Bagnall, 1915: 592-593. Lectotype female, AUSTRALIA (BMNH) [examined].

COLOUR. Variable mixtures of yellow and brown; usually, head yellow with a dark occipital ridge, pronotum yellowish brown, and median area of tergites plus last 3 abdominal segments brown. Antennal segment I and proximal half of III yellow. Forewing shaded along veins. Major setae brown.

STRUCTURE. Head (Figure 37) slightly wider than long; ocellar setae I absent, III posterolateral to 1st ocellus. Antennae (Figure 77) 7-segmented; segments III and IV each with a short, forked sense cone; segment VI with margins straight but sharply converging in apical third; segment VII small. Pronotum with 2 pairs of short major posteroangular setae, and usually 4 pairs of posteromarginal setae. Metanotum (Figure 124) reticulate; median setae not at anterior margin. Tarsi 2-segmented. Forewings with an almost complete row of setae on 1st and 2nd veins. Tergites V-VIII with paired ctenidia laterally, those on VIII posteromesad of spiracle; tergite VIII (Figure 207) with posterior margin bearing a comb of a few microtrichia laterally; tergite X with longitudinal split incomplete. Pleurotergites and sternites with 2 irregular rows of discal setae (Figure 229).

Male similar to female, but sternites III-VII each with a glandular area.

MATERIAL EXAMINED. 45 females, 5 males (BMNH, FRNZ, LCNZ, NZAC).

ND, AK, BP, TO, HB / NN, MB, SI.

From *Eucalyptus* leaves in Rotorua (BP) and from a wide range of other plants including *Malus* (apple), *Escallonia*, *Nicotiana*, *Ulex europaeus*, *Lupinus*, native leaf litter, moss, *Ganoderma*, *Leptospermum ericoides*, *L. scoparium*, *Metrosideros excelsa* flowers, and *Physalis peruviana* leaves.

Collected in all months.

REMARKS. The first recorded specimen of *T. australis* was collected at Hastings (HB) from apple trees in October 1932 by Adamson. The first published record (Spiller 1951) is from *Sonchus oleraceus*, on which it was found together with *T. tabaci*. Although widespread, *australis* has been collected infrequently.

In Australia this species feeds mainly in *Eucalyptus* flowers (Laughlin 1970); however, it probably also breeds in the flowers of other Myrtaceae. It has been introduced widely throughout the warmer parts of the world wherever *Eucalyptus* trees have been planted.

This species differs from its congeners in the shape of antennal segment VI, the margins of which are straight and then sharply angled in their apical third, not evenly curved, although its other structural characteristics are all found in one or more species of the genus. Although *australis* has been segregated to a monobasic genus, *Isoneurothrips* Bagnall, this is treated as a synonym of *Thrips* by both Bhatti (1980) and Mound & Palmer (1981a).

Thrips coprosmae Mound

Figures *38, *125, 145, and *161

Thrips coprosmae Mound, 1978: 618, 620. Holotype female, NEW ZEALAND, Punakaiki (NZAC) [examined].

COLOUR. Variably bicoloured, with brown abdomen but pale head and thorax, or brownish yellow with posterior segments darker. Several females examined have the body uniformly dark brown. Antennae brown; segment I and pedicel of III yellow. Legs pale. Forewing weakly and uniformly shaded. Major setae brown.

STRUCTURE. Head (Figure 38) with cheeks rounded; vertex with a few lines of sculpturing; setae relatively long. Antennae 7-segmented. Pronotum unsculptured, with 3 pairs of posteromarginal setae. Metanotum (Figure 125) weakly reticulate. Pretarsus of foreleg with a small terminal claw (Figure 145). Forewing (Figure 161) with setal rows complete on 1st and 2nd veins, but setae usually separated by more than their length. Tergite VIII with a sparse, irregular comb similar to that in *obscuratus*. Pleurotergites with 2 or 3 discal setae. Sternites with 5-7 discal setae; sternite II with 3 pairs of posteromarginal setae.

Male similar to female in sculpturing and chaetotaxy, but tergite IX similar to that of *obscuratus*, and sternites V-VII each with a small (5 µm), circular glandular area.

MATERIAL EXAMINED. 96 females, 3 males, 12 instar II (BMNH, NZAC).

AK, CL, BP, TO, WN / NN, SD, MB, BR, OL, CO, FD.

REMARKS. *T. coprosmae* is very similar to *obscuratus* in chaetotaxy, but the forewing and metanotum are different, and the pretarsal claw on the forelegs is found in few other species (e.g., *Thrips calcaratus* Uzel in Europe, *Dikrothrips diphyes* in New Zealand). The colour variation is confusing, just as it is in *obscuratus*, but there is no reason to suspect that more than one species is represented by the material studied. The sculpturing of the mesonotum and metanotum is similar to that of *austellus* in being weakly raised into minute flanges. This species appears to be specific to *Coprosma robusta*, and probably feeds on the young terminal leaves.

Thrips hawaiiensis (Morgan)

Figures 39, 126, and 188

Euthrips hawaiiensis Morgan, 1913: 3. Syntype females, HAWAII (USNM) [examined].

COLOUR. Brown, sometimes with head and prothorax yellow and pterothorax orange. Tibiae, tarsi, and antennal segment III yellow. Forewing brown except in basal fifth. Major setae dark.

STRUCTURE. Head (Figure 39) slightly wider than long; ocellar setae III almost lateral to 1st ocellus. Antennae 7-segmented or 8-segmented. Pronotum with numerous transverse lines of sculpturing; posterior margin with 3 pairs of setae. Metanotum (Figure 126) with setae at anterior margin. Forewing with 3 widely spaced setae on distal half of 1st vein. Tergite II (Figure 188) with 4 lateral setae; tergite VIII posteromarginal comb weak, irregular. Pleurotergites without discal setae. Sternites with a transverse row of up to 20 discal setae.

MATERIAL EXAMINED. 1 female, Levin (WN), Plant Health Diagnostic Station, from flowers of *Plumeria* in quarantine ex Australia (PLNZ); 1 female, Campbell Island, December 1961 (IHNS).

REMARKS. *T. hawaiiensis* was recorded from Campbell Island by Stannard (1964) on the basis of the single female listed above. The species is unlikely to survive in New Zealand, and particularly not in the subantarctic islands, but is widespread and abundant in tropical regions from India to Queensland (Bhatti 1980). In Australia it is a pest of bananas (under the name *Thrips florum* Schmutz). The antennae are variably seven- or eight-segmented, with the result that this species has frequently been referred to *Taeniothrips* (Wise 1977).

Thrips imaginis Bagnall

plague thrips
Figures 40, 127, 208, and 237

Thrips imaginis Bagnall, 1926: 111. Syntype females, AUSTRALIA (lost?)

COLOUR. Variable; abdomen brown with head and thorax paler, or body nearly uniformly pale brownish yellow with only tergal antecostal ridges dark. Antennal segments II-VII brown, but III pale in proximal half. Legs pale. Forewings weakly shaded. Major setae dark.

STRUCTURE. Head (Figure 40) slightly wider than long; ocellar setae III on anterolateral margins of ocellar triangle.

Antennae 7-segmented; segment III more slender in large specimens than in small ones. Pronotum with fine, transverse lines of sculpturing; posterior margin with 4 pairs of minor setae. Metanotum (Figure 127) with median setae not at anterior margin. Forewing usually with 3 distal setae on 1st vein. Tergite VIII (Figure 208) with posterior margin concave medially but bearing a few microtrichia laterally. Pleurotergites with 1 or 2 discal setae. Sternites with about 20 discal setae (Figure 237).

MATERIAL EXAMINED. 2 females, 1 male (BMNH).

SD, NN.

REMARKS. In Australia *T. imaginis* is a pest of apple flowers, and is one of the most abundant insects found in eastern Australia. Inevitably individuals must be blown by the wind to New Zealand, but despite its polyphagy the species is apparently unable to build up large populations in this country.

Thrips nigropilosus Uzel

chrysanthemum thrips
Figures 41, 128, and 189

Thrips nigropilosa Uzel, 1895: 198-199. Syntypes (both sexes), BOHEMIA [1 female (BMNH) examined].

COLOUR. Variable; usually yellow with pale brown markings. Antennae brown. Forewing pale. Major setae brown, particularly in pale micropterae.

STRUCTURE. Head (Figure 41) wider than long; ocellar setae III rather stout, arising just anterolateral to ocellar triangle. Antennae 7-segmented. Pronotum with 3 pairs of posteromarginal setae; anterior and lateral margins also each with 1 pair of setae submarginally which are stouter than remaining discal setae. Metanotum (Figure 128) reticulate to elongate reticulate. Forewing variable in length; macropterae with 3 setae on distal half of 1st vein. Tergites with median 2 pairs of setae frequently stout, and with 3 or 4 lines of sculpturing between median setae (Figure 189); tergite VIII posteromarginal comb variable, but with at least a few microtrichia medially. Pleurotergites with dentate microtrichia on lines of sculpturing. Sternites without discal setae.

MATERIAL EXAMINED. 5 females (BMNH, NZAC)

NN, BR, MC, CO, SL.

REMARKS. The first recorded specimen of *T. nigropilosus* was collected at Gore (SL) on 2 May 1968 by J. C. Watt from a peat sample comprising *Schoenus*, *Holcus lanatus*, *Agrostis tenuis*, and moss dug from between *Chionochloa* tussocks. It has since been found in a pitfall trap in tussock, and twice in *Nothofagus* forest (a moss sample and Malaise trap). It may be more common than our records suggest.

This species is widespread in the Northern Hemisphere temperate region, and is usually found on Compositae. In the Kenya highlands of East Africa it has been recorded as a pest of cultivated *Pyrethrum*. Males are usually rare, but have been recorded from both Europe and North America.

T. nigropilosus is unusual in that the wing length is almost continously variable in some populations, from macropterous to micropterous. Three of the specimens from New Zealand are micropterous and two are macropterous.

Thrips obscuratus (Crawford)

New Zealand flower thrips

Figures 1-5, 42, 78, 97, 129, 139, 162, 190, 209, 223, 230, 231, 238, 260, and 264

Isoneurothrips obscuratus Crawford, 1941: 63. Holotype female, NEW ZEALAND, Auckland (USNM) [examined].

COLOUR. Variable; body usually pale to dark brown, but sometimes yellowish. Tarsi, apices of tibiae, and pedicel of antennal segment III often yellow, but antennal segment III varies from dark brown to yellowish brown, rarely yellow in proximal half. Forewing pale basally, shaded in distal four-fifths. Major setae dark.

STRUCTURE. MACROPTERAE. Habitus, Figure 1. Head (Figure 42) wider than long; ocellar setae III on anterior margins of ocellar triangle. Antennae (Figure 78) 7-segmented or 8-segmented; segments III and IV each with a forked sense cone. Pronotum (Figure 97) with 3 pairs of posteromarginal setae. Metanotum (Figure 129) with sculpturing longitudinally striate medially, transversely striate at anterior; median setae close to anterior margin. Metasternum, Figure 139. Forewing (Figure 162a) with setal row on 1st and 2nd veins usually complete. Tergites II-V with lines of sculpturing not continuous medially (Figure 190); tergite VIII (Figure 209) with posteromarginal comb variably complete or irregular; tergite IX (Figure 223) with 2 pairs of dorsal pores. Pleurotergites and sternites with a transverse row of discal setae (Figures 230 and 231); sternite VI (Figure 238) with 6-14 discal setae. Ovipositor, Figure 264.

Male similar to female in structure, but yellow with antennal segments III-VII brown. Sternites III-VII with a transversely oval median glandular area (Figure 260).

MICROPTERAE. Female similar in colour to macroptera, but wing scale and apex of wing lobe shaded; wing lobe usually shorter than pterothoracic width (Figure 162b); metanotal sculpturing less regular than in macroptera.

Male yellow, with antennae and apex of abdomen brown, or as brown as female, with sternal glandular areas about 4x as wide as long.

IMMATURE STAGES, Figures 2-5.

MATERIAL EXAMINED. 1890 females, 480 males (AMNZ, BMNH, NMNZ, NZAC, PANZ, PLNZ).

All coded areas except WA and NC / Three Kings Islands, Chatham Islands.

REMARKS. Crawford (1941), in describing *T. obscuratus*, mentioned that it was reported to be doing considerable damage to the flowers of grapes in a restricted area of the Auckland district. Spiller (1951, 1956) listed many plant associations, and noted *obscuratus* as being very common from Kerikeri (ND) to Roxborough (CO), but Cumber (1959), in his North Island pasture survey, reported that it was of no importance in pasture. During their North Island fodder crop survey, Cumber & Eyles (1961) found this species in small numbers on chou moellier, maize, and turnips. May (1973) associated the distortion of young growth of *Passiflora edulis* with this species, having found all stages on shoots and leaves. Macfarlane & Pottinger (1976) mention *obscuratus* in their report on insects affecting lucerne. Export consignments of *Prunus* (peaches), *Fragaria*, and *Actinidia chinensis* sometimes require fumigation to remove adults.

Although *obscuratus* has been collected in New Zealand more often than any other thrips, the range of plants used for breeding is not clear. Two species of *Phormium* have definitely been established as host plants in Auckland (AK) gardens; in November, immature stages (Figures 2-5) were found feeding deep inside the bracts around the unopened flower buds. Eggs were also found, embedded in the bud stalks. Damage was heavy, and it was unlikely that the blackened buds would have developed. Adults were very dark, and there was an equal ratio of males to females. Infested flower heads were caged, and 4 days later prepupae were collected from the damp cellulose substrate, indicating that pupation occurs on the ground. Larvae have also been found on *Prunus* (sour cherry; cv. Montmorency) in October at Alexandra (CO). The tree had just finished flowering, and eggs were again found embedded in the flower stalks. Larvae were feeding at the base of the flower stalk clusters, and feeding damage to the bud scales was obvious.

T. obscuratus is, however, evidently polyphagous - adults are found throughout the year in flowers and on leaves of introduced and native plants, as well as in samples from litter, birds' nests, and moss. It is particularly common in lowland areas, but also occurs in the alpine zone. Both sexes are usually macropterous, but Mound (1978) has described a few micropterae collected from litter samples up to 1500 m in the alpine zone. Micropterae of both sexes have been collected in large numbers from *Bulbinella hookeri* leaves at 1500 m near Nelson. This species can sometimes be found in flowers in very large numbers. For example, over 3000 adults were beaten from the white flowers of a compact alpine *Hebe* measuring 30 x 50 cm at Lake Sylvester (NN).

T. obscuratus is endemic to New Zealand, and is closely related to *austellus*, *coprosmae*, and *phormiicola*, which in contrast are probably host-specific. The reduction in area of the native New Zealand flora has probably reduced the total populations of all such species. However, *obscuratus* has accepted many introduced plants as hosts, with the result that it now shows a remarkable dominance in the flower-living niche throughout New Zealand.

The ecological and physiological plasticity of *obscuratus* is probably correlated with its remarkable structural variability. Large individuals are sometimes more than twice the body length of small ones in the same population. The form of antennal segment III is evidently correlated with body size (Figure 78a,b), and large individuals tend to have more sternal discal setae and (in males) wider sternal glandular areas than small ones. Rare and probably aberrant specimens have only three or four sternal discal setae (Figure 238, cf. a and b). The pronotum usually bears some transverse lines of sculpturing on the anterior half, but some populations have the pronotum unsculptured. Furthermore, the colour of antennal segment III, details of the metanotal sculpturing, and the form of the microtrichia on the posterior margin of tergite VIII are not constant. However, since no correlations have been found between them, these different character states are interpreted as expressions of a single variable species.

Thrips phormiicola Mound

Figures 43, 98, 130, 163, 191, 192, 210, and 261

Thrips phormiicola Mound, 1978: 620, 622. Holotype female, NEW ZEALAND, Foxton (NZAC) [examined].

COLOUR. Variable; brown, with thorax, femora, and middle and hind tibiae pale brown or yellowish. Head and thorax sometimes yellow, in contrast to brown abdomen. Fore tibiae and tarsi, antennal segment III, and sometimes base of antennal segment IV yellow. Forewing rudiment pale when very short, shaded apically in hemimacropterae; fully developed wing pale at base but brown in distal three-quarters (sometimes paler medially). Major setae brown.

STRUCTURE. Micropterae. Head (Figure 43) slightly longer than wide, projecting in front of eyes; ocelli reduced; 1st ocellus often divided; postocular setae not arising in a straight line. Antennae 7-segmented (rarely 8-segmented). Pronotum (Figure 98) with 2 or 3 pairs of posteromarginal setae; surface faintly sculptured. Metanotum (Figure 130) irregularly reticulate medially. Forewing rudiment (Figure 163) oval; 1st vein with 3 setae. Tergites with 4-6 lines of sculpturing medially, and with setae relatively long (Figure 191 and 192); ctenidia not developed on tergite V, weak on VI, present on VII and VIII; tergite VIII (Figure 210) with posteromarginal comb irregular, variable. Pleurotergites with 2 or 3 discal setae. Sternites with 5-7 discal setae.

Male sternites III-VII each with a transverse glandular area (Figure 261).

Macropterae (females only). Similar to micropterae, but veinal setae arranged as in *coprosmae*, median tergal setae short, and tergites V-VIII with ctenidia.

MATERIAL EXAMINED. 11 female macropterae, 120 female micropterae, 52 males, 10 instar II (BMNH, NZAC).

AK, TO, WI, WN / NN, MB, WD.

From *Phormium tenax* and *P. cookianum*.

Adults have been collected in January, February, May, June, and September.

REMARKS. *T. phormiicola* was first collected in June 1949 at Foxton (WN). It appears to be a widespread native species on both *Phormium tenax* and *P. cookianum*. Adults and larvae can be collected in large numbers by pulling back the bases of the inner leaves of the host plant. Cumber (1954) found two species of thrips on *Phormium*, one "seldom numerous", the other swarming over plants and reaching their peak in November and December in the flower heads. From our observations and Cumber's voucher specimens it is clear that the less common species was *phormiicola* and the abundant one was *obscuratus*. Macropterae of *phormiicola* have been collected only from *P. cookianum*, but contrary to Mound (1978) there seems no good reason for

regarding the bicoloured specimens on this plant as a species distinct from the brown form on *P. tenax*. This thrips is variable in colour, wing length, and the length of the median tergal setae. One male studied has an additional glandular area on sternite II. The micropterae have reduced ocelli and relatively long tergal B_1 setae, unlike micropterae of *obscuratus*.

Thrips physapus Linnaeus

Figures 44, 131, 193, 211, and 232

Thrips physapus Linnaeus, 1758: 457. Syntype females(?), EUROPE (lost?).

COLOUR. Brown; tarsi paler. Antennal segment III yellow; segments IV-VI yellow but shaded apically. Forewing weakly shaded. Setae brown.

STRUCTURE. Head (Figure 44) slightly wider than long; cheeks rounded; ocellar setae outside ocellar triangle. Antennae 7-segmented. Pronotum with a few weak lines of sculpturing; posterior margin with 3 pairs of setae. Metanotum (Figure 131) with elongate reticulation medially. Forewing with 3 widely spaced setae on distal half of 1st vein. Tergites with median area unsculptured; tergite II (Figure 193) with 3 lateral setae; tergite VIII (Figure 211) with posteromarginal comb short, regular. Pleurotergites without discal setae (Figure 232). Sternites with 10-15 discal setae.

MATERIAL EXAMINED. 3 females, 3 males (BMNH, NZAC).

MC.

REMARKS. A solitary female collected from white clover at Lincoln (MC) in December 1974 is attributable either to *physapus* or to one of its close relatives from the Holarctic region (Pitkin 1976). These species are usually associated with yellow-flowered Compositae, and can be distinguished from each other only with great difficulty (Mound et al. 1976). Further specimens have subsequently been swept from *Lupinus angustifolius*, also at Lincoln. *T. physapus* is the type-species of genus *Thrips*. It bears sternal discal setae, but unlike *vulgatissimus* and the *obscuratus-group* it lacks discal setae on the pleurotergites.

Thrips simplex (Morison)

gladiolus thrips
Figures 45, 132, 164, and 212

Physothrips simplex Morison, 1930: 12. Holotype female, AUSTRALIA (BMNH) [examined].

COLOUR. Brown. Tarsi, apices of tibiae, and antennal segment III yellow. Forewing brown, but pale in basal quarter. Major setae brown.

STRUCTURE. Head (Figure 45) wider than long; ocellar setae III just within anterior margins of ocellar triangle. Antennae 8-segmented. Pronotum with 3 pairs of posteromarginal setae. Metanotum (Figure 132) reticulate medially, the reticles with internal markings; median setae arising well behind anterior margin. Forewing (Figure 164) with 5-7 setae on distal half of 1st vein. Tergite VIII (Figure 212) with a complete posteromarginal comb of short, fine microtrichia. Sternites with an irregular row of discal setae.

Male similar to female, but sternites III-VII each with a large glandular area, and with discal setae arising laterally.

MATERIAL EXAMINED. 43 females, 7 males, 1 instar II (AMNZ, BMNH, FRNZ, NZAC, PLNZ).

AK, CL, BP, GB, WI, WN / MC.

From *Gladiolus*, *Montbretia*, *Hypericum*, *Brassica*, *Rosa*, *Allium sativum*, *Lilium*, and *Crocosmia* × *crocosmiiflora*.

Adults have been collected from December to April.

REMARKS. The first recorded specimen of *T. simplex* was collected at Owairaka (AK) from *Tagetes erecta* in April 1939 by D. Spiller, who later (1951, 1956) published reports on its occurrence. Harrison (1976) reports that *Gladiolus* is regularly and severely attacked by *simplex*, especially in the warmer North Island districts.

This species is usually referred to genus *Taeniothrips*. However, that genus is now interpreted in a more restricted sense (Mound et al. 1976, Bhatti 1980), and all those species which have ctenidia passing posteromesad of the spiracles on tergite VIII are now referred to the *Thrips* complex. *T. simplex* probably originated in southern Africa, but is now found almost wherever the host plant, *Gladiolus*, is grown.

Thrips tabaci Lindeman

onion thrips
Figures 46, 79, 99, 133, 165, 213, 224, and 233

Thrips tabaci Lindeman, 1888: 61-75.
Syntypes (both sexes), RUSSIA (lost?).

COLOUR. Variable; from yellow to brown in different combinations, usually palest when developing under high temperatures. Antennal segments III-V bicoloured. Ocellar pigment grey. Wings pale. Major setae dark.

STRUCTURE. Macropterous. Head (Figure 46) wider than long; ocellar setae III on anterior margins of ocellar triangle. Antennae (Figure 79) 7-segmented. Pronotum (Figure 99) with 3 pairs of posteromarginal setae. Metanotum (Figure 133) with slender, elongate reticles medially; median setae not at anterior margin. Forewing (Figure 165) with 4 (rarely 5 or 6) setae on distal half of 1st vein. Tergite VIII (Figure 213) with posteromarginal comb long, fine; tergite IX (Figure 224) with only 1 pair of dorsal pores (anterior pair absent). Pleurotergal lines of sculpturing with numerous fine, ciliate microtrichia (Figure 233). Sternites without discal setae.

MATERIAL EXAMINED. 411 females, 10 larvae (AMNZ, BMNH, LCNZ, NZAC, PANZ, PLNZ).

Three Kings Islands / ND, AK, WO, BP, GB, TO, HB, WI, WN / NN, SD, MB, KA, BR, NC, MC, MK, CO, SL, SI / Chatham Islands, Macquarie Island.

From a wide variety of vegetables and introduced garden plants and flowers, as well as under glass. Also in native habitats in the alpine zone: from *Notothlaspi rosulatum* flowers (1), alpine swards (1), and mat plants (1), all on the summit of Mt Domett (1615 m) (NN); and from moss, litter, and mat plants on the Black Birch Range (MB).

Adult females were collected in all months except June and July.

REMARKS. The first known specimen of *T. tabaci* was collected at Wellington (WN) from fennel in February 1926 by E. Shaw. The first published record is from potato foliage (Cottier 1931). Numerous plant associations are listed by Spiller (1951, 1956), and there are records from cocksfoot (Doull 1956a), pastures (Cumber 1959), fodder crops (Cumber & Eyles 1961), and lucerne (Macfarlane & Pottinger 1976, Somerfield & Burnett 1976). As its common name suggests, onion is a preferred host plant for *tabaci* - Harrison & Jacks (1953) report this species as causing extensive damage to onion crops, especially in the Franklin district. Recently *tabaci* has been found causing twisting and deformity in 15-cm-high *Pinus radiata* seedlings at Rangiora (MC).

Males of this highly polyphagous species are extremely rare (Mound 1977b), and in fact none have been found in New Zealand. Chapman (1976) gives an account of the life history of *tabaci* in New Zealand, noting that it is a vector of tomato spotted wilt virus. Lewis (1973) and Mound (1977b) also give some account of its biology. In warm, dry parts of the world, and also under glass, *tabaci* can be a serious pest. Although now of world-wide occurrence, it probably originated in the eastern Mediterranean region.

Thrips vulgatissimus Haliday

Figures 47, 100, 134, 166, and 214

Thrips vulgatissimus Haliday, 1836: 447.
Syntypes (both sexes), BRITAIN (lost?).

COLOUR. Dark brown. Tarsi and antennal segment III yellowish. Forewings pale or very weakly shaded. Major setae dark.

STRUCTURE. Head (Figure 47) about as wide as long, with rounded cheeks; ocellar setae III on anterior margin of ocellar triangle; median postocular setae almost as long as ocellars. Antennae 8-segmented. Pronotum (Figure 100) with 3 pairs of posteromarginal setae, the median pair longest. Metanotum (Figure 134) almost striate medially; median setae not arising at anterior margin. Forewing (Figure 166) with 3 setae on distal half of 1st vein. Tergite VIII (Figure 214) with posteromarginal comb long, fine, sometimes irregular. Pleurotergites and sternites with discal setae.

Male (not recorded from New Zealand) smaller than female. Sternites III-VII each with an oval glandular area.

MATERIAL EXAMINED. 9 females: from *Cydonia* at Hastings (HB) in 1932; from *Rhododendron* at Hastings in 1933; from *Dianthus* at Christchurch (MC) in February 1935; and from *Cyphomandra* leaves at Auckland in December 1980 (BMNH, NZAC).

AK, HB / MC.

REMARKS. In Europe *T. vulgatissimus* is found in a wide range of (particularly white) flowers. It has previously been referred to *Taeniothrips*, but is now placed in *Thrips* because of its abdominal ctenidia (Mound et al. 1976). The sternites and pleurotergites are similar to those of *obscuratus* in having numerous discal setae, but the first vein of the forewing has a long interval in the row of setae.

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APPENDIX 1. Plant names mentioned in text.

Main sources: Allan (1940, 1961); Bailey (1949); Moore & Edgar (1970); and Healy & Edgar (1980).

Scientific name	Family	Common name
Acacia	Leguminosae	wattle
Acmena	Myrtaceae	acmena
Actinidia chinensis	Actinidiaceae	kiwifruit
Agrostis tenuis	Gramineae	browntop
Allium sativum	Amaryllidaceae	garlic
Alopecurus pratensis	Gramineae	meadow foxtail
Althaea rosea	Malvaceae	hollyhock
Anemone	Runnunculaceae	anemone
Aristotelia serrata	Elaeocarpaceae	wineberry
Begonia	Begoniaceae	begonia
Brassica	Cruciferae	e.g., cabbage
Bulbinella hookeri	Liliaceae	Maori onion
Calluna vulgaris	Ericaceae	heather
Camellia	Theaceae	camellia
Carpodetus serratus	Escalloniaceae	putaputaweta
Cassinia vauvilliersii	Compositae	
Chionochloa	Gramineae	snow tussock
Chrysanthemum maximum	Compositae	
Citrus	Rutaceae	grapefruit, poorman orange
Citrus limon	Rutaceae	lemon

Clematis quadribracteolata	Ranunculaceae	clematis
Coprosma colensoi	Rubiaceae	
Coprosma robusta	Rubiaceae	karamu
Coprosma rotundifolia	Rubiaceae	
Coriaria	Coriariaceae	tutu
Crocosmia x crocosmiiflora	Iridaceae	montbretia
Cucurbita pepo	Cucurbitaceae	pumpkin
Cydonia	Rosaceae	quince
Cyphomandra	Solanaceae	tamarillo
Dactylis glomerata	Gramineae	cocksfoot
Dahlia	Compositae	dahlia
Daucus carota	Umbelliferae	wild carrot
Deschampsia	Gramineae	
Dianthus	Caryophyllaceae	carnation
Dracaena	Agavaceae	dracena
Echium	Boraginaceae	
Erica tetralix	Ericaceae	heath
Erythrina	Leguminosae	coral tree
Escallonia macrantha	Saxifragaceae	
Eucalyptus	Myrtaceae	gum tree
Festuca	Gramineae	fescue
Fragaria	Rosaceae	strawberry
Fuchsia excorticata	Onagraceae	fuschia
Galium	Rubiaceae	cleavers
Ganoderma	Ganodermataceae	bracket fungus
Geniostoma	Loganiaceae	hangehange
Gentiana corymbifera	Gentianaceae	gentian
Gladiolus	Iridaceae	gladiolus
Griselinia	Cornaceae	broadleaf
Hebe odora	Scrophulariaceae	koromiko
Hebe stricta	Scrophulariaceae	koromiko
Hedycarya	Monimiaceae	pigeonwood
Holcus lanatus	Gramineae	Yorkshire fog
Hypericum	Hypericaceae	
Leptospermum ericoides	Myrtaceae	kanuka
Leptospermum scoparium	Myrtaceae	manuka
Lilium	Liliaceae	lily
Lupinus angustifolius	Leguminosae	lupin
Lycopersicon	Solanaceae	tomato
Macropiper	Piperaceae	kawakawa
Malus	Rosaceae	apple
Medicago sativa	Leguminosae	lucerne
Melicytus	Violaceae	mahoe
Melilotus	Leguminosae	melilot
Metrosideros excelsa	Myrtaceae	pohutukawa
Microtus unifolia	Orchidaceae	
Muehlenbeckia	Polygonaceae	
Nicotiana tabacum	Solanaceae	tobacco
Nothofagus menziesii	Fagaceae	silver beech
Nothofagus solandri	Fagaceae	beech
Notothlaspi rosulatum	Cruciferae	penwiper
Olearia	Compositae	
Passiflora edulis	Passifloraceae	passionfruit
Pelargonium	Geraniaceae	geranium
Phormium cookianum	Agavaceae	mountain flax
Phormium tenax	Agavaceae	N.Z. flax
Physalis peruviana	Solanaceae	cape gooseberry
Pinus nigra	Pinaceae	Corsican pine
Pinus radiata	Pinaceae	radiata pine

Plumeria	Apocynaceae	frangipani
Poa annua	Gramineae	
Podocarpus	Podocarpaceae	
Prunus	Rosaceae	peach, nectarine
Pseudopanax arboreus	Araliaceae	five-finger
Pseudotsuga menziesii	Pinaceae	Douglas fir
Pyrethrum	Compositae	pyrethrum daisy
Ripogonum scandens	Smilacaceae	supplejack
Rhododendron	Ericaceae	rhododendron
Rosa	Rosaceae	rose
Rubus australis	Rosaceae	bush lawyer
Rubus cissoides	Rosaceae	bush lawyer
Rumex	Polygonaceae	dock, sorrel
Salicornia	Chenopodiaceae	glasswort
Sambucus	Caprifoliaceae	elder
Schoenus	Cyperaceae	sedge
Scleranthus	Caryophyllaceae	
Senecio stewartiae	Compositae	
Solanum aviculare	Solanaceae	poroporo
Solanum nigrum	Solanaceae	black nightshade
Solanum tuberosum	Solanaceae	potato
Sonchus oleraceus	Compositae	sow thistle
Sparmannia africana	Tiliaceae	
Tagetes erecta	Compositae	marigold
Thea	Theaceae	tea
Trifolium repens	Leguminosae	white clover
Ulex europaeus	Leguminosae	gorse
Viburnum	Caprifoliaceae	viburnum
Weinmannia racemosa	Cunoniaceae	kamahi
Weinmannia silvicola	Cunoniaceae	towai
Zantedeschia aethiopica	Araceae	arum lily
Zea mays	Gramineae	maize

Alternative usage

Compositae = Asteraceae
Cruciferae = Brassicaceae
Gramineae = Poaceae
Leguminosae = Fabiaceae, Mimosaceae
Umbelliferae = Apiaceae

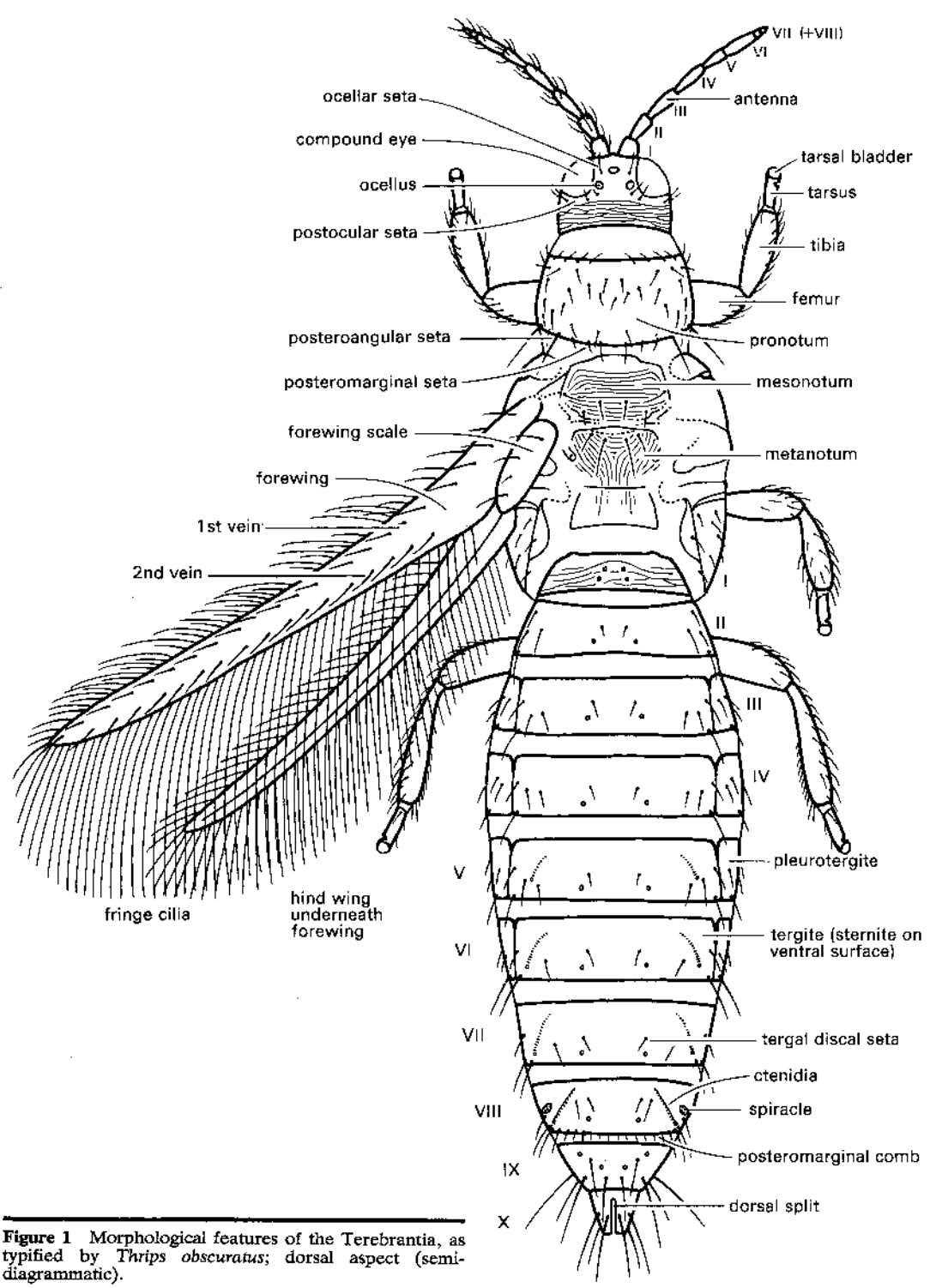
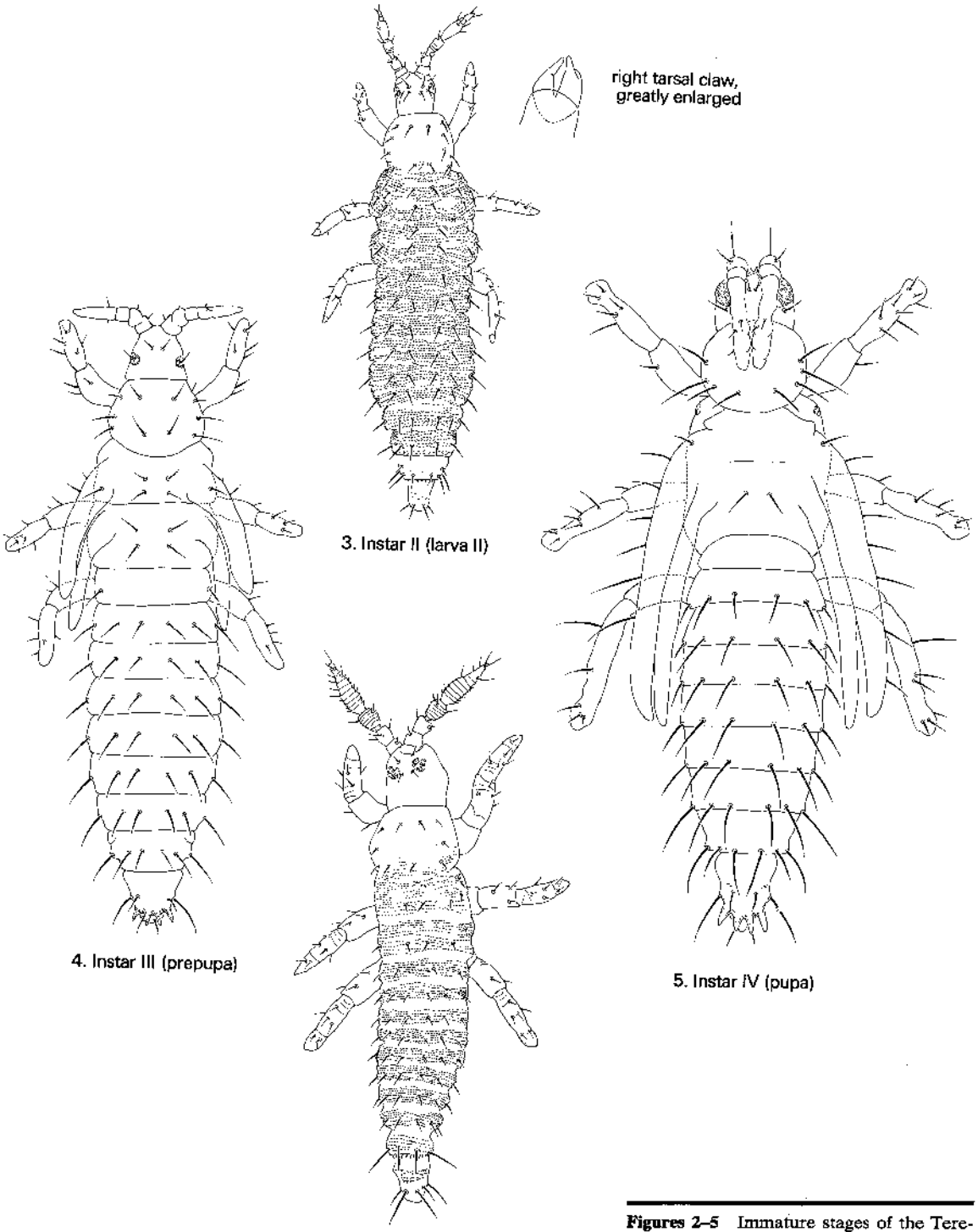
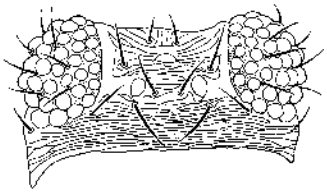


Figure 1 Morphological features of the Terebrantia, as typified by *Thrips obscuratus*; dorsal aspect (semi-diagrammatic).

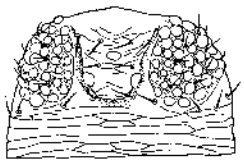


Figures 2–5 Immature stages of the Terebrantia, as typified by *Thrips obscuratus*. Instar I magnified × 2 relative to others.

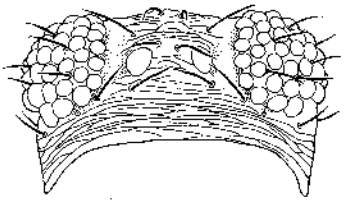
6. *Aeolothrips fasciatus*



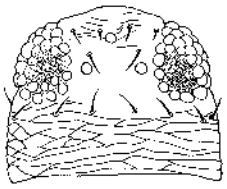
10. *Scirtothrips inermis*



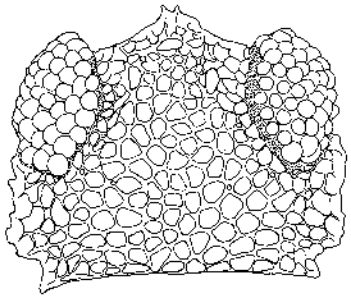
14. *Anaphothrips dubius*



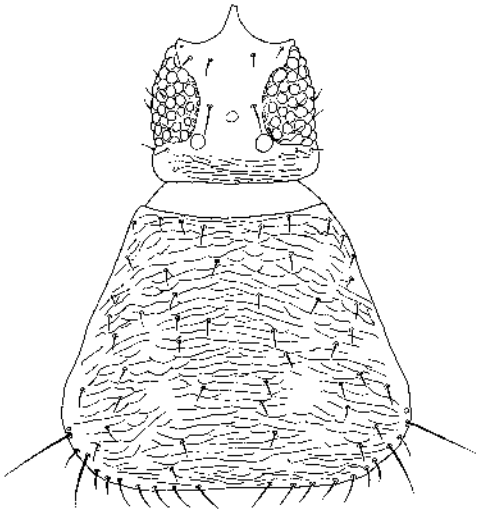
11. *Scirtothrips pan*



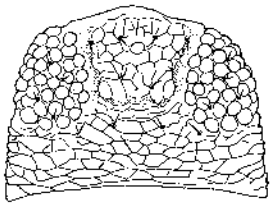
15. *Anaphothrips obscurus*



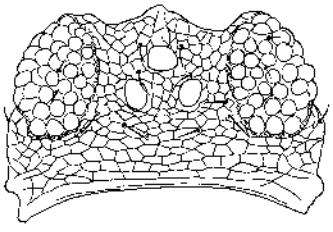
7. *Heliothrips haemorrhoidalis*



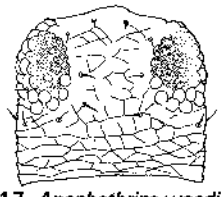
12. *Chirothrips manicatus*
(head and pronotum)



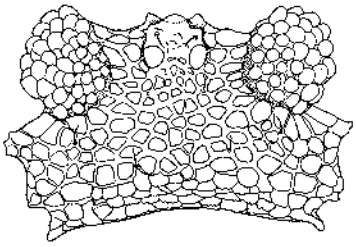
16. *Anaphothrips varii*



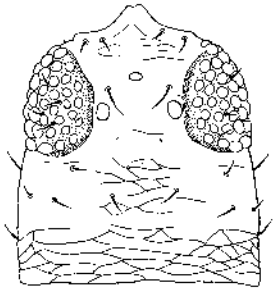
8. *Hercinothrips bicinctus*



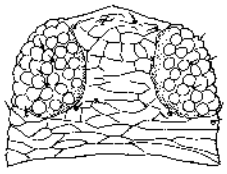
17. *Anaphothrips woodi*



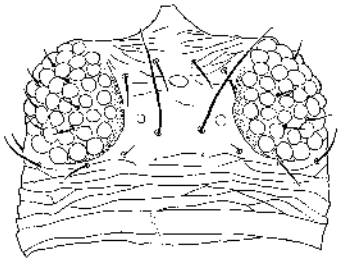
9. *Sigmothrips aotearoana*



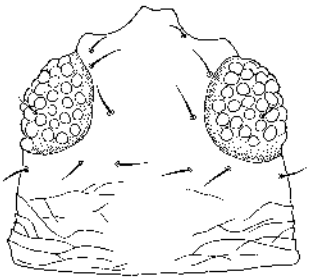
13. *Limothrips cerealium*



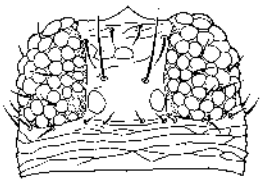
18. *Anaphothrips zelandicus*



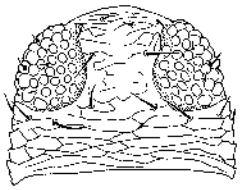
19. *Anaphrygmothrips otagensis*



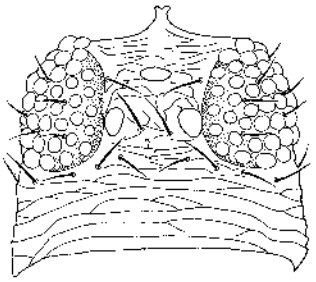
23. *Physemothrips chrysodermus*



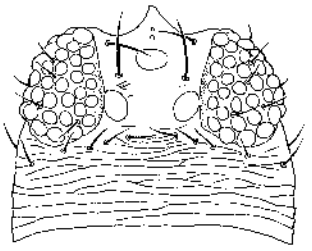
27. *Ceratothrips frici*



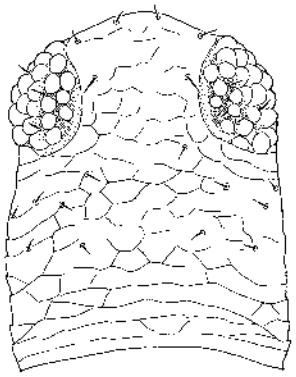
20. *Apterothrips secticornis*



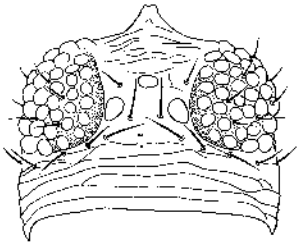
24. *Adelphithrips dolus*



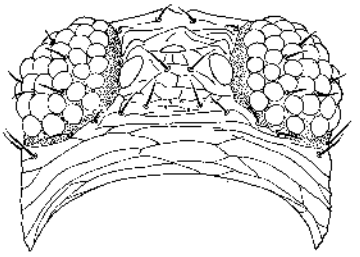
28. *Dichromothrips maori*



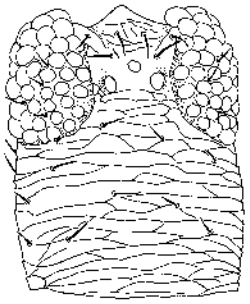
21. *Aptinothrips rufus*



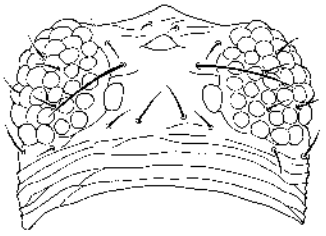
25. *Adelphithrips nothofagi*



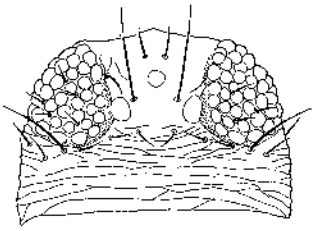
29. *Dikrothrips diphyes*



22. *Karphothrips dugdalei*

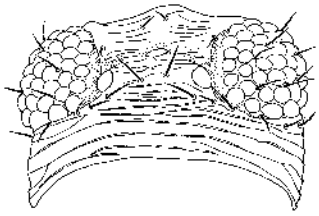


26. *Ceratothrips ericae*

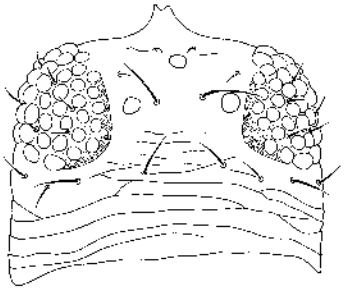


30. *Frankliniella occidentalis*

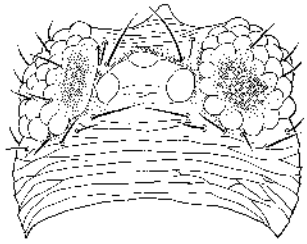
Figures 6–30 Heads.



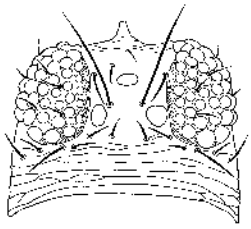
31. *Lomatothrips paryphis*



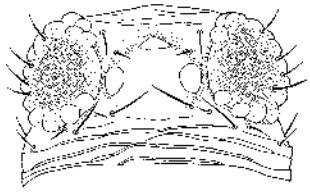
35. *Pseudanaphothrips annettae*



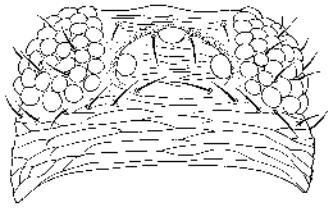
39. *Thrips hawaiiensis*



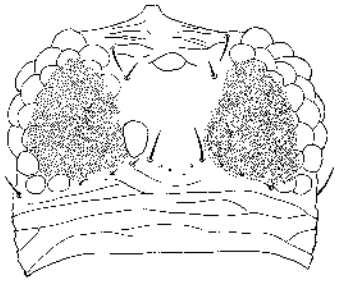
32. *Megalurothrips kellyanus*



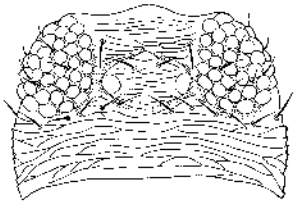
36. *Thrips austellus*



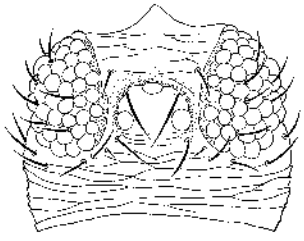
40. *Thrips imaginis*



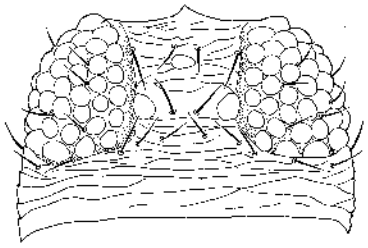
33. *Microcephalothrips abdominalis*



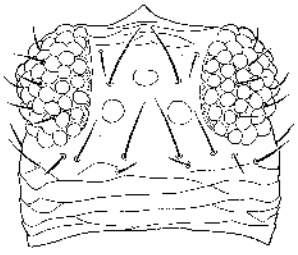
37. *Thrips australis*



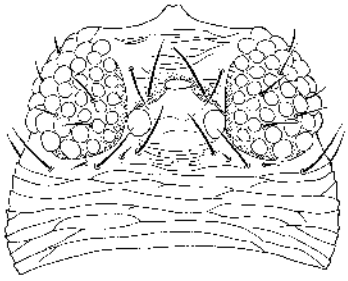
41. *Thrips nigropilosus*



34. *Pseudanaphothrips achaetus*

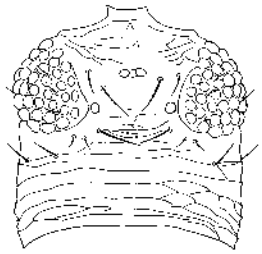


38. *Thrips coprosmae*

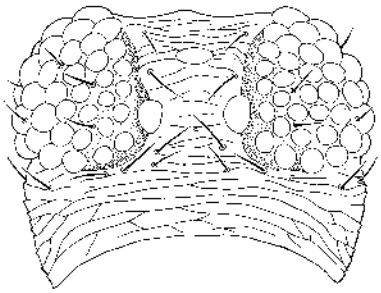


42. *Thrips obscuratus*

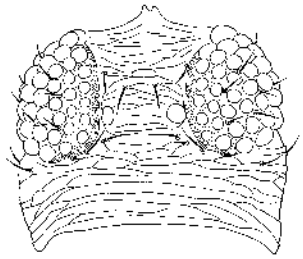
Figures 31–47 Heads.



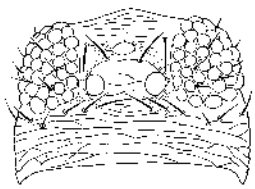
43. *Thrips phormiicola*



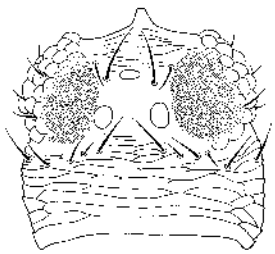
44. *Thrips physapus*



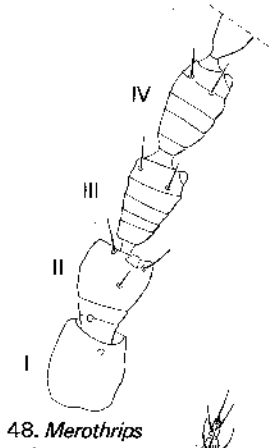
45. *Thrips simplex*



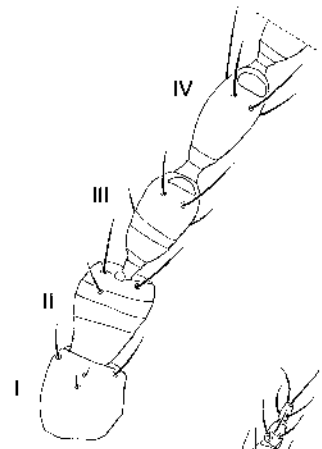
46. *Thrips tabaci*



47. *Thrips vulgatissimus*



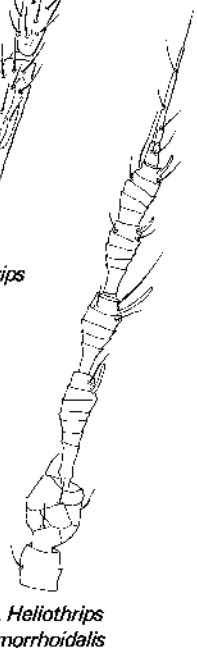
48. *Merothrips brunneus*



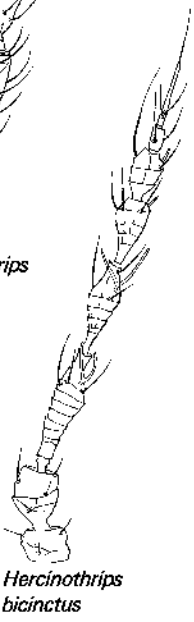
49. *Merothrips floridensis*

50. *Aeolothrips fasciatus*

51. *Desmidothrips walkerae*

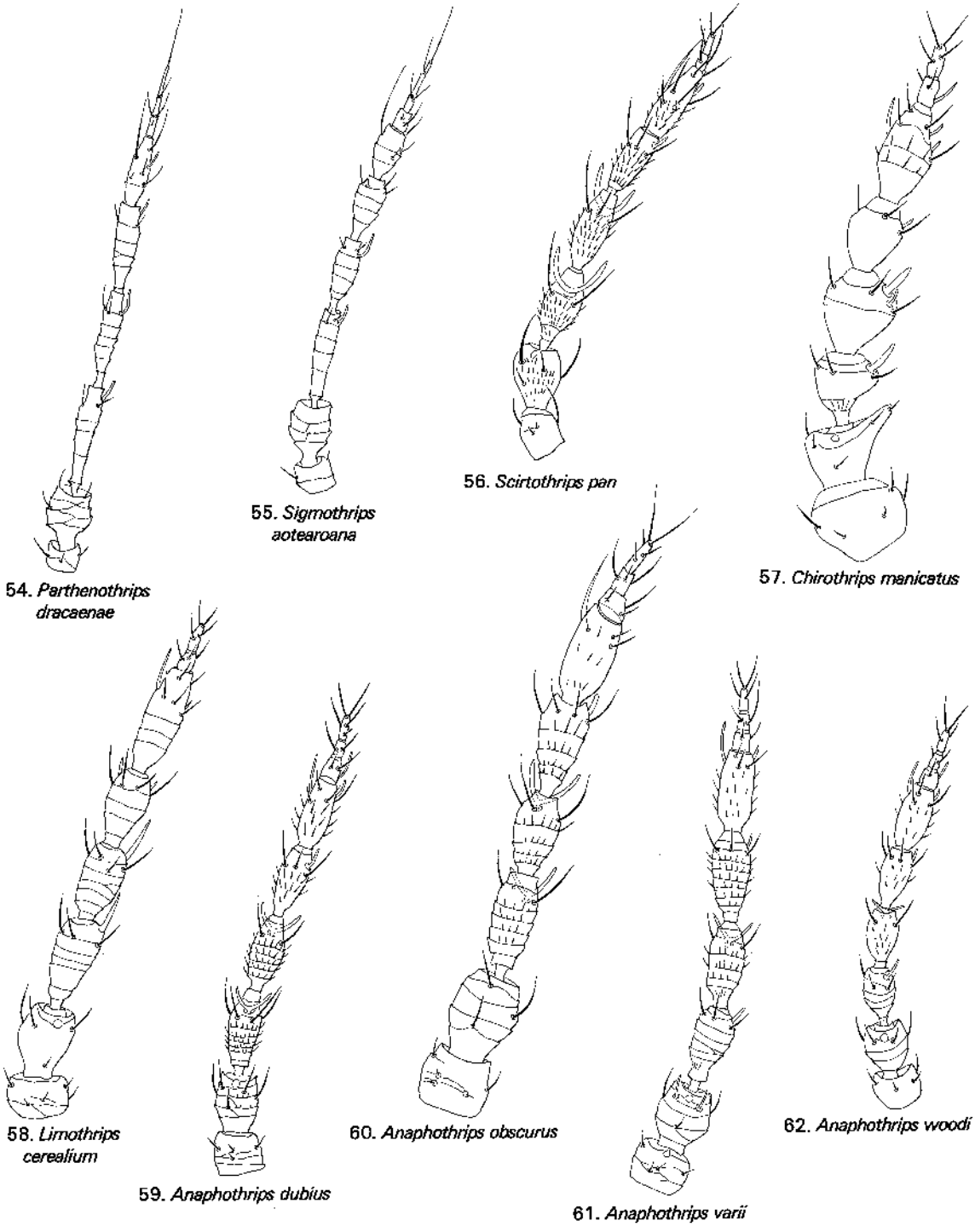


52. *Heliothrips haemorrhoidalis*

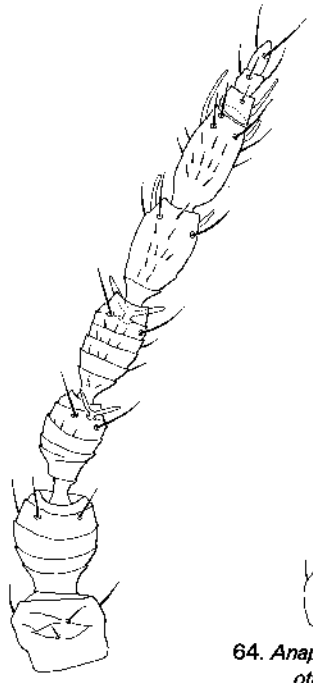


53. *Hercinothrips bicinctus*

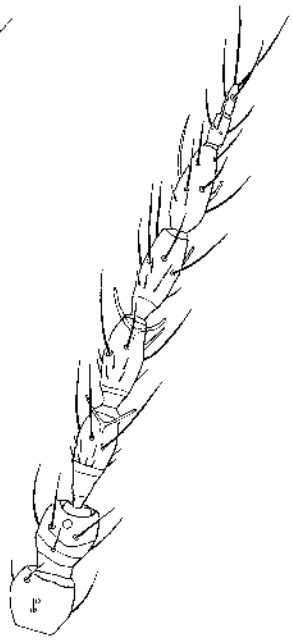
Figures 48–53 Right antennae, dorsal aspect.



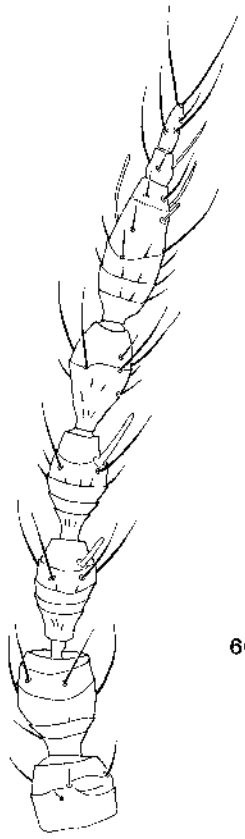
Figures 54–71 Right antennae, dorsal aspect (68, left antenna).



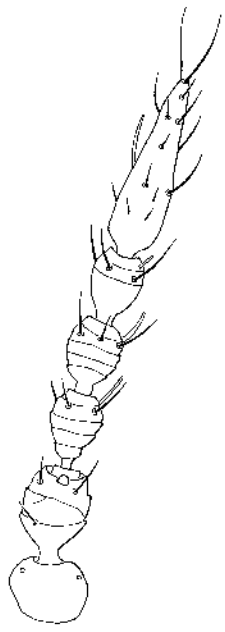
63. *Anaphothrips zelandicus*



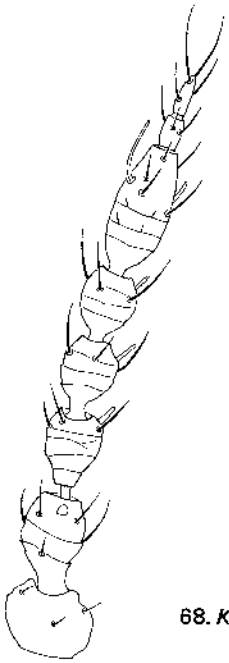
64. *Anaphrygmothrips otagensis*



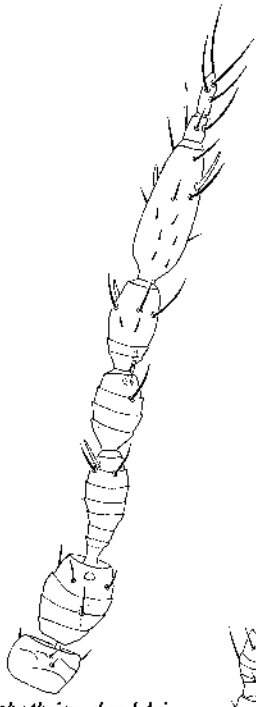
65. *Apterothrips secticornis*



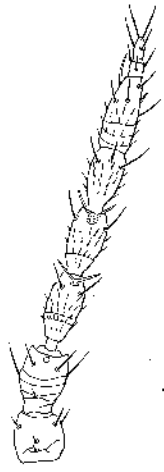
66. *Aptinothrips rufus*



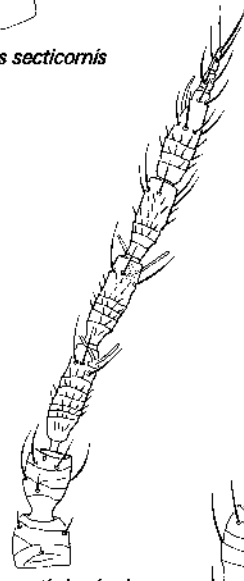
67. *Aptinothrips stylifer*



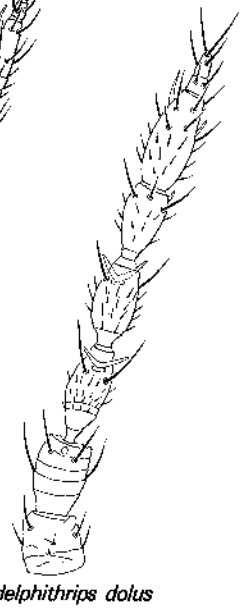
68. *Karphothrips dugdalei*



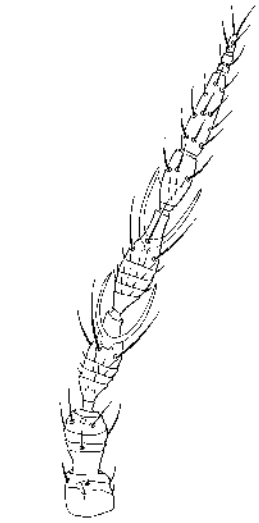
69. *Physemothrips chrysodermus*



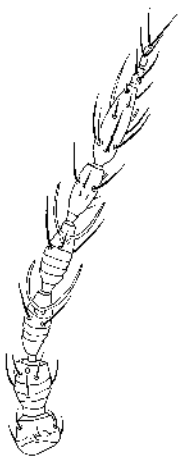
70. *Physemothrips hadrus*



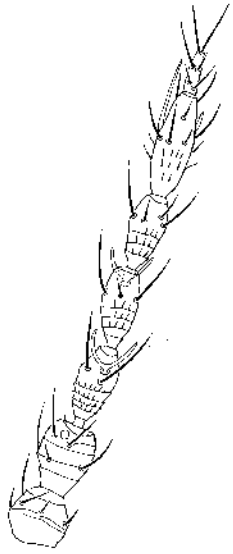
71. *Adelphithrips dolus*



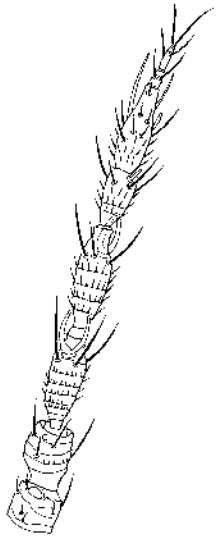
72. *Dichromothrips maori*



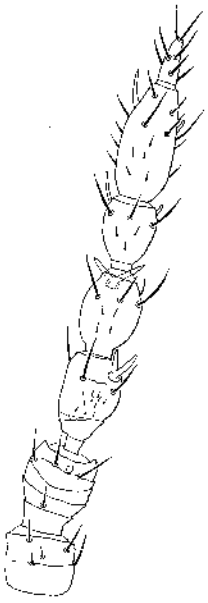
73. *Dikrothrips diphyes*



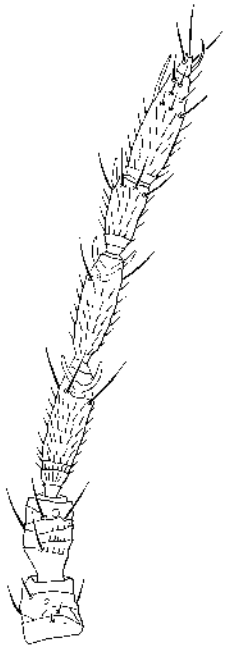
74. *Lomatothrips paryphis*



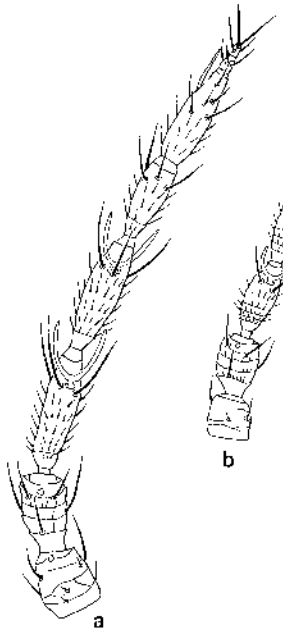
75. *Megalurothrips kellyanus*



76. *Microcephalothrips abdominalis*



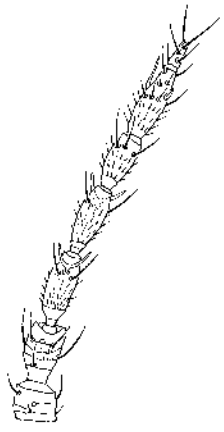
77. *Thrips australis*



a

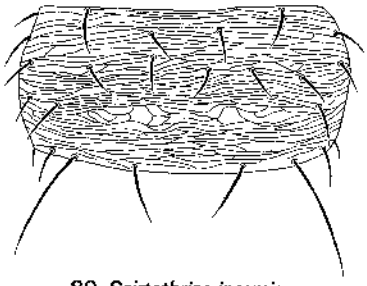
b

78. *Thrips obscuratus* (a,b, size variants)

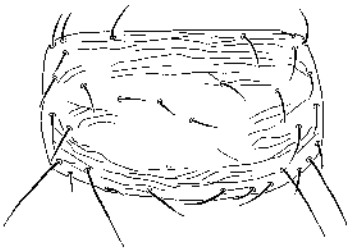


79. *Thrips tabaci*

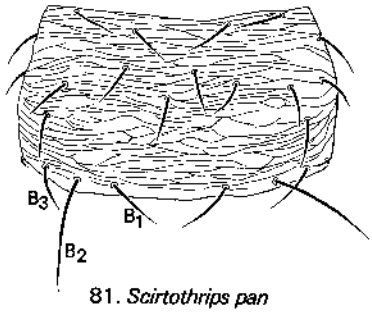
Figures 72–79 Right antennae, dorsal aspect.



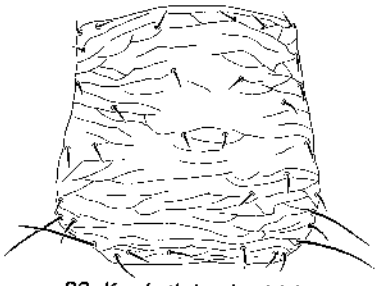
80. *Scirtothrips inermis*



82. *Anaphrygmothrips otagensis*

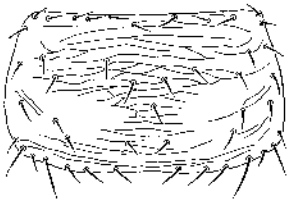


81. *Scirtothrips pan*

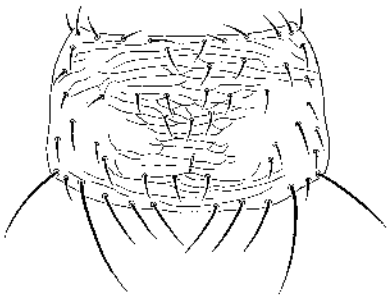


83. *Karphothrips dugdalei*

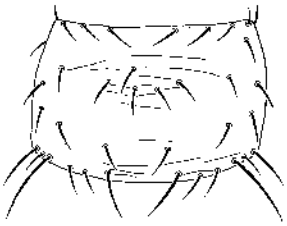
84. *Physemothrips chrysodermus*



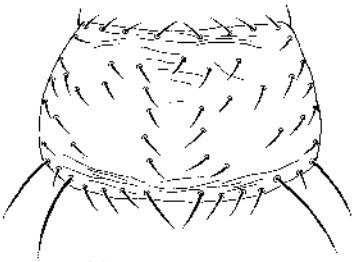
85. *Adelphithrips cassiniae*



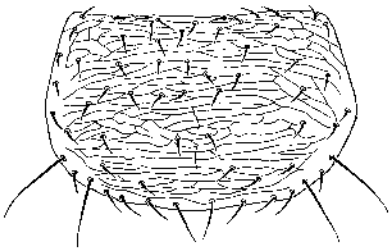
86. *Adelphithrips dolus*



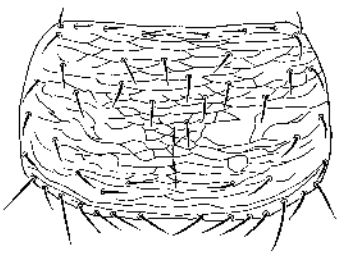
87. *Adelphithrips nothofagi*



88. *Ceratothrips ericae*

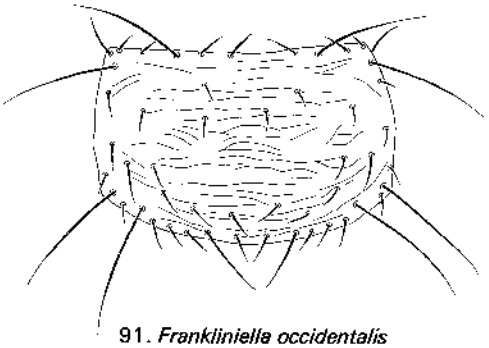


89. *Ceratothrips frici*

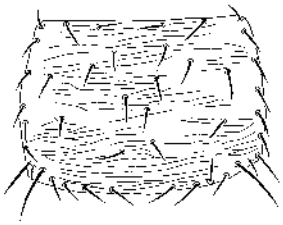


90. *Dikrothrips diphyes*

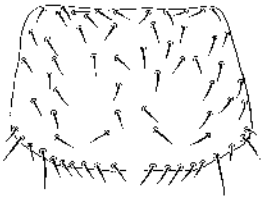
Figures 80–90 Pronota.



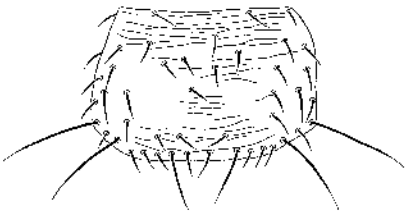
91. *Frankliniella occidentalis*



92. *Lomatothrips paryphis*

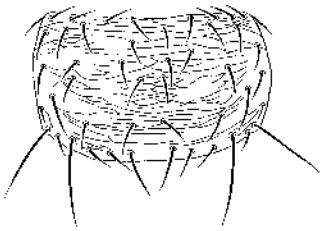


94. *Microcephalothrips abdominalis*

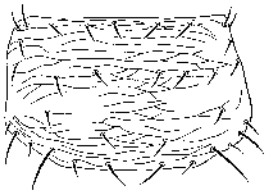


93. *Megalurothrips kellyanus*

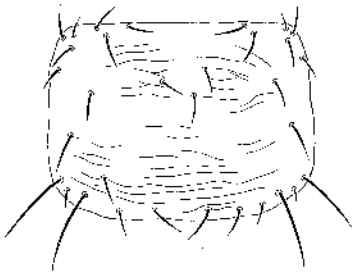
95. *Pseudanaphothrips achaetus*



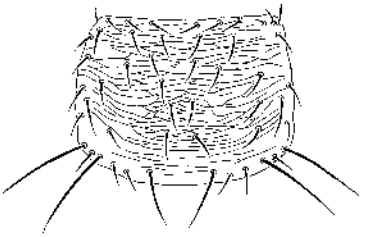
97. *Thrips obscuratus*



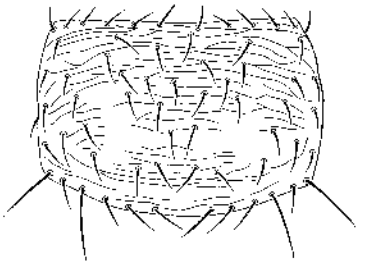
96. *Pseudanaphothrips annettae*



98. *Thrips phormiicola*

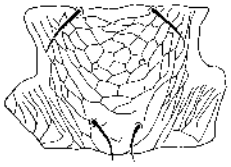


100. *Thrips vulgatissimus*

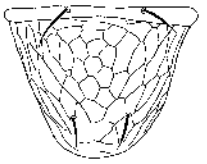


99. *Thrips tabaci*

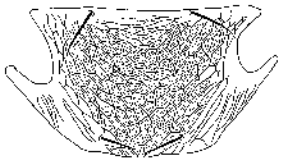
Figures 91–100 Pronota.



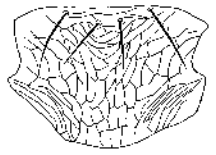
101. *Aeolothrips fasciatus*



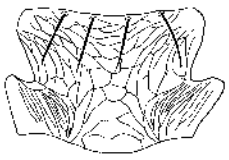
102. *Aeolothrips melaleucus*



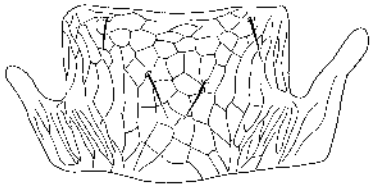
103. *Desmidothrips walkerae*



104. *Scirtothrips inermis*



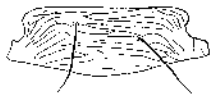
105. *Scirtothrips pan*



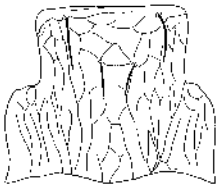
106. *Anaphothrips obscurus*

107. *Anaphothrips woodi*

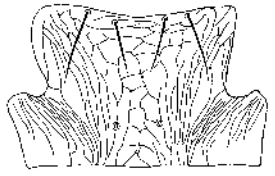
108. *Anaphothrips zelandicus*



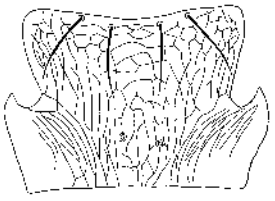
109. *Anaphrygmothrips otagensis*



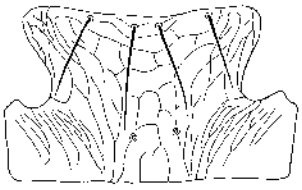
110. *Karphothrips dugdalei*



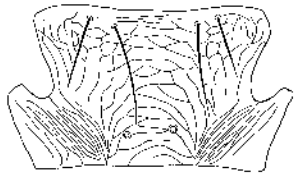
111. *Adelphithrips cassiniae*



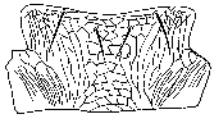
112. *Adelphithrips dolus*



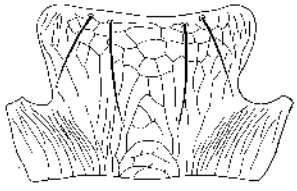
113. *Adelphithrips nothofagi*



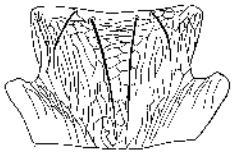
114. *Ceratothrips ericae*



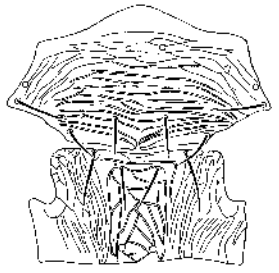
116. *Dikrothrips diphyes*



115. *Ceratothrips frici*

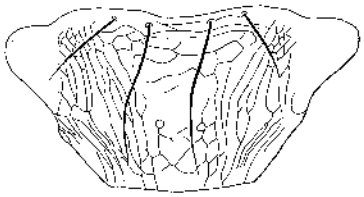


117. *Frankliniella occidentalis*

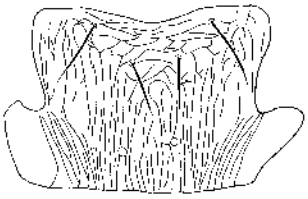


118. *Lomatothrips paryphis* (mesonotum and metanotum)

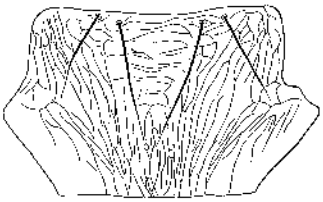
Figures 101–118 Metanota.



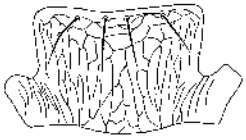
119. *Megalurothrips kellyanus*



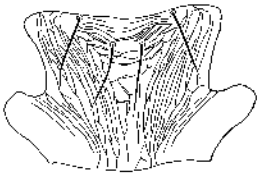
120. *Microcephalothrips abdominalis*



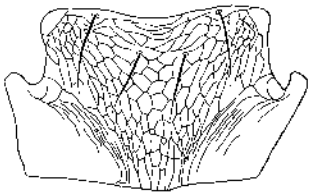
121. *Pseudanaphothrips achaetus*



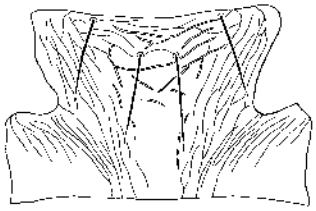
122. *Pseudanaphothrips annettae*



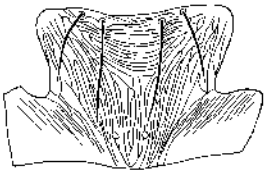
123. *Thrips austellus*



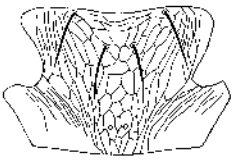
124. *Thrips australis*



125. *Thrips coprosmae*

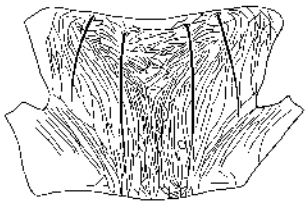


126. *Thrips hawaiiensis*

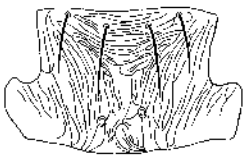


127. *Thrips imaginis*

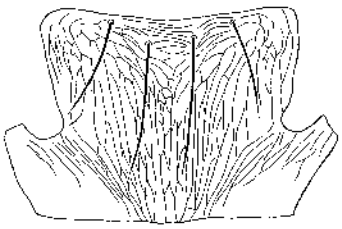
128. *Thrips nigropilosus*



129. *Thrips obscuratus*



130. *Thrips phormiicola*

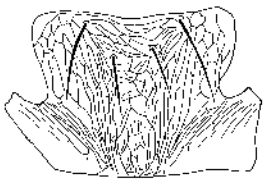


131. *Thrips physapus*

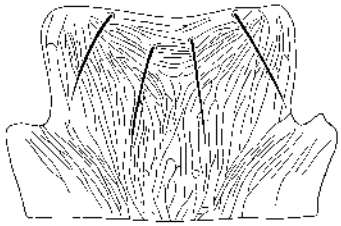
Figures 119–134 Metanota.

Figure 135 *(opposite page, below)* Lateral pterothoracic sclerites of Terebrantia (semi-diagrammatic).

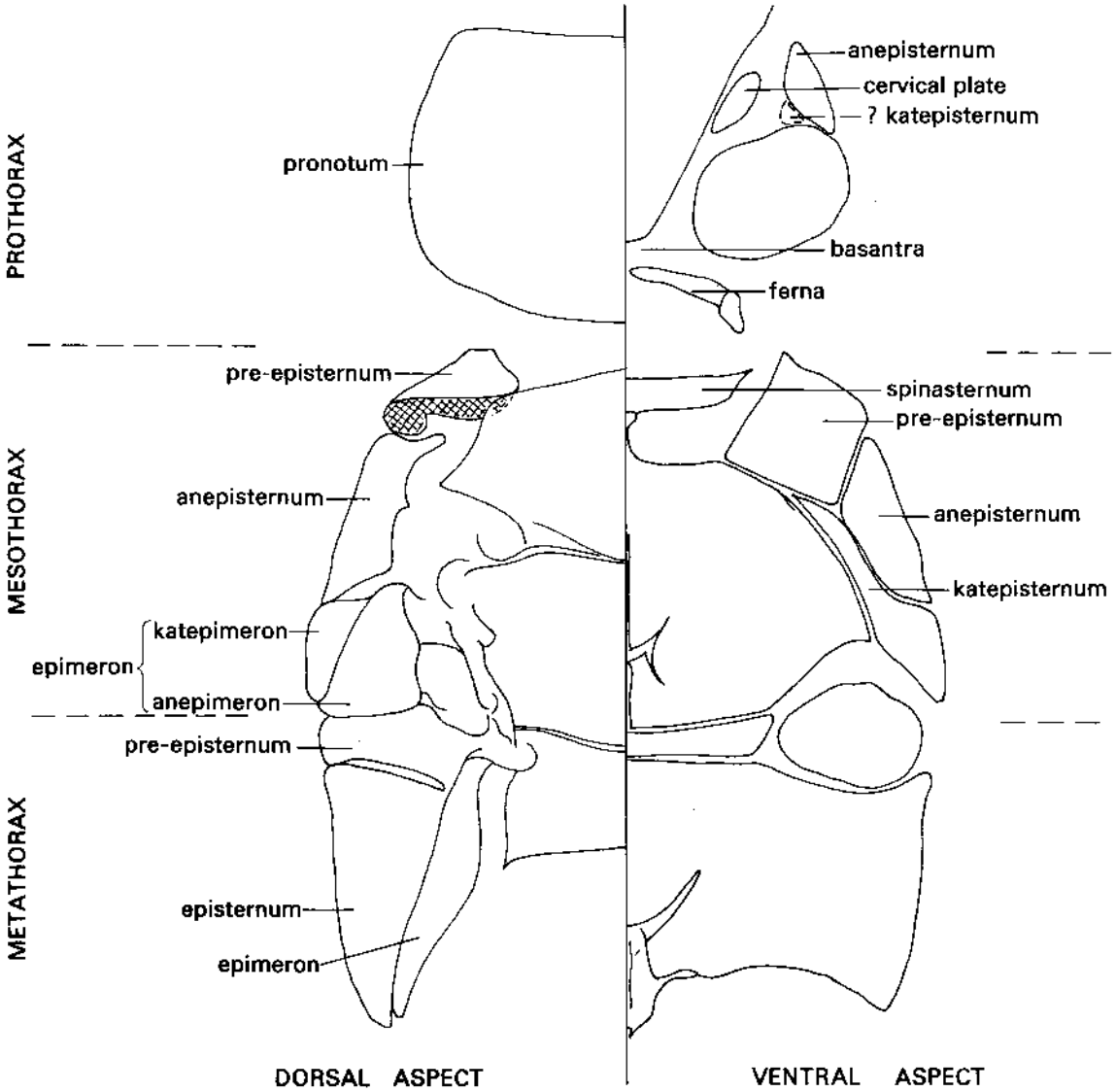
132. *Thrips simplex*

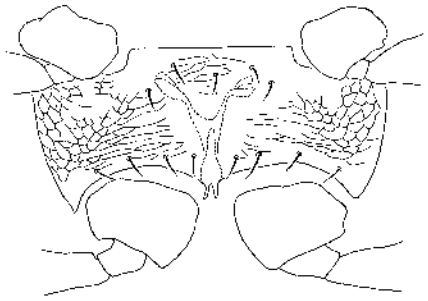


133. *Thrips tabaci*

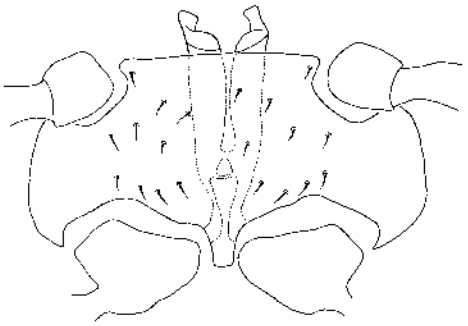


134. *Thrips vulgatissimus*

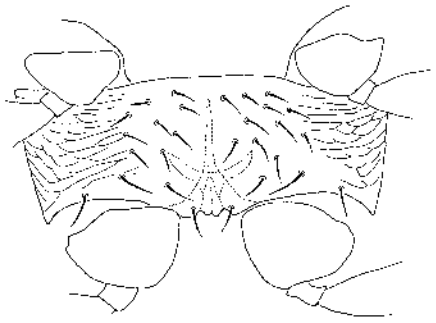




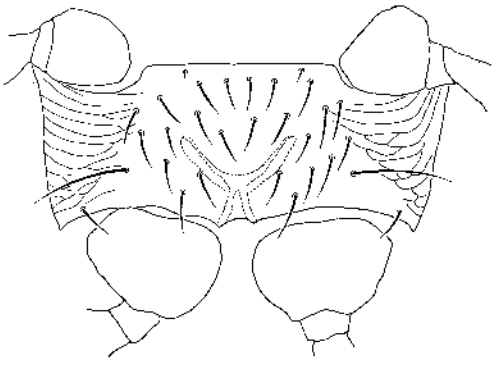
136. *Hercinothrips bicinctus*



137. *Dendrothrips ornatus*



138. *Dichromothrips maori*



139. *Thrips obscuratus*

Figures 136–139 Metathoracic endofurcae.

141. *Parthenothrips dracaenae*

140. *Hercinothrips bicinctus*

142. *Chirothrips manicatus*

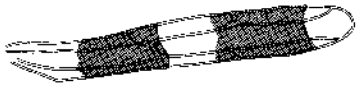
143. *Chirothrips mexicanus*

144. *Adelphithrips nothofagi*

145. *Thrips coprosmae*

Figures 140–145 Right forelegs of females (142, 143, tibia and tarsus; remainder, tarsus only).

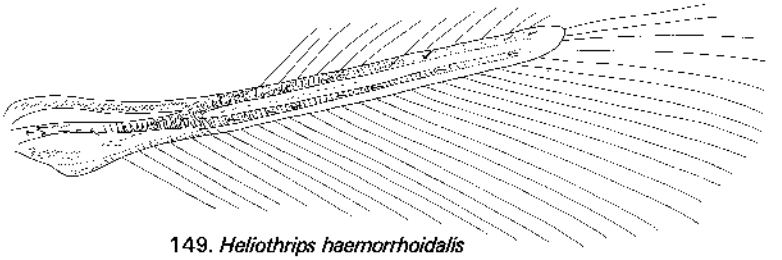
Figures 146–155 Wings, macropterous (146–148, fringe cilia omitted).



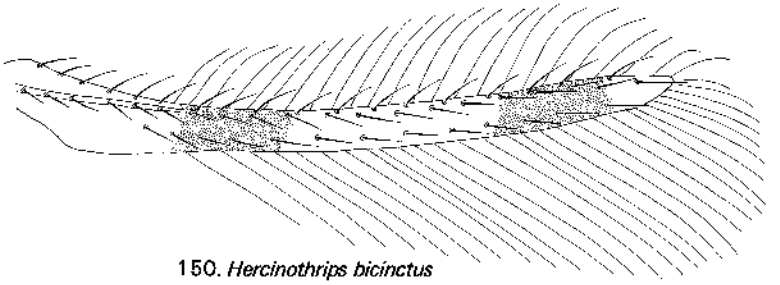
146. *Aeolothrips fasciatus*

147. *Aeolothrips melaleucus*

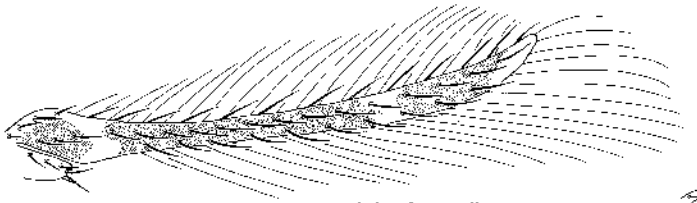
148. *Desmidothrips walkerae*



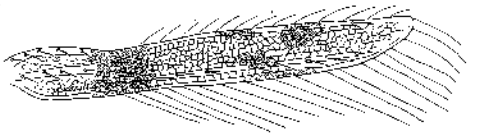
149. *Heliothrips haemorrhoidalis*



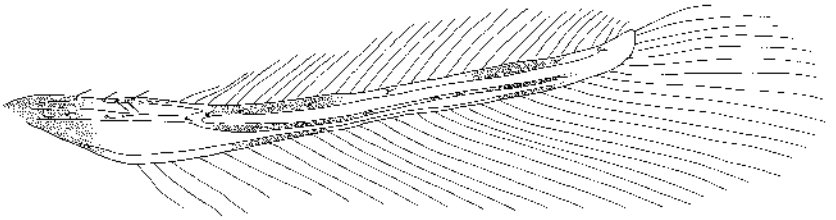
150. *Hercinothrips bicinctus*



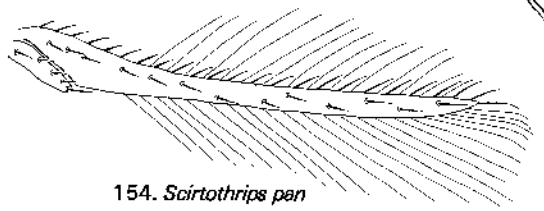
151. *Hercinothrips femoralis*



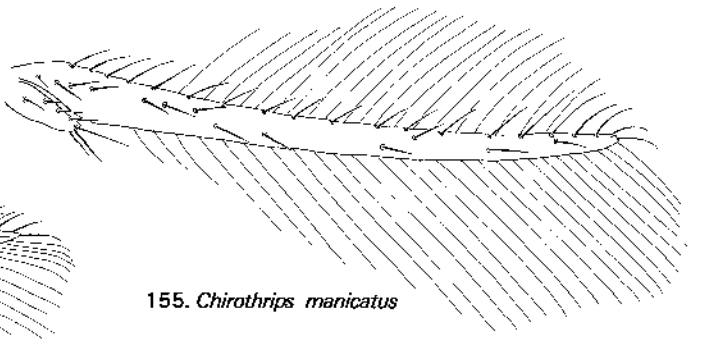
152. *Parthenothrips dracaenae*



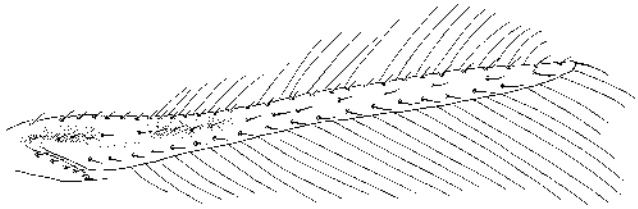
153. *Sigmothrips aotearoana*



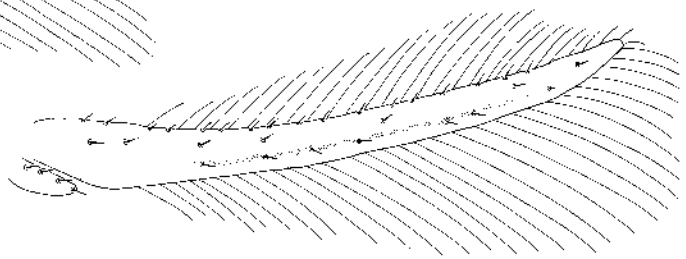
154. *Scirtothrips pan*



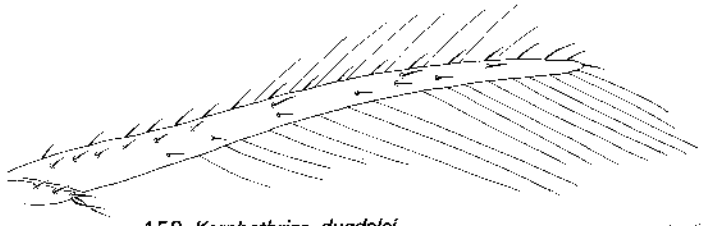
155. *Chirothrips manicatus*



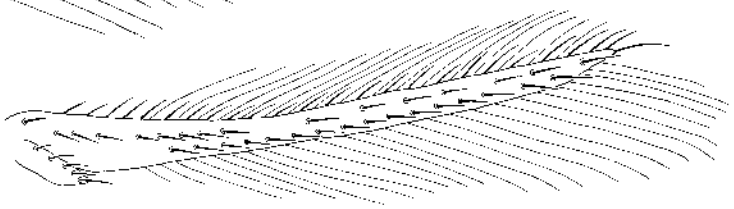
156. *Anaphothrips dubius*



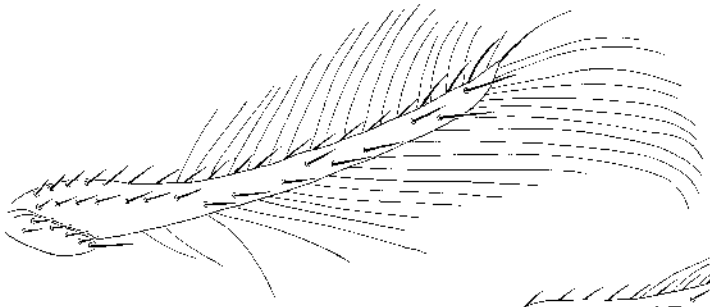
157. *Anaphothrips obscurus*



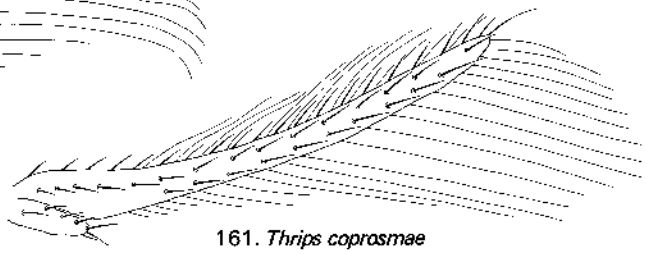
158. *Karphothrips dugdalei*



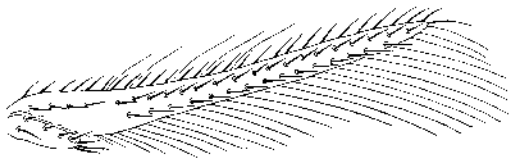
159. *Adelphithrips dolus*



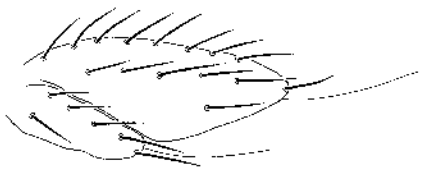
160. *Lomatothrips paryphis*



161. *Thrips coprosmae*

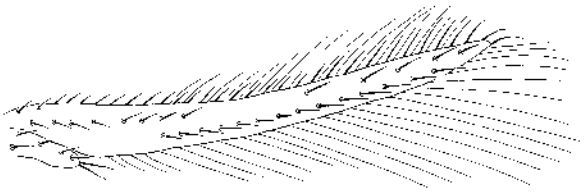


162a. *Thrips obscuratus,* macroptera

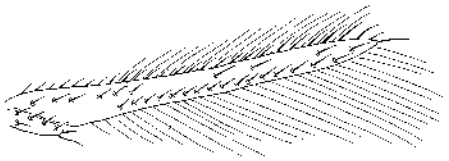


162b. *Thrips obscuratus,* microptera

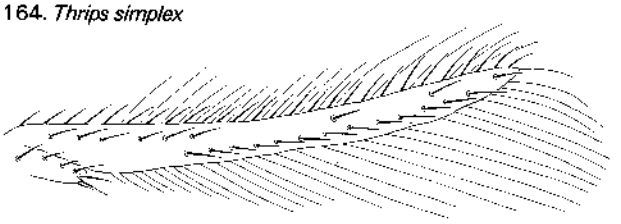
163. *Thrips phormiicola*



164. *Thrips simplex*

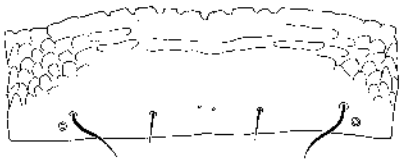


165. *Thrips tabaci*



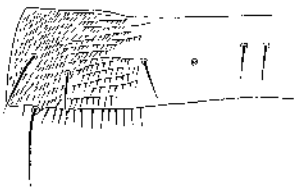
166. *Thrips vulgatissimus*

Figures 156–166 Wings, macropterous except 162b and 163 (micropterous).

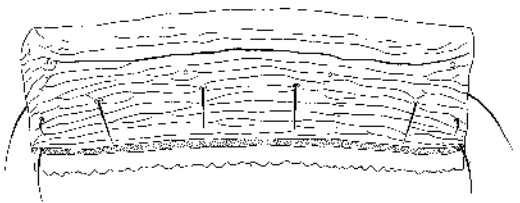


167. *Sigmothrips aotearoana*, VI

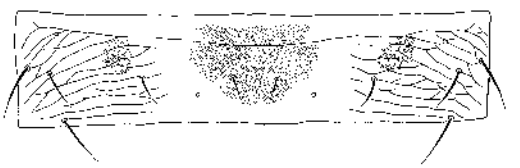
168. *Scirtothrips inermis*, VI



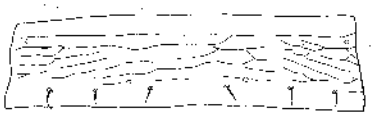
169. *Scirtothrips pan*, V



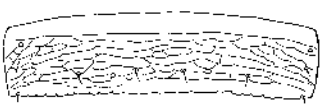
170. *Chirothrips manicatus*, VI



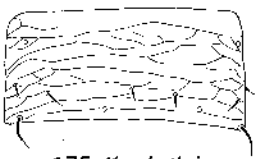
171. *Anaphothrips dubius*, VI



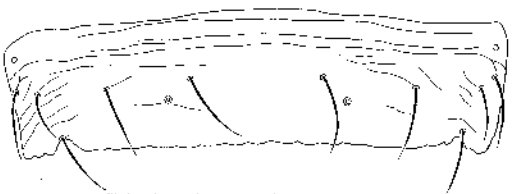
172. *Anaphothrips woodi*, IV



173. *Anaphothrips zelandicus*, VI

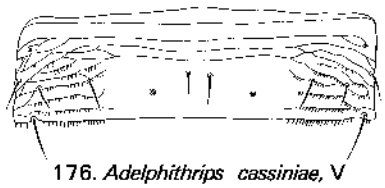


175. *Karphothrips dugdalei*, VI

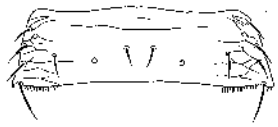


174. *Anaphrygmothrips otagensis*, VI

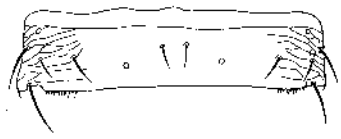
Figures 167–175 Tergites of females.



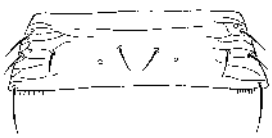
176. *Adelphithrips cassiniae*, V



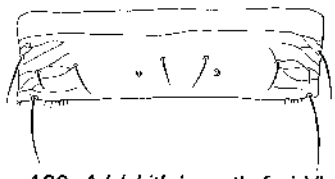
177. *Adelphithrips dolus*, II



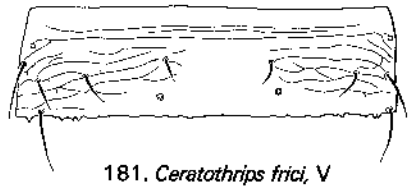
178. *Adelphithrips dolus*, V



179. *Adelphithrips nothofagi*, II

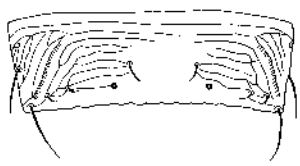


180. *Adelphithrips nothofagi*, VI

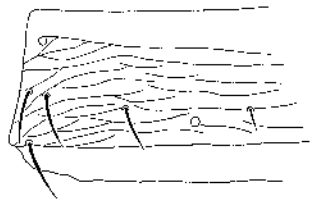


181. *Ceratothrips frici*, V

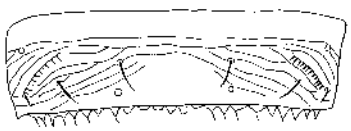
182. *Dikrothrips diphyes*, V



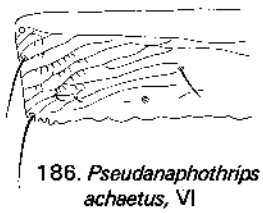
183. *Frankliniella occidentalis*, VII



184. *Lomatothrips paryphis*, IV



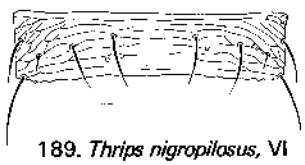
185. *Microcephalothrips abdominalis*, VI



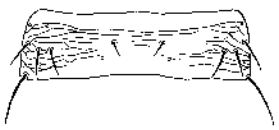
186. *Pseudanaphothrips achaetus*, VI

187. *Pseudanaphothrips annettae*, VI

188. *Thrips hawaiiensis*, II

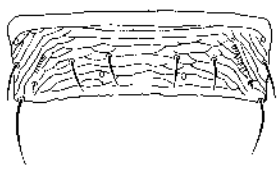


189. *Thrips nigropilosus*, VI

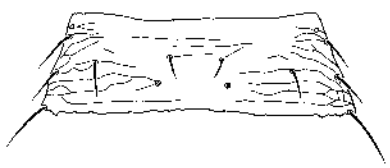


190. *Thrips obscuratus*, III

191. *Thrips phormiicola*, III



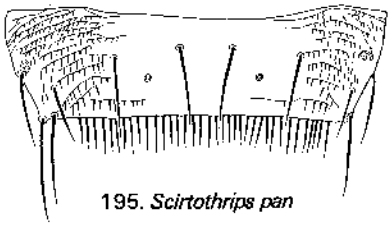
192. *Thrips phormiicola*, VII



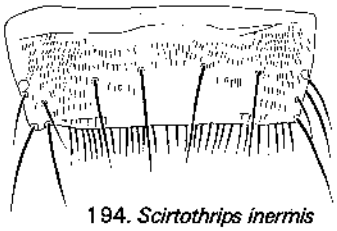
193. *Thrips physapus*, II

Figures 176–193 Tergites of females.

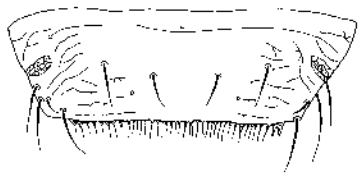
Figures 194–208 Tergite VIII of females.



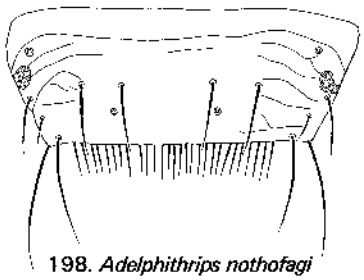
195. *Scirtothrips pan*



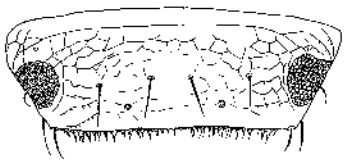
194. *Scirtothrips inermis*



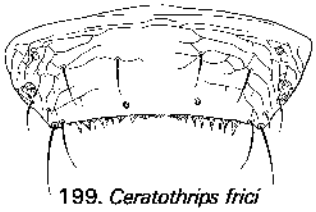
196. *Anaphothrips dubius*



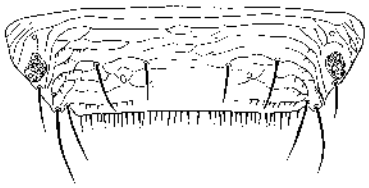
198. *Adelphithrips nothofagi*



197. *Anaphothrips varii*

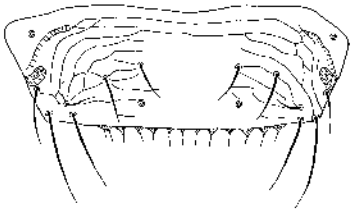


199. *Ceratothrips frici*

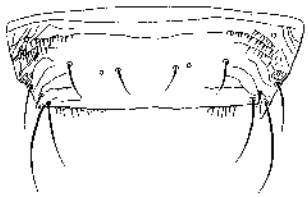


201. *Dikrothrips diphyes*

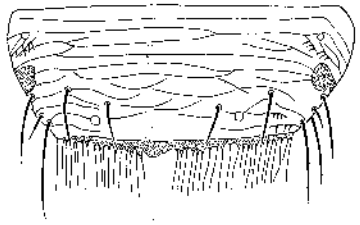
200. *Dichromothrips maori*



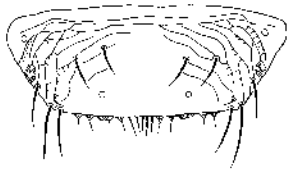
202. *Frankliniella occidentalis*



204. *Megalurothrips kellyanus*

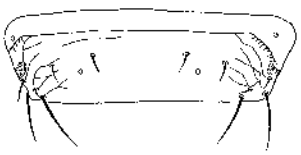


203. *Lomatothrips paryphis*

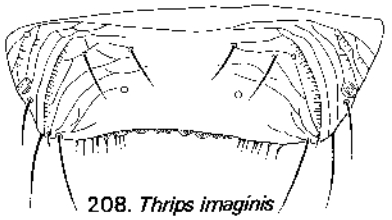


205. *Pseudanaphothrips achaetus*

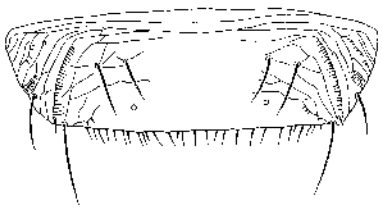
207. *Thrips australis*



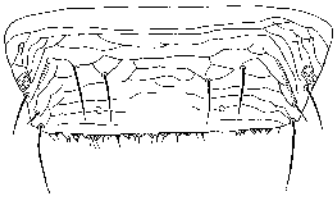
206. *Pseudanaphothrips annettae*



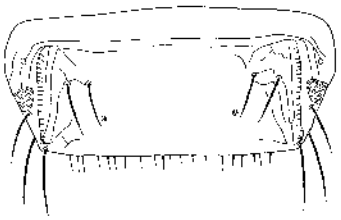
208. *Thrips imaginis*



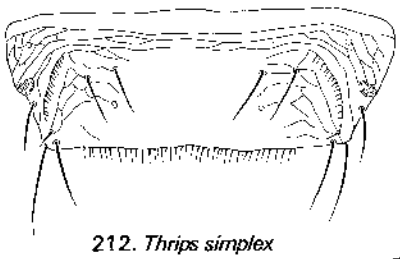
209. *Thrips obscuratus*



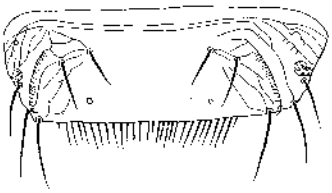
210. *Thrips phormiicola*



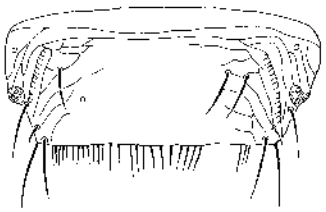
211. *Thrips physapus*



212. *Thrips simplex*

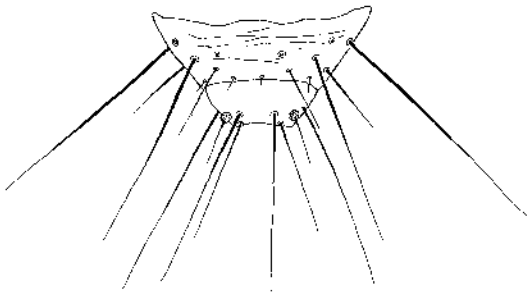


213. *Thrips tabaci*

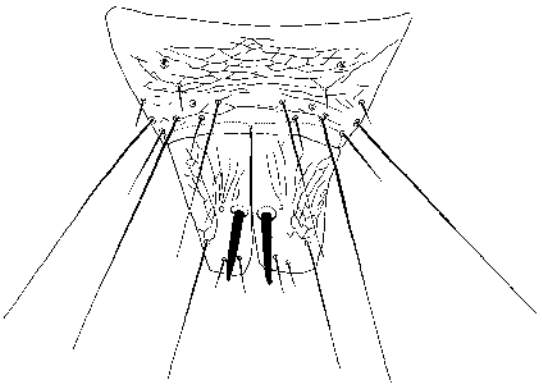


214. *Thrips vulgatissimus*

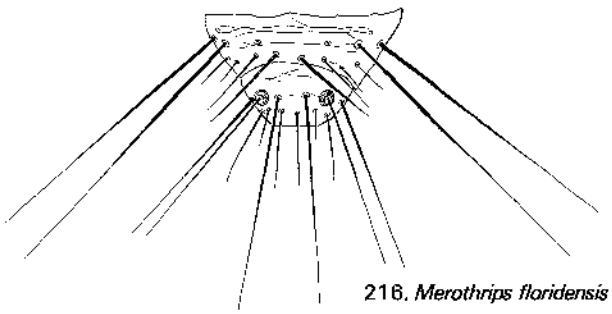
Figures 209–214 Tergite VIII of females.



215. *Merothrips brunneus*

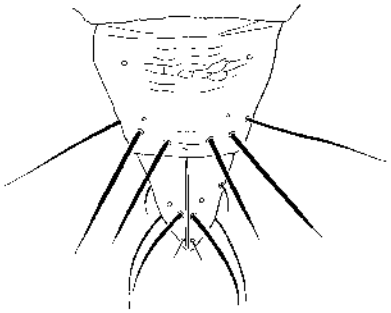


217. *Limothrips cerealium*

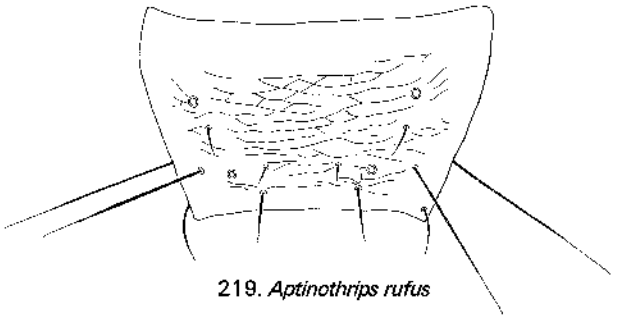


216. *Merothrips floridensis*

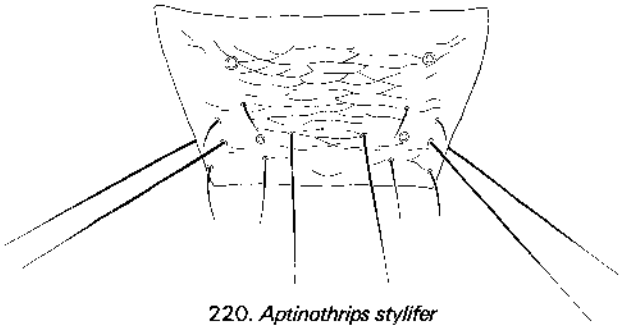
Figures 215–224 Tergites IX and X of females (219, 220, tergite IX only).



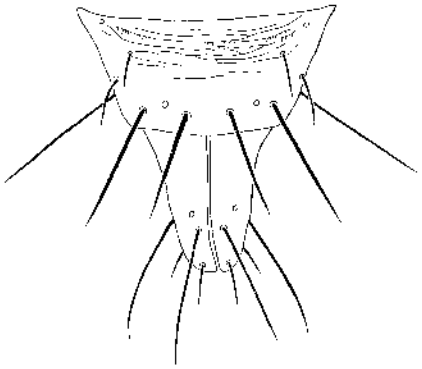
218. *Anaphothrips woodi*



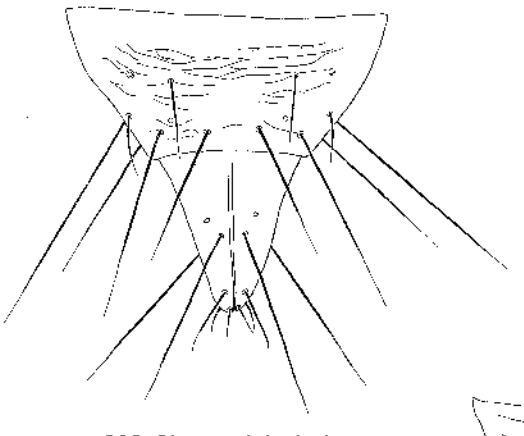
219. *Aptinothrips rufus*



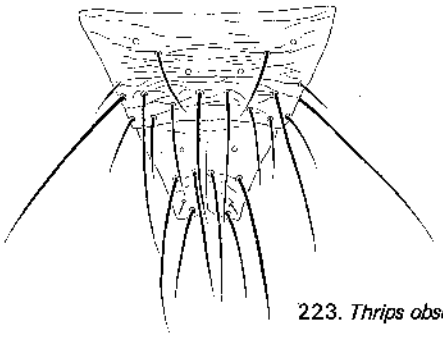
220. *Aptinothrips stylifer*



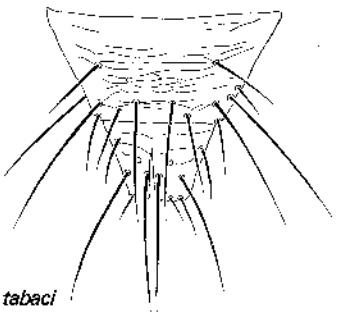
221. *Physemothrips chrysodermus*



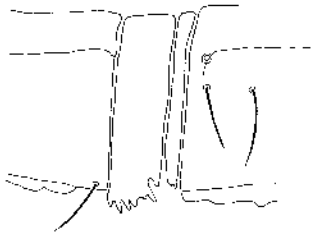
222. *Physemothrips hadrus*



223. *Thrips obscuratus*

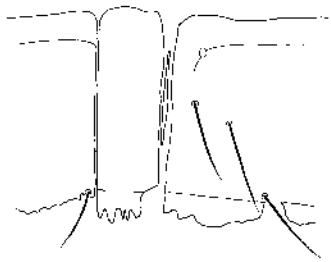


224. *Thrips tabaci*

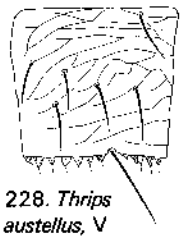


225. *Anaphrygmothrips otagensis*, IV

227. *Lomatothrips paryphis*, IV

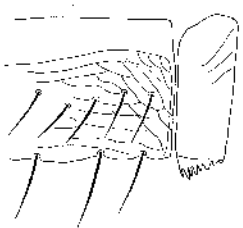


226. *Anaphrygmothrips otagensis*, VI

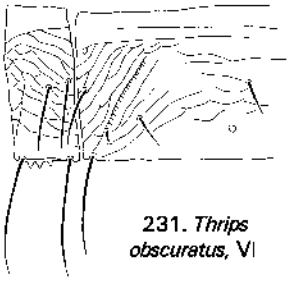


228. *Thrips austellus*, V

229. *Thrips australis*, V

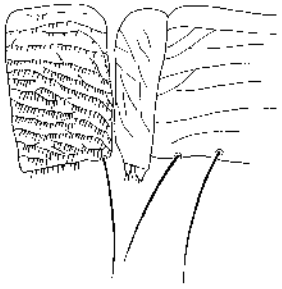


230. *Thrips obscuratus*, V



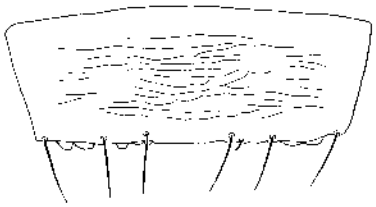
231. *Thrips obscuratus*, VI

232. *Thrips physapus*, V

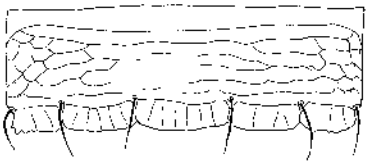


233. *Thrips tabaci*, VI

Figures 225–233 Pleurotergites and pleurosternites of females (227–229, 231, 232, pleurotergite only; 230, pleurosternite only).

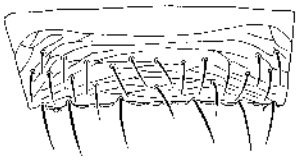


234. *Anaphrygmothrips otagensis*, VII

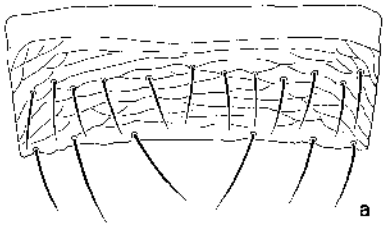


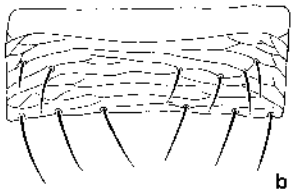
235. *Apterothrips secticornis*, V

236. *Microcephalothrips abdominalis*, VI



237. *Thrips imaginis*, VI

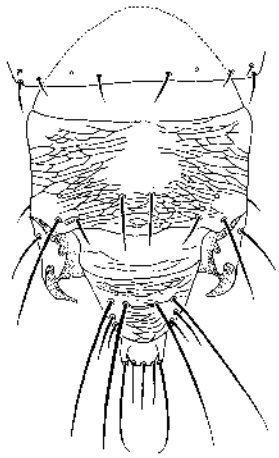




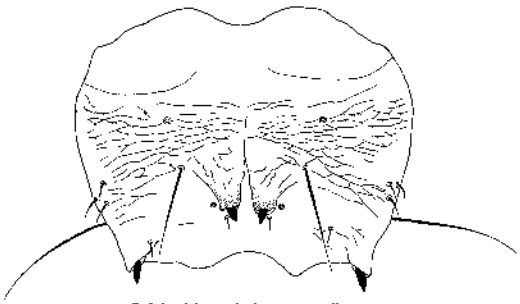
238. *Thrips obscuratus*, VI (a,b, size variants)

Figures 234–238 Sternites of females.

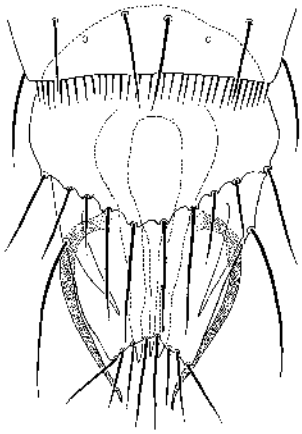
Figures 239–248 Tergites IX and X of males.



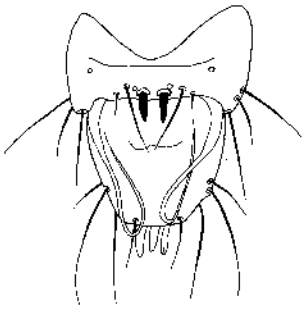
239. *Aeolothrips fasciatus*



241. *Limothrips cerealium*

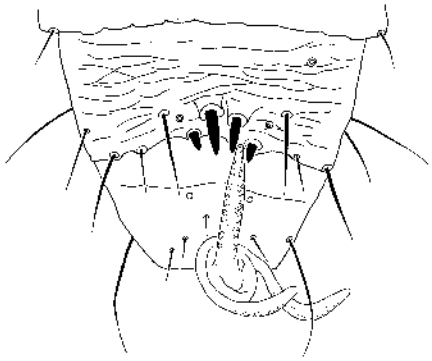


240. *Scirtothrips pan*

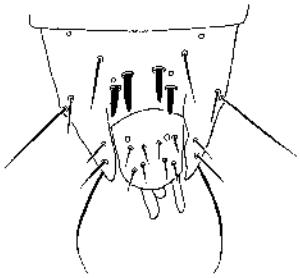


242. *Anaphothrips dubius*

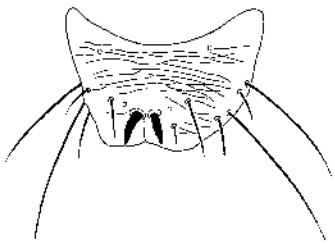
244. *Aptinothrips rufus*



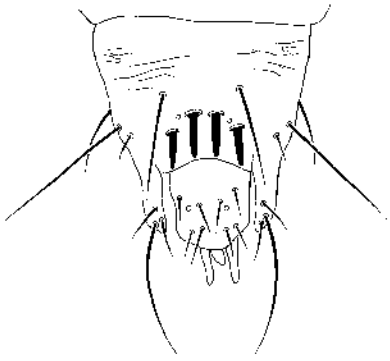
243. *Anaphothrips zelandicus*



245. *Physemothrips chrysodermus*

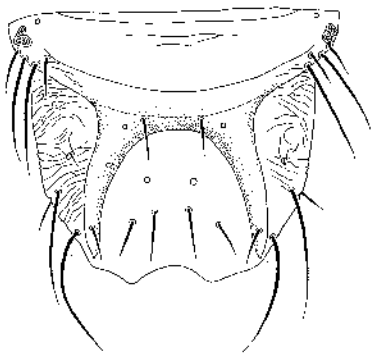


248. *Pseudanaphothrips annettae*

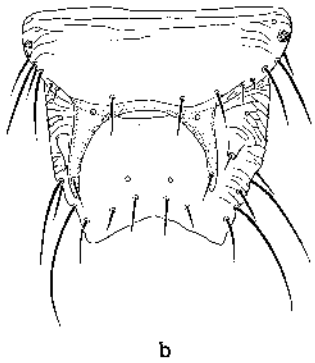


246. *Physemothrips hadrus*

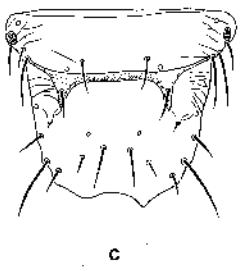
Figure 247 on next page



a

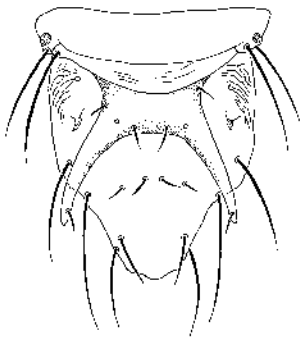


b

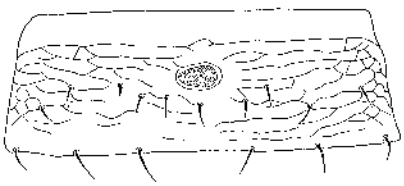


c

247. *Dikrothrips diphyes*
(a–c, macroptera, allometry; d, microptera)

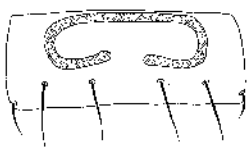


d

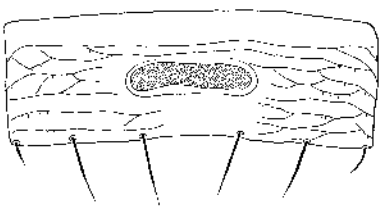


249. *Limothrips cerealium*, V

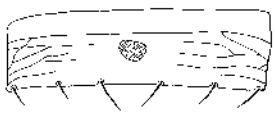
Figures 249–261 Sternites of males, to show glandular areas.



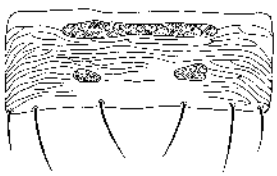
250. *Anaphothrips dubius*, V



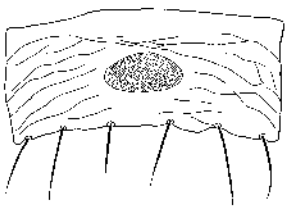
251. *Anaphothrips zelandicus*, VII



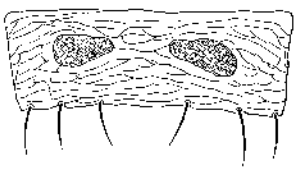
252. *Physemothrips chrysodermus*, IV



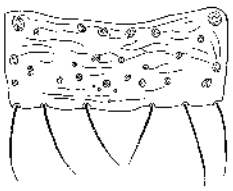
253. *Ceratothrips ericae*, IV



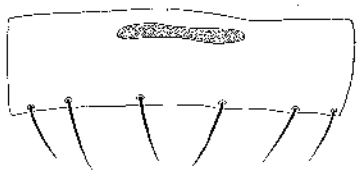
254. *Ceratothrips frici*, VI



255. *Dichromothrips maori*, V

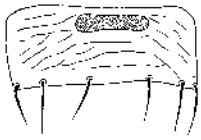


256. *Megalurothrips kellyanus*, VI

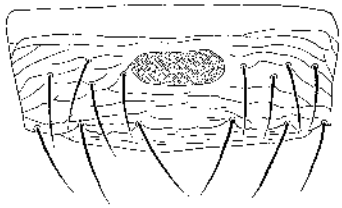


257. *Pseudanaphothrips achaetus*, VI

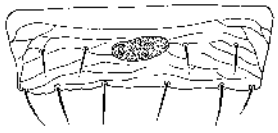
258. *Pseudanaphothrips annettae*, VI



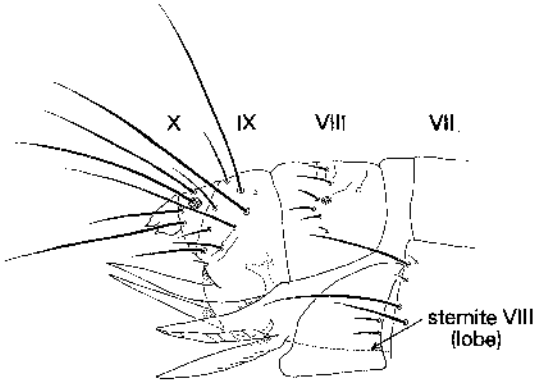
259. *Frankliniella occidentalis*, V



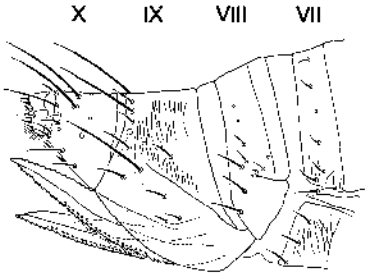
260. *Thrips obscuratus*, V



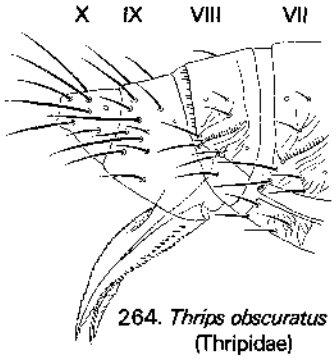
261. *Thrips phormiicola*, IV



262. *Merothrips floridensis*
(Merothripidae)



263. *Aeolothrips fasciatus*
(Aeolothripidae)



264. *Thrips obscuratus*
(Thripidae)

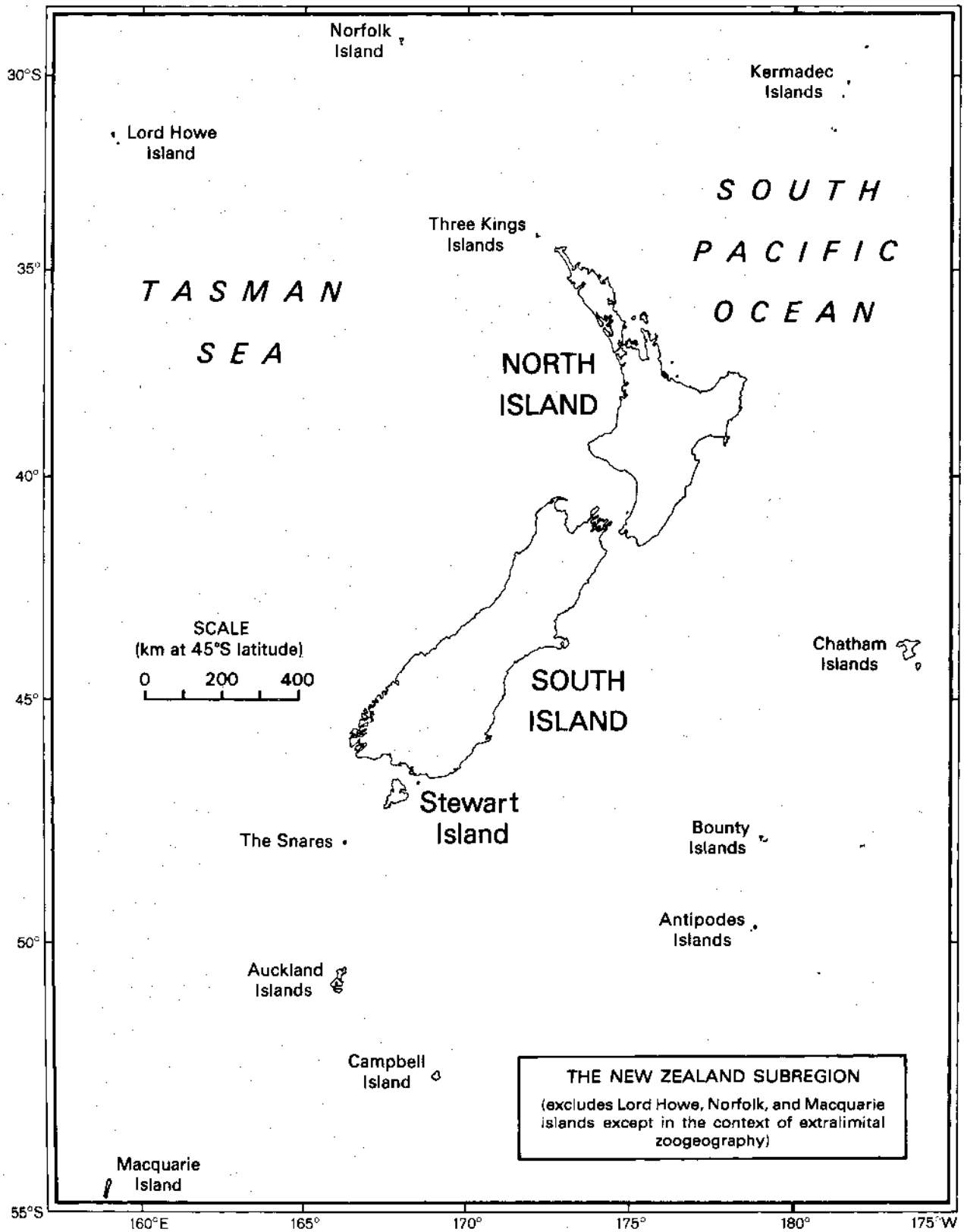
Figures 262–264 Ovipositors typical of 3 terebrantian families, lateral aspect.

Fauna of New Zealand

Number 1

Terebrantia
(Insecta: Thysanoptera)

Laurence A. Mound
& Annette K. Walker



THE NEW ZEALAND SUBREGION

(excludes Lord Howe, Norfolk, and Macquarie islands except in the context of extralimital zoogeography)

North Island

AK – Auckland

BP – Bay of Plenty

CL – Coromandel

GB – Gisborne

HB – Hawkes Bay

ND – Northland

RI – Rangitikei

TK – Taranaki

TO – Taupo

WA – Wairarapa

WI – Wanganui

WN – Wellington

WO – Waikato

South Island

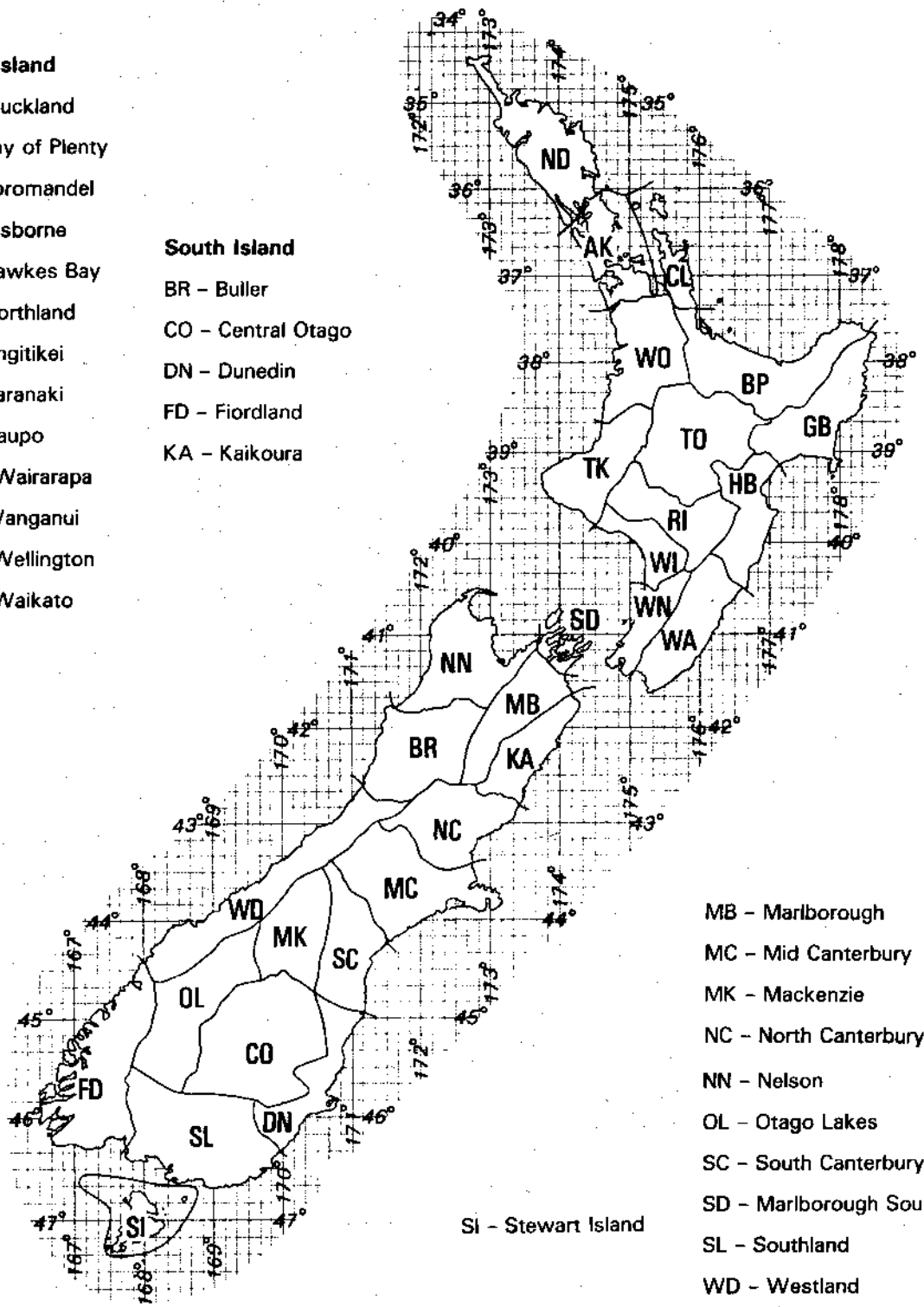
BR – Buller

CO – Central Otago

DN – Dunedin

FD – Fiordland

KA – Kaikoura



MB – Marlborough

MC – Mid Canterbury

MK – Mackenzie

NC – North Canterbury

NN – Nelson

OL – Otago Lakes

SC – South Canterbury

SD – Marlborough Sounds

SL – Southland

SI – Stewart Island

WD – Westland

Area codes and boundaries proposed by Crosby *et al.* (1976) for use with specimen locality data

Fauna of New Zealand

This series of occasional publications has been established with two major objectives: to encourage those with expert knowledge of elements in the New Zealand fauna to publish concise yet comprehensive accounts; and to provide a means of identification accessible to the non-specialist. It will deal largely with non-marine invertebrates, since the vertebrates are well documented, and marine forms are covered by the series *Marine Fauna of New Zealand.*

Contributors should discuss their intentions with an appropriate member of the Editorial Advisory Group or with the Series Editor before commencing work (for names and addresses, see page ii). All necessary guidance will be given.

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CHECKLIST OF TAXA

INTRODUCTION

KEY TO TAXA

DESCRIPTIONS

ILLUSTRATIONS

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No. 1 Terebrantia (Insecta: Thysanoptera), by Laurence A. Mound & Annette K. Walker. ISBN 0-477-06687-9. *Published December 1982. Price to be announced

No. 2 Osorilnae (Insecta: Coleoptera: Staphylinidae), by H. Pauline McColl. ISBN 0-477-06688-7. *Published December 1982. Price to be announced.

No. 3 Anthribidae (Insecta: Coleoptera), by B. A. Holloway. ISBN 0-477-06703-4. *Published December 1982. Price to be announced.

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IN PRESS

No. 4-6 Eriophyoidea (Arachnida: Acari), by D. C. M. Manson. No. 4 -- Introduction and keys to the superfamily, Sierraphytoptidae, and Diptilomiopidae; No. 5 -- Eriophyidae except Phytocoptinae; No. 6 — Phytocoptinae.

No. 7 Hydraenidae (Insecta: Coleoptera), by R. G. Ordish.

No. 8 Calliphoridae (Insecta: Diptera), by J. P. Dear.

IN PREPARATION

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

Arachnida: Acari — Ixodidae, by G. W. Ramsay.

Insecta: Coleoptera — Nemonychidae, by G. Kuschel; Introduced Curculionidae, by G. Kuschel; Key to families, by J. C. Watt. Hymenoptera — Chalcidoidea, by J. S. Noyes & E. W. Valentine. Thysanoptera — Tubulifera, by L. A. Mound & A. K. Walker. Hemiptera — Psyllidae, by P. Dale. Diptera — Bibionidae, by R. A. Harrison. Protura, by S. L. Tuxen. A further eleven contributions had been promised up to the time this number went to press.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH, WELLINGTON, NEW ZEALAND

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Laurence A. Mound and Annette K. Walker. 1982.
Terebrantia (Insecta: Thysanoptera). *Fauna of New Zealand 1*, 113 pp.

[+ 7 final blank pages with heading "Notes"]

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