BRITISH MUSEUM
17 APR 1967
NATURAL HISTORY

A TAXONOMIC REVISION OF THE AUSTRALIAN AEOLOTHRIPIDAE (THYSANOPTERA)

BY

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Pp. 41–74 ; 54 *Text-figs.*

BULLETIN OF
THE BRITISH MUSEUM (NATURAL HISTORY)
ENTOMOLOGY. Vol. 20 No. 2.
LONDON: 1967

THE BULLETIN OF THE BRITISH MUSEUM (NATURAL HISTORY), *instituted in* 1949, *is issued in five series corresponding to the Departments of the Museum, and an Historical series.*

Parts will appear at irregular intervals as they become ready. Volumes will contain about three or four hundred pages, and will not necessarily be completed within one calendar year.

In 1965 *a separate supplementary series of longer papers was instituted, numbered serially for each Department.*

This paper is Vol. 20, *No.* 2 *of the Entomological series. The abbreviated titles of the periodicals cited follow those of the World List of Scientific Periodicals.*

World List abbreviation :
Bull. Br. Mus. nat. Hist. (Ent.)

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THE BRITISH MUSEUM (NATURAL HISTORY)

Issued 19 *April*, 1967 *Price Fifteen Shillings*

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SYNOPSIS

Nineteen species of Aeolothripidae are recognized from Australia and these are distributed in seven genera. One of these species, *fasciatus*, is Holarctic, one of them, *cinctus*, is here recorded from India, but the others are known only from Australia. The type specimens of all the Australian species except *cinctus* have been examined, and all the species are re-described and keys provided for their recognition. Six new combinations and three new synonymies are included and three species are recalled from synonymy. Three new species and two new genera are described, and one of these genera includes two South American species originally described in *Desmothrips*.

INTRODUCTION

The systematics of the order Thysanoptera have been little studied in Australia, although there are records and descriptions of more than three hundred nominal species. About half of these names were published privately by A. Girault in a series of very brief descriptions (see de Santis, 1961), and almost all the other species were described in various journals by one of the following authors: Bagnall; Karny; Hood; Morison; Moulton; Priesner. With this widely scattered literature the identification of species is a serious problem, especially as the total number of species involved probably far exceeds the figure of three hundred quoted above. The only keys that have been published refer to the fifteen species of common flower thrips and potential pests (Steele, 1935), and the annotated check list published by Kelly & Mayne (1934) is in need of revision. The object of the present paper is the production of keys for the recognition of the described species in the smallest of the three major families, in order to provide a framework for future studies. Most of the species are known only from a single sample and many from a unique specimen, and this is due to the lack of collectors. Most species have been collected by one of the following three workers: Girault in Brisbane, Kelly in Melbourne and Newman in Perth. In view of the problems raised by the variation within species, further work must begin with both extensive and intensive collecting.

Many of the earlier descriptions of Australian Thysanoptera species refer mainly to colour patterns and characters derived from a study of the silhouette of the insects, but modern microscopes have made possible the examination of a wider range of characters, such as the integumental sculpture and chaetotaxy of the ventral surface. For the full examination of these characters however, specimens must be fully dehydrated and cleared and the present author usually macerates some specimens from each series in 5% sodium hydroxide solution for about one hour. This destroys the body contents and pigments, thus facilitating dehydration and clearing in clove oil, but if prolonged it lightens the cuticular colour and damages the wings. The period of maceration varies with the material available even within a species. In general however very small pale thripids require longer treatment than larger specimens, although very large black species may require partial bleaching to demonstrate some details.

The inadequacy of the silhouette type of character by itself for recognizing species is evident from the data Karny (1924) gave for separating the four then known species of *Desmothrips*. He gave the following ratios between antennal segments III and IV as the most important differences between the species : *bagnalli* 100/90 ; *propinquus* 108/102 ; *australis* 104/82 ; *tenuicornis* 165/126. When reduced to unity these figures become : 1/1·11 ; 1/1·06 ; 1/1·27 ; 1/1·31 ; whilst comparable figures produced during the course of the present study gave the following ranges : *australis* 1/1·04 to 1/1·31 and *tenuicornis* 1/1·15 to 1/1·37. The other distinguishing characters used included the relative lengths of the dark and light areas on the fore wing, and the extent of brown shading on the apex of the third antennal segment. The variation in these characters is discussed below under *D. australis*.

In the present revision considerable emphasis is laid on the chaetotaxy of both the mesonotum and the abdominal sternites, and also on the sculpture of the metanotum. These characters may be of considerable importance in defining and working out the relationships between genera. In *Arcuthrips* species the antennal sensoria have faint internal markings but this character may not be of any great value at the generic level. The sensoria of *Desmothrips bagnalli* have well developed internal markings but these are only visible in certain *australis* specimens mounted in Berlese Mountant. At the specific level, in *Desmothrips*, it has been found that the colour of the costal vein around the distal pale area of the fore wing is more constant than the colouration of the wing membrane itself.

Aeolothrips and *Desmothrips* have been considered to belong in two different tribes, the Aeolothripini and the Orothripini. This grouping was based on the number of divisions found in the second segment of the maxillary palps. In Orothripini the second maxillary palp segment is clearly broken into about six divisions. In Aeolothripini this segment has about four pale transverse lines, each accompanied by a constriction, and at the apex only a single division is clearly free (Text-figs. 24–26). This difference appears to be a matter of degree rather than a fundamental distinction, especially as in some specimens the left and right palps do not have the same number of divisions, and the males of some *Desmothrips* species have fewer divisions than the females. Bagnall regarded the subdivision of the maxillary palps in *Desmothrips* as a primitive character, but in view of the supposed Hemipteroid ancestry of the

Thysanoptera it is possible that the multisegmented condition is secondary.

The relationships between the genera treated here are not clear. In view of the presence of laterally placed sternal accessory setae, none of the Australian genera appear to have any close relationship to the Holarctic *Aeolothrips*. However the two pairs of median accessory setae found on sternite VII in *Aeolothrips* species may be homologous with the two submedian pairs of marginal setae on sternite VII in *Desmothrips* species (cf. Text-figs. 40 & 45). These two pairs of setae are usually smaller than the other marginals and *Desmothrips* species have more marginal setae than are present in *Aeolothrips*. *Cranothrips* is closely related to the Holarctic *Ankothrips*, and on account of their long setae these genera are placed in the subfamily Melanthripinae. It may be significant that other genera of the Melanthripinae have well developed sternal accessory setae. *Andrewarthaia* is clearly derived from *Desmothrips*, but *Lamprothrips* and *Arcuthrips* are rather more distant. *Franklinothrips* species show the geographical distribution pattern often associated with relict groups.

ACKNOWLEDGEMENTS

This revision has been made possible by the assistance of a number of persons to all of whom the author would like to express his gratitude. In particular Mrs. H. G. Andrewartha (*née* H. Vevers Steele) kindly made available her important collection of *Desmothrips* species. Mr. E. Reed of C.S.I.R.O., Canberra, compared the Check List given below with his own unpublished list of Australian Thrips, and also supplied copies of Girault's papers and loaned many specimens collected in New South Wales. Type material was loaned by Dr. H. Priesner, Dr. L. de Santis, Dr. J. Pelikan, Miss H. Brookes of the Waite Institute, Dr. E. C. Dahms of the Queensland Museum, the Naturhistoriska Riksmuseum, Stockholm, and the Moulton Collection, California. The author is grateful to Miss Kellie O'Neill of the U.S.D.A., Washington, for her frequent advice and the loan of many specimens, and also to Mr. E. R. Speyer for his help in determining *Aeolothrips* species.

The location of the material which has been examined and is listed below under each species is shown by the following abbreviations: Mrs. H. G. Andrewartha, Adelaide (HVS Coll.); British Museum (Natural History), London (BMNH); Moulton Collection, California Academy of Sciences (Cal. A. Sci.); National Insect Collection, C.S.I.R.O., Canberra (ANIC); National Museum of Victoria, Melbourne (VM); University of Queensland, Brisbane (UQ); United States National Museum, Washington (USNM); Waite Institute, Adelaide (WI).

AUSTRALIAN AEOLOTHRIPIDAE WITH STATE RECORDS

Aeolothrips fasciatus (Linnaeus): Vic.
Andrewarthaia aurea (Moulton): W. Aust.
kellyana (Bagnall): S. Aust.; N.S.W.; Qu.
minor sp. n.: N.S.W.
Arcuthrips cinctus (Hood): Qu.
Cranothrips emersoni Girault: Qu.
poultoni Bagnall: W. Aust.

Desmothrips australis (Bagnall) : Vic. ; N.S.W. ; W. Aust.
bagnalli Karny : Qu.
mendozai Girault : W. Aust.
obsoletus Bagnall : Vic. ; ?Qu.
propinquus (Bagnall) : Tas. ; S. Aust. ; Vic. ; N.S.W. ; Qu.
reedi sp. n. : N.S.W.
steeleae sp. n. : N.S.W.
tenuicornis (Bagnall) : S. Aust. ; Vic. ; N.S.W. ; Qu.
uniguttus Girault : Qu.

Franklinothrips variegatus Girault : Qu.

Lamprothrips maculosus Moulton : W. Aust.
miltoni (Girault) : Qu.

Key to Genera

1 Sternite VII of female with two pairs of accessory setae closer to the midline than the submedian pair of marginal setae (Text-fig. 40) ; no accessory setae laterally on sternite VII ; sternites III to VI without any accessory setae, only with marginal setae . . . . . ***AEOLOTHRIPS*** (p. 47)

– Sternite VII of female with accessory setae lateral to the submedian marginal setae ; sternites III to VI usually with accessory setae laterally at least 2

2 Antennal III about five times as long as II ; body brown, with abdominal segments I to IV and X, and antennals III and IV yellow ; wings brown with transverse pale bands sub-basally, subapically and medially ; basal abdominal segments strongly constricted . . . . . ***FRANKLINOTHRIPS*** (p. 71)

– Antennal III about three times as long as II or less 3

3 Antennal I with a median serrate lobe extending nearly to apex of II ; antennal segments all clearly separated from each other, bearing rings of microtrichia (Text-figs. 9–10) . . . . . ***CRANOTHRIPS*** (p. 53)

– Antennal I without a serrate prolongation ; antennal segments V to IX connate . 4

4 Metanotum strongly reticulate ; mesonotum usually with more than one pair of median setae. 5

– Metanotal sculpture arcuate, consisting of a series of parallel lines arched around anterior margin ; mesonotum with only one pair of median setae . . . 6

5 Pronotum with one pair of major setae at posterior angles ; sternite VII with median marginal setae about three times as long as accessory setae (Text-fig. 54) ; fore wings broad, scale with about twelve setae (Text-fig. 12) ***ANDREWARTHAIA*** gen. n. (p. 47)

– Pronotum without any long setae ; sternal marginal setae about twice as long as accessory setae or shorter ; fore wing scale with fewer setae . ***DESMOTHRIPS*** (p. 54)

6 Sensorium on antennal III short and broad, not curving around apex of segment (Text-fig. 14) ; sternal marginal setae not longer than accessory setae (Text-fig. 42) . . . . . ***LAMPROTHRIPS*** (p. 72)

– Sensorium on antennal III long and narrow, curving around apex of segment, with weak internal markings ; sternal marginal setae longer than accessory setae (Text-figs. 43 & 44) . . . . . ***ARCUTHRIPS*** gen. n. (p. 51)

DESCRIPTION OF GENERA AND SPECIES

AEOLOTHRIPS Haliday

Aeolothrips Haliday, 1836 : 451. Type-species : *Aeolothrips* (*Aeolothrips*) *albicinctus* Haliday by monotypy of nominate sub-genus.
Aeolothrips Haliday ; Bailey, 1951 : 43–80 ; Priesner, 1964 : 18–28.

This is a large genus, including about eighty species which are largely Holarctic in distribution. The sternal chaetotaxy is quite distinctive and the fore wings are usually banded. Antennal segments V to IX are connate, and, as VI is usually about as long as it is broad, these terminal antennal segments form a distinct compact unit. The sensoria on III and IV are usually short and broadly linear, that on IV curving slightly around the apex of the segment. The mesonotum has a single pair of median setae, and the males commonly have terminal claspers. Only one species has been recorded from Australia.

Aeolothrips fasciatus (Linnaeus)

(Text-figs. 26, 36 & 40)

Thrips fasciata Linnaeus, 1758 : 457.
Aeolothrips fasciatus (Linnaeus) ; Priesner, 1964 : 21.

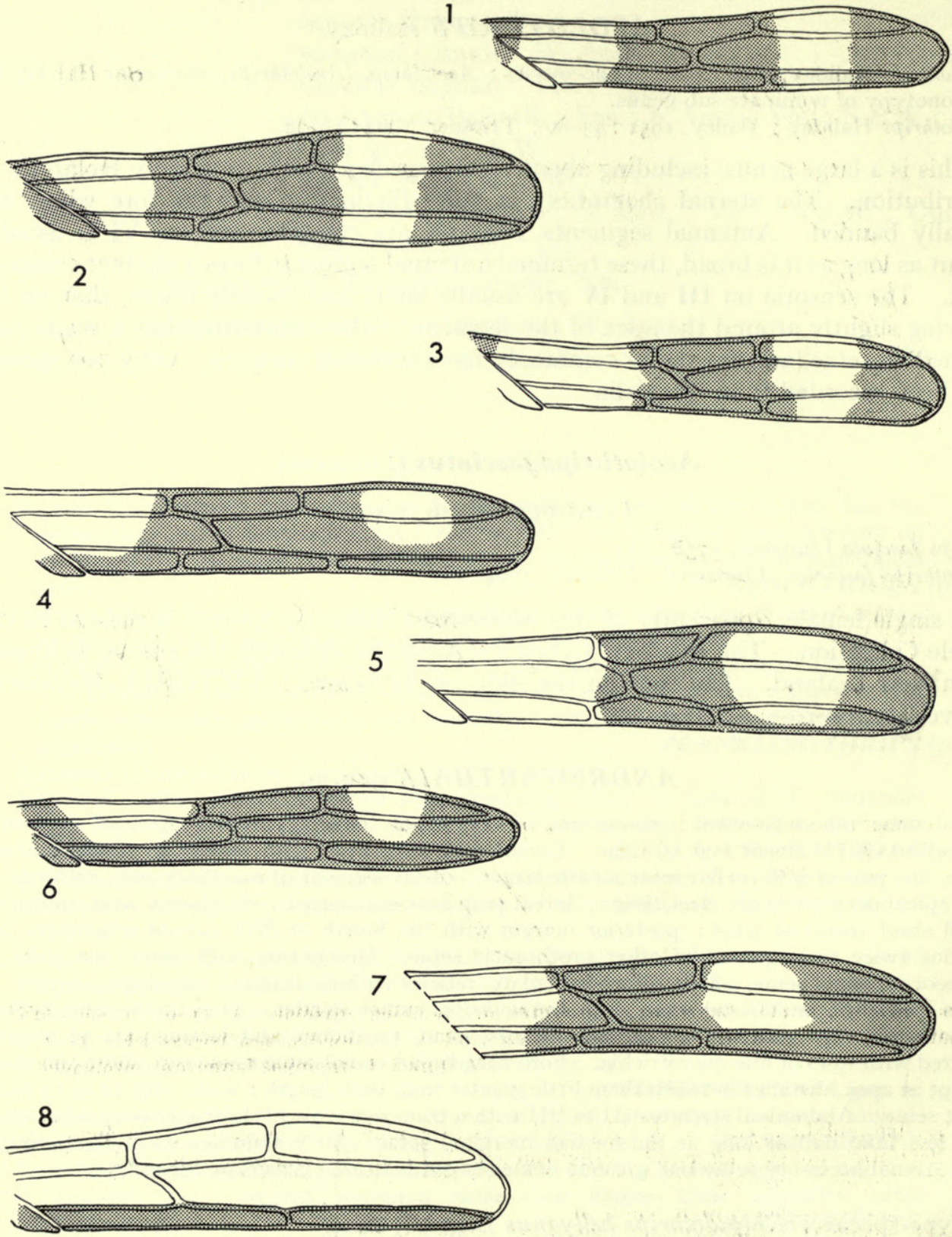
A single female, apparently of this widespread Holarctic species, is present in the Steele Collection. This is a new record for Australia although the species is known from New Zealand. The data on the slide are as follows : VICTORIA, Melbourne University, on rose, 31.iii.1934.

ANDREWARTHAIA gen. n.

Antennae nine-segmented ; sensorium on IV linear, curving around apex of segment ; sensorium on III linear and straight. Dorsal surface of head with numerous stout recurved setae, one pair of interocellar setae a little larger ; distal segment of maxillary palp with one or two apical divisions as in *Aeolothrips* ; labial palp four-segmented. Prothorax with numerous small stout recurved setae ; posterior margin with the fourth or fifth pair of setae from the midline twice as large as the other prothoracic setae. Mesonotum with about ten pairs of accessory median setae. Metanotum reticulate, reticles without internal markings ; a pair of pores medially ; metanotal setae as in *Desmothrips*, rather slender. Fore tarsus with typical Aeolothripid claw and tooth. Surface of legs, head, prothorax and lateral part of tergites covered with rows of fine microtrichia. Fore wing broad, venal setae numerous, short and stout except at apex, distance between them little greater than their length ; scale with 12 to 15 short stout setae. Abdominal sternites III to VII with a transverse row of short accessory setae, each seta less than half as long as the median marginal setae. Male abdomen as in *Desmothrips*, with sternal accessory setae but without sickle-shaped bristles, claspers or tubercles.

Type-species : *Rhipidothrips kellyanus* Bagnall, 1924.

The species included in the Holarctic genus *Rhipidothrips* have lenticular sensoria on the third and fourth antennal segments (Bailey, 1954). In *kellyana* (Bagnall) and *aurea* (Moulton) these sensoria are linear. These two species and the new one described below, are related to *Desmothrips* in having accessory mesonotal setae, a reticulate metanotum and sternal accessory setae. They can be distinguished



FIGS. 1–8. Shading of fore wings of Australian Aeolothripid species. 1, *Desmothrips australis*. 2, *D. steeleae*. 3, *D. tenuicornis*. 4, *D. bagnalli*. 5, *D. propinquus*. 6, *D. uniguttus*. 7, *D. propinquus*. 8, *Andrewarthaia kellyana*.

however by the presence of a pair of stout setae near the hind angles of the pronotum, and the greater length of the sternal marginal setae. The three known species, all Australian, lack the dark red internal body pigments of *Desmothrips* species and the cuticular colour is also much lighter. The genus is named in honour of the extensive studies on *Thrips imaginis* in South Australia by Professor H. G. Andrewartha and his colleagues.

Key to Species

1 Wings uniformly shaded ; antennal III largely brown, antennals IV to IX dark brown ***minor*** sp. n. (p. 51)
– Wings largely pale ; antennal III yellow basally, antennals IV to IX blackish brown . 2
2 Fore wings with posterior border shaded . . . . . ***kellyana*** (p. 49)
– Fore wings without any shading at posterior margin . . . . ***aurea*** (p. 49)

Andrewarthaia aurea (Moulton) **comb. n.**

Rhipidothrips aureus Moulton, 1935 : 98.

The following notes are based on the holotype and three paratypes mounted on one slide from the Moulton Collection. The species is very similar to *kellyana* in its chaetotaxy and sculpture, and the only distinguishing character appears to be the absence of shading along the hind border on the membrane of the fore wing. The type specimens are probably not fully mature but the fore wing ring vein is quite dark. Even in teneral females of *kellyana*, in which the ring vein is not fully pigmented and the body quite pale, the posterior border of the fore wing is distinctly shaded.

The golden yellow colour of *aurea* is due to the body contents, and in addition the hypodermal pigment consists of numerous small orange-red globules. The abdominal tergites and sternites are shaded grey, and the tip of the abdomen, the mouth parts, and the base of the head are darker brown.

Measurements (in μ). Antennals III–IX ; 130 ; 107 ; 68 ; 49 ; 42 ; 10 ; 16. Fore wing length/breadth : 1,000/180. Hind tibia : 320.

Material examined. Holotype ♀. Western Australia : Northam, on blossom of native tree, 11.iv.1932, (Moulton No. 5088) (Cal. A. Sci.).

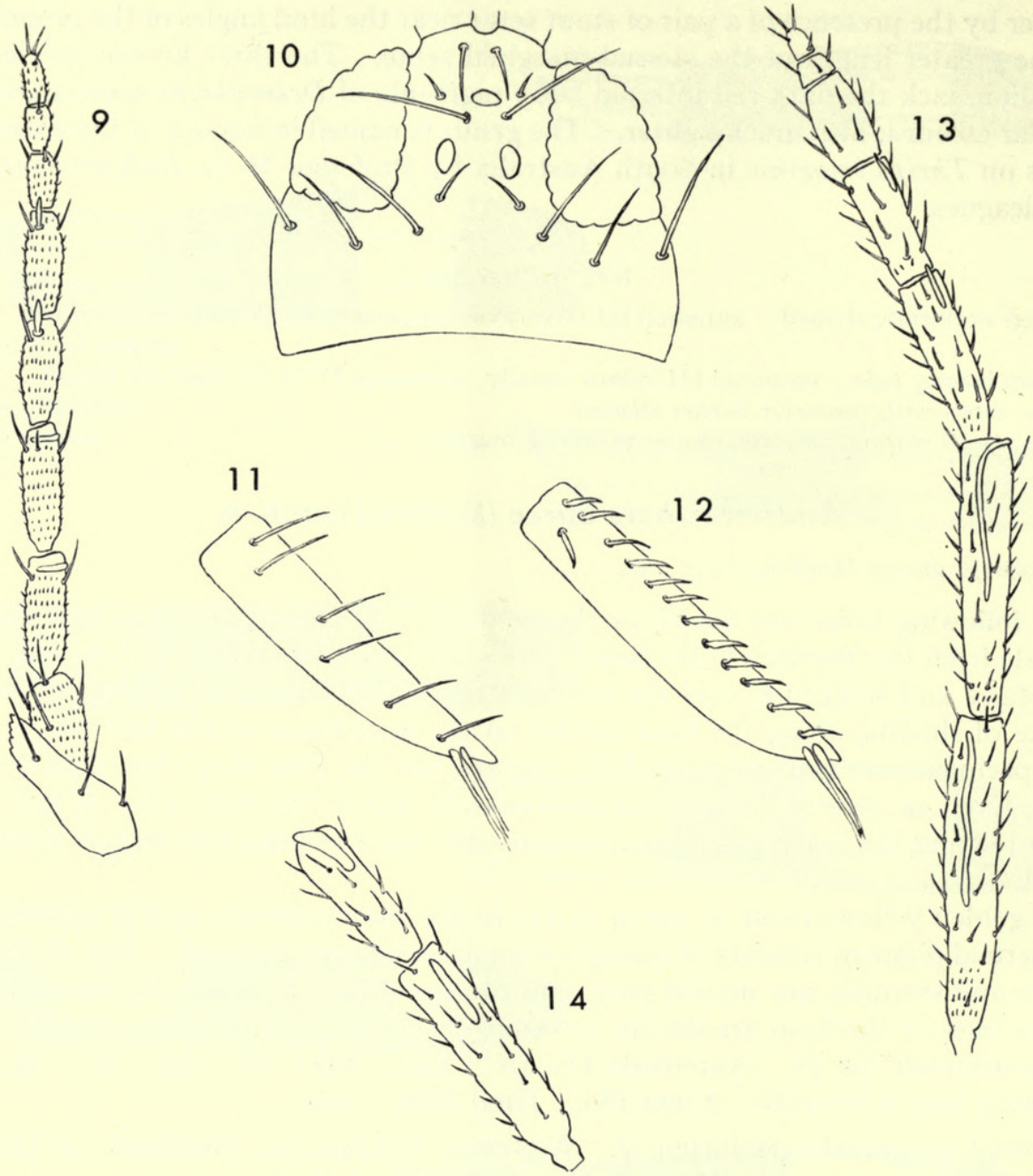
Paratypes. 3 ♀ with data as for holotype.

Andrewarthaia kellyana (Bagnall) **comb. n.**

(Text-figs. 8, 12, 13, 35 & 54)

Rhipidothrips kellyanus Bagnall, 1924*a* : 584–585.
Aeolothrips hyalinipennis Girault, 1930 : 1, **syn. n.**

Bagnall described this species from the fragmented remains of two females, which did not include the hind wings nor the prothoracic and mesothoracic legs. The more complete specimen is here designated as the LECTOTYPE, but for the following redescription a long series of females from New South Wales with one male has been examined. Most of these specimens were collected on *Eucalyptus*, but Girault collected the specimens on which he based *hyalinipennis* from the window of a house.



FIGS. 9–14. 9–11, *Cranothrips poultoni*. 9, Antenna. 10, Head. 11, Fore wing scale. 12–13, *Andrewarthaia kellyana*. 12, Fore wing scale. 13, Antenna. 14, *Lamprothrips maculosus*, antennal segments III and IV.

♀. Length 1·7 to 2·5 mm. Colour greyish yellow with dark setae ; abdominal segments IX and X dark brown, tergites III to VIII dark medially. Antennal I yellow with dark apex ; II dark medially but yellow laterally ; III yellow in basal third ; antennae otherwise blackish brown. Fore wing pale, area between second vein and hind margin shaded ; ring vein dark except basally in costal region (Text-fig. 8). Sensorium on antennal III linear, straight ; sensorium on IV linear, curving around distal margin of segment ; segments V to IX connate (Text-fig. 13). Head with numerous setae between and behind eyes ; one pair of interocellar setae stouter than the rest. Pronotal setae very numerous, about 20 along fore margin, small but stout and dark ; hind margin with about seven pairs, the fourth pair from the midline twice as large as the rest. Mesonotum with about ten pairs of accessory median setae (Text-fig. 35). Metanotum reticulate, reticles without internal markings, with two pairs of setae much finer

than the mesonotal setae. Fore wing costal setae small; scale with about twelve setae (Text-fig. 12). Abdominal sternite VII with median pair of accessory setae just lateral to median marginal setae; sternites V and VI with almost complete row of accessory setae (Text-fig. 54).

Measurements (in μ)

	Antennal segments							Fore wing		Hind
	III	IV	V	VI	VII	VIII	IX	Length	Breadth	tibia
Lectotype ♀	145	130	78	57	44	14	14	1250	240	380
Small ♀	119	112	71	52	39	10	16	1000	190	320

Material examined. LECTOTYPE ♀. SOUTH AUSTRALIA: Mount Lofty Ranges, *Eucalyptus leucoxylon*, 22.iv.1923 (*R. Kelly*) (BMNH).

Paratype. 1 ♀, with similar data to lectotype.

NEW SOUTH WALES: Parkes, *Eucalyptus albens*, 5 ♀, 5.viii.1959 (*E. M. Reed*); Carrathool, *Eucalyptus longiflorens*, 4 ♀, 1 ♂, 12.ix.1959 (*E. M. Reed*); Leeton, *Eucalyptus melliodora*, 4 ♀, 19.ix.1959 (*E. M. Reed*); Ashford, *Eucalyptus melliodora*, 1 ♀, 21.x.1960 (*E. M. Reed*); Dubbo, *Eucalyptus sideroxylon*, 8 ♀, 3.viii.1959 (*E. M. Reed*); Cowra, *Eucalyptus* sp., 6 ♀, 1959 (*M. Casimir*); Hillston, no host, 6 ♀, 22.ix.1959 (*E. M. Reed*) (ANIC). QUEENSLAND: Gatton, no host, 1 ♀, 16.x.1932 (UQ); 3 ♀ syntypes of *Aeolothrips hyalinipennis*, Indooroopilly (Brisbane), on window, xii.1929 and 22.ix.1929 (Brisbane Museum T6525).

Andrewarthaia minor sp. n.

♀. Length about 1·7 mm. Colour medium brown, abdominal segments II to VII and extreme base of antennal III a little paler; wings uniformly fuscous. Body sculpture and chaetotaxy apparently not differing from small examples of *kellyana*.

Measurements (in μ)

	Antennal segments							Fore wing		Hind
	III	IV	V	VI	VII	VIII	IX	Length	Breadth	tibia
Holotype ♀	87	68	52	35	29	13	16	900	160	270

Material examined. Holotype ♀. NEW SOUTH WALES: Hillston, no host, 22.ix.1959 (*E. M. Reed*) (ANIC).

ARCUTHRIPS gen. n.

Antennae nine-segmented, segments V–IX connate; sensorium on III straight, long and narrow; sensorium on IV recurved in a broad U-shape around apex; both these sensoria with weak internal markings. Dorsal surface of head with two irregular rows of setae behind eyes; interocellar and postocellar setae a little stouter than postoculars; maxillary palps three-segmented, i.e. one small apical division. Pronotum without major setae; posterior margin with median pair of setae at least three times as far from each other as from the submedians. Mesonotal sculpture arcuate around anterior midpoint of sclerite (Text-fig. 39); posterior setae weak. Fore tarsus with stout claw. Fore wings fasciate. Abdominal sternites III–VII with accessory setae laterally; marginal setae twice as long as accessory setae or longer.

Type-species : *Desmothrips monrosi* De Santis.

Three species are included in this new genus, two from South America, *Desmothrips monrosi* De Santis, 1959 and *D. topali* Pelikan, 1964, and one from Australia and India, *Rhipidothrips cinctus* Hood, 1918. The metanotal sculpture of these species resembles that found in *Lamprothrips* but the antennal sensoria and abdominal chaetotaxy are quite different. Unfortunately neither of the two original females of *cinctus* have been examined during the present study. The species is known to the present author only from three females provisionally determined as this species by Miss Kellie O'Neill of the U.S.D.A., Washington, after comparison with the holotype. Miss O'Neill indicated that the three specimens could be interpreted as three different species as they differ in both size and colour, but such action would not be justified without further material from Queensland.

KEY TO SPECIES.

1 Median pair of posteromarginal setae on sternite VII closer to each other than to the submedians (Text-fig. 43) . . . . . ***cinctus*** (p. 52)

– Median posteromarginal setae on sternite VII nearer to submedian setae than to each other (Text-fig. 44) 2

2 Antennal IV about 0·8 as long as III ; sensoria on III and IV about 0·75 the length of the segments . . . . . ***monrosi*** (p. 52)

– Antennal IV almost equal in length to III ; sensorium on III about 0·55, on IV about 0·7 the length of the segment . . . . . ***topali*** (p. 52)

The holotype of *monrosi* was kindly loaned by Professor Luis de Santis, La Plata University, Argentina, and paratype males and females of *topali* were loaned by Dr. J. Pelikan of the Czechoslovak Academy of Science.

Arcuthrips cinctus (Hood) **comb. n.**

(Text-fig. 43)

Rhipidothrips cinctus Hood, 1918 : 121–122.

This species was based on two females collected by A. Girault at Cooktown, Queensland, on the 4th and 24th February, 1912. As indicated above, there is a possibility that the two Australian specimens on which the following notes are based are not conspecific with the holotype of *cinctus*, and the redescription is therefore limited to characters visible in both preparations.

♀. Length 1·3 to 1·6 mm. Colour brown ; abdominal segments IV and V, and antennals III and IV yellow (in the smaller specimen antennal IV is shaded brown and II is pale). Antennae with nine segments ; sensoria on III and IV linear, not quite straight, curving around apex of segments, with internal markings similar to *D. bagnalli* (Text-fig. 23). Head with two irregular rows of setae behind eyes ; setae between and behind ocelli a little stouter than those behind eyes ; transverse lines of sculpture on vertex bear numerous microtrichia ; maxillary palps three-segmented. Pronotum without major setae ; mesonotum with one pair of median setae ; metanotal sculpture arcuate around anterior midpoint but with a few broader reticulations at posterior. Fore tarsi with a stout tooth. Fore wings dark in apical eighth and median third (wings missing in dark specimen). Abdominal sternite VII with five pairs of long postero-marginal setae, the median pair closer to each other than to the submedian ; about five pairs of

accessory setae on VII, much shorter than the marginal setae ; accessory setae also present laterally on sternites III to VI (Text-fig. 43).

Measurements (in μ)

	Antennal segments							Hind	Fore
	III	IV	V	VI	VII	VIII	IX	tibia	wing
Holotype ♀ (Hood, 1918) .	83	72	45	31	33	20	15	?	830
Pale ♀	80	74	45	35	33	26	16	240	830
Dark ♀	117	105	65	55	42	29	19	300	?

Material examined. QUEENSLAND : Halifax, sweeping along roadside, 1 ♀ (dark specimen), 4.iii.1913 (*A. Girault*) ; Nelson, sweeping in forest, 1 ♀ (pale specimen), 10.iv.1914 (*A. Girault*). USNM.

INDIA : Secunderabad, on grass, 1 ♀, 3.viii.1964 (*T. N. Ananthakrishnan* 176) (USNM).

CRANOTHRIPS Bagnall

Cranothrips Bagnall, 1915 : 315–316. Type-species : *C. poultoni* Bagnall, 1915, by monotypy.

Antennae nine-segmented, all segments distinctly separate ; segments III to IX with rings of microtrichia as in *Orothrips*, major setae restricted to apex of segments ; sensoria on III and IV short, parallel to apical border of segment ; antennal I produced at inner margin into serrate lobe almost reaching apex of II. Head without interantennal projection, with three pairs of ocellar setae and four pairs of postoculars ; maxillary palps three-segmented. Pronotal setae long, two pairs of postero-angulars, five pairs along hind margin, and one medial pair just within the hind margin. Mesonotum with one pair of long median setae. Fore tarsi without the claw found in many Aeolothripidae. Wings broad, narrowed to apex ; venal and scale setae long (fig. 11). Abdominal tergite VIII with two pairs of long setae submedially close to posterior margin ; sternites with accessory setae ; ♂ abdomen without appendages.

This genus is very close to *Ankothrips*, from which it can be separated by the presence of a serrate lobe on antennal I, whereas *Ankothrips* species have a similar lobe on antennal II. In view of the variation in length of this lobe in the South African species *Cranothrips karrooensis* Jacot-Guillarmod, 1937 it is possible that these two genera are not truly distinct. There are three species included in *Cranothrips*, two Australian and one South African, and these may be separated as follows.

1 Sternite VII with the two pairs of submedian marginal setae much shorter than the median marginals ; tergite VIII with the median setae further from the hind margin than the median pori ; wings weakly shaded ; process on antennal I sometimes not developed . . . . . ***karrooensis*** (p. 53)

– Sternite VII with the submedian marginal setae as long as the median marginals ; tergite VIII with the median setae closer to the hind margin than the pori . . 2

2 Fore wing with dark and light transverse bands ; pronotum with submedian pair of anteromarginal setae twice as long as median pair ; metanotal sculpture arcuate around anterior midpoint . . . . . ***poultoni*** (p. 54)

– Fore wing uniformly fuscous ; anterior margin of pronotum without any longer setae ; metanotal sculpture arcuate around posterior margin . . . ***emersoni*** (p. 54)

Cranothrips emersoni Girault

Cranothrips emersoni Girault, 1929 : 1.

Girault described this species as follows : " From genotype : all black, wings grey, bristles on costa only 29 ; antennal appendage pale, apex obliquely truncate, serrate."

The only known specimens are the two syntype females.

♀. Length 1·3 to 1·4 mm. Colour uniform mid-brown, scale of antennal I paler ; wings uniformly fuscous ; hypodermal pigment light red ; head and antennae very similar to *poultoni* (fig. 10). Pronotum with two pairs of postero-angular setae (75 μ) ; five pairs of postero-marginal setae, the submedian longest (55 μ), the lateral three pairs small (25 μ) ; midlateral and antero-angular setae rather longer than remaining pronotal setae. Metanotum with weak sculpture arcuate around posterior. Wing chaetotaxy similar to *poultoni*, fore wing 85 μ long. Tergites and sternites with rows of microtrichia laterally ; median setae of tergite VIII 35 μ long ; sternites III to VI with complete transverse row of accessory setae.

Syntypes, 2 ♀. QUEENSLAND: Sunnybank (Brisbane), *Boronia*, forest, 14.viii.1929 (Brisbane Museum T6523 & T6524).

Cranothrips poultoni Bagnall

(Text-figs. 9, 10, 11 & 41)

Cranothrips poultoni Bagnall, 1915 : 316.

♀. Length 1·6 to 1·7 mm. Colour mid-brown, setae dark ; tarsi paler, scale of antennal I yellow. Antennae and head as in generic description (Text-figs. 9 & 10). Pronotal postero-angular setae 85–90 μ long ; submedian posteromarginal setae 70 μ long ; submedian antero-marginal setae 55 μ long ; midlateral and antero-angular setae elongate, and at least one pair of major setae on pronotal disc. Mesonotum with a pair of pores at anterior, one pair of median setae (65 μ). Metanotal sculpture arcuate around anterior midpoint, similar to *Lamprothrips* ; posterior setae minute. Fore wing with first and third quarters pale ; costa dark around distal pale band. Fore wing 95 μ long, maximum breadth 16 μ ; posteromarginal cilia straight (cf. wavy in original description). Abdominal tergites and sternites with rows of microtrichia laterally ; median setae of tergite VIII 70 μ long ; sternite VII with six pairs of posteromarginal setae, three pairs of accessory setae laterally ; sternites III to VI with four pairs of marginal setae, about nine pairs of accessory setae in a continuous transverse row (Text-fig. 41).

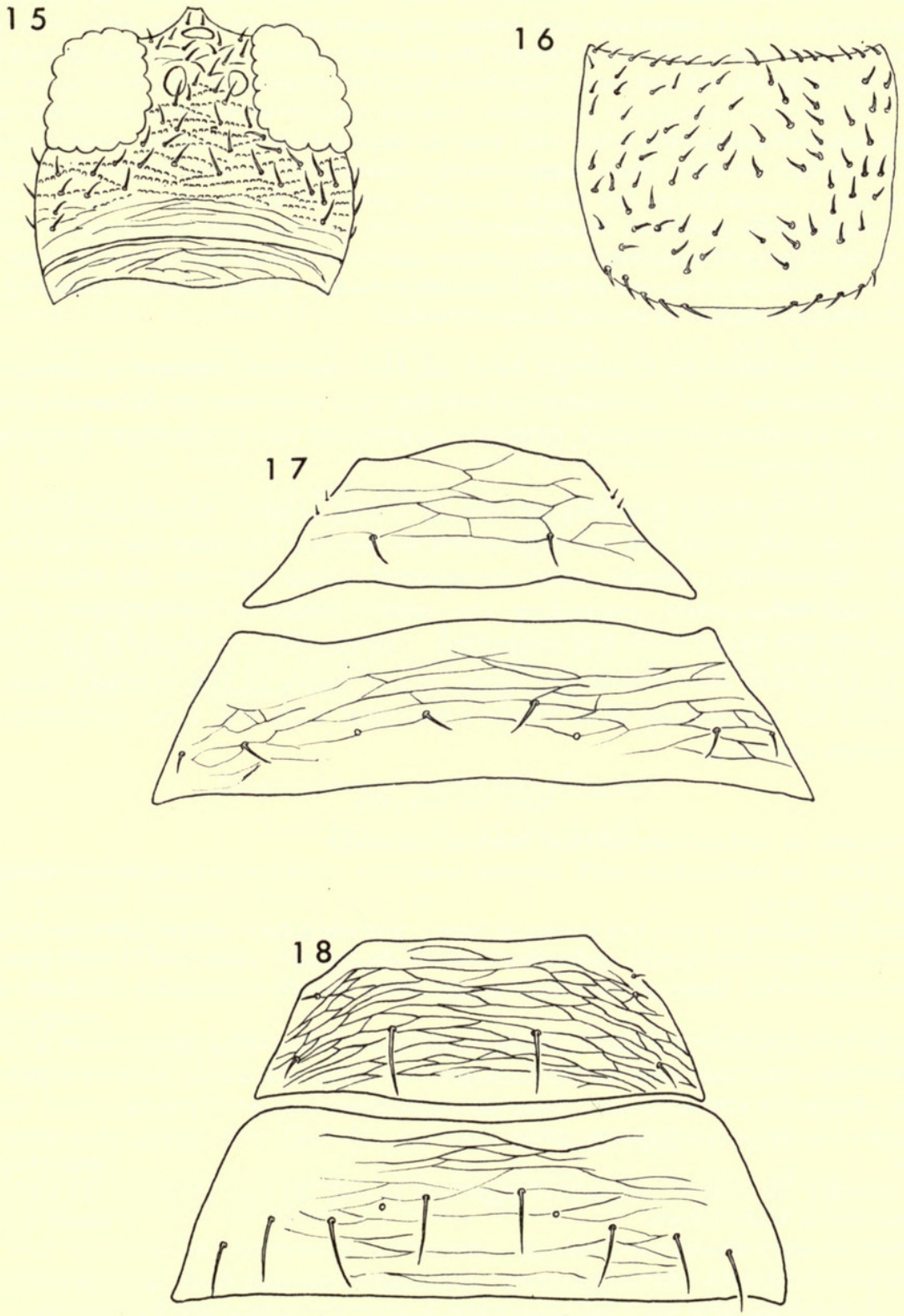
♂. Length 1·1 mm. Colour paler than female. Abdomen without tubercles or sickle shaped bristles ; sternites III to VIII with six to eight pairs of setae not clearly distributed on margin or submargin.

LECTOTYPE ♀. WESTERN AUSTRALIA : nr. Freemantle, on flowers, viii.1914 (*E. B. Poulton* no. 17) (BMNH).

The specimen here designated as lectotype was marked " Type " by the original author, although not mentioned as such in his description. There are one female and two males bearing the same data as the type in the British Museum (Natural History).

DESMOTHRIPS Hood

Desmothrips Hood, 1915 : 57. Type-species, *Orothrips australis* Bagnall, 1914, by monotypy.
Archaeolothrips Bagnall, 1924*b* : 627. Type-species, *A. fontis* Bagnall, 1924, by monotypy.
Desmothrips Hood ; Bagnall & Kelly, 1928 : 204.
Desmothrips Hood ; Steele, 1940 : 353–354.



FIGS. 15–18. 15–17, *Desmothrips steeleae*. 15, Head. 16, Pronotum. 17, Abdominal tergites I and II. 18, *D. reedi*, abdominal tergites I and II.

Vespiform appearance similar to *Aeolothrips*. Antennae nine-segmented ; V–IX connate but not forming so distinct a club as in *Aeolothrips* ; sensoria on III and IV elongate, linear, occasionally sinuate, curving around distal extremity of segment (Text-figs. 19–22). Numerous small setae between and behind eyes on dorsal surface of head (Text-fig. 15) ; mouth cone long, reaching almost to base of prothorax. Distal (second) segment of maxillary palps divided into six in female but sometimes only into two in male. Labial palps three- or four-segmented. Pronotum without major setae but with numerous small setae (Text-fig. 16). Fore tarsi with stout recurved claw and spine. Mesonotum usually with accessory median setae in addition to the usual pair of major median setae, without a pair of pores at the anterior apex (Text-figs. 27 & 28). Metanotum completely reticulate, reticles usually with pronounced internal markings ; two pairs of metanotal setae, one pair at anterior rather widely spaced, one pair at posterior (Text-figs. 27–34). Fore wings usually fasciate (Text-figs. 1–7), not strongly constricted at base ; costal fringe not much enlarged, posterior fringe cilia straight. Abdominal sternites of female with accessory setae laterally and frequently medially as well. Sternite VII with five or more pairs of marginal setae (except *mendozai*) (Text-figs. 45–53). Male abdomen without dorsal tubercles, claspers or the sickle shaped setae found in some *Aeolothrips* species, but with a variable number of sternal accessory setae.

The species included in *Orothrips* have all the antennal segments clearly distinct from each other as in *Cranothrips* (Text-fig. 9), whereas in *Desmothrips* species segments five to nine are connate, broadly articulated one to another, forming a more or less distinct club.

The genus *Desmothrips* was last revised by Steele (1940), who established that the characters originally used for the separation of the species were too variable to be of value by themselves. Steele only recognized three species as valid, *australis*, *davidsoni* and *tenuicornis*, regarding the other forms as synonyms of *australis*. Unfortunately the types were not examined. In the present study it has been found possible to establish new characters upon which many of the original taxa may be distinguished by comparing Miss Steele's material with the type specimens as well as much other material.

Key to Species

1 Reticulations on metanotum without internal markings 2
– Reticulations on metanotum with internal sculpture of either lines, dots or wrinkles (Text-figs. 29–33) 3
2 Antennal III yellow at apex but brown at base ; fore wing dark with a pale area on the anterior margin sub-basally and subapically (Text-fig. 6) ; sternite VII with 5 pairs of marginal setae, these are not much longer than the accessory setae (Text-fig. 53) ***uniguttus*** (p. 71)
– Antennal III brown, a little paler at base than apex ; fore wing shaded with a sub-basal diffuse pale area near the hind margin ; sternite VII with 3 pairs of marginal setae, these are about twice as long as the accessory setae (Text-fig. 47) ; male sternite IX without accessory setae, sternites III–VIII with about 10 accessory setae . . . . . ***mendozai*** (p. 62)
3 Body strongly bicoloured, abdominal segments II and III and antennal III yellow, remainder of body brown . . . . . ***reedi*** sp. n. (p. 66)
– Body not strongly bicoloured although antennal III sometimes yellow . . . 4
4 Metanotal reticles with only a few linear markings (Text-figs. 32 & 33) ; sternites V and VI of female with less than three pairs of accessory setae, usually only one . 5
– Metanotal reticles with numerous small wrinkles or dots (Text-figs. 29–31) ; sternites V and VI of female with three or more pairs of accessory setae, although these are sometimes placed laterally 6

5 Sensoria on III and IV vermiform (Text-fig. 22) ; distal pale area of fore wing continuous across wing, almost parallel-sided, with marginal veins much paler than around dark areas (Text-fig. 2) ; male sternite IX usually without accessory setae, sternites VII and VIII with 6 to 10 accessory setae in an irregular transverse row ***steeleae*** sp. n. (p. 66)

– Sensoria on III and IV linear, scarcely wavy ; distal pale area not continuous across fore wing, costal vein dark in region of pale area ; male unknown . . ***obsoletus*** (p. 63)

6 Costal vein as dark around distal pale area of fore wing as around the dark areas ; distal pale area much wider at costal margin than at posterior margin of fore wing, or not reaching posterior margin at all 7

– Costal vein much paler around distal pale area of fore wing than around dark areas, usually not shaded at all ; distal pale area continuous across wing, almost parallel-sided 8

7 Sensoria on antennals III and IV with internal discoid markings (Text-fig. 23) ; antennal III dark in apical half or more ; distal pale area of fore wing reduced to a spot between anterior margin and second vein (Text-fig. 4) ; male sternite IX with 4 accessory setae, sternites VII and VIII with 1 or 2 pairs placed laterally ***bagnalli*** (p. 60)

– Antennal sensoria without internal markings ; antennal III dark only at extreme apex in female but in apical third or more in male ; distal pale area of fore wing variable, sometimes as in *bagnalli* but commonly extending to or almost to hind margin of wing, in this case much wider at anterior than posterior margin (Text-figs. 5 & 7) ; male sternite IX with 2 to 4 pairs of accessory setae, sternite VIII with 2 to 3 pairs, sternite VII with 3 to 4 pairs . . . ***propinquus*** (p. 65)

8 Antennal III clear yellow, rarely shaded at extreme apex ; distal pale area of fore wing longer than wing breadth ; antennal IX two-thirds as long as VIII or shorter ; male sternite IX with 3 or 4 pairs of accessory setae, sternites III to VIII with almost complete row of accessory setae . . . . . ***tenuicornis*** (p. 68)

– Antennal III dark in apical third or half ; distal pale area of fore wing shorter than wing breadth ; male sternite IX with about 6 pairs of accessory setae, sternites VII and VIII with two transverse rows of accessory setae . . . ***australis*** (p. 57)

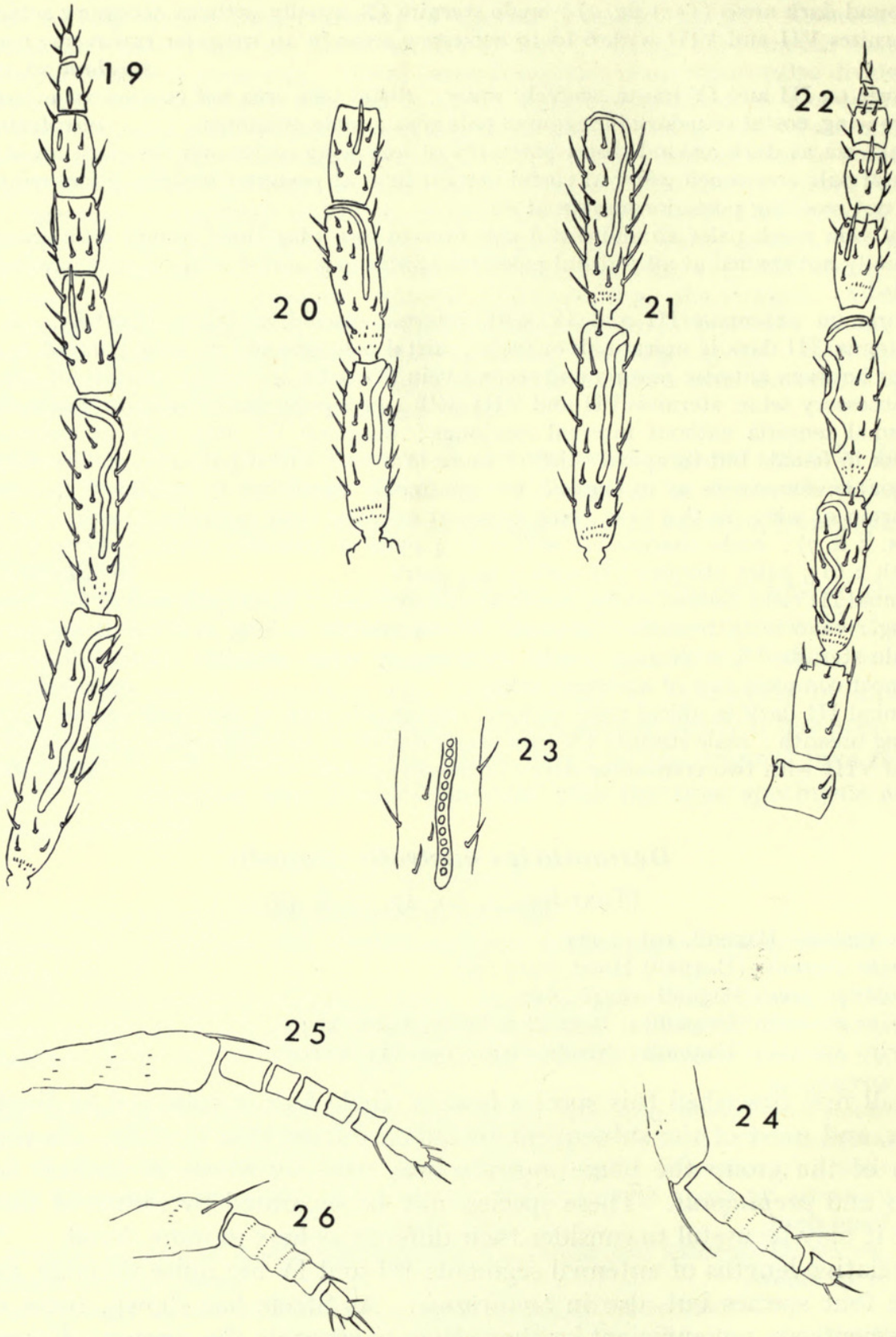
Desmothrips australis (Bagnall)

(Text-figs. 1, 20, 27, 29 & 45)

Orothrips australis Bagnall, 1914 : 287.
Desmothrips australis (Bagnall) Hood, 1915 : 57.
Archaeolothrips fontis Bagnall, 1924*b* : 627.
Desmothrips australis (Bagnall) ; Bagnall & Kelly, 1928 : 204.
Desmothrips australis (Bagnall) ; Steele, 1940 : 353–354 (in part).

Bagnall first described this species from a single female collected at Healesville, Victoria, and most of the subsequent records are from that locality. In the latest revision of the group the name *australis* was used by Steele to include *bagnalli*, *obsoletus* and *propinquus*. These species may be separated by means of the above key but it may be useful to consider their differences here in more detail.

The relative lengths of antennal segments III and IV are quite variable, not only in these four species but also in *tenuicornis*. As Steele has shown, these relative measurements are not sufficient by themselves to separate the species. For example the ratio, antennal III/antennal IV, is 1·17 for the right and 1·31 for the left antenna in the type specimen of *australis*. The extent of the brown shading on the apex of the third antennal segment is variable in both *bagnalli* and *australis*, in both of which



FIGS. 19–26. 19–23, Antennae of *Desmothrips* species. 19, *D. tenuicornis*. 20, *D. australis*. 21, *D. reedi*. 22, *D. steeleae*. 23, *D. bagnalli*, sensorium on antennal III. 24–26, Maxillary palps. 24, *D. steeleae*, ♂. 25, *D. steeleae*, ♀. 26, *Aeolothrips fasciatus*.

species the apical half or apical third is brown, but in *propinquus* this shading is restricted fairly constantly to the extreme apex. On the other hand the extent of the distal pale area on the fore wing is highly variable in *propinquus* but is quite constant in *australis*. In *propinquus* the costal vein around the distal pale area is dark, and the pale area may barely reach the second vein or may extend fully to the hind margin. In *australis* the costal vein is not dark at the distal pale area, and this pale area is parallel-sided, extending fully across the wing. The wing colour of *bagnalli* is very like an extreme form of *propinquus*, with the pale area restricted anterior to the second vein, but this species is easily recognized by the beaded antennal sensoria. The fourth species mentioned above, *obsoletus*, can be recognized from the metathoracic sculpture as belonging in a very different section of the genus. Figure " A " in the paper by Steele is here considered to represent the wing of *australis* Bagnall.

Archaeolothrips fontis was described by Bagnall from a single male which was later recognized by Bagnall and Kelly as the male of *Desmothrips australis*. This specimen was collected with two females of *tenuicornis*, but comparison with the known male of that species and one other male specimen of *australis* makes its identity clear. Pigmentation is very similar to the female, and the seventh, eighth, and ninth abdominal sternites have two irregular transverse rows of accessory setae.

♀. Length 1·4–1·8 mm. Colour dark brown ; antennal III yellow in basal half or two-thirds ; distal pale area of fore wing usually parallel-sided, extending right across wing, marginal veins pale around this area. Sensoria on antennals III and IV linear, almost straight, two-thirds the length of these segments, usually without internal markings (Text-fig. 20). Sensoria on antennals V and VI less than half the length of these segments. Mesonotum with two or three pairs of accessory median setae. Metanotum reticulate, reticles completely filled with fine wrinkles (Text-figs. 27 & 29). Sternite VII with median pair of accessory setae usually just lateral to the submedian pair of marginals (Text-fig. 45).

♂. Length 1·3 mm. Colour similar to female but median abdominal segments paler. Head and thorax as in female, distal maxillary palp segment with one small apical subdivision. Sternites III to IX with accessory setae, VIII with about 8 pairs in two transverse rows.

Measurements (in μ)

	Antennal segments							Fore wing		Hind	Tergite IX			Tergite X	
	III	IV	V	VI	VII	VIII	IX	L	B	tibia	B_1	B_2	B_3	B_1	B_2
Holotype ♀	89	68	44	28	19	14	14	830	130	250	130	?	?	140	?
♀ (RK 150)	82	77	47	26	21	14	14	850	140	260	130	135	130	135	150
♀ (RK 147)	94	73	47	28	26	14	14	910	150	270	130	150	130	145	150
♂ (*fontis*)	74	61	42	26	16	14	14	730	110	240	45	45	115	?	115

Material examined. Holotype ♀. VICTORIA : Healesville, *Xanthorrhoea australis* flowers, 12.x.1913 (*A. E. Shaw*) (BMNH).

VICTORIA : Box Hill, on roses, 7 ♀, 3.xi.1927 (*R. Kelly* n.s. 37) (BMNH & VM) ; Box Hill, no host, 9 ♀, x.1928 (*R. Kelly* n.s. 147) (BMNH & Cal. A. Sci.) ; Box Hill, " general ", 2 ♀, 21.x.1928 (*R. Kelly* n.s. 149) (BMNH & USNM) ; Box Hill, " general ", 1 ♀, xi.1928 (*R. Kelly* n.s. 150) (BMNH) ; Box Hill, " general ", 1 ♀, 15.xi.1928 (*R. Kelly* n.s. 151) (BMNH) ; Kalorama, *Prunella vulgaris*, 2 ♀, 9.ii.1933

(*H. V. Steele*) (HVS Coll.); Healesville, *Erythraea australis*, 1 ♂ (holotype of *A. fontis*), 21.xii.1913 (*A. E. Shaw* & *R. Kelly*) (BMNH); Box Hill, on rose, 1 ♂, 3.xi.1927 (*R. Kelly* n.s. 37) (BMNH). NEW SOUTH WALES: Brooklyn, sweeping forest lowland, 1 ♀, 9.xi.1914 (*A. Girault*) (USNM). WESTERN AUSTRALIA: Northam, blossom of native tree, 1 ♀, 11.iv.1932 (Cal. A. Sci); Perth, Michaelmas Daisy, 1 ♀, 5.iv.1932 (*L. J. Newman*); Perth, Dahlia, 1 ♀, 5.iv.1932 (*L. J. Newman*); Perth, flowers, 1 ♀, 6.iv.1932 (*W. Read*); Perth, flowers, 1 ♀, 14.iv.1932 (*B. A. O'Connor*); Mundaring, Gum blossom, 1 ♀, v.1932 (*B. A. O'Connor*); Spearwood, *Acacia*, 1 ♀, 31.viii.1932 (BMNH).

Desmothrips bagnalli Karny **sp. rev.**

(Text-figs. 4, 23 & 46)

Desmothrips bagnalli Karny, 1920 : 36.
Desmothrips bagnalli Karny; Karny, 1924 : 7–11.
Orothrips unguttipennis Girault, 1926*a*; Girault, 1926*b*.
Desmothrips comparabilis Priesner, 1928 : 643–645.
Desmothrips australis; Steele, 1940 nec Bagnall, 1914 (in part).

The type specimen of *unguttipennis* Girault has been re-examined during the present study and compared with the holotype of *bagnalli*. As Girault (1926*b*) pointed out, his species is to be regarded as a synonym of Karny's. Kelly & Mayne (1934 : 13) indicated that *comparabilis* was the male of *bagnalli*, and through the courtesy of Dr. Priesner the present author has been able to examine the unique holotype and confirm this synonymy. No other species of *Desmothrips* are known to have the distinct discoid markings in the sensoria of antennals III and IV.

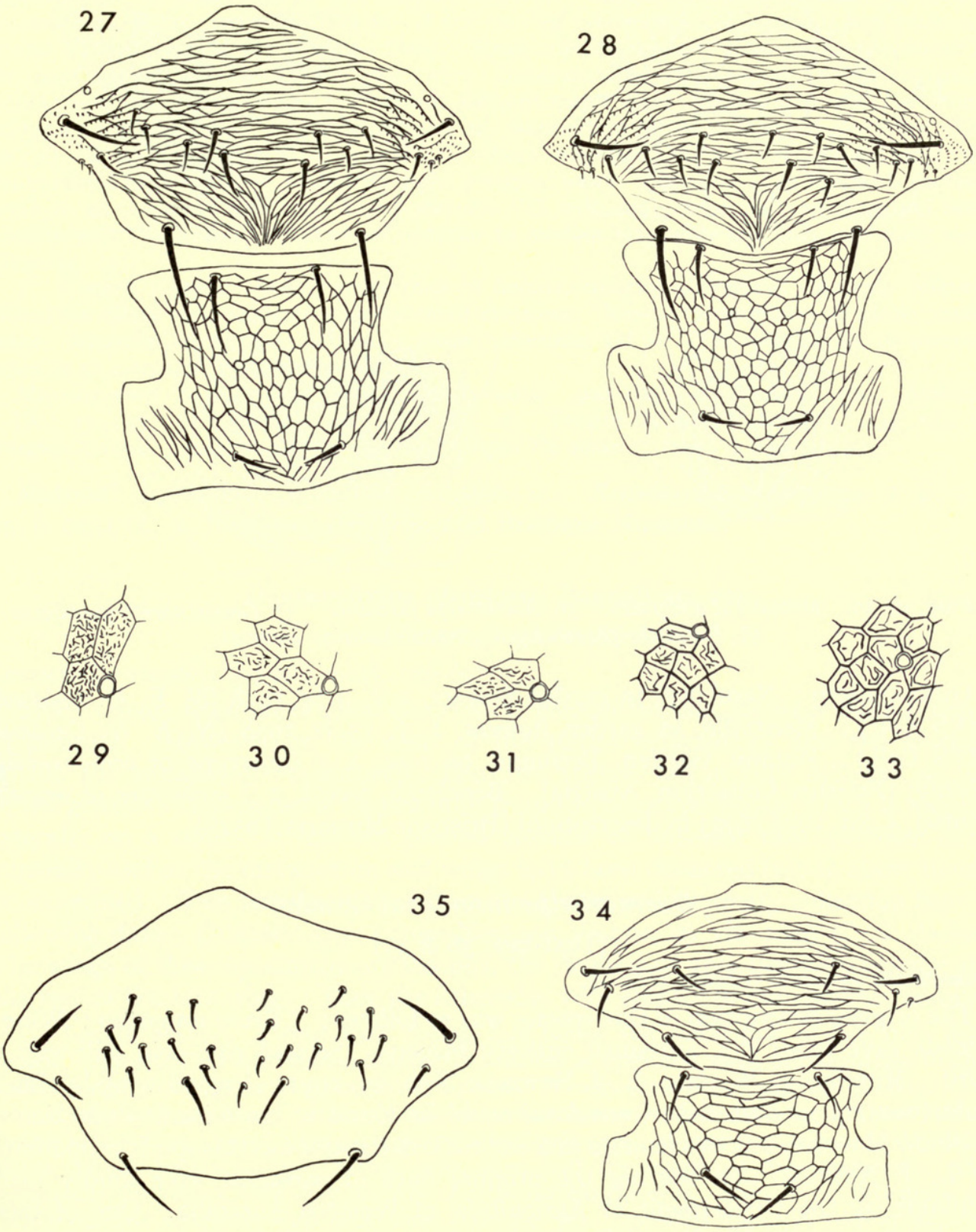
The figure labelled "F" in Steele (1940) of a specimen collected at Montville, Queensland, and considered by her to represent a form of *australis*, is here considered to refer to *bagnalli*. This specimen is a male, but a female was collected in the same month from Nambour, a town about five miles distant from the Montville locality. These two localities are within one hundred miles of the type locality, Mount Tambourine, near Brisbane.

♀. Length about 1·7 mm. Colour dark brown, fore tarsi and apex of fore tibiae paler. Antennal III yellow in basal half or two-thirds. Distal pale area of fore wing restricted anterior to second vein, costal vein dark in this region (Text-fig. 4). Sensoria on antennals III and IV weakly sinuate, with internal discoid markings (Text-fig. 23), rather more than three-quarters of the length of these segments. Sensoria on V and VI about half the length of the segments. Mesonotum with two pairs of accessory median setae; metanotum reticulate, very similar to *australis*. Accessory setae absent medially on sternites V, VI and VII (Text-fig. 46).

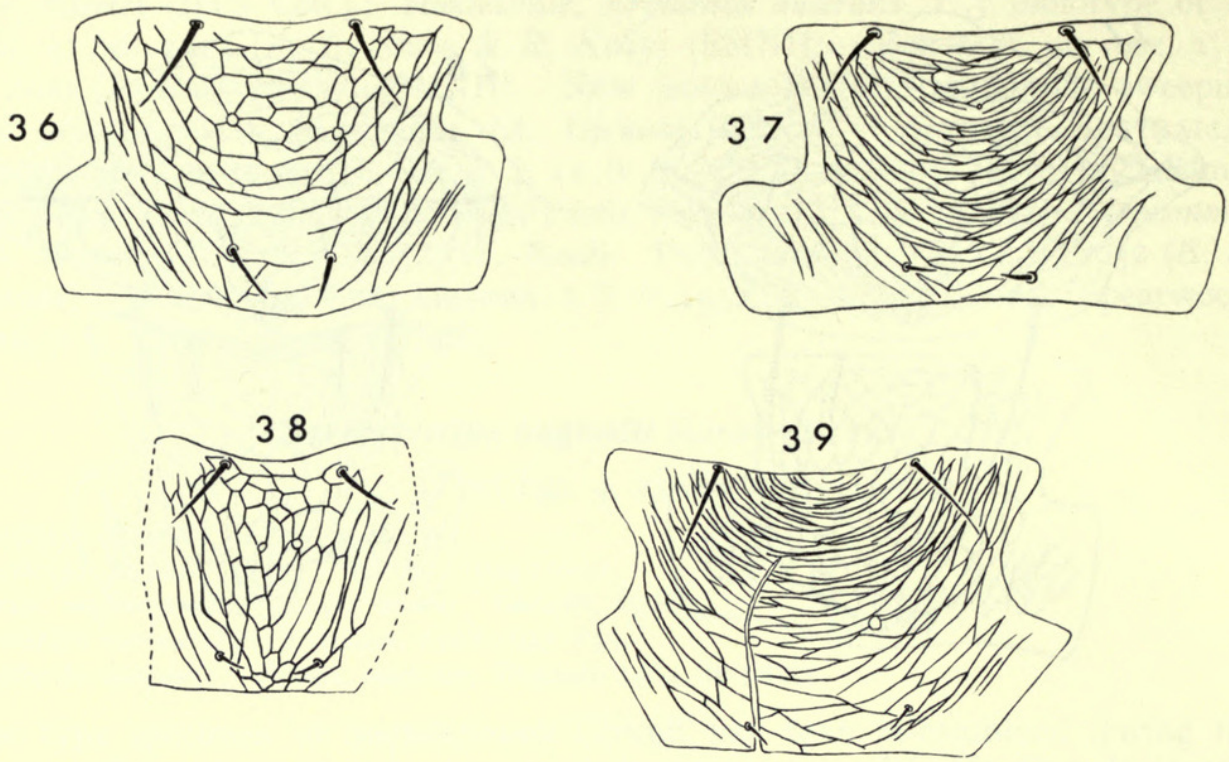
♂. Length 1·2–1·3 mm. Colour dark brown similar to female, median abdominal segments paler and antennal III with more extensive brown shading. Head and thorax as in female, distal maxillary palp segment with one small apical subdivision. Sternites VI to IX with accessory setae, VI to VIII with 1 or 2 pairs laterally, IX with 2 pairs medially.

Measurements (*in* μ). Fore wing length/breadth: 940/150. Hind tibia: 310. Antennals I–IX: 39; 57; 104; 83; 47; 37; 26; 13; 13. Tergite X setae 1, 2 and 3: 170, 180, 185. Tergite X setae 1 and 2: 170, 180.

Material examined. Holotype ♀. QUEENSLAND: Mt. Tambourine, in flowers, October, 1910–1913 (*E. Mjöberg*) (Naturhistoriska Riksmuseum, Sweden).



FIGS. 27–35. 27, *Desmothrips australis*, mesonotum and metanotum. 28, *D. steeleae*, mesonotum and metanotum. 29–33, Details of metanotal reticulations. 29, *D. australis*. 30, *D. tenuicornis*. 31, *D. propinquus*. 32, *D. obsoletus*. 33, *D. steeleae*. 34, *D. reedi*, mesonotum and metanotum. 35, *Andrewarthaia kellyana*, mesonotum (sculpture omitted).



FIGS. 36–39. Metanotal sculpture. 36, *Aeolothrips fasciatus*. 37, *Lamprothrips maculosus*. 38, *Desmothrips mendozai*. 39, *Arcuthrips monrosi*.

QUEENSLAND: Nambour, in garden flowers, 1 ♀, 9.ix.1938 (*N. E. H. Caldwell*) (HVS Coll.); Montville, in garden flowers, 1 ♂, 15.ix.1938 (*N. E. H. Caldwell*) (HVS Coll.); Botanic Garden, Brisbane, on rose, 1 ♂ (holotype of *comparabilis*) (*Hardy*) (Priesner Collection, Austria); Beenleigh, forest, 2 ♀ (syntypes of *unguttipennis*), 4.xii.1922 (1923 in description) (Brisbane Museum T6526).

Desmothrips mendozai Girault

(Text-figs. 38 & 47)

Desmothrips mendozai Girault, 1932 : 6.

The original description of this species was as follows: " From *uniguttus*: Wing 1 fuscous save basal 1/4, antennae entirely fuscous. Second ring-vein half-way to third. Mundaring, W. Aus., L. J. Newman, Feb. 25, 1931. Second wing hyaline." Unfortunately no material of *mendozai* could be found in the Girault Collection at Brisbane Museum, but two females and one male determined as this species apparently by L. J. Newman and bearing the original data of *mendozai* were kindly made available by the Department of Agriculture of Western Australia. One of these females, bearing the Moulton Collection Number 5085, is labelled " Type ", although this is not in Girault's handwriting, and this specimen is now deposited at the Brisbane Museum. The species is distinguished from other *Desmothrips* species by having only three pairs of marginal setae on sternite VII.

♀. Length 1·8–2·0 mm. Colour dark brown with orange-red hypodermal pigment; fore tibiae with longitudinal pale brown mark; antennal III paler at base than at apex; fore wing

shaded, paler in basal quarter but base of scale very dark. Antennal segments as in other *Desmothrips* species, but sensorium on III not curving around apex of segment, and sensoria on V and VI with circular not elongate bases. Head crushed laterally in available specimens but the male has only one row of setae behind eyes ; distal maxillary palp segment with six divisions ; labial palps with four divisions. Pronotum without major setae ; mesonotum with two pairs of accessory median setae ; elongate reticles of metanotum without internal sculpture (Text-fig. 38). Fore tarsi with stout claw and seta. Fore wings rather broad, venal setae shorter than the distance between them, scale with eight marginal setae. Sternites II to VII with accessory setae in an irregular transverse row ; sternite VII with only three pairs of marginal setae ; median pair of accessory setae about anterior to median marginals and only half their length (Text-fig. 47).

♂. Length 1·5 mm. Colour paler than in female, anterior abdominal segments yellowish. Distal maxillary palp segment with six small divisions. Mesonotum without accessory median setae. Sternite IX without accessory setae ; sternites III to VIII with about 10 accessory setae in an irregular transverse row.

Measurements (*in* μ). Fore wing length/breadth : 900/180. Hind tibia : 280. Antennals I–IX : 23 ; 35 ; 61 ; 51 ; 35 ; 28 ; 28 ; 10 ; 13. Tergite IX setae 1, 2 and 3 : 135, 145, 145. Tergite X setae 1 and 2 : 135, 135. Male tergite IX setae 1, 2 and 3 : 32, 48, 113.

Material examined. WESTERN AUSTRALIA : Mundaring, sweepings, 2 ♀, 1 ♂, 25.ii.1931 (*L. J. Newman*) (BMNH, and Brisbane Museum).

Desmothrips obsoletus Bagnall **sp. rev.**

(Text-figs. 32 & 48)

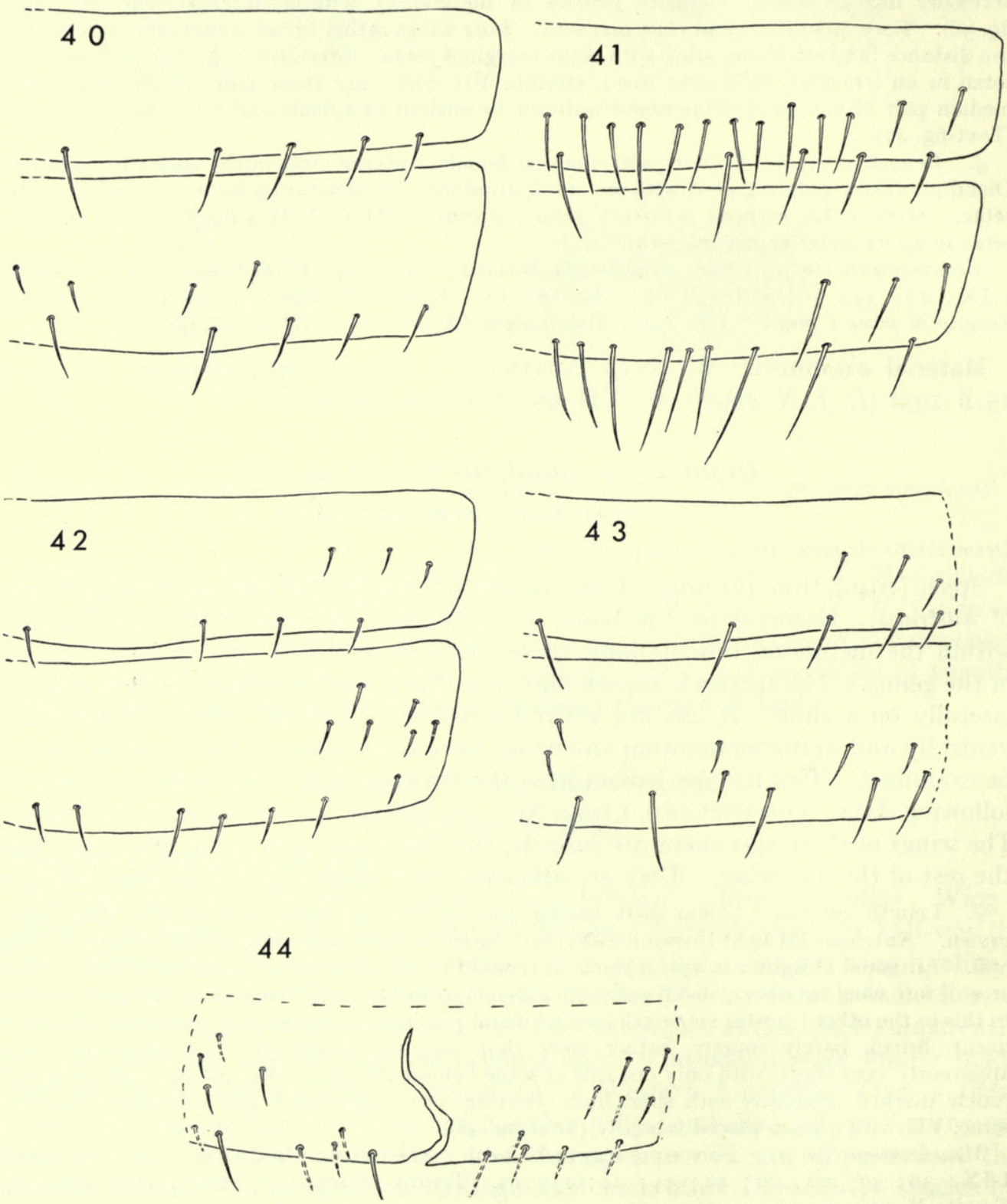
Desmothrips obsoletus Bagnall, 1924*b* : 626–627.

Steele (1940), from the original description, considered that *obsoletus* was a synonym of *australis*. However on the basis of the sternal chaetotaxy and the markings within the metanotal reticulations, these two species fall in very different sections of the genus. The species is known only from the holotype female which is mounted laterally on a slide. It has not proved possible to remount this specimen dorso-ventrally and so the metanotum and wings have been dissected free to allow them to be examined. Two females loaned from the Brisbane University collection bear the following data : QUEENSLAND, Crows Nest, on Wattle, 26.viii.1949 (*C. S. Andrew*). The wings of these specimens are fuscous, the distal pale area being little paler than the rest of the fore wing. They are otherwise very similar to the *obsoletus* holotype.

♀. Length 2·0 mm. Colour dark brown, fore tarsus and distal part of fore tibia lighter brown. Antennal III light brown basally, but darker at apex and along dorsal surface of apical half. Antennal II lighter in apical third, antennal IV very little paler than rest of body. Dark area of fore wing extensive, distal pale area extends to second vein in one wing and just posterior to this in the other ; costal vein dark around distal pale area. Sensoria on antennals III and IV linear, broad, barely sinuate, rather more than half the length of these segments. Head apparently very short, with only one row of setae behind the eyes. Metanotum reticulate, each reticle marked internally with short lines (Text-fig. 32). Sternites V and VI without accessory setae, VII with 3 pairs placed laterally (Text-fig. 48).

Measurements (*in* μ). Fore wing length/breadth : 1100/210. Hind tibia : 350. Antennals I-IX : 39 ; 57 ; 96 ; 80 ; 52 ; 34 ; 24 ; 13 ; 13. Tergite IX setae 1, 2 and 3 : 150 ; 180 ; 145. Tergite X setae 1 and 2 : 210 ; 210.

Material examined. Holotype ♀. VICTORIA : Melbourne, Brighton Beach, *Mesembryanthemum* growing in sand, 8.xii.1923 (*R. Kelly*) (BMNH).



FIGS. 40–44. Chaetotaxy of sternites VI and VII. 40, *Aeolothrips fasciatus*. 41, *Cranothrips poultoni*. 42, *Lamprothrips maculosus*. 43, *Arcuthrips cinctus*. 44, *Arcuthrips monrosi*.

Desmothrips propinquus (Bagnall) **sp. rev.**

(Text-figs. 5, 7, & 49)

Orothrips propinquus Bagnall, 1916 : 397.
Desmothrips propinquus (Bagnall) Bagnall & Kelly, 1928 : 205.
Desmothrips elegans Morison, 1931 : 451–453, **syn. n.**
Desmothrips australis ; Steele, 1940 nec Bagnall, 1914 (in part).

The differences between *propinquus* and *australis* have been discussed above under the latter species. The illustrations B, C, D and E given by Steele (1940) are regarded here as representing various wing forms of *propinquus*. Morison (1930) suggested that *elegans* might be related to *bagnalli* and stated that his species differed from *propinquus* by the markings of the fore wings. However in the specimen of *propinquus* here designated as lectotype the distal pale area of the fore wing does not reach the hind margin contrary to the impression given by Bagnall's description. In the right wing about half of the area between the hind margin and the second vein is dark, and in the left wing about a third. The difference is small between this condition and *elegans*, in which the whole of the area posterior to the second vein is dark.

♀. Length 1·7–2·0 mm. Colour dark brown, fore tarsi and tibiae paler. Antennal III yellow, brown at extreme apex with some shading extending proximally along inner apical margin ; base of IV and apex of II paler brown. Distal pale area of fore wing variable, sometimes restricted anterior to second vein, sometimes extending to hind margin ; costal vein dark in region of distal pale area (Text-figs. 5 & 7). Sensoria on antennals III and IV linear, straight, without internal markings, two-thirds to three-quarters the length of these segments ; sensoria on IV and V about half the length of these segments. Vertex with numerous small setae between and behind eyes. Mesonotum with three or more pairs of accessory median setae. Metanotum reticulate, internal markings of reticles not as extensive within each reticule as in *australis*. Sternite VII with median pair of accessory setae often mesad of the second pair of marginal setae. Accessory setae on sternite VI form an almost complete transverse row (Text-fig. 49).

♂. Length 1·2–1·5 mm. Colour similar to female, but median abdominal segments paler and brown shading on antennal III more extensive. Head and thorax as in female, distal maxillary palp segment with six small subdivisions. Accessory setae present on sternites III to IX, irregular in number (4 to 8) but in a single transverse row on sternites III to VIII, in two rows on sternite IX.

Measurements (in μ)

	Hind tibia	Antennal segments							Fore wing		Tergite IX setae			Tergite X setae	
		III	IV	V	VI	VII	VIII	IX	L	B	1	2	3	1	2
Lectotype ♀	300	90	90	45	32	26	16	16	990	170	?	?	175	?	170
♀ ex Hillston	260	80	71	42	29	26	13	13	930	140	140	145	145	155	160
♀ ex Hillston	330	105	90	49	33	26	16	16	1080	190	150	165	170	160	175

Material examined. LECTOTYPE ♀ (present designation). VICTORIA, Creswick, on sweet pea, 17.i.1915 (*R. Kelly*) (BMNH). This specimen was labelled "Type" by the original author. No material is deposited in the University Museum, Oxford, although this was given as the depository in the original description.

Paratype. 1 ♀ collected with the lectotype (BMNH). VICTORIA: Mildura, 1 ♀, 5 ♂, 29.ix.1926 (*H. W. Davy*) (Cal. A. Sci.); Warrugal, 1 ♀, 23.x.1944 (HVS Coll.). TASMANIA: no locality or host, 1 ♀, ?1942 (*J. W. Evans*) (HVS Coll.). SOUTH AUSTRALIA: Adelaide, on lucerne and rose bushes, 4 ♀ (holotype and paratypes of *elegans*), x.1929 (*J. Davidson*) (BMNH & WI); Adelaide, on roses, 8 ♀, 2 ♂, 1932 (*J. W. Evans*) (HVS Coll.); Jamestown, lucerne flowers, 2 ♀, 15.ii.1953 (*D.C.S.*); Waite Institute, on lucerne, 3 ♀, 24.iii.1953 (*D.C.S.*) (WI); NEW SOUTH WALES: Gogeldrie, *Hordeum leporinum*, 1 ♀, 19.ix.1959 (*E. M. Reed*); Hillston, *Polygonum hydropiper*, 14 ♀, 4 ♂, 23.ix.1959 (*E. M. Reed*) (ANIC). QUEENSLAND: Kingaroy, on cotton and lucerne, 7 ♀, 15.i.1941 (UQ).

Desmothrips reedi n. sp.

(Text-figs. 18, 21, 34 & 50)

This new species is based on a single micropterous female which is very reminiscent of the common Holarctic species *Aeolothrips albicinctus* Haliday. The second and third abdominal segments are clear yellow contrasting with the remainder of the brown body. In *Arcuthrips cinctus* the fourth and fifth abdominal segments are yellow. The species is named in honour of Mr. E. M. Reed who collected much of the material upon which this paper is based.

♀ (micropterous): Length fully expanded 2·0 mm. Colour brown, tarsi light brown; antenna III yellow with apical rim dark, antennal IV with base light brown; abdominal segments II and III clear yellow, apical margin of II brown. Sensoria on antennals III and IV rather sinuate, about three-quarters the length on these segments; sensoria on V and VI linear, about half the length of these segments (Text-fig. 21). Eyes prolonged posteriorly on ventral surface of head with a few large ommatidia. Ocelli reduced, numerous small setae between and behind eyes. Prothoracic setae numerous, small; fore tarsus with stout recurved tooth. Mesonotum with only one pair of median setae. Metanotum without a pair of pores, transversely reticulate, numerous wrinkles within each reticle (Text-fig. 34). Abdominal tergite I with numerous transverse anastomozing lines (Text-fig. 18); tergites II to VIII with four or five pairs of setae each one-third to one-half the length of the tergite. Major setae on segments IX and X not very long, extending little beyond apex of abdomen. Median pair of accessory setae on sternite VII lateral to the submedian pair of marginal setae (Text-fig. 50).

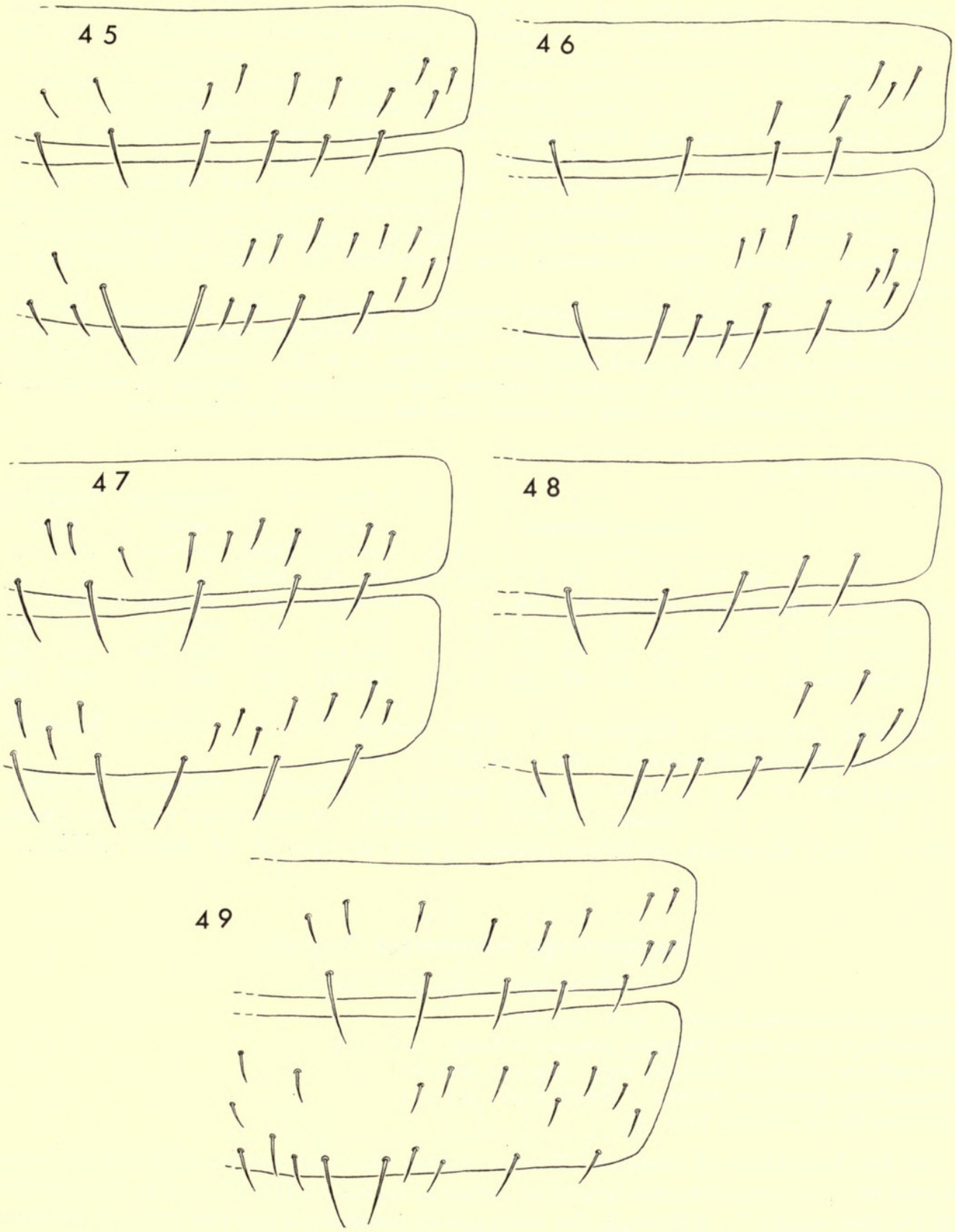
Measurements (in μ). Antennals I–IX: 39; 52; 117; 104; 57; 45; 34; 21; 18. Head length/breadth: 160/160. Pronotum length/breadth: 200/200. Wing length: 160. Hind tibia: 350. Tergite IX setae 1, 2 and 3: 117; 130; 130. Tergite X setae 1 and 2: 117; 130.

Material examined. Holotype ♀ (micropterous). NEW SOUTH WALES: Tunderbrine, nr. Gilgandra, *Medicago hispida* var. *denticulata*, 4.viii.1959 (*E. M. Reed*) (ANIC).

Desmothrips steeleae n. sp.

(Text-figs. 2, 15, 16, 17, 22, 24, 25, 28, 33 & 51)

Both males and females of this new species have been collected in Eastern Australia. It is easily recognized from its congeners by the exaggerated development of the vermiform sensoria on the third and fourth antennal segments. The species is named in recognition of the work of Miss H. Vevers Steele (Mrs. H. G. Andrewartha) on Australian Thysanoptera.



FIGS. 45–49. Chaetotaxy of sternites VI and VII. 45, *Desmothrips australis*. 46, *D. bagnalli*. 47, *D. mendozai*. 48, *D. obsoletus*. 49, *D. propinquus*.

♀. Length 1·7–1·8 mm. Colour dark brown (most of the specimens in the type series are teneral with pale median abdominal segments) ; antennal II pale distally ; antennal III yellowish in basal half or two-thirds with dark brown at apex extending proximally along inner margin. Fore wing dark at base and apex, with a transverse pale area on either side of the median dark band ; distal pale area irregularly parallel-sided (Text-fig. 2). Sensoria on antennals III and IV strongly vermiform, almost encircling apex and extending to basal quarter of segments ; sensoria on antennals V and VI linear, about half the length of these segments (Text-fig. 22). Head a little broader than long, dorsal surface with two rows of small setae behind eyes (Text-fig. 15). Prothorax with numerous small setae (Text-fig. 16). Mesonotum with three or more pairs of accessory median setae (Text-fig. 28). Metanotum reticulate, each reticle with internal linear markings (Text-fig. 33). Abdominal tergite I almost devoid of sculpture, tergite II with some weak transverse reticulations medially (Text-fig. 17); tergites III to VIII with an anterior submarginal transverse ridge. Accessory setae on sternite VII lateral to the third pair of marginal setae (Text-fig. 51).

♂. Length 1·2–1·3 mm. Colour brown similar to female, median abdominal segments yellowish, antennal III dark in apical third. Head and thorax as in female, distal maxillary palp segment with one small apical subdivision (Text-figs. 24 & 25). Sternites III to VIII with 1 to 5 pairs of accessory setae, irregular in number and arrangement ; sternite IX with 3 accessory setae in one specimen but these are absent from the other four available males.

Measurements (in μ)

	Antennal segments									Fore wing		Hind tibia	Tergite IX setae		Tergite X setae	
	I	II	III	IV	V	VI	VII	VIII	IX	L.	B.		1	2	1	2
♀ Holotype	31	52	96	78	44	31	26	13	10	1000	160	280	?	145	145	155
♀ ex Roseville	31	52	96	81	44	29	21	13	13	880	150	250	130	140	140	150
♀ ex Black Mt.	31	42	78	71	39	26	21	10	8	810	120	200	120	130	125	130
♂ ex Roseville	26	44	81	71	42	26	19	10	10	810	130	240	34	34	130	120

Material examined. Holotype ♀. NEW SOUTH WALES : Sydney, Roseville, *Pultanaea stipularis* flowers, ix.1960. (ANIC).

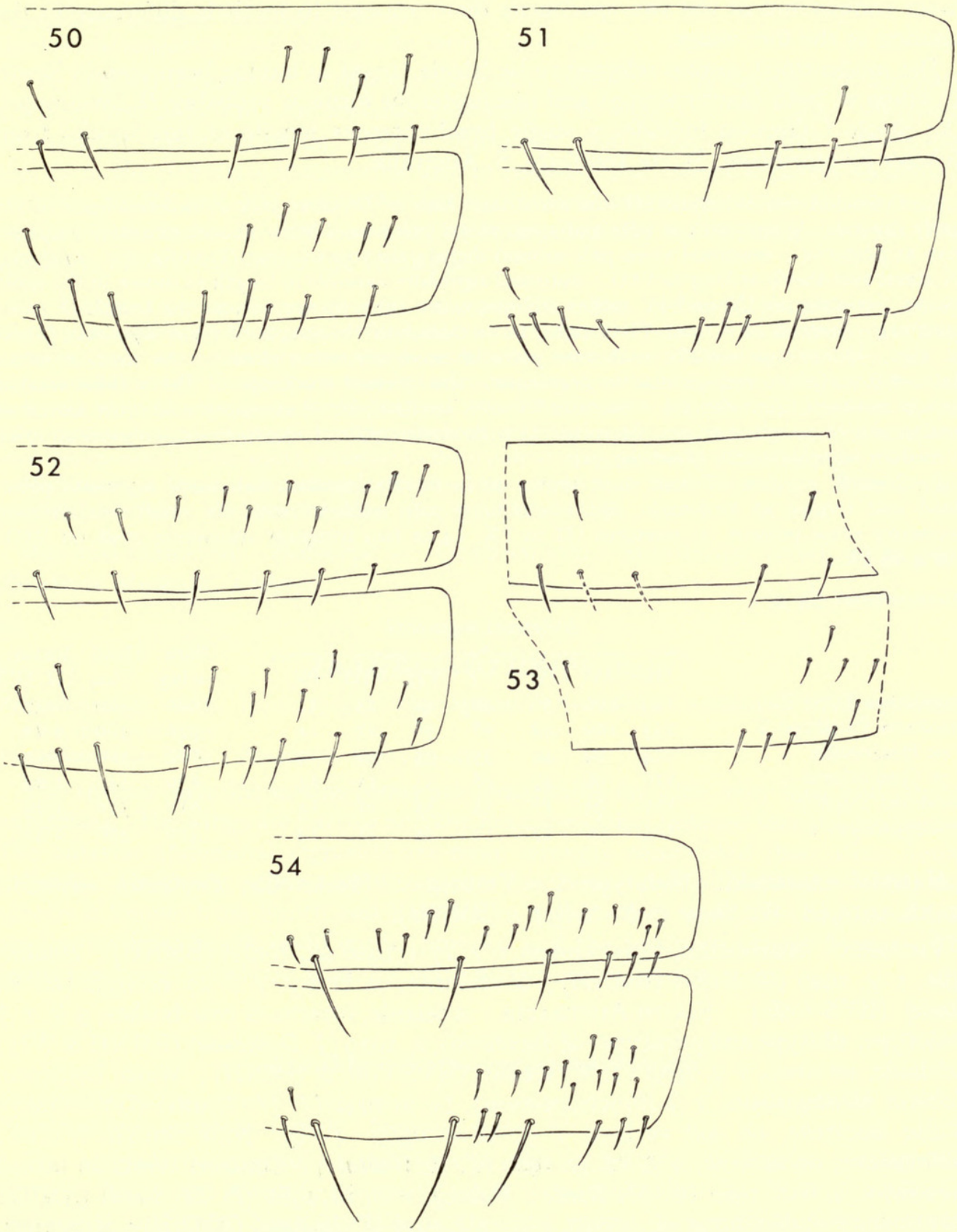
Paratypes. 6 ♀, 5 ♂, collected with holotype ; Woodford, *Pultanaea ericifolia*, 3 ♀, 22.viii.1959 (*M. Casimir*) (ANIC & BMNH). AUSTRALIAN CAPITAL TERRITORY : Black Mountain, on mixed grasses, 4 ♀, 8.xi.1960 (*E. M. Reed*) (ANIC).

Desmothrips tenuicornis (Bagnall)

(Text-figs. 3, 19, 30 & 52)

Orothrips tenuicornis Bagnall, 1916 : 397–398.
Desmothrips tenuicornis (Bagnall) Bagnall & Kelly, 1928 : 205.
Desmothrips davidsoni Morison, 1931 : 449–451, **syn. n.**
Desmothrips davidsoni Morison ; Steele, 1940 : 353–354.
Desmothrips sp., Steele, 1935 : 16.

In his description of *davidsoni* Morison states that this species differs from *tenuicornis* in " the proportionate length of antennal segments III–IX and in the banding of the fore wings ". Although the holotype of *tenuicornis* has the ratio of antennal segments III/IV larger than in the holotype of *davidsoni*, the variation of this ratio in the other specimens listed below suggests that this difference is not significant.



FIGS. 50–54. Chaetotaxy of sternites VI and VII. 50, *Desmothrips reedi*. 51, *D. steeleae*. 52, *D. tenuicornis*. 53, *D. uniguttus*. 54, *Andrewarthaia kellyana*.

It should be noted that the type of *tenuicornis* is much larger than the type of *davidsoni*, the wings are 25% longer and the hind tibiae 30% longer. However in a direct comparison of the two specimens there appears to be little difference in the banding of the fore wings.

The unidentified species referred to by Steele (1935) as having been seen in South Australia in both brachypterous and macropterous forms is probably *D. tenuicornis*. The Steele Collection includes a single brachypterous female of this species from *Echium plantagineum*, Waite Institute, S. Australia.

♀. Colour brown, antennal III and sometimes base of IV clear yellow, extreme apex of III rarely shaded. Wings dark at base and apex, distal pale area a little broader at anterior margin than at posterior ; marginal veins pale around distal pale area of wing (Text-fig. 3). Antennal IX about two-thirds as long as VIII ; antennal segments variable in length as shown in the table below ; sensoria on III and IV rather sinuate, more than three-quarters the length of these segments ; sensoria on V and VI straight, more than half the length of these segments (Text-fig. 19). Mesonotum usually with two pairs of accessory setae close to the median setae. Metanotal sculpture very similar to *propinquus*, the internal markings of the reticles weaker than in *australis* (Text-fig. 30). Sternite VI with median pair of accessory setae just mesad of median pair of marginal setae. Sternite VII with median pair of accessory setae almost anterior to median marginal setae (Text-fig. 52).

♂. Length 1·5 mm. Colour dark brown as in female, median abdominal segments paler. Head and thorax as in female, distal maxillary palp segment with six small subdivisions. Accessory setae present on sternites III to IX, 14 in two irregular transverse rows on VIII, 3 or 4 on IX.

Measurements (in μ)

	Antennal segments									
	III	IV	V	VI	VII	VIII	IX	Fore wing	Hind tibia	Ratio III/IV
tenuicornis Type ♀	145	106	56	40	42	23	14	1000	400	1·37
davidsoni Paratype ♀	133	109	49	38	38	23	14	940	380	1·22
♀ ex Healesville	124	99	49	35	35	21	14	880	360	1·25
♀ ex Queensland	110	96	47	28	33	21	14	850	340	1·15
davidsoni Type ♀	117	94	47	35	35	21	14	810	310	1·24
brachypterous ♀	125	96	47	34	34	21	14	310	380	1·30

Material examined. Holotype ♀. VICTORIA : Healesville, *Erythraea australis*, 21.xii.1913 (*A. W. Shaw & R. Kelly*). (BMNH).

VICTORIA : Warburton, white clover, 1 ♀, 17.i.1926 (*R. Kelly*) (BMNH) ; Healesville, 1 ♀, 1926 (*R. Kelly*) (BMNH) ; Melbourne, on Daisy, 1 ♀, 17.ix.1932 (*H. V. Steele*) (HVS Coll.). SOUTH AUSTRALIA : Adelaide, lucerne & rose bushes, 3 ♀, 1 ♂ (holotype, allotype and paratypes of *davidsoni*), x.1929 (*J. Davidson*) (BMNH & WI) ; Adelaide, on roses, 7 ♀, 1932 (*J. W. Evans*) (HVS Coll. & BMNH) ; Waite Institute, *Echium plantagineum*, 1 ♀ (brachypterous), 12.x.1932 (*J. W. Evans*) (HVS Coll.) ; Waite Institute, on soil surface, 1 ♂, 18.x.1933. (WI). NEW SOUTH WALES : Wilberforce, on lucerne, 4 ♀, 12.ix.1960 (*C. R. Wallace*) ; Concord West, on mixed grasses, 2 ♀, 6.ii.1960 (*E. M. Reed*) ; Bolong, 1 ♀, iii.1962 (*E. M. Reed*) (ANIC). QUEENSLAND : Brisbane, on cotton, 1 ♀, 11.i.1926 (*E. Ballard*) (BMNH) ; Kingaroy, lucerne and cotton, 3 ♀, 15.i.1941. (UQ). HAWAII : Honolulu, ex Australia, radish leaf, 1 ♀, 1.iv.1947 (USNM).

Desmothrips uniguttus Girault

(Text-figs. 6 & 53)

Desmothrips uniguttus Girault, 1927*b* : 1.
Desmothrips uniguttatus [sic] Girault ; de Santis, 1961 : 168.

The original description of this species was as follows : " As *bagnalli* but antennal 3 white, first area wing on cephalic 1/2, wing 2 as wing 1 as to colour, narrower. Stanthorpe, forest, April 24, 1924." Although related to the other *Desmothrips* species in the reticulate metanotum and in possessing accessory setae on abdominal sternites V, VI and VII, *uniguttus* has no internal markings within the metanotal reticles and there is only one pair of setae medially on the mesonotum. The species is known only from the Holotype.

♀. Length 1·5 mm. Colour brown ; antennal III yellow, but basal third shaded brown. Distal pale area on fore wing restricted anterior to second vein, costal vein in this region pale ; proximal pale area similarly restricted anterior to second vein (Text-fig. 6). Sensoria on antennals III and IV linear, about three-quarters the length of these segments. Head with about two rows of small setae posterior to the eyes. Mesonotum with only the major pair of median setae. Metanotum reticulate, reticles without internal sculpture. Median pair of accessory setae on sternite VII far apart, anterior to third pair of marginal setae (Text-fig. 53).

Measurements (in μ). Fore wing length/breadth : 890/115. Hind tibia : 270. Head length/breadth : 180/180. Antennals I–IX : 34 ; 52 ; 78 ; 65 ; 39 ; 35 ; 31 ; 13 ; 13.

Material examined. Holotype ♀. QUEENSLAND : Stanthorpe, forest, 24.iv.1924 (Brisbane Museum, T.6507).

FRANKLINOTHRIPS Back

Franklinothrips Back, 1912 : 75–77. Type-species : *Aeolothrips vespiformis* D. L. Crawford, 1909, by monotypy.
Franklinothrips Back ; Stannard, 1952 : 14–23.

The species included in this genus are remarkable for their very long and slender antennae. The wings are narrow and the head somewhat reflexed into the prothorax. The anterior abdominal segments are more strongly constricted than other Aeolothripids. Only one species of this genus has been recorded from Australia, one species is known from South and East Africa and another from the Congo, and four are known from South and Central America and the Southern United States. The genus has been revised by Stannard with figures and redescriptions.

Franklinothrips variegatus Girault

Franklinothrips variegatus Girault, 1927*b* : 1.
Franklinothrips variegatus Girault ; Stannard, 1952 : 19–21.

The original description of this species was as follows : " Black ; pterothorax brown ; first 4 and ultimate abdomens white ; so antennals 2–4, 1 brown ; abdomen narrowing to base ; wing fasciate, ocula near apex ; long marginal fringes over twice length regular placed setae of veins ; antennal 3 elongate, 5–7 $\frac{1}{2}$ + 4 which is shorter than 3."

The holotype is the only known specimen and Stannard has redescribed this with figures of the head and antenna.

Holotype ♀. QUEENSLAND: Brigalow-Jandowie, 17.ii.1924 (Brisbane Museum T.6522).

LAMPROTHRIPS Moulton

Lamprothrips Moulton, 1935 : 97. Type-species : *L. maculosus* Moulton, 1935, by monotypy.

Antennae nine-segmented, segments V–IX connate ; sensorium on III straight, broadly linear ; sensorium on IV similar but slightly curved around apex of segment (Text-fig. 14). Dorsal surface of head with two irregular rows of setae behind eyes ; distal maxillary palp segment with one small apical division, i.e. palp three-segmented. Pronotum typically Aeolothripoid, without major setae or any interval in the row of minor posteromarginal setae. Mesonotum with one pair of median setae. Metanotal sculpture arcuate about the anterior midpoint of the sclerite (Text-fig. 37). Fore wings with or without dark bands. Abdominal sternites III–VII with accessory setae laterally but not medially ; sternal marginal setae about as long as accessory setae (Text-fig. 42).

The original description of this genus refers to a swelling on the apex of antennal III. These swellings are only present on one of the three original females and are due to the sensoria expanding when the specimens were mounted in Berlese Mountant. The genus is similar to *Arcuthrips* described above. Only two species are known, and these are both Australian.

KEY TO SPECIES

1 Fore wing with median transverse dark band, apex also shaded ; antennal III yellow, much paler than the rest of antenna which is brown . . . . ***miltoni*** (p. 72)

– Fore wing without dark bands ; antennae almost uniformly coloured, pale brownish yellow . . . . . ***maculosus*** (p. 72)

Lamprothrips maculosus Moulton

(Text-figs. 14, 37 & 42)

Lamprothrips maculosus Moulton, 1935 : 97–98.

The original description refers to a dark marking on antennal III. This is only present on one of the three original females, and apparently is an internal artifact due to the inferior preparation in Berlese Mountant. The light coloured markings on the body referred to by Moulton are not unusual in *Aeolothrips* species, particularly on the pronotum, and their significance is not understood.

Material examined. Holotype ♀. WESTERN AUSTRALIA: Perth, *Eucalyptus rudis*, 20.xii.1928. (*B. A. O'Connor*). Moulton No. 5184 (not 5084). (Cal. A. Sci.).

Lamprothrips miltoni (Girault) **comb. n.**

Desmothrips miltoni Girault, 1927*a* : 1.

The unique holotype of this species is a very badly damaged teneral female upon which very little detail can be observed. There is an extensive distal pale area on the fore wing with little more than the apical ring vein shaded. The original

description was " Middle band wing over ½, distal very short, none costal ; short marginal fringe cephalad. As other species elsewise."

Measurements (in μ). Antennals III–IX : 96 ; 65 ; 42 ; 26 ; 32 ; 16 ; 13. Fore wing length/breadth : 1,000/130. Hind tibia : 300.

Material examined. Holotype ♀. QUEENSLAND : Flaxton, jungle, 3.vii.1923 (Brisbane Museum T.6508).

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