

Intra-generic diversity in *Paracholeothrips*, an Australian genus of domicile-building phlaeothripine Thysanoptera on *Acacia* phyllodes

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Abstract

Two new species are described in the *Acacia*-associated genus *Paracholeothrips* each of which is readily distinguished by remarkable autapomorphies. *P. morrissi* **sp. nov.** bears a pair of prominent horns laterally on the head. *P. phillipsi* **sp. nov.** has the head, pronotum, prosternal ferna and pelta all greatly elongate. The intra-generic structural diversity is illustrated, and a key provided to the seven species now recognised.

Key words: Prosternal ferna, mesonotal division, kleptoparasites, phyllode galls

Introduction

In Australia the plant genus *Acacia* provides hostplants for more than 250 species of Thysanoptera in at least 25 genera of the Phlaeothripidae sub-family Phlaeothripinae (Crespi *et al.* 2004). Amongst these, the 24 species of *Kladothrips* induce *Acacia* phyllodes to produce galls of various shapes and sizes in which the thrips then breed. In contrast, 33 species, in seven different genera, use an anal secretion to glue or sew together pairs of phyllodes; they then develop colonies within these simple domiciles. The seven genera, and their total species, are: *Carcinothrips* (2), *Dunatothrips* (7), *Lichanothrips* (10), *Panoplothrips* (1), *Paracholeothrips* (5), *Sartrithrips* (7) and *Truncatothrips* (1). The *Acacia* thrips galls and domiciles are the target of a much larger number of Phlaeothripinae species, all of which are either kleptoparasites of the structures when these are developing, or invaders of old and abandoned thrips structures.

A few of these genera include one or more species that are readily distinguished by some structural character state that is unique. Such autapomorphies occur amongst species of *Dactylothrips* (*D. bos*, tube with terminal horns), *Dunatothrips* (*D. skene*, tube wider than long), *Katothrips* (*K. spinosissimus*, posterior tergites with more than 50 short stout discal spines) and *Sartrithrips* (*S. mars*, fore femur apical margin with long tubercle). If the structural diversity amongst other members of each of these genera was unknown, such distinctive individual species would traditionally have been placed into separate genera. The target genus in this report, *Paracholeothrips*, is one such genus, of which two new species are described here that each bear unusual and distinctive character states. This is one of the genera in which the described species are known to be domicile builders, fixing together pairs of phyllodes. This behaviour has been observed in four of the five species previously known, but unfortunately, there is limited information at present about the behaviour of either of the two new species described in the present work.

Paracholeothrips Moulton

Paracholeothrips Moulton, 1968: 110. Type species *Paracholeothrips validus* Moulton, by monotypy.

Despite the extensive review by Crespi *et al.* (2004), relationships between some of the genera of Phlaeothripinae in Australia on *Acacia* phyllodes continue to be obscure. The two species in the genus *Turmathrips* share many character states with those of *Paracholeothrips* species, notably the elongate form of the prosternal ferna and the longitudinal division of the mesonotum. However, both these species have a pronounced tubercle on the fore femora. Similarly, the species of *Lichanothrips* share many character states with those of *Paracholeothrips*, but in both sexes of *Lichanothrips* species the fore femora are more enlarged, and in females the fustis is broader rather than linear, and the subgenital plate unusually broad and sometimes with a toothed margin.

There is considerable variation in appearance between the species of *Paracholeothrips*, and within some of the species considerable differences in body size are known. Despite the remarkable differences in structure between some of these species they all share the following character states: Macropterous; head longer than wide and narrower at base; maxillary stylets not deeply retracted into head, about one-third of head width apart. Antennae 8-segmented, III with one sense cone (two in one species), IV with 3 sense cones. Pronotum notopleural sutures complete; mesonotum with complete median longitudinal division (rarely incomplete). Fore femur without tubercles; fore tibia sometimes with apical tubercle; fore tarsus with large or elongate tooth. Prosternal basantra weak or absent, ferna large and sometimes longer than wide with median margins closely parallel; sternopleural sutures usually present. Pelta broad (except one species); tergites II–VII each with 2 pairs of sigmoid wing-retaining setae; tergite IX setae slender in both sexes; tube shorter than head. Male similar to female, fore tarsal tooth smaller; sternite VIII pore plate present or absent.

Key to *Paracholeothrips* species

1. Head more than 2.5 as long as wide (Fig. 3); mesonotal median division often weak and incomplete anteriorly (Fig. 16); pelta at least 1.5 times as long as basal width (Fig. 18); metathoracic sternopleural sutures extending almost to posterior of metasternum (Fig. 19) *phillipsi* **sp. nov.**
- . Head about 1.5 times as long as wide, rarely as much as 2.0 times; mesonotal median division robust and complete; pelta broader than long; metathoracic sternopleural sutures variable, never unusually long 2
2. Postocular setae small, less than 0.5 of width of an eye (Fig. 5) 3
- . Postocular setae well-developed, longer than width of an eye 5
3. Pronotal epimeral setae very small, usually no longer than discal setae; tergite IX setae S1 usually much shorter than tube *mulgae*
- . Pronotal epimeral setae well-developed; tergite IX setae as long as or longer than tube 4
4. Head of female with prominent tubercle behind both eyes (Fig. 2). *morrissi* **sp. nov.**
- . Head of female without prominent lateral tubercles (Fig. 1) *gracilis*
5. Antennal segment III apex with 1+1 sense cones on external margin; prosternal basantra absent (Fig. 12); fore tibia of female without tubercle at inner apex (Fig. 4) *validus*
- . Antennal segment III with only one sense cone; prosternal basantra present but small (Fig. 7); female fore tibia inner apical margin with small tubercle 6
6. Fore femora and body yellowish brown; metanotum finely reticulate medially; male sternite VIII with band of reticulation anterior to pore plate. *calcicolae*
- . Fore femora and body uniformly dark brown; metanotal median sculpture absent or weak; male sternite VIII fully occupied by pore plate *clavisetae*

Paracholeothrips calcicolae Crespi *et al.*

Paracholeothrips calcicolae Crespi *et al.*, 2004: 270

This species is known only from two samples taken in tied phyllodes of *Acacia calcicola* in central Australia. Two males and one female, taken with many typical *clavisetae* from *Acacia papyrocarpa* near Whyalla, South Australia, share the character states by which *calcicolae* is distinguished from *clavisetae*. This sample thus suggests that, despite the difference in sculpture on sternite VIII of males, it is possible that *calcicolae* may represent aberrant specimens of *clavisetae*.

***Paracholeothrips clavisetae* (Girault)**

(Fig. 7)

Adiaphorothrips clavisetae Girault, 1926: 1

Girault described the species based on five syntypes taken at Dalby in southern Queensland, but only one of these specimens is now identified as *clavisetae* (Crespi *et al.* 2004). The species is interpreted as being widespread and common across the Australian mainland and specimens have been studied from at least 12 species of *Acacia*. Individuals vary greatly in size and structure, particularly the length of the head. Larger individuals have the prosternal ferna elongate with the median margins approaching each other, whereas smaller individuals have the fernal plates more nearly transverse and well separated (Fig. 7). Most specimens identified as *clavisetae* have been collected in Queensland, but many have come from semi-arid areas of South Australia and New South Wales, including one female from *Acacia melvillei* at Euston on the border with Victoria, and a few of both sexes from *Acacia sibilans* at Cue in Western Australia. However, no specimens have been seen from Victoria or from Northern Territory. It shares with *P. validus* and *P. calcicolae* the character state of long postocular setae, whereas this pair of setae is short in the other members of the genus.

Paracholeothrips gracilis* Crespi *et al.

(Figs 1, 8)

Paracholeothrips gracilis Crespi *et al.*, 2004: 272

This elegant slender species is known only from the type series taken at Meekathera, Western Australia. The *Acacia* host was given as *?citrinoviridis*, although it was never satisfactorily identified. The fore tarsal tooth is particularly long and slender, and the fore tibia also has a spur at the inner apex. The prosternal basantra are small or even absent in both sexes, but in females the ferna are massive, elongate with the median margins closely parallel (Fig. 8). In males, the ferna are similar in shape but not so elongate, and sternite VIII does not have a pore plate.

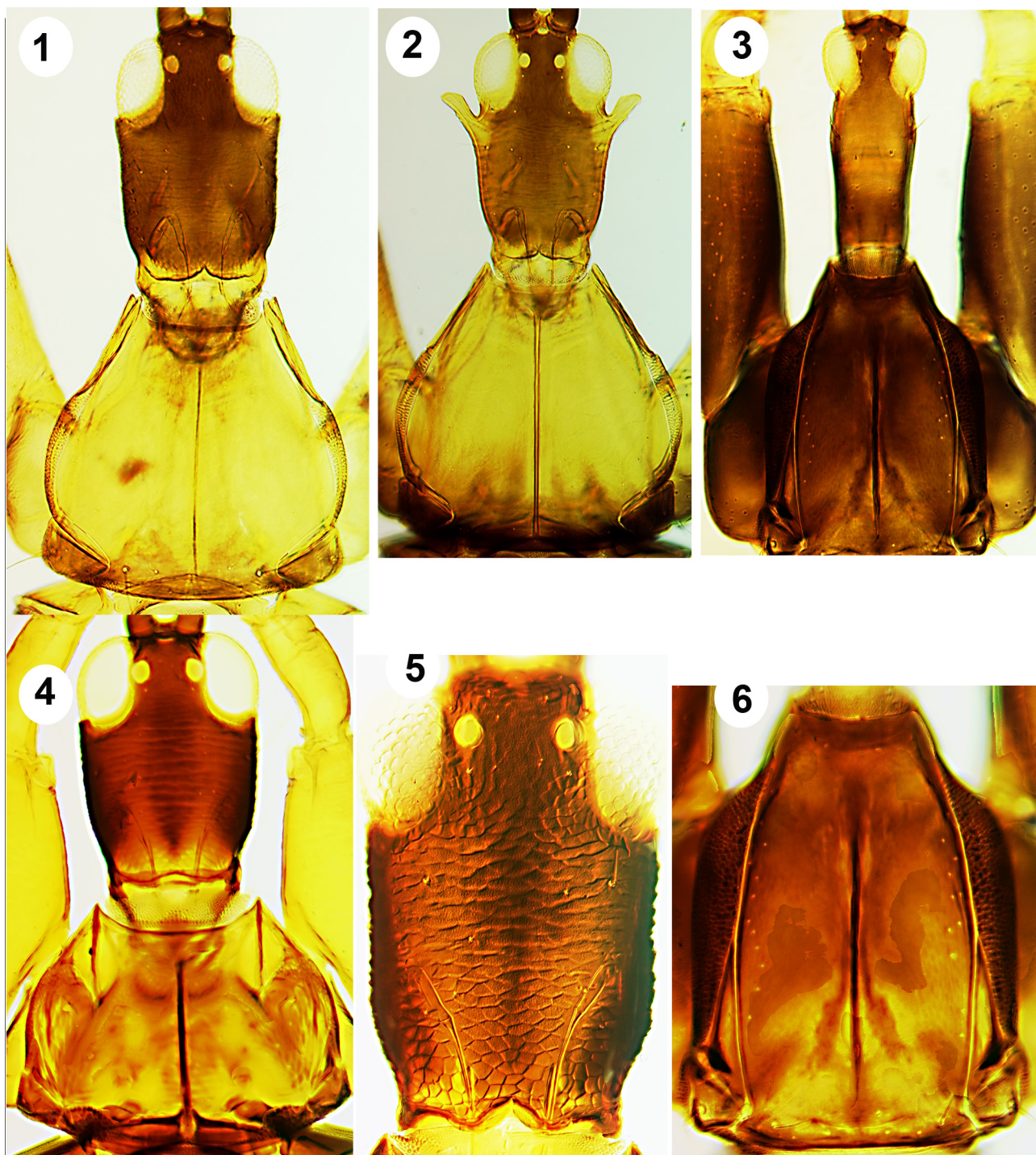
***Paracholeothrips morrisi* sp. nov.**

(Figs 2, 9, 13, 15)

Female macroptera. With the generic character states indicated above. Body mainly dark brown, pronotum brownish-yellow, tubercles on head yellow; antennal segment III mainly brownish-yellow, IV–VII brown with basal third decreasingly paler; major setae pale except dark brown anals; fore wing pale. Antennal segments III–IV with sense cones small, slender and curved (Fig. 13); segment VIII short and broadly joined to VII. Head with elongate tubercle laterally behind both eyes (Fig. 2); postocular setae acute, shorter than postocular tubercles. Pronotum elongate, narrowed at apex, with median longitudinal ridge; epimeral and posteroangular setae long and slender, remaining major setae not longer than discal setae. Mesonotal median division complete (Fig. 15). Metanotum reticulate, but anteromedian triangular area less strongly reticulate. Prosternal basantra absent, ferna elongate with truncate apex (Fig. 9); mesopresternum of two small triangles; metathoracic sternopleural sutures short, scarcely extending beyond hind margin of coxal cavity. Fore tarsus with long and robust tooth, fore tibia inner apex with stout tubercle. Fore wing broad, parallel sided, with more than 20 duplicated cilia, terminal cilia short, sub-basal setae short. Pelta reticulate, wider than long; tergites II–V each with two pairs of sigmoid wing-retaining setae placed laterally, these setae weaker or absent on VI–VII; tergite IX setae long and pale, anal setae on X long and dark brown.

Measurements. (Holotype female in microns) Body length 3900. Head, length 500; width across eyes 300; width to apex of tubercles 400; postocular setae (left/right) 75/30. Pronotum, length 550; width 550; epimeral setae (of paratype) 125; posteroangular setae (of paratype) 150. Fore wing, length 1800; sub-basal setae 40–50. Tergite IX setae S1 230, S2 255; tube length 250. Antennal segments III–VIII length: 145; 115; 100; 95; 90; 35.

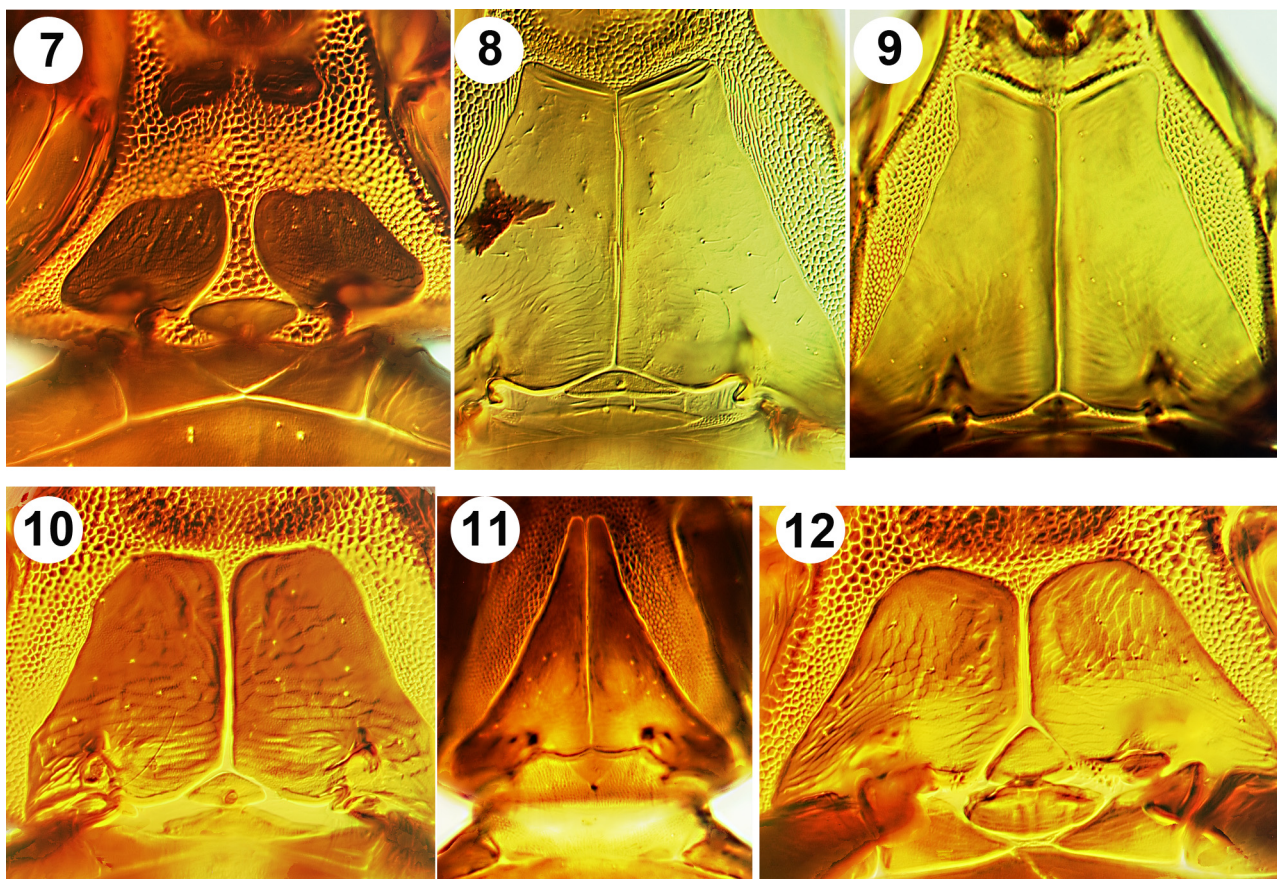
Specimens studied. Holotype female, Western Australia, Mullewa [400 km north of Perth], from *Acacia ampliata*?, 24.ii.2004 (David Morris), in Australian National Insect Collection.



FIGURES 1–6. *Paracholeothrips* species: Head & pronotum. (1) *gracilis*; (2) *morrissi*; (3) *phillipsi*; (4) *validus*; (5) *mulgae*; (6) *phillipsi*.

Paratype female, Western Australia, Paynes Find [420 km northeast of Perth], from *Acacia minyura*, 15.ii.2004 (David Morris).

Comments. Although this species shares many character states with its congeners, the form of the head is unique. The most similar species is *P. gracilis*, particularly in the structure of the pronotum. Moreover, large females of *gracilis* also have a small tubercle behind each eye, but the fore tarsal tooth is much longer and more slender.



FIGURES 7–12. *Paracholeothrips* species: Venter of prosternum. (7) *clavisetae*; (8) *gracilis*; (9) *morrisi*; (10) *mulgae*; (11) *phillipsi*; (12) *validus*.

Paracholeothrips mulgae* Crespi *et al.

(Figs 5, 10)

Paracholeothrips mulgae Crespi *et al.*, 2004: 273

This species is widespread on mulga, the common arid zone tree, *Acacia aneura*. The holotype was taken at Adavale, Queensland, with other specimens in the general area of Charleville. Further populations have been studied from western central New South Wales, also in South Australia just south of the border with Northern Territory. In Western Australia it was found commonly between Kalgoorlie and Mt Magnet. The head has postocular setae present but short and is often more or less reticulate (Fig. 5). The prosternal ferna are elongate, varying between two and three times as long as wide medially (Fig. 10), and on tergite IX the lengths of setae S1 are variable but usually considerably shorter than the tube length. The metathoracic sternopleural sutures are usually not developed.

***Paracholeothrips phillipsi* sp. nov.**

(Figs 3, 6, 11, 14, 16, 18–21)

Female macroptera. With most of the generic character states indicated above. Body dark brown, fore tibiae and fore tarsi paler; antennal segments brownish-yellow and variably slightly shaded on apical third; major setae pale but anals slightly shaded; fore wings pale. Antennal segments III–IV with sense cones short and stout (Fig. 14), V–VI with apex ventrally bearing several small sense cones; segment VIII short and broadly joined to VII. Head exceptionally long, eyes large, genae convex but scarcely constricted at base (Fig. 3); postocular setae distant from eyes. Pronotum long and slender, narrowed at apex, with median longitudinal ridge (Fig. 6); epimeral and

posteroangular setae well-developed but not long, remaining major setae not longer than discal setae. Mesonotal median division weak and variable, sometimes incomplete at anterior (Fig. 16). Metanotum reticulate medially, except on anteromedian triangular area. Prosternal basantra absent, ferna elongate with long pointed apex, sometimes partially fused medially (Fig. 11); mesopresternum of two very small sclerites; metathoracic sternopleural sutures long, extending almost to posterior margins of metasternum (Fig. 19). Fore tarsus with stout, robust, tooth (Fig. 20); fore tibia short, inner apex with small tubercle. Fore wing broad, parallel sided, with more than 24 duplicated cilia, terminal cilia short, sub-basal setae short. Pelta reticulate, long and slender (Fig. 18); tergites II–VI each with two pairs of sigmoid wing-retaining setae placed laterally, these setae weaker or absent on VII; tergite IX setae shorter than tube; fustis short, about 1.5 times as long as wide (Fig. 21); tube about half as long as head.

Measurements. (Holotype female in microns) Body length 4200. Head, length 450; width across genae 150. Pronotum, length 450; width 300; epimeral setae 120; posteroangular setae 30. Fore wing, length 1700; sub-basal setae 50, 30. Tergite IX setae S1 145, S2 155; tube length 250. Antennal segments III–VIII length: 78; 75; 75; 78; 55; 25.

Male macroptera. Similar in structure to females but head and pronotum less elongate, prosternal basantra also slightly shorter with apex rounded. Sternite VIII without pore plate; tergite IX setae S2 about two-thirds as long as setae S1. Teneral males much paler than mature adults.

Specimens studied. Holotype female, Queensland, nr Esk, from phyllode gall on *Acacia fasciculifera*, 4.vii.2025 (DJ Tree 2124), in Australian National Insect Collection.

Paratypes. With same data as holotype, 11 females each taken in a separate gall. Queensland, two sites 60 km northwest of Brisbane: Glamorgan Vale, 6 females 1 male from phyllode galls on *Acacia fasciculifera*, 21.vii.2025, (DJ Tree 2125); Lark Hill, 1 female 3 males from phyllode galls on *Acacia fasciculifera*, 21.vii.2025 (DJ Tree 2127), in Australian National Insect Collection and Queensland Primary Industries Insect Collection.

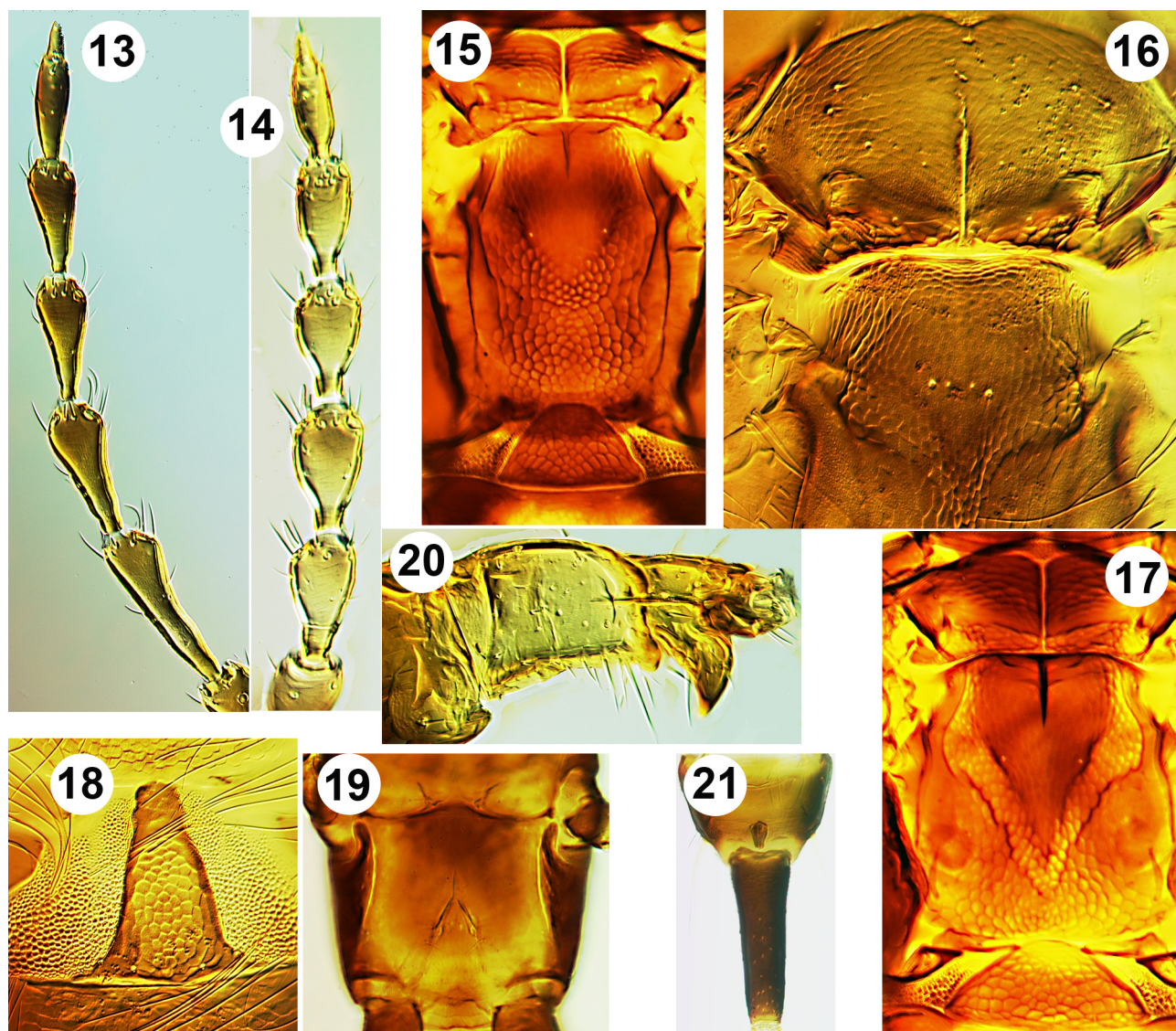
Comments. There are several character states that distinguish this species from its congeners: Head slender, 2.5 times as long as wide and not sharply constricted at base; pronotum long and narrow, not extending across prothorax (Fig. 6); prosternal ferna long with apex acute; anterior of mesonotal median division incomplete or weakly complete; metathoracic sternopleural sutures very long; pelta longer than wide. Despite these differences that at first sight appear to be distinctive, the head in other species of *Paracholeothrips* varies in length as do the metathoracic sternopleural sutures and the prosternal ferna (Figs 7–12). In neither *P. mulgae* nor *P. gracilis* is the pronotum transverse but is similarly elongate as in the new species. However, the pronotal sclerite of *P. phillipsi* is much narrower than in any other member of the genus (Fig. 6). Each of the females in the type series was taken separately, in low numbers in varying shaped galls, including pea-pod shaped galls and twisted/dimply galls. No glued phyllodes, new or old, were seen on any of the sampled trees, despite thoroughly searching over several months. The number of specimens found makes it unlikely that these have drifted in from other *Acacia* trees nearby. Another possibility is that the specimens represent an overwintering population, and that they glue together pairs of phyllodes in pairs in a different season. At present there is no evidence whether the species invades or induces these phyllode galls. But it appears that this species may, within *Paracholeothrips*, be as unusual in its biology as in its body structure.

***Paracholeothrips validus* Moulton**

(Figs 4, 12, 17)

Paracholeothrips validus Moulton, 1968: 111

Based on two females taken in the Great Victoria Desert, probably at one of the stations on the East-West railway, this species has also been seen from two sites in Western Australia, about 250 km and about 480 km northeast of Perth. At the first of these sites, it was taken from tied phyllodes of an unidentified *Acacia* species. Four further specimens were taken in central-western New South Wales at Wilcannia. It is one of three species in this genus with unusually long postocular setae, but it is unique in having antennal segment III with two sense cones on the external apex.



FIGURES 13–21. *Paracholeothrips* species. (13) *morrisi* antenna; (14) *phillipsi* antenna; (15) *morrisi* meso and meta nota & pelta; (16) *phillipsi* meso and meta nota; (17) *validus* meso and meta nota & pelta; (18) *phillipsi* pelta; (19) *phillipsi* metathoracic sternopleural sutures; (20) *phillipsi* fore tibia & tarsus; (21) *phillipsi* abdominal segments IX–X and fustis.

Acknowledgements

We are indebted to Sue and Brian Phillips for recognising that the distorted phyllodes which they observed on *Acacia fasciculifera* were associated with thrips, and thus discovered the remarkable species described here as *Paracholeothrips phillipsi*. We are indebted to Adriano Cavalleri, Zootaxa Editor and his reviewers for improvements to the text.

References

- Crespi, B.J., Morris, D.C. & Mound, L.A. (2004) *Evolution of ecological and behavioural diversity: Australian Acacia thrips as model organisms*. Australian Biological Resources Study, Canberra & Australian National Insect Collection, Canberra, 328 pp.
- Girault, A.A. (1926) *New pests from Australia V*. Published privately, Brisbane, 2 pp.
- Moulton, D. (1968) New Thysanoptera from Australia. *Proceedings of the California Academy of Sciences*, 36, 93–124.