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**Patterns of speciation in Neotropical spore-feeding thrips of the genus
Zeugmatothrips (Insecta, Thysanoptera, Phlaeothripidae)**

by

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Abstract

Analysis of the morphological characters of *Zeugmatothrips* species, all of which feed on fungal spores in leaf litter and on dead branches in Neotropical rain forests, indicates that there are two species groups, one essentially northern and the other essentially southern. Vicariant distributions can be recognised between a few species pairs, but local speciation events appear to have given rise to smaller groups of related species both in Peru and in southern Brazil. An illustrated key is provided to the 16 members of this genus.

Keywords: Speciation, Neotropical, spore-feeding, Thysanoptera, *Zeugmatothrips*.

Resumo

Análise das características morfológicas de espécies do gênero *Zeugmatothrips*, todas das quais alimentam em esporos de fungos existentes em folhas caídas e em ramos mortos das selvas neotropicais, indica que existe dois grupos de espécies, um essencialmente setentrional e o outro essencialmente do sul. Distribuições vicariantes podem ser reconhecidas entre algumas pares de espécies, mas parece que especiação local provocou a aparência de grupos menores de espécies relacionadas em ambos Peru e o sul do Brasil. Está apresentada uma chave ilustrada para os dezesseis membros deste gênero.

Introduction

Insects of the order Thysanoptera have a wide range of biologies and are found throughout the world. Species in the largest family, the Phlaeothripidae, are mainly fungus-feeders, but include predators on other arthropods as well as flower- or leaf-feeders some of which induce plant galls (MOUND, HEMING & PALMER 1980). The 400 or more species in the subfamily Idolothripinae, which includes some of the largest members of the order, all feed by ingesting whole fungal spores. They live on dead branches and dead leaves, and are found throughout the world but particularly in the tropics (MOUND & PALMER 1983). Within this sub-family, one sub-tribe of 13 genera, the Hystriothripina, is almost restricted to the Neotropical Region, although only two of these genera have more than three species, *Actinothrips* with 11 and *Zeugmatothrips* with 16 species.

Current knowledge of *Actinothrips* is hampered by complex patterns of structural variation both within and between populations. Too few specimens have been collected, usually with inadequate field data, and the standards of descriptive taxonomy are particularly poor. As a result, it is not possible to know at present how many real species the 11 available descriptions refer to. In similar circumstances, whilst working with another Idolothripine genus, *Elaphrothrips*, PALMER & MOUND (1978) concluded that many described species were synonyms, and that several were widespread and structurally variable both within and between populations. The available evidence suggests that this may also be true of some *Actinothrips* species.

In contrast, after a re-examination of most of the original material, the species of *Zeugmatothrips* have been found to be relatively well-defined, despite the fact that they have been described sequentially in 10 separate publications over a period of 35 years. These insects are comparatively small and are found on rather large, dead leaves in rain forests between Mexico and southern Brazil. Most of them seem to be relatively restricted in distribution, and the purpose of this paper, having made identification of the species possible, is to compare these patterns of distribution with the patterns of presumed phylogenetic relationships based on structural similarities.

Taxonomic conclusions are dependent on the quality of the available data, and it must be remembered that eight *Zeugmatothrips* species are still known from single samples. Other species may yet be found to be more widespread, because, of the three species here recorded from Trinidad, *bennetti* is also known from Guyana, *gracilis* from Belem, and *priesneri* from Panama. The area around Belem at the mouth of the Amazon, where the Amazon fauna meets that of the coastal regions, is particularly interesting in that six species of *Zeugmatothrips* have been collected there.

Biology

The species of *Zeugmatothrips* seem to differ in their biology from many other Thysanoptera. Thus although most thrips, including the known *Actinothrips* species, exist as local aggregations or dense populations, the species of *Zeugmatothrips* appear to have a more diffuse population structure. The most frequently collected species, *priesneri*, is usually observed one specimen at a time, sitting parallel to the mid-rib on a dead leaf, whether this is on the ground or hanging from a branch. Although readily collected in Panama this species has never been found in large numbers at any one site. As with most *Zeugmatothrips*, the adults are fully winged (*bennetti* and *pallidulus* being exceptions), but are remarkably sluggish in behaviour and are probably relatively non-vagile compared with most thrips.

Moreover, Elane STRATES (pers. comm.), who frequently observed *priesneri* during field studies in Panama on another spore-feeding species (see KIESTER & STRATES 1984), considered that pupal rape might occur in this species as in the European grass thrips, *Limothrips denticornis* (BOURNIER 1956). Such a habit, together with low vagility and the diffuse population structure, might be related to the pattern of localised species in *Zeugmatothrips* which contrasts with the widespread, vagile species so typical of other Thysanoptera.

Characters studied

The characters used to distinguish species in this genus (see Table I and Key) are as follows.

Head sculpture: the dorsal surface of the head is reticulate in most species (Fig. 8), almost transversely striate in several others (Fig. 4), but intermediate in *priesneri*.

Head setae: the length of the mid-dorsal setae is variable; they are usually about as long as the postocular setae, or else they are much shorter; their origin varies from close to the postoculars to far back on the head; the plesiomorphic condition is probably short and far back (Fig. 3).

Antennal colour: the segments are all dark in a few species, but almost all pale in a few others; segment IV is often paler than III, an unusual condition since in most thrips III is the palest segment.

Antennal setae: for the purpose of this discussion "major setae" refers to those setae with the apices expanded; small setae with the apex expanded are listed in Table I in parentheses, but intra-specific variation must be expected in this character (Figs. 9 - 19).

Antennal sense cones: the fourth antennal segment has either two or four sense cones apically (Figs. 9 - 11), the latter condition being plesiomorphic.

Leg colour: the legs of thrips are variously coloured dark brown, yellow, or bicoloured, but several species in this genus have remarkably colourless or "white" femora.

Abdominal tergite I: this tergite is reduced in size in Phlaeothripidae and is referred to as the pelta; outgroup comparisons suggest that a broad pelta bearing two pairs of setae laterally is plesiomorphic in this genus (Fig. 20); derived from this is the condition with one pair of lateral setae (Figs. 21 - 25), and the extreme derived condition is with the lateral setae arising on separate sclerites (Figs. 26 - 30).

Abdominal tergal setae: the number of paired lateral setae on the first three tergites, including the pelta, appears to undergo reduction from 2, 2, 3 to 1, 1, 2 (Figs. 1 - 2), but this is probably subject to some reversal.

Relationships

Colour and the number of long setae, the traditional characters used to distinguish species in this genus, are probably poor indicators of phylogenetic relationships. Such characters are likely to be controlled by relatively simple genetic mechanisms and thus readily subject to reversal during evolution. In contrast, the form of the pelta is probably more stable, and therefore a better guide to such relationships.

The most fully developed pelta of any species of *Zeugmatothrips* is that found in *mumbaca* (Fig. 20) with a large, undivided central plate bearing two pairs of lateral setae. A similar pelta is found in three other Hystricothripine genera, *Saurothrips*, *Azeugmatothrips* and *Zeuglothrips* (MOUND & PALMER 1983), suggesting this condition is plesiomorphic in *Zeugmatothrips*. The species of these other three genera also resemble *mumbaca* in having two stout setae on antennal segment two (Fig. 9), and the relatively broad head shape in *mumbaca* with the short mid-dorsal setae placed posteriorly (Fig. 3), also seems to be plesiomorphic. The only obvious apomorphy in this species is the presence of a single dorsal seta on each of antennal segments three and four. This species from Belem thus appears to retain the largest number of plesiomorphies in the genus.

In *bispinosus* (Fig. 24), *priesneri*, *bennetti* (Fig. 25) and *hoodi* the pelta is smaller than that of *mumbaca* and bears only one pair of lateral setae. *Z. bennetti* from Trinidad and Guyana is the sister-species of *hoodi* from Costa Rica, these two being distinguished by the synapomorphy of both dorsal setae being reduced on antennal segments three and four (Figs. 14, 15). Together these two appear to be the sister-group of *bispinosus* from the Amazon Basin and *priesneri* from Trinidad and central America. In *bispinosus* the major setae on the antennae are not particularly large (Fig. 13), and in *priesneri* there is only one major seta on each segment (Fig. 12).

A further stage in reduction of the pelta is found in *annulipes* (Fig. 22), *badiipes* and *badiicornis* (Fig. 21) from Peru, also *niger* and *femoralis* from Brazil. These five, large, species all have relatively long tubes and are very similar to each other in structure, differing only in the colour of the legs and antennae.

The remaining six members of the genus, in contrast, have the lateral setae on the first abdominal tergite arising on sclerites separate from the pelta (Fig. 28). Moreover, there is an irregular transverse line of sculpture on the pelta close to its posterior border. Amongst these species, *hispidus* from Mexico is unique in having the mid-dorsal setae on the head well behind the postocular setae, and the inner of the paired setae on antennal segments three and four is reduced although still capitate.

One species, *gracilis* from northern Brazil and Trinidad, has the median metanotal setae exceptionally small, and this species possibly represents the sister-group of the remaining four species. Three of these come from southern Brazil, although it is interesting to note that only *pallidulus* is recorded from the southern-most State of Santa Caterina, despite the very large number of litter-dwelling thrips described from that area by J. D. Hood (MOUND 1977). The pelta of *peltatus* (Fig. 30) at first sight seems to be unique, but intermediate stages with the median area slightly enlarged are found in *pallidulus* and *gracilis* (Figs. 27, 29).

Summarising the above, it seems that evolution within *Zeugmatothrips* involved an early speciation event giving rise to two groups, one predominantly northern (the *priesneri* group) and one predominantly southern (the *cinctus* group). Within the northern group some species pairs with vicariant distributions can be recognised (*bennetti/hoodi*; *bispinosus/priesneri*), but other speciation events would appear to have been more localised giving rise to the three Peruvian species. The predominantly southern group includes one northern outlier, *hispidus* from Mexico, which may be the sister-group of the remaining species. Of these, *gracilis* from northern Brazil could possibly be the sister-group of the species from southern Brazil. However, as with the Peruvian species, the three from the southern limits of the genus appear to be closely related to each other suggesting relatively local speciation events.

Zeugmatothrips PRIESNER

Zeugmatothrips PRIESNER, 1925: 313. Type-species: *Z. hispidus*, by monotypy.

No member of this genus has ever been placed in any other genus, indicating that, unlike so many other thrips genera it is readily distinguished. The antennae have a long stout seta on segment I and usually one or two similar setae on II, III and IV; segment III is relatively short and VIII lanceolate. The prothoracic praepectal plates are not developed, the forewings lack duplicated cilia, the fore tarsal tooth is absent in both sexes, the tube bears numerous lateral setae, and the tergites each have only one pair of wing-retaining setae. MOUND & PALMER (1983), in distinguishing this genus from related genera, recognised two species-groups: *cinctus*-group (*borgmeieri*, *cinctus*, *gracilis*, *pallidulus*, *peltatus*), and *priesner*-group (*annulipes*, *badiicornis*, *badiipes*, *femoralis*, *niger*, *mumbaca*, *priesneri*), with three intermediate species (*bispinosus*, *hispidus*, *hoodi*). The present study largely confirms these groups, as discussed above and summarised in Table I.

Key to species

- | | |
|--|-----------------|
| 1. Antennal segments III-IV on dorsal surface each with two small pale major setae
(Figs. 14, 15) | 2 |
| – Antennal segments III - IV each with one or two very stout dark major setae | 3 |
| 2. Mid and hind tibiae brown, scarcely paler at apex; hind femora pale with brown shading externally near apex, mid femora shaded brown; abdominal tergite III with 2 pairs of lateral setae | <i>hoodi</i> |
| – Mid and hind tibiae brown but sharply pale in distal third; mid and hind femora pale without any brown markings; abdominal tergite III with 3 pairs of lateral setae | <i>bennetti</i> |

3. Antennal segments III-IV on dorsal surface each with 2 dark major setae, the inner seta sometimes weaker than the outer (Figs. 13, 16 - 19)	4
- Antennal segments III-IV each with only one dark major seta (Figs. 10 - 12)	10
4. Head with mid-dorsal setae arising well behind post ocular setae (Figs. 4 - 6) .	5
- Head with mid-dorsal setae arising almost in line with, or only just posterior to, the postocular setae (Figs. 7, 8)	6
5. Pelta hat-shaped with lateral setae arising from separate sclerites (Fig. 26); tergite II with one pair of lateral setae; mid-dorsal head setae about one third as long as postoculars; fore femora dark	<i>hispidus</i>
- Pelta wide with lateral setae arising at extremities (Fig. 24); tergite II with 2 pairs of lateral setae; mid-dorsal head setae about two thirds as long as postoculars; fore femora white	<i>bispinosus</i>
6. Legs dark	<i>cinctus</i>
- Legs pale or brownish yellow	7
7. Pelta almost semi-circular (Fig. 30)	<i>peltatus</i>
- Pelta with lateral wings (Figs. 27, 29)	8
8. Abdominal tergites II & III with 2 & 3 pairs of lateral setae	<i>borgmeieri</i>
- Tergites II & III with 1 & 2 pairs of lateral setae	9
9. Metanotal median setae well developed, apices expanded; pterothorax pale	<i>pallidulus</i>
- Metanotal median setae small and acute; pterothorax brown	<i>gracilis</i>
10. Antennal segment IV dark	11
- Antennal segment IV yellow	13
11. Legs uniformly dark	<i>niger</i>
- Legs with fore femora pale	12
12. Hind femora dark	<i>femoralis</i>
- Hind femora pale	<i>badiicornis</i>
13. Pelta broad with 2 pairs of lateral setae (Fig. 20); antennal segment VII yellow	<i>mumbaca</i>
- Pelta with one pair of lateral setae (Figs. 22, 23); antennal segment VII brown	14
14. Fore and hind femora largely white; tergite III with 2 pairs of major lateral setae	<i>priesneri</i>
- Fore and hind femora largely brown; tergite III with 3 pairs of major lateral setae	15
15. Femora dark brown	<i>badiipes</i>
- Femora brown with yellow apices	<i>annulipes</i>

Zeugmatothrips annulipes HOOD

HOOD, 1941: 233 - 236. Holotype ♀, PERU (USNM). (Figs. 11, 22)

This species is known from a single series comprising 23 females and 9 males collected at 3000 m in the Peruvian Andes. It is very similar in structure to *badiipes*, collected at a lower altitude in northern Peru, and may simply represent a smaller paler form.

Specimen studied: 1 ♀ paratype, Peru, Dept. Huanuco, Piedras Grandes, xi. 1937 (BMNH).

Zeugmatothrips badiicornis HOOD

HOOD, 1936: 457 - 460. Holotype ♀, PERU (USNM). (Figs. 1, 21)

Described originally from a single specimen collected at Sani Beni, Dept Junin, in central Peru, this species is here recorded from the south eastern part of that country. Unlike the other two Peruvian species, *annulipes* and *badiipes*, it appears to be a lowland species, and although closely related to these others it is readily distinguished by the dark antennae.

Specimens studied: 2 ♀, Peru, Dept Madre de Dios, 30 km S. W. of Pto Maldonato, x. 1983 (BMNH).

Zeugmatothrips badiipes HOOD

HOOD, 1937a: 292 - 296. Lectotype ♀, (PITKIN, 1978), PERU (USNM). (Fig. 10)

Hood described this large dark species from six females and three males collected in northern Peru at an altitude of 1300 m. In structure it is very similar to the smaller paler *annulipes*.

Specimen studied: 1 ♀ paralectotype, Peru, Dept Amazonas, Guayabamba, viii. 1936 (BMNH).

Zeugmatothrips bennetti sp. n.

(Figs. 6, 14, 25)

♀ microptera. Body and legs bicoloured; abdominal segments III - X dark brown, head and antennal segments II - III brown, also thorax laterally; median area of thorax and abdominal segment II lighter, pelta brownish yellow; antennal segments III - VII yellow, VIII shaded also base of III and apex of VII; all femora and tarsi yellowish white, also fore tibiae; basal two thirds of mid and hind tibiae dark brown, distal third sharply pale.

Head with two pairs of long setae (Fig. 6); antennae slender, one long seta on segment I, but dorsal setae on III - V slender and pale with apices scarcely blunt (Fig. 14). Pronotum with five pairs of long setae, *aa* and *ml* close together on an elongate tubercle, *epim* on a conical tubercle; epimeral sutures complete. Metanotum faintly reticulate, median setae extending to posterior margin. Pelta broad, lateral setae arising from small sclerites which are scarcely joined to the median sclerite (Fig. 25); tergite II with 2 lateral setae, III with 3 lateral setae.

Measurements of holotype ♀ in μm .

Body length 2700. Head, length 300; maximum width 200; postocular setae 140; mid-dorsal setae 135. Pronotum, length 140; width 260; major setae, *am* 110, *aa* 140, *ml* 150, *epim* 135, *pa* 150. Forewing, length 240; basal setae 85, 95, 115. Metanotal setae 145. Tube length 135. Antennal segments III - VIII, 96, 100, 115, 90, 75, 72; dorsal seta on I 120, on III 40.

♂ microptera. Colour and structure similar to female but smaller.

Larva II. Structure typical of the genus; colour brownish yellow with transverse crimson bands in the meso and meta thorax and abdominal segments; terminal setae on abdomen exceptionally long, six times as long as last tergite; dorsal seta on antennal segment III reaching to apex of antenna.

Holotype ♀: TRINIDAD; Coura Valley, 7 km north of Eastern Main Road, in mango leaf litter, 20. v. 1972 (B. R. PITKIN, 439) (BMNH).

Paratypes 6 ♀ 4 ♂: TRINIDAD; 2 ♂ collected with holotype; 4 ♀ in banana and mango litter, Tacarigua, St Michael, 24 - 30. vi. 1972 (B. R. PITKIN, 328, 354); 1 ♀ 2 ♂ in *Cassia* litter, 3 - 4. xi. 1970 (L. A. MOUND, 899, 910). GUYANA; 1 ♀ in leaf litter, Rupununi, ? 1960 (T. Clay) (BMNH).

This species is closely related to *hoodi* from Costa Rica, and can be distinguished only by the characters indicated in the key. The paratype listed from Guyana has the major setae and apices of the hind femora shaded; this shading appears to be a rather purplish artefact however, possibly as a result of the specimen having been collected and stored with Collembola prior to mounting.

Zeugmatothrips bispinosus HOOD

HOOD, 1937b: 527 - 530. Holotype ♀, PERU (USNM). (Fig. 13)

This species is probably widespread in the Amazon Basin, although only seven specimens have been collected. No structural or colour difference has been detected between the holotype, collected from near a tributary of the Upper Amazon, and six specimens collected from about 2000 km away at the mouth of the Amazon. It seems to represent the sister-species of *priesneri*, differing mainly in the setae on antennal segments III and IV, and in the colour of the legs. The pelta is very similar, but has the anterior lobe darker and more sculptured than the posterior area and delimited by a transverse line. The fore femora are white, in contrast to the dark brown hind legs and the lighter brown fore tibiae. Unlike the other members of the *priesneri* group antennal segments III and IV bear two major setae although these are relatively weak even if dark (Fig. 13).

Specimens studied: Peru; ♀ holotype, Dept San Martin, Moyobamba, xii. 1936. Brazil; 5 ♀ 1 ♂, Para, Belem, vii - viii. 1951 (USNM).

Zeugmatothrips borgmeieri HOOD

HOOD, 1949: 80 - 85. Holotype ♀, BRAZIL (USNM).

This species is known only from the type series of seven females and five males. It is similar in structure and sculpture to the other members of the *cinctus* group, although the external pair of setae on tergites II and III are almost as long as the inner pairs, but curved as in *cinctus* rather than straight.

Specimens studied: 2 ♀ 1 ♂ paratypes, Brazil, Jacarepagua (Buenos Aires), v. 1948 (USNM).

Zeugmatothrips cinctus HOOD

HOOD, 1952: 170 - 171. Lectotype ♀ (PITKIN, 1978), BRAZIL (USNM). (Figs. 2, 7, 17, 28)

In structure this species is similar to *pallidulus*, both differing from *gracilis* in having the metanotal setae elongate as is typical of the genus. Unlike these other species *cinctus* has dark legs and the third antennal segment shaded basally, moreover the median antennal segments are exceptionally stout. In the type series, comprising 16 females and 11 males from Belem, antennal segments VI and VII are yellow, whereas these segments are shaded in the male from Bahia listed below. Moreover, in this specimen the outer pair of lateral setae on tergites II and III are curved and longer and stouter than in the type series, although not as long as the inner pairs of setae.

Specimens studied: Brazil; 1 ♀ paralectotype, Para, Belem, viii. 1951; 1 ♂ in *Cacao* leaf litter, Bahia, Itabuna, ix. 1971 (BMNH).

Zeugmatothrips femoralis HOOD

HOOD, 1952: 169. Holotype ♀, BRAZIL (USNM).

The only known specimen of this species is similar in structure to *badiicornis* and *niger*, but with more slender antennal segments and differently coloured legs.

Specimen studied: ♀ holotype, Brazil, Para, Belem, vii. 1951 (USNM).

Zeugmatothrips gracilis HOOD

HOOD, 1952: 171. Syntypes 3 ♀ 6 ♂, BRAZIL (USNM). (Fig. 27)

Although previously known only from the type series collected at Belem near the mouth of the Amazon, this species has now been taken at several sites in northern Trinidad. It is unique in the genus in having the median metanotal setae short and acute, scarcely 15 μm in length. The outer pair of lateral setae on tergites II and III are almost half as long as the inner pairs in some of the Trinidad specimens, but are always much more slender.

Specimens studied: 4 ♀ 5 ♂, Trinidad, at five separate sites in the northern part of the island, xi. 1970 & v - vi. 1972 (BMNH).

Zeugmatothrips hispidus PRIESNER

PRIESNER, 1925: 314 - 316. Holotype ♀, MEXICO (SMF). (Fig. 27)

This, the type species of the genus, is based on a single specimen from southern Mexico, the most northerly record of the genus but still just within the zone of wet tropical forest. It is an unusual species in that it shares most of the characters of the predominantly southern *cinctus*-group (Table 1), apart from its geographical position and the origin of the mid-dorsal setae on the head well behind the postoculars. Moreover, the inner major seta on antennal segments III and IV is short although stout and dark.

Specimen studied: ♀ holotype, Mexico, Vera Cruz, 10/11. 1923 (SMF).

Zeugmatothrips hoodi PRIESNER

PRIESNER, 1927: 189-192. Syntypes 2 ♀, COSTA RICA (SMF). (Fig. 15)

The two original specimens of *hoodi*, apparently collected near San Jose in central Costa Rica, differ from the three females listed below from the Osa Peninsular in the south western part of that country in having only one instead of two large setae laterally on the second tergite. These five specimens are regarded as conspecific despite this variation. They are all macropterous, whereas the closely related *bennetti* from Trinidad and Guyana is known only from micropterae.

Specimens studied: Costa Rica; 2 ♀ syntypes, San Jose, i. 1917 (SMF); 3 ♀ on dead leaves, Osa Peninsular, Sirena, vii. 1983 (BMNH).

Zeugmatothrips mumbaca HOOD

HOOD, 1952: 169 - 170. Lectotype ♀ (PITKIN, 1978), BRAZIL (USNM). (Figs. 3, 9, 20)

This is a remarkable species due to the structure and chaetotaxy of the pelta (Fig. 20), and the relatively broad head with a pair of stout cheek setae and short mid-dorsal setae (Fig. 3). It is known only from the type series of nine females and seven males.

Specimens studied: 1 ♀ 1 ♂ paralectotypes, Brazil, Para, Belem, viii. 1951 (BMNH).

Zeugmatothrips niger HOOD

HOOD, 1952: 168 - 169. Lectotype ♀ (PITKIN, 1978), BRAZIL (USNM). (Fig. 4)

This species, known only from the type series of ten females and three males, is closely similar in structure to *femoralis* from Brazil and the three Peruvian species, but has uniformly dark brown legs and antennae.

Specimen studied: 1 ♀ paralectotype, Brazil, Para, Belem, viii. 1951 (BMNH).

Zeugmatothrips pallidulus HOOD

HOOD, 1958: 225 - 228. Holotype ♀, BRAZIL (USNM). (Figs. 18, 29)

Known only from southern Brazil, the most southerly record for the genus, this species is also the only *Zeugmatothrips* for which both macropterae and micropterae are known. The original series comprised one female macroptera with 12 female and one male micropterae. Apart from *bennetti*, all the other specimens of *Zeugmatothrips* which are known are fully winged. In structure *pallidulus* is closely similar to *gracilis* and *cinctus*.

Specimens studied: 1 ♀ paratype, Brazil, Santa Catarina Prov., Linha Facao, v. 1957 (BMNH).

Zeugmatothrips peltatus HOOD

HOOD, 1949: 85 - 88. Holotype ♀, BRAZIL (USNM). (Figs. 8, 19, 30)

This yellow legged species is till known from a single specimen collected near Sao Paulo. It is closely related to two other species from southern Brazil, *pallidulus* and *borgmeieri*. Abdominal tergites II and III have the outer pair of lateral setae unusually long for a member of the *cinctus*-group, but as in the specimen of *cinctus* discussed above these lateral setae are curved, not long and straight as in most members of the *priesneri*-group (Fig. 1). The mid-dorsal setae on the head are also relatively long, about 0.75 times as long as the postoculars, and the pelta is unique in the genus (Fig. 30).

Specimen studied: ♀ holotype, Brazil, Sao Paulo State, Salesopolis, Boracea, 7. vi. 1948 (USNM).

Zeugmatothrips priesneri HOOD

HOOD, 1935: 102 - 106. Holotype ♀, PANAMA (USNM). (Figs. 5, 12, 23)

This species has been collected in considerable numbers in both Panama and Trinidad. In colour, it is one of the most distinctive members of the genus, with pale fore and hind femora, and bicoloured mid femora.

Specimens studied: Panama; 2 ♀ paratypes, Porto Bello, 10. vii. 1933; 4 ♀ 1 ♂, Barro Colorado Island, vi. 1933, vi 1935, iii. 1937. Trinidad, 10 ♀ 7 ♂ at various sites near Arima, xi. 1970, v - vi. 1972 (BMNH).

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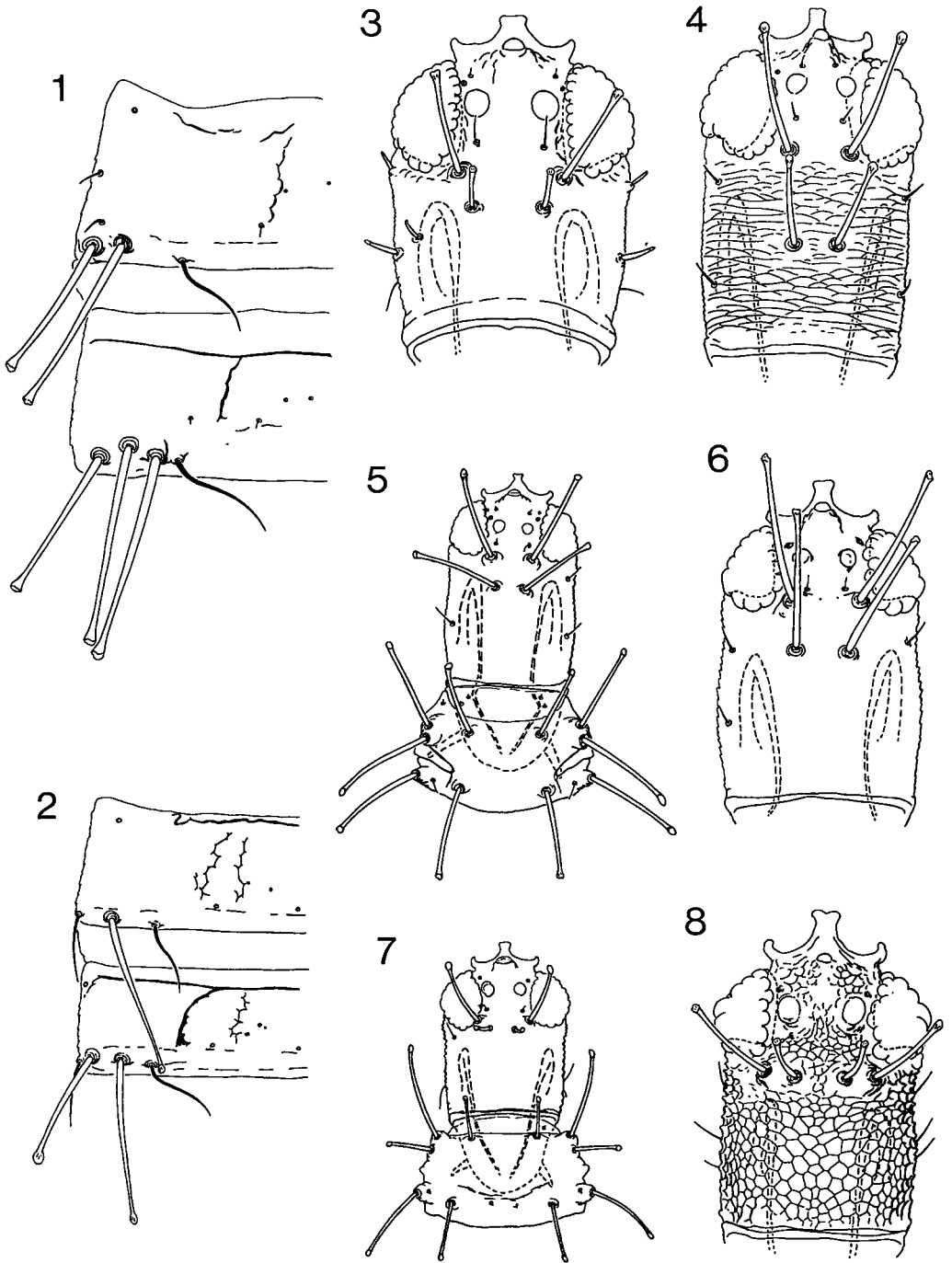
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Table 1: Distribution and characters of *Zeugmatothrips* species.

Species	Distribution	Major lateral setae on tergites			Pelta shape	Mid-dorsal head setae long or short/near or far from po setae	Sense cones on ant. IV	Major setae on ant. segments			Sculpture on head	Antennal colour	Leg colour
		I	II	III				I	II	III			
<i>numbaca</i>	N. Brazil	2	2	3	entire	short/far	4	1(+1)	2	1	reticulate	IV - VII yellow	dark
<i>annulipes</i>	Peru	1	2	3	entire	long/far	4	1	(1)	1	striate	IV - VI yellow	fem. brown apex pale
<i>badiicornis</i>	Peru	1	2	3	entire	long/far	4	1	0	1	striate	dark	fore fem. white hind fem. bicol.
<i>badiipes</i>	Peru	1	2	3	entire	long/far	4	1	(1)	1	striate	IV - VI yellow	dark
<i>femoralis</i>	N. Brazil	1	2	3	entire	long/far	4	1	0	1	striate	dark	fore fem. white hind fem. dark
<i>niger</i>	N. Brazil	1	2	3	entire	long/far	4	1	0	1	striate	dark	dark
<i>priesneri</i>	Panama/ Trinidad	1	2	2	entire	long/far	2	1	(1)	1(+1)	str./retic.	IV - VI yellow	fore/hind fem. white; mid fem. bicol.
<i>bispinosus</i>	Amazon	1	2	2	entire	long/far	2	1	(1)	(2)	striate	IV - VI yellow	fore fem. white hind fem. dark
<i>bennetti</i>	Trinidad/ Guyana	1	2	3	entire	long/far	2	1	(1)	(2)	reticulate	IV - VI yellow	femora yellow
<i>hoodi</i>	Costa Rica	1	1(2)	3	entire	long/far	2	1	0	(2)	reticulate	IV - VI yellow	mid. femora shaded
<i>hispidus</i>	Mexico	1	1	2	divided	short/far	2	1	0	1(+1)	reticulate	IV - VI yellow	dark
<i>gracilis</i>	N. Brazil/ Trinidad	1	1	2	divided	short/near	2	1(+1)	1(+1)	2	reticulate	III - V yellow	pale
<i>cinctus</i>	N. Brazil	1	1(2)	2(3)	divided	short/near	2	1	(1)	2	reticulate	IV - VII yellow	dark
<i>borgmeieri</i>	S. Brazil	1	2	3	divided	short/near	2	1(+1)	(1)	2	reticulate	III - VII yellow	fem. yellow
<i>pallidulus</i>	S. Brazil	1	1	2	divided	short/near	2	1(+1)	(1)	2	reticulate	III - V yellow	pale
<i>peltatus</i>	S. Brazil	1	2	3	divided	long/near	2	1(+1)	2	2	reticulate	III - V yellow	yellow

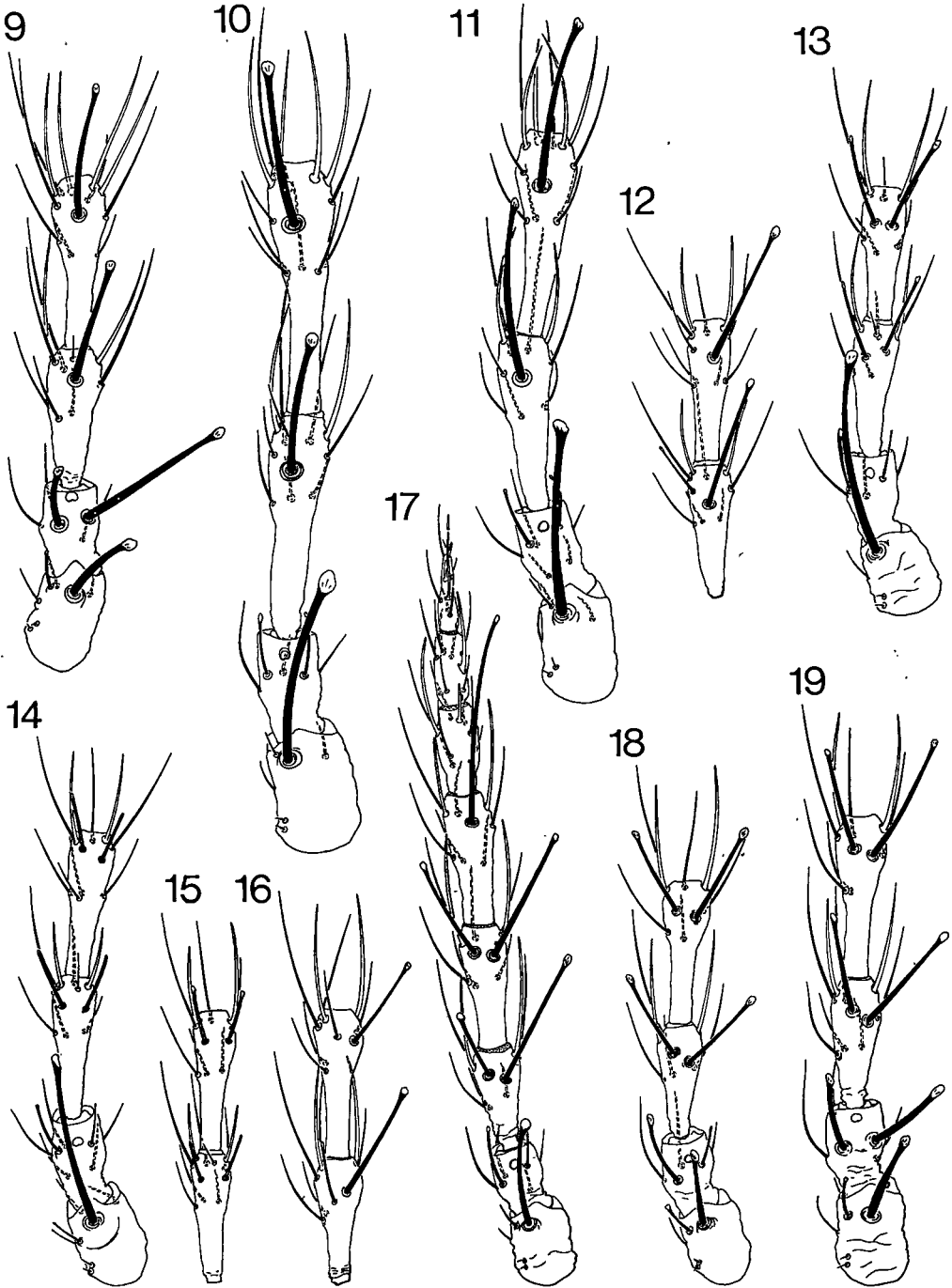


Figs. 1 - 8:

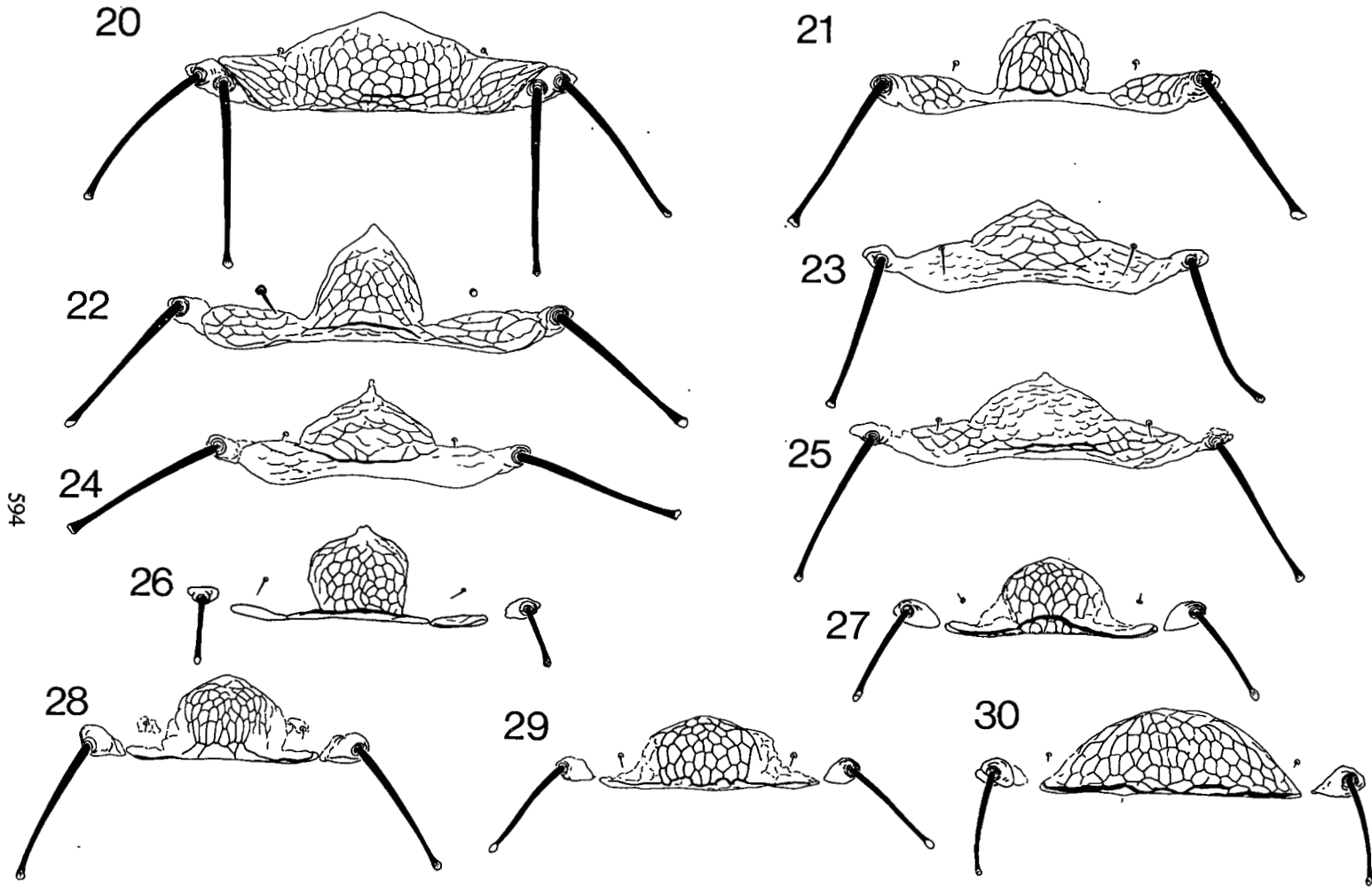
1 - 2: left half of abdominal tergites II & III, 1: *badiicornis*; 2: *cinctus*.

3 - 8: head (& pronotum), 3: *mumbaca*; 4: *niger*; 5: *priesneri*; 6: *bennetti* - holotype;

7: *cinctus*; 8: *peltatus* - holotype (sculptural details only in 4, 8).



Figs. 9 - 19:
 Antennal segments I - IV,
 9: *mumbaca*; 10: *badipes*; 11: *annulipes*; 12: *priesneri* (III - IV); 13: *bispinosus*; 14: *bennetti*;
 15: *hoodi* (III - IV); 16: *hispidus* (III - IV); 17: *cinctus* (I - VIII); 18: *pallidulus*; 19: *peltatus*.



Figs. 20 - 30:

Pelta,

20: *mumbaca*; 21: *badiicornis*; 22: *annulipes*; 23: *priesneri*; 24: *bispinosus*; 25: *bennetti*; 26: *hispidus*; 27: *gracilis*; 28: *cinctus*;
 29: *pallidulus*; 30: *peltatus*.