

**A new Brazilian species of *Heterothrips* (Insecta: Thysanoptera) co-existing with ants in the flowers of *Peixotoa tomentosa* (Malpighiaceae)**

K. DEL-CLARO†, R. MARULLO‡ and L.A. MOUND\*

†*Departamento de Biociencias, CP 593, Universidade Federal de Uberlandia, MG, Brazil*

‡*Dipartimento di Biologia Difesa e Biotecnologie agro-forestali, Universita della Basilicata, Potenza, Italy*

\**Department of Entomology, The Natural History Museum, London SW7 5BD, UK*

*(Accepted 6 December 1996)*

*Heterothrips peixotoa* Del-Claro, Marullo and Mound is described as new. It has remarkably pale forewings, and lives in the flowers of a malpighiaceous shrub in Brazilian cerrado. The sepals of each flower are S-shaped and enclose a central cavity within which the thrips live and breed. Although some large ants are unable to penetrate this cavity, other ants are small enough to enter the space between the petals and sepals, and this leads to a reduction in thrips numbers. Several other members of this genus of thrips are known from the flowers of other species of Malpighiaceae.

KEYWORDS: Thrips, ants, flowers, pollination.

---

**Introduction**

Members of the thrips family, Heterothripidae, live in flowers, and are found only in the New World. The 67 recognised species are classified into four genera. Two of these are monobasic whilst a third contains four species, and these six species are known only from South America. In contrast, the remaining 61 species are all included in the nominate genus, *Heterothrips*, and these are widely distributed between Illinois and Argentina (Mound and Marullo, 1996). Unfortunately, little is known about the biology of any member of this family. Even their natural host-plants are unknown, many having been described from single collections or single individuals. As a result, little conception of intra-specific, inter-population variation in colour and structure has developed, and some of the described species are likely in the future to be recognised as synonyms. The objective of this paper, in describing a new species with unusually pale wings, is to draw attention to the host-plant relationships between several Heterothripidae and flowers of Malpighiaceae, and the importance of ants in determining the level of thrips populations.

The identification key to the members of *Heterothrips* provided by Mound and Marullo (1996) employed several previously unused characters for species discrimination. These authors emphasised, however, not only the lack of information on

variation in structure of many species, but also the lack of information on their host relationships. For example, adult *Heterothrips* and *Scutothrips* are commonly collected, both as individuals and even as series of individuals, from the flowers of weedy members of the Compositae or even Leguminosae. However, in the absence of evidence from the presence of larvae in such samples it would be premature to assume a true host-plant relationship. Adult thrips are highly vagile, often alighting in large numbers on flowers on which they are unable to breed. Despite this, several species of *Heterothrips* and *Scutothrips* have been found in the flowers of Malpighiaceae, including *Brachypterys*, *Byrsonima* and *Peixotoa*, under circumstances that indicate that these are genuine host plants. The possibility that the members of Heterothripidae have a particular relationship to the members of this plant family thus needs further investigation.

### Field observations

The site at which *H. peixotoa* was studied is a reserve of cerrado vegetation, a type of tropical savanna. This site, the Clube de Caca e Pesca Itorora de Uberlandia, is in Minas Gerais State, Brazil, where the climate includes a rainy, hot season from November to May, followed by a dry autumn and winter from June to September. The thrips species was found only in the flowers of *Peixotoa tomentosa* A. Juss (Malpighiaceae), a decumbent shrub that is common in cerrado vegetation. The flowering period of *P. tomentosa* at the study site peaked between June and July (Fig. 1), but individuals and groups of plants could be found bearing flowers during most months of the year in other parts of the cerrado.

At the base of each leaf and bract of *P. tomentosa* there is a pair of extrafloral nectaries that attract ants, and on the outside of each sepal there is a pair of oil-glands. The flowers have five separate, clawed and fringed petals, and in longitudinal section these petals are S-shaped. The lower curves of the sepals enclose a space between the calyx and the inner reproductive structures, and it is within this space that the thrips live (Fig. 2). The flowers are yellow and are grouped into paniculate inflorescences, each flower being about 1.0 cm in diameter, and each panicle ranging

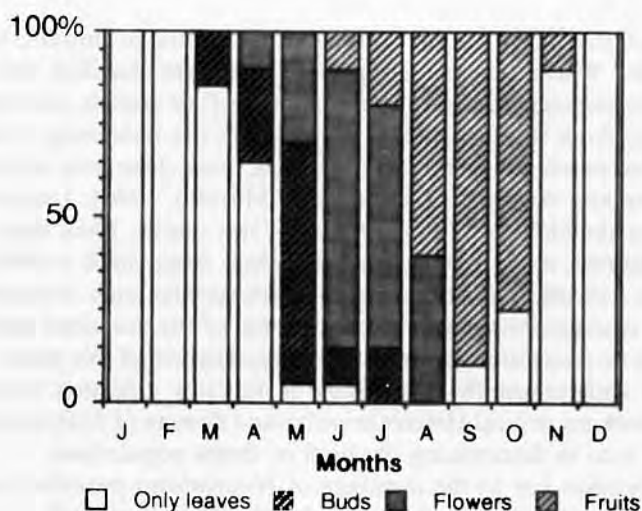


FIG. 1. *Peixotoa tomentosa*: phenology of 20 plants at Uberlandia Brazil, in 1995. ●

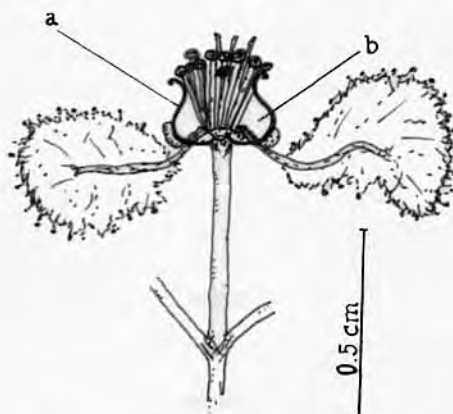


FIG. 2. Flower of *Peixotoa tomentosa* with frontal sepal removed to show 's'-shaped sepal (a) and the chamber (b) created by the sepal. ●

from 10 to 70 cm in length. The flowers do not produce nectar, but despite this they are pollinated by Anthophorine bees that specialise in exploiting the calyx oil-glands (Vogel, 1990). The extra-floral nectaries are visited by a wide range of ant species of various genera and subfamilies, Formicinae (*Camponotus*, *Brachymyrmex*), Ponerinae (*Ectatomma*), Myrmecinae (*Zacryptocerus*, *Crematogaster*), and Pseudomyrmecinae (*Pseudomyrmex*).

The *H. peixotoa* adults and larvae live inside the flowers of *P. tomentosa* within the chamber-like space created by the curvature of the sepals and, judging from the presence of larvae, they lay eggs at this same site. In order to estimate the thrips density, 20 flowers were sampled during July 1995 from different *P. tomentosa* shrubs. Adults were present in all flowers, at a density of between 1 and 17 individuals, and the larvae between 0 and 15. Larvae were observed only within the flowers, but adults were sometimes seen walking on the petals. Other insects were also noted to occur in association with these flowers, including other thrips species (*Frankliniella*, *Scutothrips*), beetles, lepidopterous larvae, aphids (below the sepals), and particularly ants.

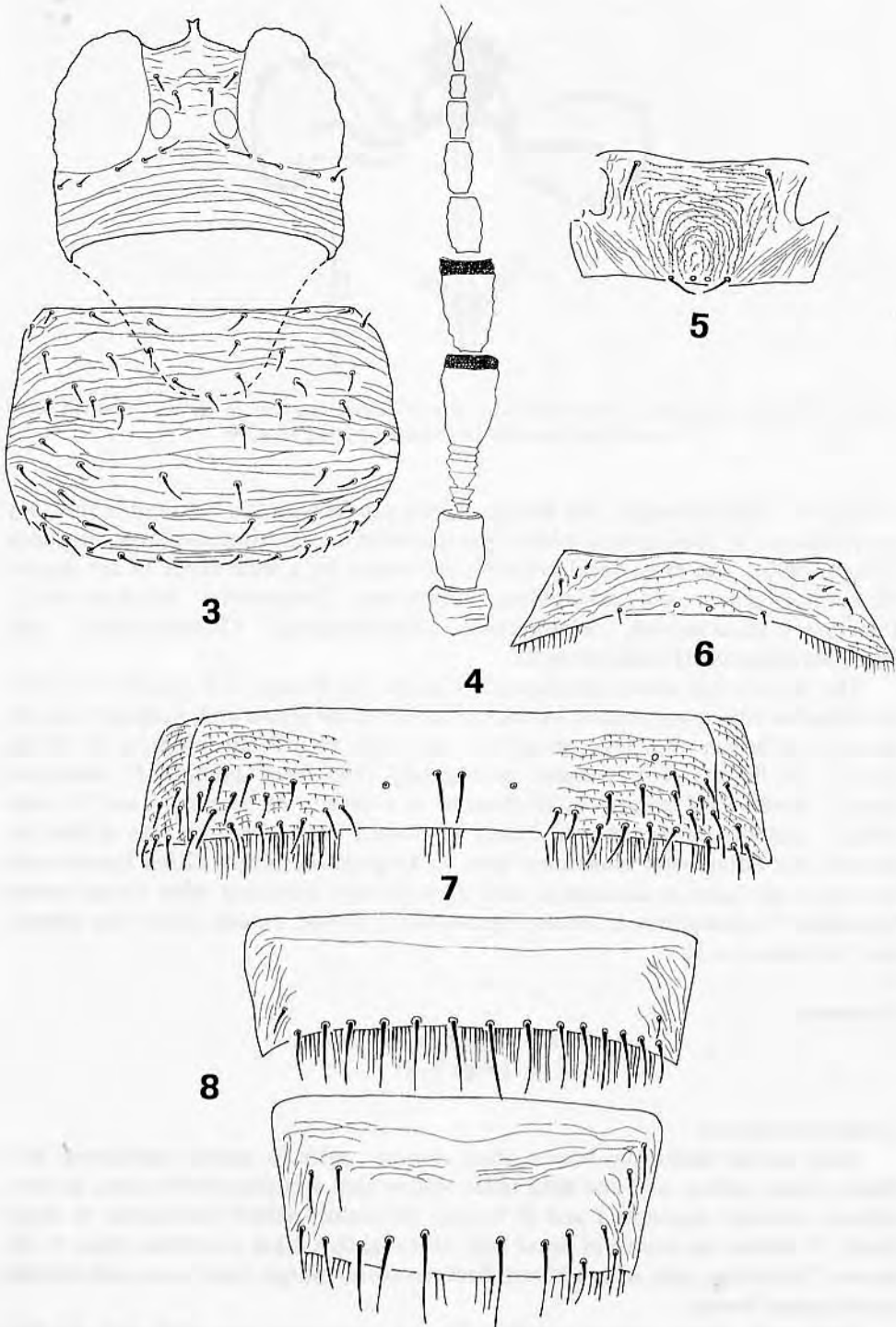
### Taxonomy

#### *Heterothrips peixotoa* sp.n. (Figs 3–8)

##### *Female macroptera*

Body colour uniformly brown when mature, paler in teneral specimens; fore tibiae mainly yellow, mid and hind tibiae yellow with a median brown area, all tarsi yellow; antennal segments I and II brown, III mainly yellow but darker in distal third; IV yellow but brown in distal half, also slightly darker at extreme base; V–IX brown. Forewings pale, with a brown fleck on costal margin near base, and extreme apex shaded brown.

Head with cheeks almost parallel (Fig. 3); compound eyes each with six pigmented facets; ocellar setae I absent, III within but near anterior margins of ocellar triangle; four pairs of postocular setae. Antennal segment III tripartite, pedicel short above disc; apical sensory area on III and IV with two rows of pores (Fig. 4).



FIGS 3-8. *Heterothrips peixotoa*: (3) head and pronotum; (4) antenna; (5) metanotum; (6) tergite I; (7) tergite IV; (8) sternites VI-VII.

Pronotum with transverse narrow reticulation comprising about 30 transverse lines medially, with about 32 discal setae (Fig. 3). Metanotum with transverse rows of microtrichia on the anterior half, but these are concentric around the midpoint in the basal third (Fig. 5). Tergite I with numerous discal microtrichia medially (Figs 6,7), and also laterally; tergites I–V with comb of microtrichia laterally, II–V with a few marginal microtrichia medially; VI–VIII with complete marginal comb; II–VII without rows of discal microtrichia medially, but with regular transverse rows laterally; VIII–IX with transverse fine rows of discal microtrichia. Sternites with a long microtrichial fringe on posterior margin and many discal rows of microtrichia; sternite VII without discal microtrichia medially; sternites III–VI with 14–18 marginal setae, VII with four pairs of discal setae laterally and median four pairs of marginal setae arising well in front of hind margin (Fig. 8).

*Measurements* (in microns). Holotype ♀. Body length 1500. Head, length 120; width 160. Pronotum, length 140; width 220. Forewing length 750. Tergite lengths IX 80; X 75. Antennal segment III–IX lengths 70, 50, 30, 27, 20, 12, 12.

#### *Male macroptera*

Similar to female in body colour and structure but smaller with body more slender; sternites VII–VIII with one irregularly transverse glandular area just in front of antecostal ridge.

*Measurements* (in microns). Paratype ♂. Body length 1200. Tergite VIII glandular area width 80.

#### *Material examined*

HOLOTYPE ♀, **Brazil**, MG, Uberlandia, 14.vii.1995, in flower of *Peixotoa tomentosa* (K. Del-Claro), in ESALQ, Piracicaba, S.P. Brazil. PARATYPES: 9 ♀♀ 1 ♂ same data as holotype (ESALQ & BMNH).

#### **Discussion**

Within the genus *Heterothrips* this species belongs in the informal species-group known as 'Group 1' (Bailey and Cott, 1955). Within this species-group the only other species with the forewings largely pale are *H. animosus* Johansen from Mexico, *H. bicolor* Hood from Brasil and *H. semiflavus* De Santis from Argentina. The first of these has the pronotum yellow, and the other two (which possibly represent a single species) (Mound and Marullo, 1996) have a dark sub-basal cross-band on the forewing with the distal area pale. In most species of *Heterothrips* the forewing is dark with a pale sub-basal mark. The pale forewings of *H. peixotoae* with the apex weakly but distinctly shaded are unique in the genus at present.

In tropical countries, thrips populations seem to come under considerable pressure from ants (Priesner, 1964; Mound and Marullo, 1996), and it is unusual to find thrips on plants or on dead wood in the presence of ants. Del-Claro and Mound (1996) indicated that ants prey on, or disturb and thus repel, thrips from some plants. Recent observations on *P. tomentosa* flowers indicate further that there is a size relationship involved in the interactions between thrips and ants, and the structure of the flowers on this plant is probably important in the survival of the thrips. The flowers of *P. tomentosa* plants visited by large-bodied species of ants, such as *Ectatomma tuberculatum* Oliver and *E. permagnum* Forel, and some *Camponotus* species, also contained *Heterothrips* species. In contrast, plants visited



by small ant species, such as *Crematogaster* and *Brachymyrmex*, had few or no thrips in their flowers.

It appears that large ants are unable to penetrate the enclosed chamber of *P. tomentosa* flowers where the thrips live, because their bodies are larger than the gap between the insertion of a petal and a sepal. The smaller-bodied ants, such as *Crematogaster*, *Brachymyrmex* and one small species of *Camponotus* are able to invade the floral chamber, although it is not yet known whether they prey on the thrips or simply disturb and repel them. When disturbed, the *Heterothrips* adults have been observed to jump or fall to the ground, and this is presumably an important defensive mechanism in avoiding ants, similar to that found in flea-beetles (Del-Claro, 1991).

The complexities of this flower system are particularly interesting. The oil-glands attract bee species belonging to the genera *Centris* and *Epicharis* (Anthophoridae) that are involved in pollination; the enclosed flowers provide a habitat for a particular thrips species (the significance of which is unknown in pollination), and the extra-floral nectaries attract a suite of ant species that appear to repel other insects. The advantages to the plant in terms of seed set or pollen transfer need further study. *Heterothrips lewisi* Mound and Marullo (1996) from Trinidad was found living similarly within the flowers of a malpighiaceae shrub, *Brachypterys ovata*. Unfortunately, no observations have been recorded of the relationships between *Byrsonima* flowers and the Heterothripidae collected from them in Costa Rica and Panama.

#### Acknowledgement

The first author is grateful for financial support from the Brazilian agency, CNPq.

#### References

- BAILEY, S.F. and COTT, H., 1955, A review of the genus *Heterothrips* Hood (Thysanoptera) in North America, with descriptions of two new species, *Annals of the Entomological Society of America*, **47**, 614–635.
- DEL-CLARO, K., 1991, Notes on the mimicry between two tropical beetles in south-eastern Brasil, *Journal of Tropical Ecology*, **7**, 407–410.
- DEL-CLARO, K. and MOUND, L.A., 1996, Phenology and description of a new species of *Liothrips* (Thysanoptera: Phlaeothripidae) from *Didymopanax* (Araliaceae) in Brazilian cerrado, *Revista de Biologia Tropical*, **44**, 193–197.
- MOUND, L.A. and MARULLO, R., 1996, The thrips of Central and South America: an introduction, *Memoirs on Entomology International* **6**, 1–488.
- PRIESNER, H., 1964, A monograph of the Thysanoptera of the Egyptian deserts, *Publication de l'Institut Desert Egypte*, **13**, 1–1549.
- VOGEL, S., 1990, History of the Malpighiaceae in the light of pollination ecology, *Memoirs of the New York Botanical Garden*, **55**, 130–142.