NEOTROPICAL FUNGUS-FEEDING THYSANOPTERA OF THE GENUS *SEDULOTHRIPS* (PHLAEOTHRIPINAE)

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ABSTRACT

The genus *Sedulothrips* is redefined, a key is provided for the separation of the species, and the morphological variation and biology of the species are discussed. Only 2 species are recognized, *vigilans* (Hood) and *tristis* Hood, and the other nominal species in the genus, (*brevispinosus* Moulton, *hubbelli* Watson, *insolens* Bagnall, and *quichua* Hood), are placed as synonyms of *vigilans*. More than 400 specimens collected between central Mexico and southern Brazil were studied.

Sedulothrips species are large black tubuliferous thrips which can be beaten, sometimes in large numbers, from dead branches of trees or picked from dense populations that may develop on newly felled logs and recently dead tree trunks in the neotropics. Many tropical species of Tubulifera can be collected from wood in the first stages of decay but the length of time that newly-killed wood is suitable for a thrips habitat is brief. Thrips are not usually found in wood that has rotted appreciably. Some species feed on fungal spores (Megathripinae), but most species, including those of *Sedulothrips*, apparently feed on fungal hyphae or more probably the breakdown products associated with fungal growth. Very little is known about the thrips method of feeding, but recent studies (Mound 1971) have indicated that these insects have suctorial maxillary stylets which probably are not used for scraping as several text books suggest.

Sedulothrips species are sometimes collected with species of *Eupathithrips* and *Macrophthalmothrips*. All are associated with freshly dead wood and have 2 unusual structural characteristics: the compound eyes are hypertrophied and surround the antennae, and the mouth cone is exceedingly long, reaching across the prosternum. In *Macrophthalmothrips* these characteristics are particularly well developed, the eyes being partly holoptic and the mouth cone reaching the mesosternum. There is no evident adaptive significance in these characteristics, however, for they are not shared with other species in the same habitat. Stannard (1957) discussed the relationships between these genera, and it seems possible that they share a common ancestry with such genera as *Neurothrips* and *Acanthothrips*. These also have rather large eyes with the postocular setae placed closer together than is usual in Tubulifera. *Sedulothrips* and *Eupathithrips* are particularly closely related, and *E. atripes* Hood is intermediate between them in having small cheek tubercles comparable in size with the expanded setal bases on the cheeks of large specimens of *S. vigilans*. If the same degree of variability exists in *Eupathithrips* as in *Sedulothrips* there may be justification for combining the two.

Six nominal species have been referred to *Sedulothrips* but unfortu-

nately, as with many other thysanopterous genera, little attempt has been made to compare the nominal species with each other. The present authors have studied type material of these species as well as series of specimens which include both large and small individuals. As a result of this study only 2 species can be recognized, *vigilans* and *tristis*, the other nominal forms being regarded as synonymous with *vigilans*. This synonymy exists because too few specimens were studied originally, *insolens* and *brevispinosus* being based on uniques, and *vigilans* on 1 male and 1 female. As with many other fungus-feeding Tubulifera, much of the observed variation is intraspecific and related to overall body size (Mound 1972).

The material studied is mainly in the J. D. Hood collection at the U.S. National Museum of Natural History (USNM) but some species are in the British Museum (Natural History) (BMNH). The authors are grateful to Mr. H. A. Denmark for the loan of J. R. Watson specimens from the Florida State Arthropod Collection (FSAC), Division of Plant Industry, Florida Department of Agriculture and Consumer Services, Gainesville; to Professor T. E. Moore for the loan of J. R. Watson specimens from the University of Michigan Museum of Zoology (UMMZ), Ann Arbor; and to Dr. P. H. Arnaud, Jr., for the loan of the type of *brevispinosus* from the Moulton Collection in the California Academy of Sciences (CAS), San Francisco.

Sedulothrips Bagnall

Sedulothrips Bagnall, 1915: 503. Type-species *S. insolens* Bagnall, designated by Moulton, 1933: 400.

Large black Phlaeothripinae with shaded wings and dark major setae. Head elongate; eyes large, surrounding ocelli and bases of antennae, nearly meeting posteriorly; postocular setae relatively close together; cheeks with ventro-lateral setal bases slightly expanded and looking like small tubercles in profile; maxillary stylets retracted nearly to compound eyes, close together in middle of head (Fig. 1); mouth cone elongate, reaching mesosternum. Antennae arising ventrally, 8- segmented; VII and VIII closely united; III-V constricted apically; III and IV each with 3 sense cones and at least 1 truncate seta (Fig. 2). Pronotum with 5 pairs of major setae; anterior margin deeply recessed to allow head to rotate backwards, epimeral sutures complete; praepectal plates weakly sclerotised, elongate and reticulate; mesopraesternum entire, large, and boat shaped. Mesonotum reticulate, midlateral setae well developed. Metanotum reticulate medially with 5 or more pairs of small pale setae. Fore-tarsal tooth usually absent in both sexes (a minute fore-tarsal tooth is present in 2 females from Peru). Fore femora swollen in large specimens, setal bases on inner margin of fore tibiae and fore femora slightly expanded. Forewing parallel sided with 4 sub-basal setae and 20-40 duplicated cilia. Pelta triangular, posterior reticulations bear microtrichia. Tergites II-VII with 2 pairs of major sigmoid wing-retaining setae and 2 to 6 pairs of accessory sigmoid setae; lateral setae on II-VI very stout in large individuals, on IX long and slender; male with B_2 on IX very short and slender. Sternal marginal setae placed laterally; sternites II-III

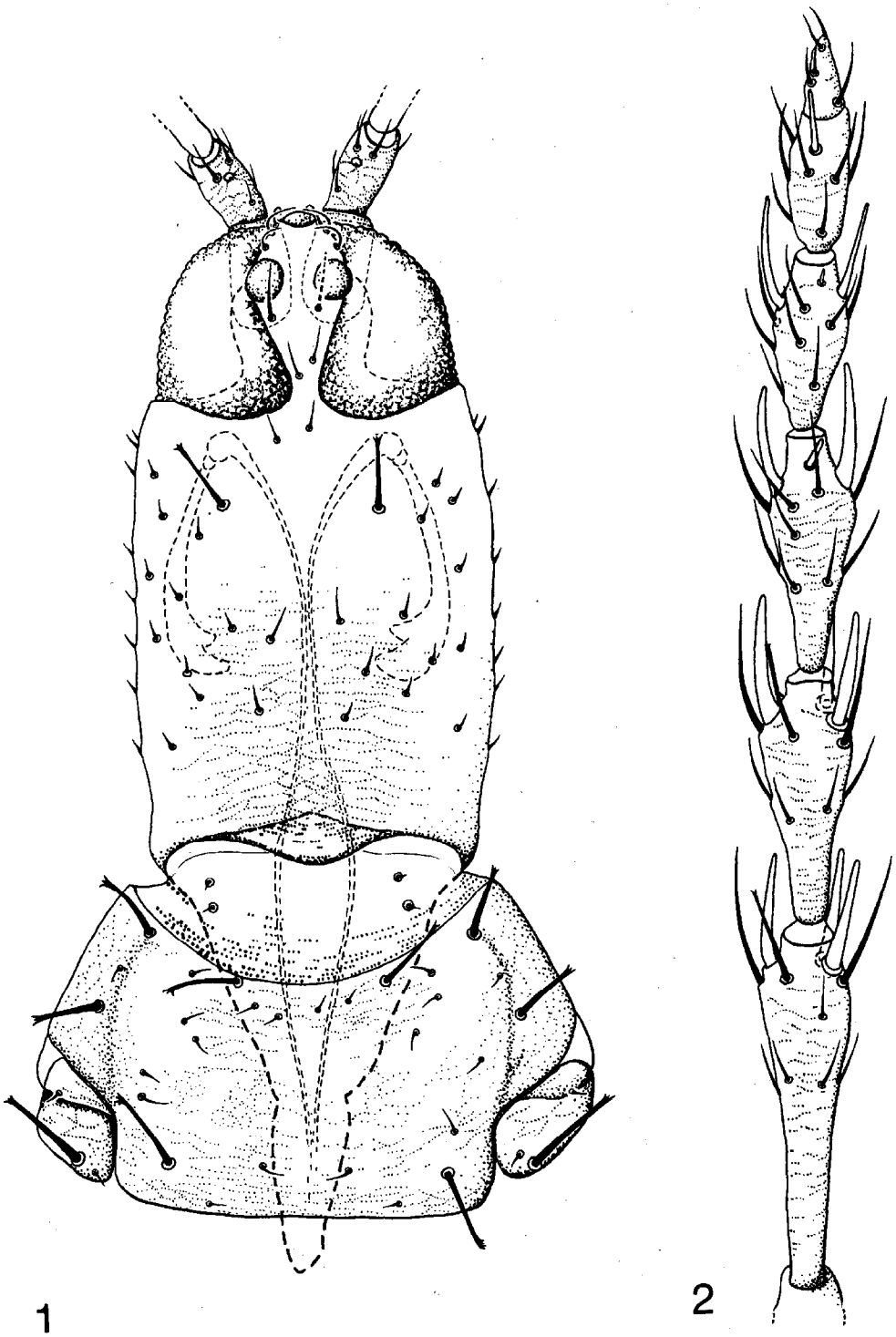

Fig. 1-2, *Sedulothrips tristis* Hood: 1. Head and pronotum, maxillary stylets and mouth cone dotted; 2. Right antenna, segments III-VIII. (Camera lucida drawing—Jennifer Palmer)

and VI-VIII with 2 or more rows of accessory setae, IV and V unusually short with 1 row of accessories in female; male without sternal glandular areas. Tube relatively short, terminal setae longer than tube.

Key to the Species of *Sedulothrips*

1. Abdominal segments III-VIII with chalky white markings anterolaterally; setae on tergite IX more than 2.0 times as long as the tube; forewing with a pale area posterior to distal sub-basal setae ..... *vigilans* (Hood)
1.′ Abdominal segments uniformly dark, without chalky white markings; setae on tergite IX less than 1.75 times as long as the tube; forewing dark behind distal sub-basal setae except around the bases of the marginal cilia ..... *tristis* Hood

Sedulothrips vigilans (Hood)

Polyommatothrips vigilans Hood, 1913: 123-124.
Sedulothrips insolens Bagnall, 1915: 503. Syn. n.
Sedulothrips hubbelli Watson, 1923: 76-77. Syn. n.
Sedulothrips brevispinosus Moulton, 1933: 401-402. Syn. n.
Sedulothrips quichua Hood, 1938: 420-423. Syn. n.

The type-specimens of *vigilans* are unusual in having the antennae and the fore-tibiae and tarsi yellowish. However, virtually all specimens studied have dark legs and the antennal segments frequently have light brown pedicels. The pale colour of the type specimens is probably due to immaturity.

The unique holotype of *insolens* was listed by Mound (1968: 7) as apparently lost, but this specimen is in the J. D. Hood material at the U.S. National Museum. Bagnall stated that *insolens* differed from *vigilans* in having abdominal segment 8 longer than the tube. This observation was inaccurate, for tergite 8 of the *insolens* holotype is 205μ long and the tube 240μ. The forewings were stated by Bagnall to be "richer in colour basally," but only 1 forewing is visible in the holotype and that part of the base which can be seen is clear as in *vigilans*. The length of the pronotal setae and the sculpturing of the forewing discussed by Bagnall are too variable to be used as specific criteria.

Watson described *hubbelli* by comparison with the descriptions of both *insolens* and *vigilans*, but comparison of the type-specimens indicates that all belong to one species. Differences in mounting cause variations such as Watson mentioned in protrusion of the eyes, extension of the mouth cone, and conspicuousness of the abdominal setae. Watson referred to "about forty females and several males collected from rubber trees," but he labeled several males as females and the proportion among the type-specimens examined is 18 males to 16 females. Probably "rubber trees," as well as the terms that appear on the type labels, "strangling fig" and "iguerro" (*higuera*?), refer to adventitiously-rooting *Ficus* species. Watson and Hubbell (1924) published a list of Honduran thrips that gives data for *hubbelli* conforming to the information on the type labels, "Tela Division [of United Fruit Company railroad], Gua[i]mas District. May

2, 3, 10. On branches of a strangling fig tree immediately after it was felled and on bark and log of one felled two weeks previously." The data of the LECTOTYPE designated here are given under Material Studied.

Moulton compared the unique specimen of *brevispinosus* with the description of *insolens*. He did not refer to the other species, and the differences he gave for *insolens* are of no significance. The supposed difference in the relative lengths of abdomen 8 and the tube is based on Bagnall's inaccurate statement about them. The antennal color and setal lengths are related to age and body size, the holotype of *brevispinosus* being a small specimen. Bournier (1970) redescribed "*brevispinosus*" from a single female collected in French Guiana, but did not give any reason for using that name. He omitted *vigilans* from the list of species in the genus. Bournier also stated that the species is "certainly predaceous," but observations in Trinidad by Mound do not support this assertion.

When Hood described *quichua* he had types of *vigilans* and *tristis* but only Moulton's description of *brevispinosus*. In mounted specimens the arch of the head causes variation in the apparent distance between the bases of the postocular setae, by which Hood distinguished *brevispinosus*. This distance is about 1/5 the length of the head in undistorted specimens and increases to more than 1/4 the length in flattened ones. The differences between *quichua* and *vigilans* discussed by Hood are all related to body size. Large specimens have a longer head, longer antennae, and stouter lateral abdominal setae than small specimens. Even more confusing is the variation in the sculpture of the mesonotum. The mesonotal reticles are simple in small specimens, but in large ones the walls of the reticles bear numerous minute tubercles. Because these characters are continuous in the available series there is no reason for considering that the specimens represent different species. Hood described 2 larvae which were collected with 1 series of the type-specimens of *quichua* but it is not possible to be sure that these represent the same species as the adults because of the number of tubuliferous species which live together on dead wood. Both species of *Sedulothrips* have been collected together at the same site in 3 different countries as detailed under *tristis*.

One series of specimens from northeast of Tingo Maria, Peru, includes 2 females each of which possesses a minute fore-tarsal tooth, although the other 3 females and 1 male have unarmed tarsi. Another series taken at the same locality 4 months later includes 4 females and 3 males which are apparently typical *vigilans*, as well as 2 females and 2 males which are extremely large with slightly longer and paler setae on the fore part of the body. The last 4 specimens are regarded with some doubt as members of the species *vigilans*.

MATERIAL STUDIED: 202 ♀ 153 ♂ mostly collected on dead branches. Full data are given here only for holotypes and lectotypes.

Holotype, ♀, of *vigilans*, PANAMA, Canal Zone, Paraiso, sweeping, III 1912 (J. Zetek), USNM 71982; allotype, ♂, collected with holotype.

Holotype, ♀, of *insolens*, TRINIDAD (F. W. Urich), no further data, USNM 71983.

Lectotype, ♀, of *hubbelli*, HONDURAS, Tela, Guaimas Dist., Farm 20, on bark of large Iguerro log in sun baked clearing, 5.3.23 (T. H. Hub-

bell), with the number 155 on Watson's paratype label now emended to read Lectotype, FSAC.

Holotype, ♀, of *brevispinosus*, BRAZIL, no locality, July 1928 (O. Conde), Moulton No. 3228, CAS.

Holotype, ♀, of *quichua*, PERU (San Martin) Moyobamba, ca. 900 m., dead branches in jungle, 6 XII 1936 (F. Woytkowski), USNM 71984.

MEXICO: (San Luis Potosi) Tamazunchale, 13 ♀ 10 ♂, IV; USNM (1 ♀ BMNH).

HONDURAS, Guaimas District, Tela, 15 ♀ 18 ♂ 6 larvae, V; FSCA, UMMZ, USNM, BMNH.

PANAMA: Barro Colorado Island, 21 ♀ 14 ♂ 6 larvae, VI-VII; Guabito, Bocas del Toro, 1 ♂, IV; Porto Bello, 4 ♀ 5 ♂, VII; Chorrera, 1 ♀, VIII; USNM.

TRINIDAD: 48 ♀ 29 ♂ 27 larvae, II-IV, VI, & XI, USNM & BMNH.

SURINAM: 12 ♀ 7 ♂ 1 larva, VII, USNM (1 ♀ BMNH).

VENEZUELA: Miranda, Sierra del Arula, 3000', 1 ♀ 3 larvae, USNM.

BRAZIL: (Para) Belterra, Fordlandia, Santarem, and Belem, 6 ♀ 5 ♂ 2 larvae, VI-VIII; (Distrito Federal) 23 ♀ 22 ♂ 5 larvae, V-VI; (Rio de Janeiro) 5 ♀ 2 ♂, V; (Sao Paulo) Itanhaem, Sao Carlos, and Fazenda Salta, 8 ♀ 2 ♂ 1 larva, VI; (Santa Catarina) 3 ♀ 2 ♂, II; (Parana) 1 ♀, IX; USNM (1 BMNH).

PERU: (Huanuco) Tingo Maria, 10 ♀ 4 ♂, I, V, & VII; (Junin) Sani Beni, 9 ♀ 7 ♂, VII-IX; (San Martin) Moyobamba and Rioja, 13 ♀ 10 ♂ 2 larvae (1 ♀ 1 ♂ BMNH).

Sedulothrips tristis Hood

Sedulothrips tristis Hood, 1933: 434.

This species is very similar to *vigilans* apart from the rather trivial characters referred to in the key. The sculptured reticles on the metanotum of the type series are longer than is usual in *vigilans*, but the specimens identified as *tristis* from Brazil and Peru, and listed below, have equiangular reticulations. The head and tube of *tristis* are rather shorter than those of *vigilans*, but in view of the variation in size of the latter species these differences are of little use in identification. The 2 species have been collected together at Rioja, Peru, at Sao Carlos and Belem, Brazil, and in Panama. The lectotype of *tristis* was designated by O'Neill, Arnaud and Lee (1971).

MATERIAL STUDIED: 34 ♀ 17 ♂ mostly collected from dead branches.

Lectotype, ♀, PANAMA, Barro Colorado Island, on dead leaves and branches of pomarosa (*Eugenia jambos*), 4 VII 1933 (J. D. Hood), USNM 71243.

PANAMA: Barro Colorado Island, 9 ♀ 8 ♂ 7 larvae, VII-VIII; Porto Bello, 11 ♀ 4 ♂, VII; Chorrera, 1 ♂, VIII; Juan Diaz, 1 ♀, I; Chapira, 3 ♀ 3 ♂, XII; USNM (1 ♀ 1 ♂ BMNH).

BRAZIL: (Para) Belem, 3 ♀ 1 ♂, VIII; (Sao Paulo) Sao Carlos, 2 ♀, VI; USNM (1 ♀ BMNH).

PERU: (Huanuco) Tingo Maria, 2 ♀, XII; (Junin) Sani Beni, 1 ♀, VII; (San Martin) Rioja, 1 ♀, XI; USNM (1 ♀ BMNH).

LITERATURE CITED

Bagnall, R. S. 1915. On a collection of Thysanoptera from the West Indies, with descriptions of new genera and species. J. Linn. Soc. Zool. 32: 495-507.

Bournier, A. 1970. Thysanoptera recoltes en Guyane Francaise par la mission du Museum National d'Histoire Naturelle. Ann. Soc. Entomol. France (N.S.) 6: 577-580.

Hood, J. D. 1913. On a collection of Thysanoptera from Panama. Psyche 20: 119-124.

Hood, J. D. 1933. New Thysanoptera from Panama. J. N.Y. Entomol. Soc. 41: 407-434.

Hood, J. D. 1938. Studies on Neotropical Thysanoptera VIII. Rev. Entomol., Rio de Janeiro 9: 404-426.

Moulton, D. 1933. The Thysanoptera of South America (IV). Rev. Entomol., Rio de Janeiro 3: 385-419.

Mound, L. A. 1968. A review of R. S. Bagnall's Thysanoptera collections. Bull. Brit. Mus. Nat. Hist. (Entomol.) Suppl. 11. 181 p.

Mound, L. A. 1971. The feeding apparatus of thrips. Bull. Entomol. Res. 60: 547-548.

Mound, L. A. 1972. Tropical fungus feeding Thysanoptera of the genus *Macrophthalmothrips*. J. Entomol. (B) 41: in press.

O'Neill, Kellie, Paul H. Arnaud, Jr., and Vincent Lee. 1971. Lectotype designations for certain species of Thysanoptera described by J. D. Hood. J. Wash. Acad. Sci. 61: 24-26.

Stannard, L. J. 1957. The phylogeny and classification of the North American genera of the suborder Tubulifera (Thysanoptera). Ill. Biol. Monog. 25. 200 p.

Watson, J. R. 1923. Synopsis and catalog of the Thysanoptera of North America. Fla. Agr. Exp. Sta. Tech. Bull. 168. 100 p.

Watson, J. R., and T. H. Hubbell. 1924. On a collection of Thysanoptera from Honduras. Fla. Entomol. 7: 60-62.