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A REVIEW OF TWO UNCOMMON CALIFORNIA GENERA OF THYSANOPTERA (TEREBRANTIA)

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Having previously reviewed the Aeolothripoid genera, as well as *Heterothrips*, a summary of the two California genera, *Merothrips* and *Oligothrips*, may now be presented. The latter is known only from this state. A discussion of these two genera follows their technical descriptions.

MEROTHRIPS Hood

Hood, J. D., 1912. Proc. Ent. Soc. Wash. 14:132–134

Head usually elongate, with a long seta on dorsum between base of antenna and eye. Eyes normal in macropterous forms, reduced in apterous forms. Ocelli present in macropterous forms. Antennae long, moniliform, eight-segmented; segments III and IV with sensory areas at distal end. Mouthcone bluntly rounded. Maxillary palpi two or three-segmented; labial palpi two-segmented. Prothorax wider than long, nearly always longer than head; anterior angles without prominent setae, posterior angles with one or two long setae at each angle. Legs short and stout, fore and hind femora swollen, armature present on fore legs; heterogonic forms known. Wings, when present, without microsetae on surface; forewing with two longitudinal veins. Abdomen very blunt at posterior; ovipositor very greatly reduced. No comb on posterior margin of segments. Abdomen of male without ventral sensory areas and without externally projecting claspers.

Type of the genus: *Merothrips morgani* Hood, 1912. Apterous female holotype in Hood collection.

The family Merothripidae is represented presently by this single, non-fossil genus.

As has been pointed out so sagely by J. D. Hood (1937), the eminent thysanopterist, "individuals of this aberrant genus are so extremely rare that a critical study of the taxonomy of the group cannot be made until various unknown forms, some macropterous and some apterous, have been discovered." At present no macropterous males have been collected, and in only two species have the oedymerous males been seen. As years pass the accumulated knowledge should be periodically summarized for the record and to aid future workers in taking the next step forward. No previous summary of this genus, now with twelve valid species, has been published. The bits of knowledge of this rare group which were

obtained by the now deceased J. R. Watson, Dudley Moulton, and J. C. Crawford unfortunately were never summarized. I have compiled the scattered information on the group and specifically record as new (1) the male of *laevis* Hood, (2) the nymphal stage of *morgani* Hood only, (3) present new synonymy of *morgani*, (4) offer a provisional key to the world species, (5) thanks to Priesner, extend the known distribution of the genus to continental Europe[1], and (6) through correspondence with K. Sakimura, make note that Kurosawa in 1941 observed cocoon-spinning. I have been pared with many genera, but forming sufficient base upon which to broaden our concept of the genus.

Ideally a published description should be sufficiently complete and accurate that a worker familiar with the group could visualize and reconstruct the species. When unique specimens are unavailable for study such a device is most helpful, even though it has obvious vulnerable aspects. The writer first used this method in *Erythrothrips* (Bailey, 1947, Pan-Pac. Ent. 23:105). In *Merothrips* the more recent descriptions have been so well detailed and the measurements so inclusive that on graph paper it is possible to reconstruct the salient features of *genuinus* Hood, *nigricornis* Hood, and *productus* Hood. With the exception of *morgani*, I have been able to examine neither the Hood species nor *williamsi* of Priesner. In discerning and evaluating small differences between thrips species it appears to me that physical measurements should be weighted about 40 per cent and judgment, acquired over the years, weighted 60 per cent.

From the nature of the micro-habitat in which *Merothrips* species live, it has been supposed they are fungus feeders or scavengers of some sort. To our knowledge none have been reared through their life cycle. The majority of specimens have been collected under dead bark, in plant debris and in fungi. H. E. Cott and the writer have collected a few specimens of *morgani* from the frass in beetle burrows in dead willow. Large numbers of collections of leaf mold, dead bark of various trees, moss, duff from beaches and pine woods have not yielded *Merothrips* in California. Eggs observed in the body cavity of *morgani* and *laevis* indicated that normal reproduction by oviposition occurs. The

[1] In correspondence dated September 19, 1957, Priesner stated, "I had a visit this year from Dr. Bournier (France) who collected a lot of most interesting thrips in Southern Europe, among them two specimens of a *Merothrips* of which we only knew some fossil forms from the Baltic amber." (*M. fritchi* Pr., 1924.)

greatly reduced ovipositor and the habitat in which the adults are found lead one to believe the eggs are merely dropped in or on the substrate as is the case with many Tubulifera. The only nymphs of *Merothrips* known to the writer are those of *morgani* collected by K. Sakimura in pineapple trash and one by F. Andre from dead pine bark.

Lastly I might note that the very well-developed fore legs with spurs are usually indicative of a predaceous habit, or at least indicative that such a need for these structures once existed.

Key to the Species of Merothrips Hood

1—Posterior two-thirds of lateral margins of head (cheeks) expanded to form a narrow shelf (Plate II, fig. 4) ..... *genuinus* Hood
—Head not so expanded 2
2—Head produced anteriorly beyond eyes (Plate II, fig. 5) ..... *productus* Hood
—Head not produced anteriorly 3
3—Sensory areas on antennal segments III and IV transverse 4
—Sensory areas on antennal segments III and IV oval (Plate I, fig. 3), not linear or not as a broad band 5
4—Maxillary palpi 2-segmented. Sensory areas linear and very narrow ..... *laevis* Hood
—Maxillary palpi 3-segmented. (This character is not given in descriptions of *cognatus, genuinus, nigricornis, productus* and *williamsi*) Sensory areas in the form of a broad band extending not over half way around antennal segments III and IV 7
5—Color dark brown to blackish brown. Head length 99 microns, width 85 microns ..... *nigricornis* Hood
—Color yellow to pale yellowish brown or grey brown. Head much smaller 6
6—Very small species; total length of antennal segments III-V, 81 microns ..... *capensis* Faure
—Total length of antennal segments III-V, 99 microns; segments more slender (see Plate I, fig. 8) ..... *morgani* Hood (apterous male)
7—Pronotum with two long setae at each posterior outer angle (Plate II, fig. 3). Antennae very long, segments III-V, 152 microns (Plate I, fig. 10) ..... *mirus* J. C. Crawford
—Pronotum with one long seta at each posterior outer angle. Antenna much shorter 8
8—Major setae very short; postoculars, 13 microns; posterior pronotals, 39 microns ..... *brevisetis* Hood (macropterous female)
—Major setae longer 9
9—Head with two small setae between postocular and smaller postocellar seta ..... *tympanis* Hood
—Head with only one seta (the occipital) between each postocular and postocellar seta 10
10—Macropterous female with large tibial tooth. Without postocular

setae.....*fusciceps* Hood and Williams
—Macropterous female (of those described) with small tibial tooth. Postocular setae present.....11
11—Head very broad (135 microns); ratio of length to width 0.94. Antennal segment IV, 43 microns.....*williamsi* Priesner
—Head much narrower and antennal segments IV much shorter.....12
12—Eyes "prolonged on ventral surface to a point directly beneath posterior dorsal margin of head".....*cognatus* Hood
—Eyes not prolonged ventrally to the same length as the posterior dorsal margin of head.....*morgani* Hood

MEROTHRIPS BREVISETIS Hood

Merothrips brevisetis Hood, 1954. Proc. Biol. Soc. Wash. 67:20–21.

The terminally located sensory areas on antennal segments III and IV and the short setae separate this species from *morgani* Hood and *tympanis* Hood. Hood specifically noted that the eyes are "margined posteriorly and medially by one pair of setae (the occipitals) between postoculars and postocellars." This species, like *morgani*, is known to have oedymerous (or maximum heterogonic) males. Collection data: SOUTH AMERICA. Brazil: Belem, Para. Both sexes taken from dead branches of *Heavea* and *Bixa*, July-August.

MEROTHRIPS CAPENSIS Faure

Merothrips capensis Faure, 1938. Pub. Univ. Pretoria. Ser. II, Nat. Sc. No. 4: 6-7, Pl. I, figs. 3–4.

Faure informs me that considerable additional material in this genus has been collected in Cape Province and Zululand. Apparently a complete range of heterogonous forms of *capensis* is now known. The small oval sensory areas on the antennae (Plate I, fig. 9) and small size enables this species to be distinguished from the gynecoid apterous males of *morgani*. Collection data (incomplete): AFRICA. Cape Province, Hermanus. Both sexes taken from fallen leaves and moss, January. Recent correspondence with R. zur Strassen indicates additional species now are known in Africa.

MEROTHRIPS COGNATUS Hood

Merothrips cognatus Hood, 1925. Psyche 32(1):53–54.

Information on this species is scanty. It was originally compared with *fusciceps* Hood and Williams, and *williamsi* Priesner, both known from unique, macropterous females. The describer separated it from the holotype of his *fusciceps* by the ventrally prolonged eyes. Collection data: WEST INDIES. Trinidad. Female

"on dead branch of *Lagerstroemia* infested with bromeliads." Other data lacking.

MEROTHRIPS FUSCICEPS Hood and Williams

Merothrips fusciceps Hood and Williams, 1915. Jour. N.Y. Ent. Soc. 23(2):123–125, Pl. VII, figs. 1–4.

This species appears to be very distinctive in that postocular setae are absent (see original illustration of Hood) and that the macropterous female has large tibial spurs typical of the oedymerous male of *morgani*. The antenna is very similar to that of the macropterous *morgani* (Plate I, fig. 6). If a colony of this species is collected, undoubtedly apterous forms would be among the individuals. Such a finding should clarify its relationships. Collection data: NORTH AMERICA. Louisiana, New Orleans. One female from an ornamental clump of bamboo, December.

MEROTHRIPS GENUINUS Hood

Merothrips genuinus Hood, 1938. Rev. de Ent. 8(3–4):354–357.

The very distinctive shelf-like expansion of the cheeks and the very large oval sensoria (Plate II, fig. 4, Plate I, fig. 2) further exhibit the greater diversity in the genus on the Atlantic coast than is presently known elsewhere. There is no other known member of the genus which has these unique characters. Collection data: NORTH AMERICA. Florida: Homestead. Both sexes collected from dead branches, December.

MEROTHRIPS LAEVIS Hood

Merothrips laevis Hood, 1938. Rev. de Ent. 8(3–4):350–352.

What I believe to be the male of this species has been seen from Jamaica (Ill. Nat. Hist. Sur. Collection, No. 49642). One specimen only was examined. It is apterous and of normal form. The pronotum (male) and critical antennal segments (female) are illustrated in Plate II, fig. 1 and Plate I, fig. 4. The original description stated that the pronotum was without sculpture. Apterous females (det. Watson) from Key West and Stock Is., Florida, which I have seen, have faint anastomosing lines on the surface. Such variations throw some doubt on the determination even though the sensory areas on the antennae definitely place them with *laevis*, as do the two-segmented maxillary palpi. These specimens have a minute tooth on the terminal tarsal segment on all legs (Plate III, fig. 4). I have not seen the unique type. Collection data: WEST INDIES. Jamaica. NORTH AMERICA. Florida: Pine Key, Key West, Stock Is.

Both sexes in shells, debris, moulding leaves, etc., January and May.

MEROTHRIPS MIRUS Crawford

Merothrips mirus J. C. Crawford, 1942. Proc. Ent. Soc. Wash. 44(7):152–154.

This species is very distinctive and can be readily distinguished by its large size, the two long setae at each posterior outer angle of the pronotum, and the large sensory areas on antennal segments III and IV (Plate II, fig. 3 and Plate I, fig. 10). Collection data: SOUTH AMERICA, Brazil: Nova Teutonia, Santa Catharine. Females taken on dead branches, May–July.

MEROTHRIPS MORGANI Hood

Merothrips morgani Hood, 1912. Proc. Ent. Soc. Wash. 14:132–134, Pl. V, figs. 1–3.

Merothrips floridensis Watson, 1927. Fla. Ent. 10(4):60–61. (New synonymy.)

Merothrips hawaiiensis Moulton, 1937. Proc. Haw. Ent. Soc. 9(3):411–412. (New synonymy.)

Merothrips plaumanni J. C. Crawford. 1942. Proc. Ent. Soc. Wash. 44(7): 150–152. (New synonymy.)

The genotype, *morgani*, was described from apterous forms of both sexes. Collections recorded up to 1937 apparently included only apterous forms. Moulton (1937) described *hawaiiensis* from winged specimens. I now have available a sufficiently large series of this species to see the range in forms, although I feel the complete range to maximum heterogonic forms, possibly in both sexes, has not yet been brought together. A careful study of the macropterous *fusciceps* Hood & Williams and *cognatus* Hood should be made with illustrations of the chaetotaxy of the head to enable one to more accurately separate them from *morgani*. To date

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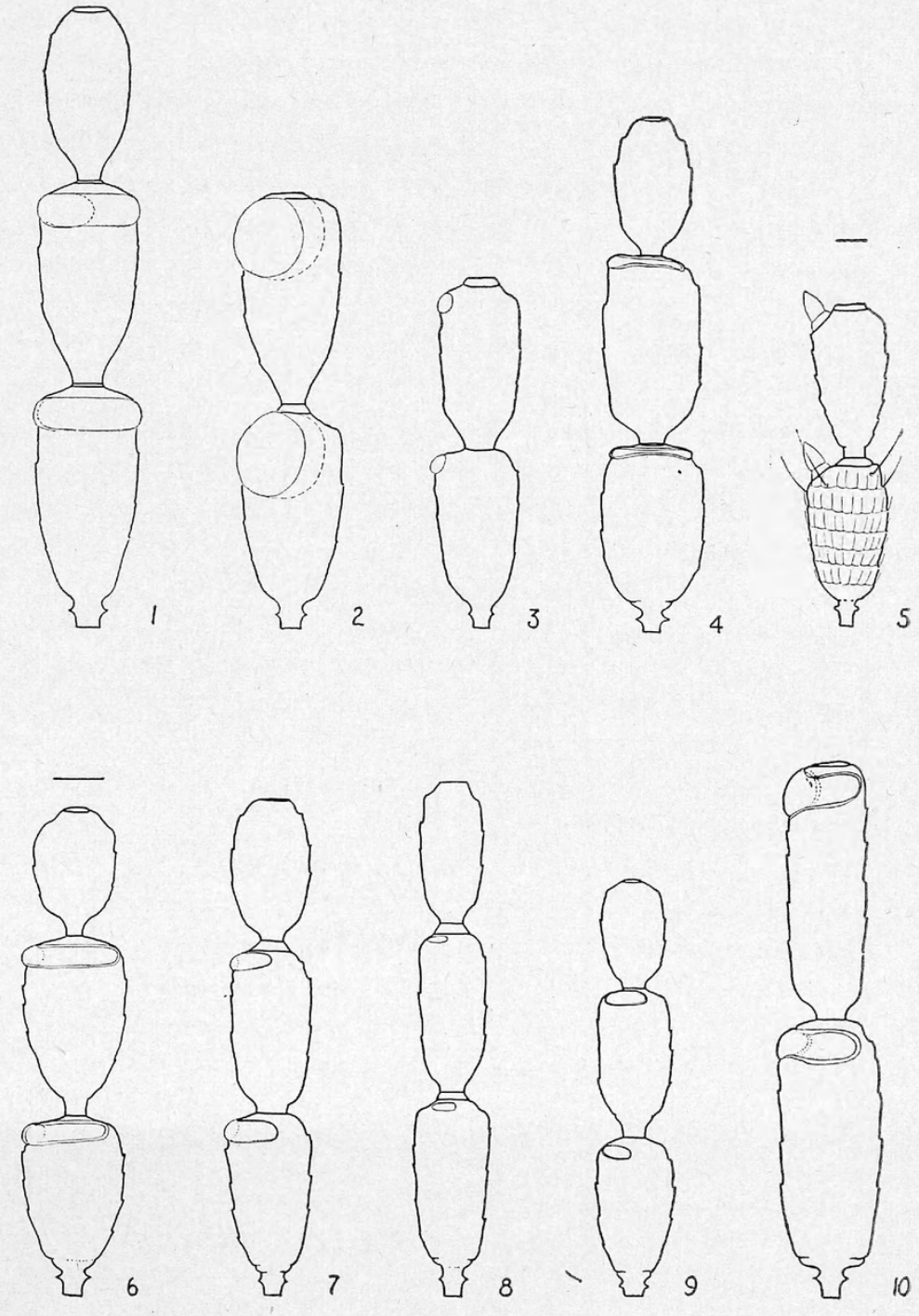
EXPLANATION OF FIGURES

Fig. 1. Antennal segments III, IV, V of *Merothrips productus* Hood, macropterous female (reconstructed from original description); 2. Antennal segments III and IV of *Merothrips genuinus* Hood, macropterous female (reconstructed); 3. *Merothrips nigricornis* Hood, apterous female (reconstructed); 4. Antennal segments III, IV, V of *Merothrips laevis* Hood, apterous female; 5. Antennal segments III and IV of *Oligothrips oreios* Moulton, topotype female; 6. Antennal segments III, IV, V of *Merothrips morgani* Hood, macropterous female; 7. *Merothrips morgani*, apterous female; 8. *Merothrips morgani*, apterous male, maximum form; 9. *Merothrips capensis* Faure, apterous female (reconstructed); 10. Antennal segments III and IV of *Merothrips mirus* J. C. Crawford, macropterous paratype female. Scale: Figs. 1–4, 6–10, line equals 0.01 mm.; fig. 5, 0.032 mm.

I am unaware of a hetergonic form in the female, although some specimens verge on "monstrous" forms. Some specimens studied appear to be de-alated. Note also should be made of the record of *morgani* (Hood, 1917) from Pine Key, Fla., Jan., 1914. This specimen apparently was described many years later, in 1938, as *laevis* Hood as the collection data are identical.

K. Sakimura has been fortunate in obtaining a series of



morgani (= *hawaiiensis* Moulton) which shows the range in size of apterous males and both the macropterous and apterous females, as well as the nymph. This excellent series was collected from pineapple trash, via a Berlese funnel, at Poamohu, 1600 ft., Oahu, T.H. Moulton's specimens of *hawaiiensis* (California Academy of Sciences, San Francisco, type slide No. 5397) were compared with this material as well as with Watson's types of *floridensis (floridanus* Watson, 1927, *lap. cal.)* and Crawford's paratype of *plaumanni* (Crawford specimen No. 835) from Brazil. I believe all three to be synonymous with *morgani.* Variations exist in the degree of sculpture on the pronotum. The California and Hawaiian specimens have a much smoother pronotum than specimens collected in Virginia by Andre (USNM collection). No differences are noted in the antennae, palpi, or chaetotaxy. The known forms are illustrated in accompanying plates. Collection data: BRAZIL. TERRITORY OF HAWAII. NORTH AMERICA. California, D.C., Florida (many localities), Illinois, Iowa, Kentucky, Maryland, New Jersey, New York, Ohio, Texas, Virginia. Both sexes collected all year from many "hosts" which are rotting bark of various trees, spanish moss, *Polyporus, Andropogon,* pineapple trash, date palm, bromeliads, ferns, etc. Some collections have been made via a Berlese funnel.

MEROTHRIPS NIGRICORNIS Hood

Merothrips nigricornis Hood, 1937. Rev. de Ent. 7(2–3):272–274, fig. 3c.

This species is known from a unique female. It is separated by "the unusually dark coloration, strongly protruding eyes, and the greatly reduced antennal sensoria." Collection data: SOUTH AMERICA. Peru: vic. Celendin, Depart. de Cajamarca. From flowers of *Helianthus Jelskii,* June.

MEROTHRIPS PRODUCTUS Hood

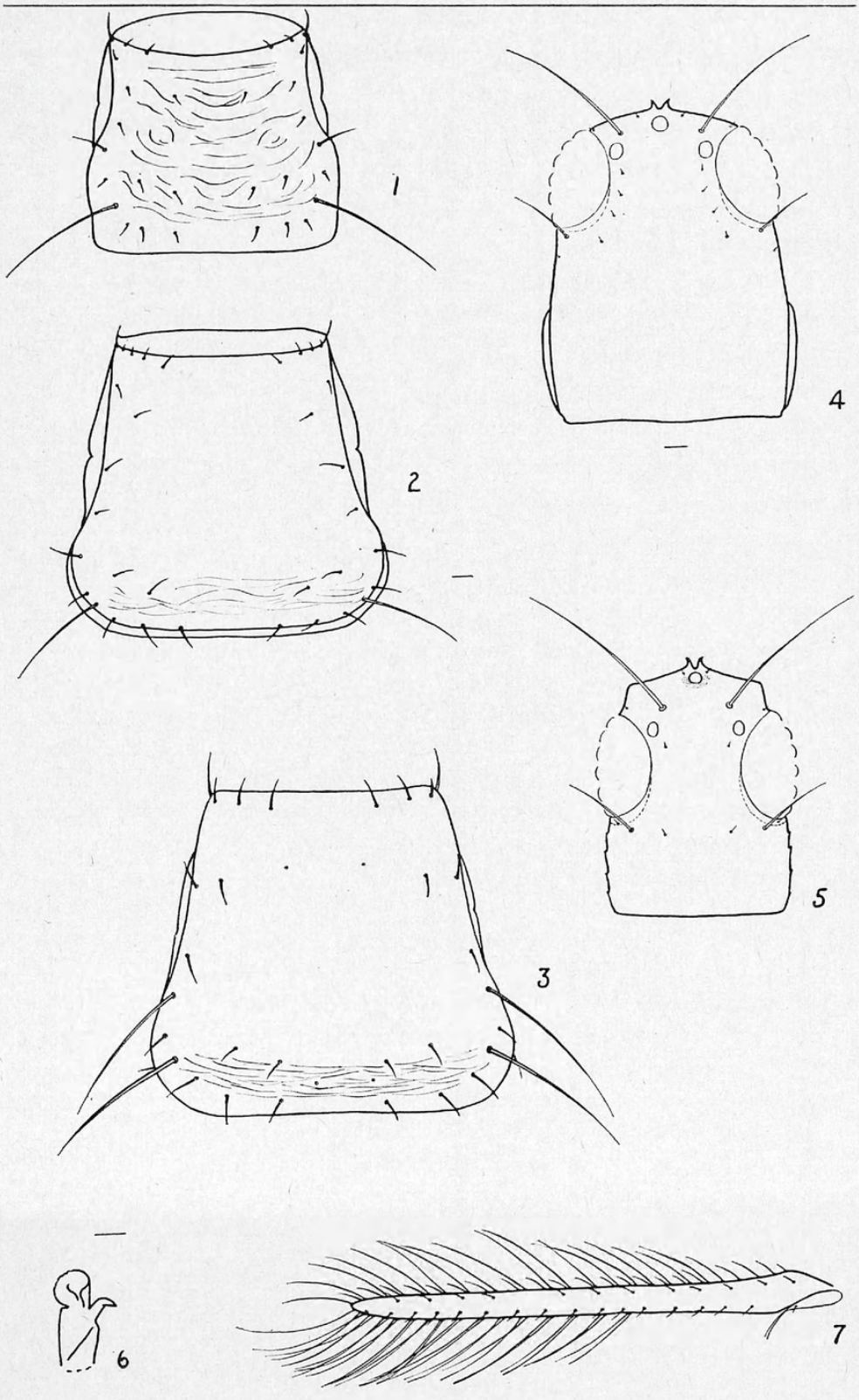
Merothrips productus Hood, 1938. Rev. de Ent. 8(3–4):352–354.

This North American species, while known from a unique

EXPLANATION OF FIGURES

Fig. 1. Pronotum of *Merothrips laevis* Hood, apterous male; 2. *Merothrips morgani* Hood, maximum apterous male; 3. *Merothrips mirus* J. C. Crawford, macropterous female; 4. Dorsum of head of *Merothrips genuinus* Hood, macropterous female (reconstructed); 5. *Merothrips productus* Hood, macropterous female (reconstructed); 6. Fore tarsus of *Oligothrips oreios* Moulton; 7. Fore wing of *Merothrips morgani* Hood, macropterous female. Scale: Figs. 1–3, line equals 0.01 mm.; figs. 4, 5, 7, 0.02 mm.; fig. 6, 0.016 mm.

female is readily separated by its produced head and the form of the sensoria (Plate II, fig. 5 and Plate I, fig. 1). Hood in describing it raised the question of the possibility of it being a de-alated specimen. Collection data: NORTH AMERICA. North Carolina:



Rocky Point, Pender County. One female from a dead branch. October.

MEROTHRIPS TYMPANIS Hood

Merothrips typmanis Hood, 1954. Proc. Biol. Soc. Wash. 67:20.

This South American representative, along with its close relative, *brevisetis* Hood, has not been illustrated. It has relatively broad sensory bands on the antennae and is separated by its describer by means of "two pairs of setae between postoculars and postocellars." Collection data: SOUTH AMERICA. Brazil: Nova Teutonia, S.C., Rondon, Parana. Many females from dead branches, September and December.

MEROTHRIPS WILLIAMSI Priesner

Merothrips williamsi Priesner, 1921. Deutsche Ent. Mus. 3:191–192.

To date it has not been possible to locate the unique type and, with the aid of the always-helpful describer, to redescribe and illustrate some of the salient characters. At present we separate it from *cognatus* and *morgani* by the very broad head and the long fourth antennal segment. Collection data: SOUTH AMERICA. Paraguay. One female under bark, June.

OLIGOTHRIPS Moulton

Moulton, D., 1933. Pan-Pac. Ent. 9(3):139–140.

Head slightly wider than long, widest at posterior margin. Setae on dorsum of head long; four postocular setae, one pair within ocellar triangle. Dorsum of head with horizontal striations. Eyes normal, not extended ventrally. Antennae nine-segmented, terminal joints not fused; segments III and IV each with one sub-apical spearhead-shaped sensory cone on outer margin, about 10 microns long. Mouth cone short, bluntly rounded maxillary palpi 3-segmented, labial palpi 2-segmented. Prothorax wider than long. Pronotum with irregular longitudinal thickening in center, with irregular horizontal striations, heaviest near posterior, setae long with a pattern similar to *Ankothrips* and *Melanthrips*. Fore legs slightly swollen, fore tarsi with large, curved, simple claw. Fore wings bluntly pointed, with two longitudinal veins both supporting regularly spaced setae, surface covered with micro-setae, costal fringe present. Abdomen normal, sharply pointed, posterior margins of segments without comb. Ovipositor well-

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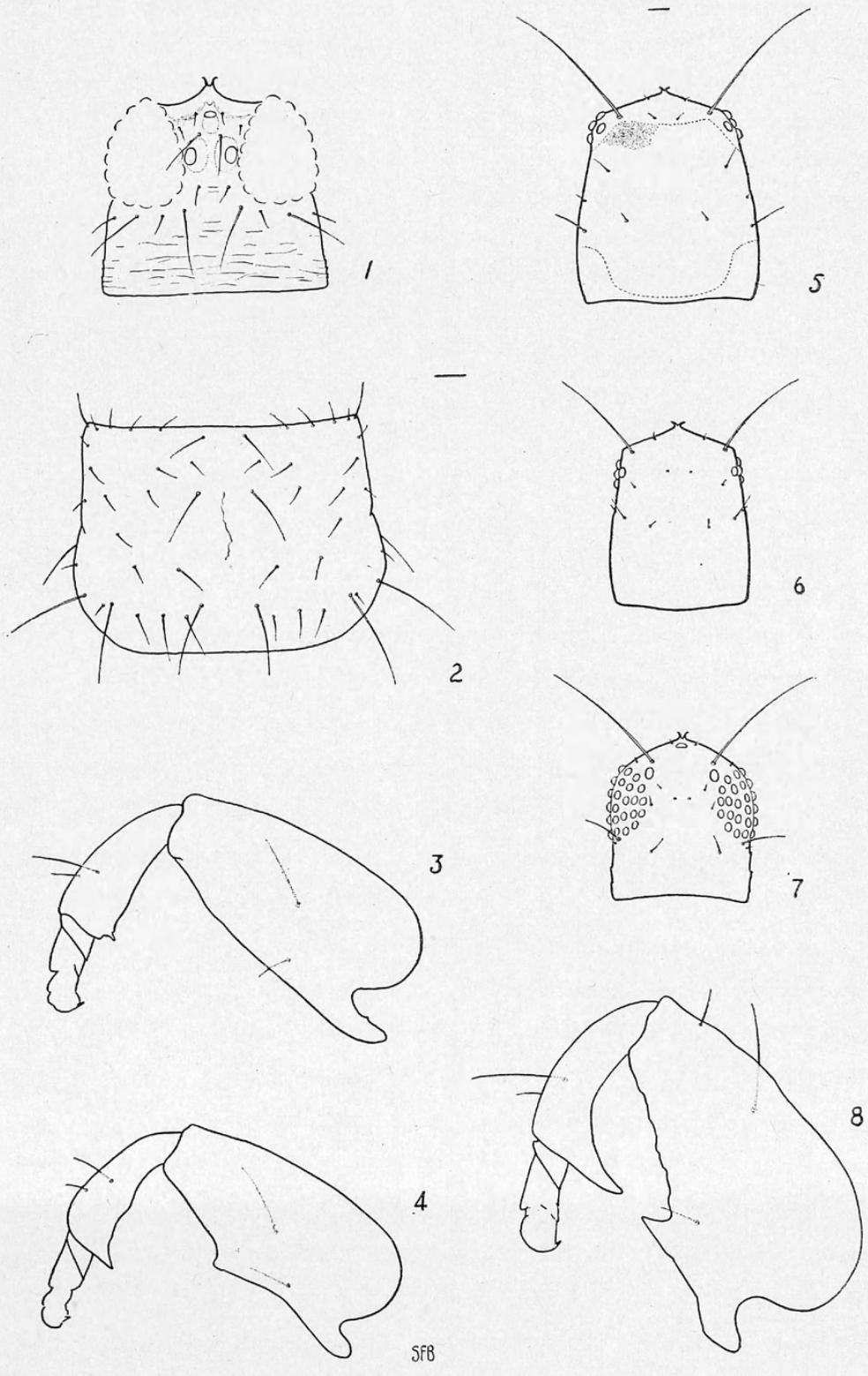
EXPLANATION OF FIGURES

Fig. 1. Dorsum of head of *Oligothrips oreios* Moulton, female; 2. Pronotum of *O. oreios*, female; 3. Femora, tibia and tarsus of *Merothrips morgani* Hood, macropterous female; 4. *M. laevis* Hood, apterous male; 5. Dorsum of head of *morgani*, maximum apterous male; 6. *morgani*, apterous female; 7. *morgani*, macropterous female; 8. Femora, tibia, and tarsus of *morgani*, maximum apterous male. Scale: Figs. 1, 2, line equals 0.016 mm.; figs. 3–8, 0.01 mm.

developed and down-curved. Male smaller than female, winged, with fore femora strongly swollen, claw on fore tarsus as in female. Abdominal segments III-VIII with narrow, elongate, clear, sensory areas on venter occupying central third of segment.



Type of the genus: *Oligothrips oreios* Moulton, 1933. Holotype female, No. 4753, in California Academy of Sciences, San Francisco.

This genus still remains monotypic. It appears to stand between the aelothripoid genera and the typical thripoids. The nine-segmented antennae, the lack of forked sensory trichomes, the pronotal setal pattern, and the claw on the fore tarsi associate *Oligothrips* with the more "primitive" thrips. On the other hand the down-curved ovipositor, the reduced number of palpal segments, the pointed wings, and the clear sensory areas on the male abdominal sternites exhibit an association with the generalized thripoids. The Moulton collection contains only the holotype and three paratype females. The various characters referred to are illustrated in Plate I, fig. 5; Plate II, fig. 6; Plate III, figs. 1, 2.

Presently it is known only in California, from various localities in mountainous portions of the northern part of the state (Bailey, 1957). The hosts of *O. oreios* are principally madrone and manzanita. There is one annual generation only. The abundance of the species varies greatly from year to year. All stages except non-feeding nymphs ("pupae") are found in the bell-shaped blossoms of these spring-blooming shrubs and trees. The yellowish-orange nymphs (similar to and found with *Orothrips*) drop to the ground beneath the host when mature and form loose cocoons in the soil at a depth of 3–12 inches depending on the soil structure. I have learned to associate the claw on the fore tarsi of thrips with this cocoon-spinning habit and infer this structure is employed by the adult in emergence. I expect that in the future, on semi-arid mountain slopes in April and May, this thrips also will be found in Oregon and Washington. In a similar environment in Chile and Peru this genus or related forms also could be expected to occur. For convenience in identifying such possible future collections the accompanying table of related genera has been prepared.

This summary of a small segment of the Terebrantia has been made possible by the favors generously granted by the following persons: J. F. Gates Clarke, H. E. Cott, J. C. Faure, K. O'Neill, H. Priesner, E. S. Ross, K. Sakimura, L. J. Stannard, and A. N. Tissot.

Morphological Characters of the Genera of Heterothripidae

Genus	*Joints in maxillary palp*	*Antennal segments*	*Comb on abdominal tergites*	*Type of sense cones on antennals III and IV*	*Setae on pronotum*	*Postocular setae*	*Ovipositor*
Heterothrips Hood, 1908	3		present	band of small circular areas	small	very small	down-curved
(Protemnothrips) Hood, 1937		9 (7–9 fused)					
(Herothrips, s. str.*)*		9 (free)					
Holarthrothrips Bagnall, 1927	3	9	present	lanceolate	prominent	very small	down-curved
Adiheterothrips Ramakrishna, 1928	5	9	present	lanceolate	small	absent	"long"
Fauriella Hood, 1937	3	9	absent	transverse ventral areas	small	very small	straight
Opisthothrips Hood, 1937	3	8	absent	transverse ventral areas	small	very small	straight
Oligothrips Moulton, 1933	3	9	absent	lanceolate	long; posterior angulars longest	long	down-curved

LITERATURE CITED

BAGNALL, R. S.

1927. Contributions towards a knowledge of the European Thysanoptera. III. Ann. Mag. Nat. Hist. (9th Ser.) 20(120):561–585.

BAILEY, S. F.

1940. Cocoon-spinning Thysanoptera. Pan-Pac. Ent. 16(2):77–79.

1957. The thrips of California. Part I: Suborder Terebrantia. Bull. Calif. Insect Survey 4(5):143–220.

BAILEY, S. F. AND H. E. COTT

1954. A review of the genus Heterothrips Hood (Thysanoptera: Heterothripidae) in North America, with descriptions of two new species. Ann. Ent. Soc. Amer. 47(4):614–635. Plates I-V.

CRAWFORD, J. C.

1942. Two new South American species of Merothrips Hood (Thysanoptera, Merothripidae). Proc. Ent. Soc. Wash. 44(7):150–154.

FAURE, J. C.

1938. Descriptions of new Thysanoptera. Pub. Univ. Pretoria, Ser. II, Nat. Sci. No. 4:1–20, figs. 3, 4.

HOOD. J. D.

1912. Descriptions of new North American Thysanoptera. Proc. Ent. Soc. Wash. 14:129–160, Pl. V, figs. 1–3.

1914. Notes on North American Thysanoptera, with descriptions of a new family and two new species. Insec. Insc. Mens. 2(2):17–22.

1917. An annotated list of the Thysanoptera of Plummer's Island, Maryland. Insec. Insc. Mens. 5(4–6):53–65.

1925. New Neotropical Thysanoptera collected by C. B. Williams. Psyche 32(1):48–69.

1927. A contribution toward the knowledge of New York Thysanoptera, with descriptions of new genera and species. Ent. Americana 7(n.s.) (4):209–245.

1937a. New genera and species of Thysanoptera from South Africa. Ann. Mag. Nat. Hist. 19 (ser. 10):97–113, figs. 1–2.

1937b. Studies in Neotropical Thysanoptera, IV, Rev. de Ent. 7(2–3): 255–296, fig. 3c.

1938. New Thysanoptera from Florida and North Carolina. Rev. de Ent. 8(3–4):348–420.

1954. Brasilian Thysanoptera. IV. Proc. Biol. Soc. Wash. 67:17–54.

HOOD, J. D. AND C. B. WILLIAMS

1915. New Thysanoptera from Florida and Louisiana. Jour. N.Y. Ent. Soc. 23(2):121–138, Pl. VII, figs. 1–4.

MELIS, A.

1941. Tisanotteri Italiani. VII. Genus *Holarthrothrips*. Redia. 27:25–43, figs. I-VII.

MOULTON, D.

1933. *Oligothrips oreios* a new genus and species of thrips belonging to the family Opadothripidae Bagnall. Pan-Pac. Ent. 9(3): 139–140.

1937. Further notes on Hawaiian thrips with description of new species. Proc. Haw. Ent. Soc. 9(3):409–414.

PRIESNER, H.

1921. Neue und wenig bekannte Thysanopteren der neotropischen Fauna aus der Sammlung des Berliner Zoologischen Museums. Deutsche Ent. Mus. 3:187–223.

1949. Genera Thysanopterorum. Bull. Soc. Fouad 1st. Ent. 33:31–157.

RAMAKRISHNA AYYAR, T. V.

1928. A contribution to our knowledge of the Thysanoptera of India. Mem. Dept. Agr. India. Calcutta. Ent. Ser. 10(7):217–316, fig. 15.

WATSON, J. R.

1927. New Thysanoptera from Florida. Fla. Ent. 10(4):59–62.

THE RESPONSE OF MICROSANIA AND HORMOPEZA TO SMOKE

(Diptera: Platypezidae and Empididae)

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For the past several years it has been my privilege to observe and collect smoke flies in many parts of North America. There are two genera of these flies, *Hormopeza* of the family Empididae, and *Microsania* of the Platypezidae. It was at Mill Valley, California, that I first became acquainted with both of these forms where they were found to occur together in the smoke purposely produced to attract microsanias (Kessel, 1947, 1952). Subsequently, I collected microsanias in other parts of California and also in New York, New Mexico, Washington, Montana, British Columbia, Yukon Territory, and Alaska. Also in Alaska, western Canada, and Montana I found a second species of *Hormopeza* (Kessel, 1958) commonly associated with *Microsania*.

During my second trip to Alaska in August and September, 1959, going by way of Washington, British Columbia, and the Yukon, I again found both microsanias and hormopezas prevalent in the smoke smudges which we made at numerous officially designated campsites along the way. And this time I was able to make some observations which may prove to be significant in regard to our understanding of the response of these insects to smoke. Is the response a reaction to a visual or an olfactory stimulus?

I had always thought it likely that both the visual and the olfactory senses play a part in the positive tropism to smoke which is exhibited by these flies, but I am now convinced that