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A NEW SPECIES OF *PARATETRACNEMOIDEA* GIRAULT, 1915, FOUND IN NORTH AMERICA, WITH A DISCUSSION OF GENERIC PLACEMENT (HYMENOPTERA: ENCYRTIDAE)

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ABSTRACT

Paratetracnemoidea americana NEW SPECIES (North America) is described and compared with *P. malenoti* (Mercet) (Europe) and *P. breviventris* Girault (Australia). The genus presently holds three described species, but undetermined specimens have been reported from South Africa and Australia. The taxonomic history of the genus and its better known junior synonym, *Rhinoencyrtus*, is reviewed and reasons for its placement in the Copidosomatini are given. Unusual morphological features including a peculiar protuberance on the head and rudimentary venation at the base of the forewing are illustrated and discussed.

RESUMEN

Paratetracnemoidea americana, una especie nueva en norteamerica, se describe y se compara con *P. breviventris* Girault (Australia) y *P. malenotti* (Mercet). El género tiene actualmente tres especies descritas, pero especimenes no-determinados se han reportado del Africa del Sur y Australia. La historia taxonómica del género y su mejor conocido sínónimo junior se discute y las razones por su colocación en el Copidosomatini se explican. Las características morfológicas diferentes, incluyendo una protuberancia peculiar en la cabeza y una nervadura rudimentaria en la base del ala anterior, se ilustran y se discuten.

INTRODUCTION

Material submitted for identification by Mr. T. D. Miller of Boise, Idaho is conspecific with other material of an undescribed species of *Paratetracnemoidea* taken from several localities in North America. Previously the genus was known under its junior synonym, *Rhinoencyrtus* Mercet, but no species name was available for North American material. This paper provides a name for Mr. Miller's work and considers the placement of *Paratetracnemoidea* among 500 genera of Encyrtidae currently recognized.

Paratetracnemoidea americana, NEW SPECIES

FEMALE: 1.0 mm long. Body uniformly black with weak blue-copper reflections in certain plays of light; antenna dark reddish brown; coxae, femora concolorous with body, tibiae somewhat more pale, tarsomeres 1-4 tan, pretarsi somewhat darker. Forewing hyaline except indicated infuscations (Fig. 12); hindwing hyaline.

HEAD: in dorsal aspect 3.20 times wider than long (64:20); fronto-vertex 0.47 times as wide as head (30:64), surface rather coarsely reticulate, anterior margin transverse, vertex margin rounded; ocelli forming a broadly obtuse triangle, lateral ocellus separated from medial margin of compound eye by about 1.5 times ocellus width. Head in lateral aspect (Fig. 1) 2.80 times longer than wide (56:20); malar space 0.61 times as long as compound eye height (20:33), surface reticulate; malar sulcus complete (Fig. 2). Head in frontal aspect 1.03 times wider than long (64:62), tapering ventrad; scrobal impression long and shallow, lateral walls broadly rounded, surface transversely reticulate; toruli well below imaginary transverse line extending between ventral margins of compound eyes, separated by about two times torulus width; intertorular prominence forming a conspicuous, spoon-like protuberance (Fig. 1-5). Mandible with a large, prominent tooth, and a smaller proximal tooth giving mandible a falcate appearance. Maxillary palpus four-segmented; labial palpus three-segmented. Antenna as illustrated (Fig. 8).

MESOSCUTUM: 2.25 times wider than median length (54:25), strongly convexly rounded laterad and anteriad, surface reticulate laterad and anteriad, longitudinally nearly lineolate-reticulate mesad and polished posteriad (Fig. 6), with moderate vestiture of pale setae; axillae fused to scutellum and widely separated mesad, with a few minute setae and sculpture as lateral portion of mesoscutum. Scutellum 1.21 times as long as mesoscutum (29:24), 1.07 times wider than long (31:29), strongly convexly rounded laterad and posteriad; surface narrowly, longitudinally lineolate, giving a velvet-like appearance, with a few minute setae and a larger subapical pair; apex polished (Fig. 6). Mesopleuron finely, faintly longitudinally reticulate. Forewing veinational shape and chaetotaxy as illustrated (Fig. 12); postmarginal vein extending to forewing margin.

METASOMA: 0.92 times as long as mesosoma (55:60); pygostyli at basal one-eighth of metasoma. T1 weakly reticulate; remaining terga smooth, polished. Paratergites absent.

MALE: Similar to the female in habitus, coloration and sculpture. Differing in the larger ocelli, antennal conformation (Fig. 7), and slightly smaller body size. Venation of forewing as illustrated (Fig. 11).

HOLOTYPE: 1 mi. NE Portal, Cochise Co., Arizona, 14-IX-1978, on *Acacia* sp. by John La Salle.

PARATYPES: 1 female taken with the holotype, 1 female and 2 males (1 headless) taken at Hellsgate State Park, Nez Perce Co., Idaho, 10-22-IX-1983 from a pitfall trap by T. D. Miller; 8 females and 2 males same locality, same collector, same technique 22-VIII-6-IX-1984; 2 females and 2 males, pit trap, 12-28-VII-1984, same locality, same collector.

ADDITIONAL MATERIAL: female, Stillwater, Oklahoma, 18-VII-1964, from bermuda grass (collector not given); and 1 male, Halsey, Nebraska, 12-VIII-1958, R. Henzlik (both specimens deposited U. S. National Museum). Two males taken from yellow pan trap 19-V-1984, Las Barracas, BCS, MEXICO, Paul DeBach; 2 males from the same locality 1-VI-1984, Paul DeBach. Holotype and paratypes deposited in the Entomological Collections UCR; paratypes deposited in the Entomological Museum, University of Idaho. The host remains unknown.

VARIATION: Specimens from Oklahoma and Nebraska differ principally in coloration of the scape and tibiae being pale and the interocular width is somewhat greater than in the type-series. They may constitute a different species, but more material is needed to confirm this.

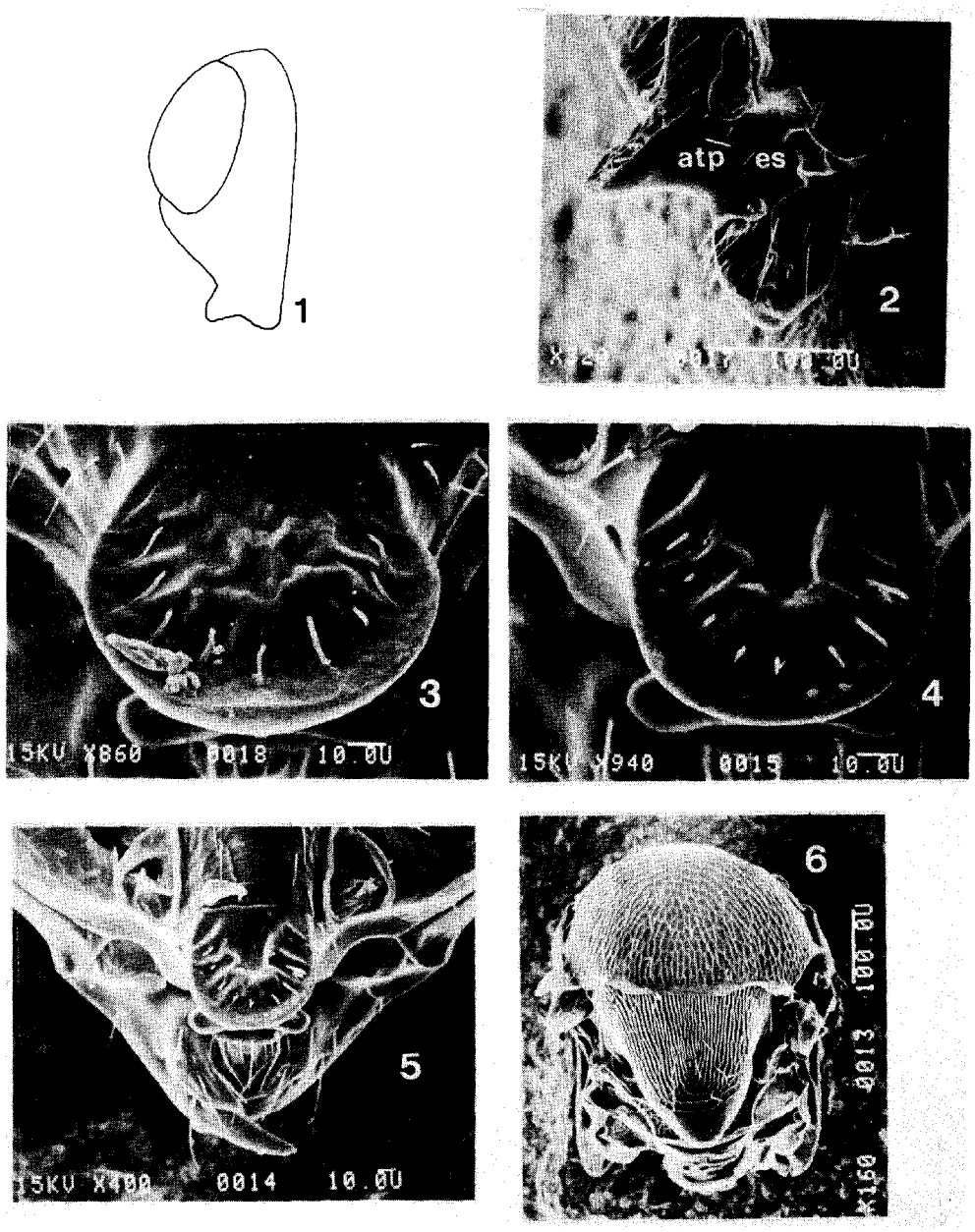

Fig. 1-6. 1. Head, *Paratetracnemoidea americana*, lateral aspect. 2. SEM of clypeal protuberance in female *P. americana* (ATP = anterior tentorial pit; ES epistomal suture). 3. SEM, male clypeal protuberance. 4. SEM, female clypeal protuberance. 5. SEM, female clypeal protuberance. 6. SEM Thorax and propodeum of *P. americana* female.

Paratetracnemoidea americana may be distinguished from other species of *Paratetracnemoidea* by the characters given in Table 1. It may be further separated from the type-pecies by the more broadly rounded vertexal margin in *americana* and the larger mesoscutal sculptural pattern and from *malenotti* by the shape of antennal F1 (cf. Fig. 8,9).

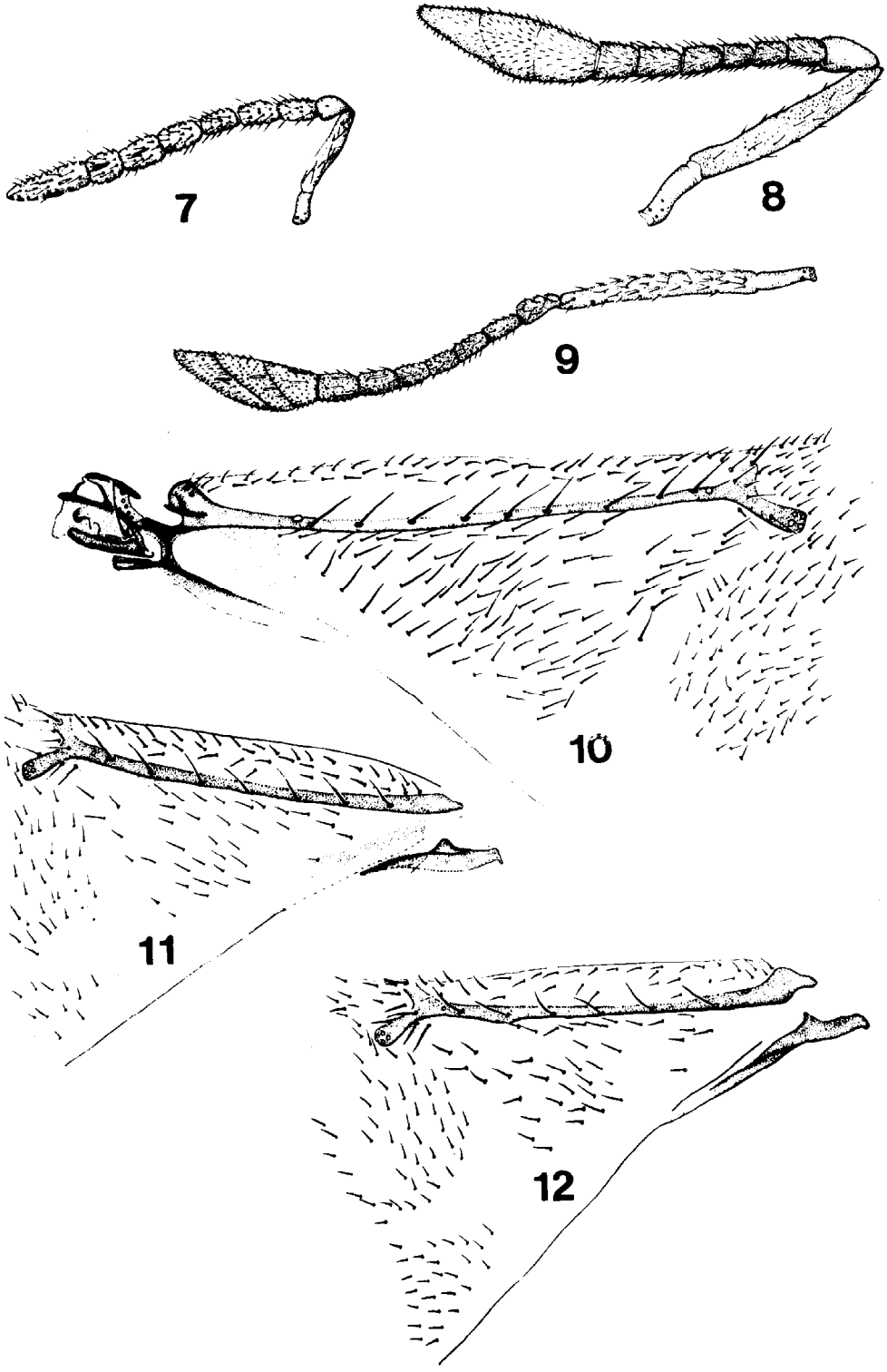

Fig. 7-12. 7. Male antenna, *P. americana*. 8. Female antenna, *P. americana*. 9. Female antenna, *P. malenotti*. 10. Female forewing, *P. malenotti*. 11. Male forewing, *P. americana*. 12. Female forewing, *P. americana*.

TABLE 1. DIAGNOSTIC CHARACTERS DIFFERENTIATING THREE SPECIES OF *Paratetracnemoidea*.

Species	Scape	Funicle 1	Postmarginal Vein	Scrobal Impression	Frontovertex: Head Width
malenotti	Dark	2xLTW	Not Meeting Wing margin	Punctate, not clearly defined	<0.40
americana	Dark-Pale	1.5xLTW	Meeting Wing margin	Impunctate, clearly defined	>0.40
breviventris	Dark	1.7xLTW	Not Meeting Wing Margin	Impunctate smooth, not well defined	>0.40

DISCUSSION

Rhinoencyrtus was characterized by Mercet (1918) for a species he called *malenotti* taken near Madrid. Aside from supplementary descriptive notes by Mercet (1921) on the type-species, *Rhinoencyrtus* remained relatively inconspicuous among the 500-odd genera of Encyrtidae recognized during the following thirty years. Hoffer (1955) next considered the genus and placed it in a new subtribe, the Rhinoencyrtina, of the Discodini. Later, Hoffer (1957, 1970a, b) extended the range of *R. malenotti* to include Czechoslovakia and Bulgaria while Trjapitzin (1971) included it in a key to the genera of Palearctic Encyrtidae. Trjapitzin (1973) subsequently elevated that group to tribal status and expanded the concept of the group to include two subtribes and seven genera. He later reported the distribution of *R. malenotti* as western U.S.S.R., Hungary, Yugoslavia, and Italy (Trjapitzin 1978).

The species described here has been known in North America for many years (Gordh 1979). Prinsloo and Annecke (1979) include an undetermined species (as *Rhinoencyrtus*) in a key to the genera of encyrtids found in the Ethiopian region, and I have collected specimens of an undetermined species in Australia (Gordh, unpublished). Noyes (1980) did not include it among the genera of Neotropical encyrtids currently known, and Hayat and Subba Rao (1981) do not include it in their catalog of the Encyrtidae found in India and coterminous countries. However, the genus is obviously widespread.

I have not seen the holotype of *P. malenotti* (Mercet) which should be in Madrid. My concept of this species is based on the original description and a female specimen taken in Spain and identified by Mercet as *malenotti* then sent to P. H. Timberlake in an exchange of material. I have not seen the male of *malenotti*, and its forewing is not illustrated by Mercet or discussed by Hoffer.

Noyes and Hayat (1984) synonymized *Rhinoencyrtus* with the taxonomically unknown *Paratetracemoidea* Girault. *Paratetracnemoidea* was previously known only from the type-species, *P. breviventris* taken in Australia. (Girault, 1915). This synonymy was recognized earlier (Gordh and Dahms, unpublished) and is correct. For a discussion of the synonymy and redescription of the type-species see Gordh and Dahms (in prep.). Girault (1915) characterized *Paratetracnemoidea* based on a female he called *breviventris* which was taken at Gordonvale (Cairns), Queensland, Australia. Through the courtesy of Mr. E. C. Dahms, I have had the opportunity to reexamine the type. All that remains is the crushed head, antennae and a forewing mounted on a microscope slide with part of *Epitetralophidea bicinctipes* Girault. An intact specimen, regarded

as conspecific, taken at Mt. McCartney, Cathu State Forest (MEQ) by E. C. Dahms is also available for study. *Paratetracnemoidea americana* may be distinguished from the type-species by characters given in Table 1. A redescription of *P. breviventris* will be given in a treatment of Girault's Australian Encyrtidae (Gordh and Dahms, unpublished.)

Elements of the habitus of *Paratetracnemoidea* are distinctive and could not be confused with any other known genus of encyrtid. Both sexes possess a well developed, spoon-like protuberance below the toruli (Fig. 1-5), the margin of which is sharply defined and forms a lip to the process (Fig. 2-4). The mandible superficially appears two toothed and the frontovertex width is moderate. Wing venation is not always coincident with forewing margin and the scutellum is longitudinally, narrowly, deeply reticulate. Other characters useful in identifying *Paratetracnemoidea* include the coarsely reticulate frontovertex with shallow punctures; compound eyes with small pale setae; seventh sternum extending near the midline of the metasoma; paratergites absent; forewing with an incipient medial or radial vein (see below); and ovipositor not projecting beyond metasomal apex or projecting less than the width of a gonostylus.

From the discussion above, it is apparent that the placement of *Paratetracnemoidea (Rhinoencyrtus)* has been inconclusive. Two important morphological features which must be considered in placing *Paratetracnemoidea* are the shape of the lower part of the head and the incipient venation at the base of the forewing. Head shape is frequently difficult to characterize and it has not been extensively or consistently used in encyrtid classification. I believe that head shape is often a relible indicator of taxonomic position and explore this source of character in my revision of North American Encyrtidae (Gordh, unpublished.)

The presence of a peculiar spoon shaped protuberance where a carina or more conventionally formed convexity is often found in encyrtids deserves mention. This represents a unique feature of all *Paratetracnemoidea*. It may be regared as a synapomorphic character at the generic level, but is valueless in placing *Paratetracnemoidea*. The protuberance (Fig. 2-5) is thickened integument and therefore a transformation of the existing head shape is of little value in reconstruting the shape of the hypothetical ancestor's head to determine shared taxonomic affinities involving head shape. The position and shape of the setae near the margin of the protuberance suggests a sensory role. If the protuberance were involved exclusively with moving objects it is unlikely that it would be heavily invested with sensilla directly opposed to reinforced integument. The anterior tentorial pits are slightly below the crest of the protuberance when the head is viewed in lateral aspect, suggesting the protuberance is in part supraclypeal in origin. The slight deflection of the epistomal suture and its direction of deflection corroborate this supposition (Fig. 2 es, atp). The frontoclypeal suture has been lost in all species studied. The shape of the protuberance differs slightly between the sexes (Fig. 3 male, Fig. 4 female) and there is a basomedial plateau in both sexes which is more scalloped in the female.

Wing venation is used extensively in encyrtid systematics but character development has not been consistently evaluated. The forewing of *Paratetracnemoidea* is interesting from several aspects. Mercet (1918, 1921) clearly illustrated the vein as extending to the forewing margin, but Hoffer (1957), treating material he regarded as conspecific with *P. malenotti* from Czechoslovakia, showed that it did not. The Timberlake material in the UCR collection shows that the venation does not extend to the margin of the forewing (Fig. 10). The postmarginal vein of *P. americana* does reach the anterior margin of the wing in the female (Fig. 12) (but imperceptibly), and in the male (more clearly) (Fig. 11). This character is difficult to see in some plays of reflected light, but is apparent with phase contrast of transmitted light. Perhaps more interesting but not reported in earlier studies is the presence of additional venation at the base of

the forewing in all material examined. Although this character does occur in other chalcidoids including encyrtids, it appears somewhat different in *Paratetracnemoidea*. The base of the forewing shows a complex of evanescent veins represented by sclerites, apparently sclerotized areas, and regions showing pigmentation. It is not possile to homologize these veins with veins found in more generalized Hymenoptera, but the extensive number of scolopophorous or campaniform sensillae at the base of the venation of the specimens identified as *P. malenotti* suggests the remnant of a medial vein. The forewing of the type-species bears heavy infuscation but signs of venation are not apparent in the slide of the holotype or the pinned specimen taken by Dahms. Unfortunately the preparation of *P. americana* does not include the base of the forewing.

Paratergites and mandible configuration have been regarded as subfamilial characters. Species possessing paratergites and two-toothed mandibles have been assigned to the Tetracneminae. Species lacking paratergites and whose mandibles are otherwise have been assigned to the Encyrtinae. Trjapitzin's (1973) placement of *Rhinoencyrtus* was apparently based on the published descriptions of *R. malenotti* Mercet. Examination of the type-species and cleared and slide mounted material of *P. americana* does not reveal paratergites and thus the genus should be placed in the Encyrtinae as the subfamily is now understood. However, this character may not be universally reliable because Compere (pers. comm.) noted that remnants of paratergites are found in cleared and stained specimens of *Metaphycus*, an encyrtine. The mandibles of encyrtids are more variable than earlier workers suspected and many encyrtines have two toothed mandibles while some tetracnemines have three toothed mandibles.

Host associations are frequently helpful in determining relationships among encyrtids, but unfortunately the hosts of *Paratetracnemoidea* are unknown. Noteworthy is that all of the recently collected material was taken from traps in the ground. That specimens were taken from distant geographical locations and conditions suggests the genus may be more widespread and associated with soil inhabiting hosts. Mr. Terry Miller believes the host is a mealybug associated with *Sporobolus* sp. (pers. comm.).

The habitus of all three species studied strongly suggests that *Paratetracnemoidea* should be placed in the Copidosomatini as that tribe is understood by me. The shape of the body and wings and forewing venation are suggestive of a relationship with genera currently assigned to this tribe. The form of sexual dimorphism expressed in *Paratetracnemoidea* (i.e. antennal conformation) fits the Copidosomatini. More particularly, the kinds and distribution of sculpture types on the head and mesosoma are within the range of variation expressed by genera of the Copidosomatini (cf. Fig. 6). For these reasons I place *Paratetracnemoidea* within the Copidosomatini. However, should the suspicions of Mr. Miller regarding host associations prove correct, then the postion of *Paratetracmenoidea* within the Copidosomatini should be questioned because most representatives of this tribe are parasites of Lepidoptera.

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IMMATURE STAGES OF *GNOPHOTHRIPS FUSCUS* AND METHODS FOR DISTINGUISHING ITS ADULTS FROM THOSE OF *LEPTOTHRIPS PINI* (THYSANOPTERA: PHLAEOTHRIPIDAE)[1]

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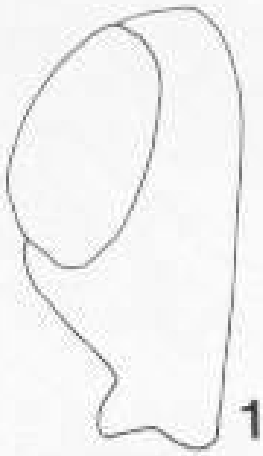
ABSTRACT

Immature stages of the slash pine flower thrips, *Gnophothrips fuscus* (Morgan) (Thysanoptera: Phlaeothripidae) are described for the first time, based on light and scanning electron microscopy. The chorion of the egg has a reticulate sculpturing anteriorly that may be diagnostic for the species. The other stages differ from one another in antennal structure and chaetotaxy. A key to larvae, prepupae, and pupae is presented.

Some morphological and behavioral differences between adults of *G. fuscus* and the similar-looking *Leptothrips pini* (Watson) (Thysanoptera: Phlaeothripidae] are given.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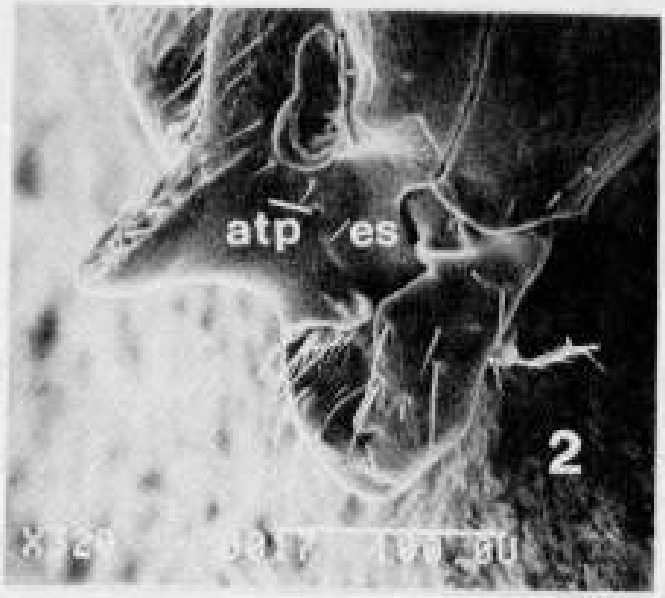
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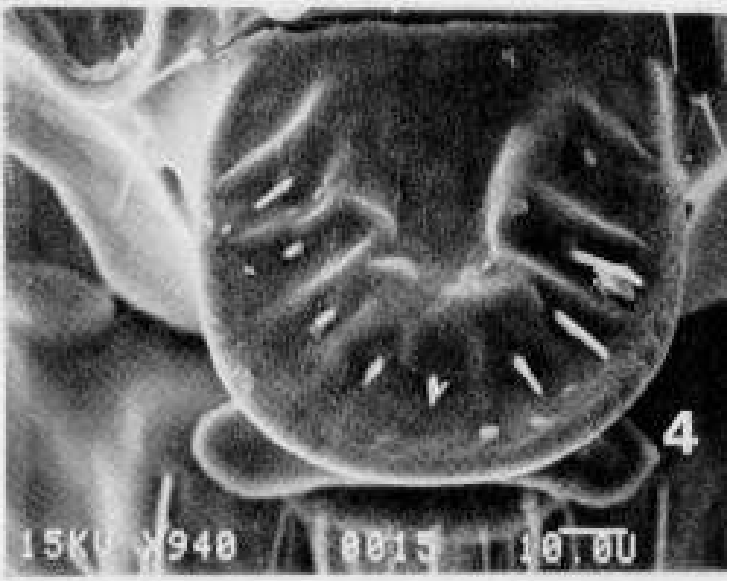
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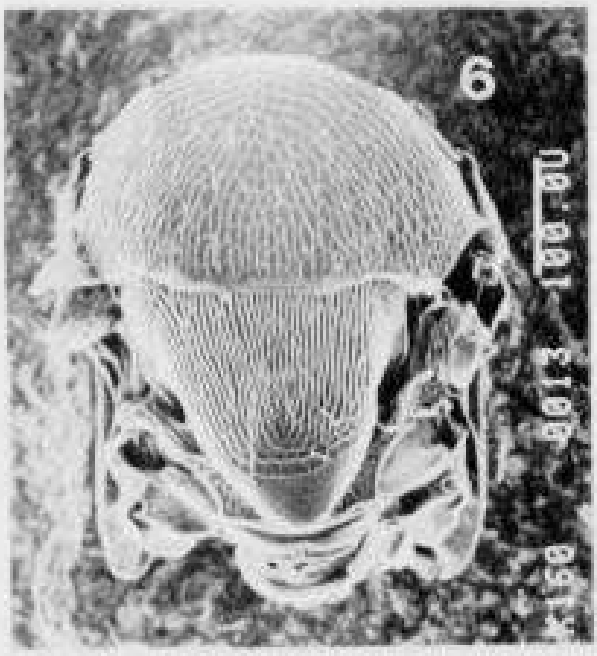
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