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SYSTEMATICS OF NEARCTIC *TELENOMUS:*

CLASSIFICATION AND REVISIONS OF THE *PODISI* and *PHYMATAE* SPECIES GROUPS

(HYMENOPTERA: SCELIONIDAE)

By

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ABSTRACT

Eleven monophyletic groups represented in the Nearctic fauna of *Telenomus* are proposed, and the species of two, the *T. podisi* and *T. phymatae* groups, are revised. The genera *Pseudophanurus* Szabó, *Verrucosicephalia* Szabó, *Pseudotelenomoides* Szabó and *Pseudotelenomus* Costa Lima are synonymized with *Telenomus*. The species *Telenomus chloropus* (Thomson), *T. consimilis* Ashmead, *T. dolichocerus* (Ashmead), *T. grenadensis* Ashmead, *T. persimilis* Ashmead, *T. podisi* Ashmead, *T. sanctivincenti* Ashmead, *T. scaber* Ashmead and *T. zeli* new name are redescribed. *Telenomus abitus, T. abruptus, T. astrictus, T. calvus, T. cristatus, T. dentatus, T. exilis, T. goliathus, T. oculeus, T. prolatus, T. puticulus, T. sulculus* and *T. tanymerides* are described as new. The following new names are proposed for junior homonyms: *T. ferganae* for *T. chrysopae* Vasiliev, *T. olsenni* for *T. emersoni* Girault, *T. doddi* for *T. giraulti* Dodd, *T. corniger* for *T. longicornis* (Dodd), *T. acares* for *T. minimus* (Dodd), *T. atomus* for *T. minutus* (Ratzeburg), *T. atratus* for *T. niger* (Dodd), *T. carnifex* for *T. ovivorus* (Dodd), and *T. zeli* for *T. pentatomus* Kieffer. The following species synonymies are proposed: *T. convergens* Ashmead, 1895 = *T. consimilis* Ashmead, 1895; *T. pulchricornis* Cameron, 1913 = *T. grenadensis* Ashmead, 1895; *T. dimmocki* Ashmead, 1901, *T. fimbriatus* Kieffer, 1904, *T. heracleicola* Brues, 1906, *T. perplexus* Girault, 1906 and *T. szelenyii* Muesebeck, 1974 = *T. podisi* Ashmead, 1893; *T. tetratomus* Kieffer, 1906 = *T. pentatomus* Kieffer, 1906. *Telenomus monilicornis* Ashmead, *T. gifuensis* Ashmead and *T. hyalinatus* (Thomson) are resurrected from synonymy with *T. sphingis* (Ashmead), *T. chloropus* (Thomson) and *T. dalmanni* (Ratzeburg) respectively.

EDITORS' NOTE

The publication of the Knull Series of the Department of Entomology, The Ohio State University, is a cooperative effort with the Ohio Biological Survey. The goal of the Editorial Committee of the Knull Series is to publish, at irregular intervals, the results of high-quality, systematic research in entomology. Initially, the series will be used as a vehicle for monographic works prepared by faculty and students of the Department of Entomology, The Ohio State University. Publication has been made possible by the generous financial support of Dorothy Johnson Knull. Without this support many of the manuscripts in this series would remain unpublished and relatively inaccessible to the national and international entomological community.

COVER ILLUSTRATION: Female of *Telenomus alsophilae* emerging from the egg of its host, *Campaea perlata* (Lepidoptera: Geometridae).

DEDICATION

The Knull Series of the Department of Entomology, The Ohio State University, is dedicated to the memory of Josef N. Knull (12 October 1891—24 April 1975), Emeritus Professor of Entomology at The Ohio State University and former curator of its Insect Reference Collection. From 1935 to 1974, Professor Knull and his wife, Dorothy Johnson Knull, made extensive annual trips to collect insects which were added to this collection. The Ohio State University Insect Reference Collection ranks among the best in the United States of America, and specialists who visit it are impressed by the meticulous care with which the specimens are prepared and arranged. Curating was more than just a job to Professor Knull; he loved it, he was very good at it, and by doing it diligently, he provided society with an exceptional entomological legacy. The Knull Series is dedicated to the continuation of that legacy. (Photograph courtesy of Photo Archives, The Ohio State University, March 1962.)

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AUTHOR'S NOTE

Since the completion of the manuscript for this paper in 1980, Kononova has described a new genus of Telenominae *s. str., Latonius* (1982, [A new genus and species of egg parasite (Scelionidae, Telenominae) from the south of the Ukraine], Vest Zool. 1982(3): 76-78) and three works have appeared that deal with the classification of the Telenominae. Fergusson (1983, The status of the genus *Allophanurus* Kieffer (Hym., Proctotrupoidea, Scelionidae), *Entomol. Mthly. Mag.* 119:207-209) has placed the genus *Allophanurus* as a junior synonym of *Telenomus.* Both Huggert (1983, On *Telenomus*, mainly European. Redescriptions, new taxa, synonymies and combinations (Hymenoptera, Proctotrupoidea: Scelionidae), Entomol. Scand. 14:145-167) and Kozlov and Kononova (1983, [Telenominae of the Fauna of the USSR, in the series Determinations of the Fauna of the USSR], published by the Zoological Institute, Academy of Sciences USSR, Issue 136, 336 pp.) have come independently to the conclusion that several of the genera described by J.B. Szabó should be considered to be junior synonyms of *Telenomus.* Kozlov and Kononova further offer a breakdown of the genus *Telenomus* into species groups; these concepts differ substantially from those I present here. I received a copy of their paper too late for it to be considered here and therefore I must defer any comments to a later time.

ACKNOWLEDGEMENTS

I acknowledge with great appreciation the generous offer of time, knowledge and understanding of two individuals in particular: Dr. William L. Brown, Jr. (Cornell University) and Dr. Lubomir Masner (Biosystematics Research Institute, Ottawa). In addition I thank G.C. Eickwort, J.G. Franclemont, L. L. Pechuman, D.J. Bickel, R.L. Brown, J.M. Carpenter, D.C. Darling, E.R. Hoebeke, R.C Kugler, B.M. O'Connor, J.E. Rawlins, and F. Ramberg for the many hours of discussion of problems in the Telenominae and systematics in general. I also thank the curators and individuals who made their telenomine material available to me.

This project was supported financially in large part by the National Science Foundation through a Graduate Fellowship and a Grant for the Improvement of Doctoral Dissertations (DEB 7919679). This paper is published as part of the Knull Series, a series devoted to the publication of monographs in systematic entomology, a cooperative effort between the Department of Entomology of The Ohio State University and the Ohio Biological Survey.

1984

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INTRODUCTION

Telenomus Haliday (Hymenoptera, Proctotrupoidea: Scelionidae) is a large cosmopolitan genus of wasps whose species parasitize the eggs of other insects. Species of *Telenomus* are very common, especially in sweep, pan-trap, malaise-trap, and pitfall-trap samples.

The subfamily Telenominae, of which *Telenomus* is the largest genus, appears to be a very young group. Only two specimens from the Oligocene Baltic amber, with reservations, can be placed in the Telenominae. The first definite telenomines are found in amber from the Dominican Republic of late Oligocene-Miocene age (L. Masner, personal communication). *Telenomus* today is both a morphologically and biologically diverse genus, and appears to be in a period of explosive speciation.

The systematics of *Telenomus* has been largely ignored, despite the potential economic importance of its species as biological control agents. The acute need for accurate means of identification has recently been emphasized by Bustillo and Drooz (1977) and Anderson (1976).

Many of the hosts of *Telenomus* species are important pests in agriculture, forestry, and human and veterinary medicine. Parasitism rates in the field commonly exceed 50 per cent (Anderson, 1976); *Telenomus* species are obviously important biological control agents. They have been successfully used to suppress outbreaks of *Oxydia trychiata* (Lepidoptera: Geometridae) in Colombia (Drooz et al., 1977) and of *Dendrolimus sibiricus* and *Malacosoma neustria* (Lepidoptera: Lasiocampidae) in the USSR (Fankhänel, 1963; Kozlov, 1967). In general, although the results of biological control projects are impressive, approximately three out of four of such programs end in failure (Messenger, 1976). Detailed studies of the interactions between beneficial insects and their biotic and abiotic environment are needed in order to increase substantially the rate of success. As emphasized by Compere (1969), Rosen (1978), and especially for *Telenomus* by Anderson (1976), such studies depend upon accurate identification of the insects involved, possible only with a sound systematic foundation for each group. In the sections that follow I hope to begin to shore up that foundation, at least for the Nearctic species of *Telenomus*.

This revision deals with the Nearctic species of *Telenomus*. I follow Brown (1973) in including in the Nearctic: Canada, the United States, and the Mexican plateau south to about 15° N latitude. I have also considered extralimital specimens of those species whose range extends beyond the Nearctic region.

MATERIAL

I have studied specimens of *Telenomus* from the institutions and individuals listed below. Abbreviations of museums used in the text are indicated in parentheses.

D.C. Allen, College of Environmental Science and Forestry, Syracuse, New York.
American Museum of Natural History, New York, N.Y. M. Favreau.
University of Arizona, Tucson. F.G. Werner.
University of Arkansas, Fayetteville. P. Rouse.
British Museum (Natural History), London. N.D.M. Fergusson.
California Academy of Sciences, San Francisco. P.H. Arnaud, Jr.
University of California, Riverside. J.C. Hall.
University of California, Berkeley. L.E. Caltagirone.
Canadian National Collection of Insects, Arachnids, and Nematodes, Ottawa, Ontario. L. Masner. (CNC)
Carnegie Museum, Pittsburgh, Pennsylvania. G. Wallace.
Cornell University, Ithaca, N.Y. L.L. Pechuman.
A.T. Drooz, USDA, Research Triangle Park, North Carolina.
Florida State Collection of Arthropods, Gainesville. E.E. Grissell. (FSCA)
University of Idaho, Moscow. W.F. Barr.
Illinois Natural History Survey, Urbana. W.E. LaBerge.
W. Jones, USDA, Stoneville, Mississippi.
University of Kansas, Lawrence. G.W. Byers.
W.H. Kearby, University of Missouri, Columbia.
Los Angeles County Museum, Los Angeles, California. R.R. Snelling. (LACM)
Louisiana State University, Baton Rouge. J.B. Chapin.
University of Lund, Lund, Sweden. R. Danielsson.
Magyar Nemzeti Muzeum, Természettudományi Muzeum, Budapest. J. Papp.
University of Missouri, Columbia. W.R. Enns.
Museum of Comparative Zoology, Cambridge, Massachusetts. A.F. Newton, Jr.
Naturhistorishes Museum, Vienna. M. Fischer.
New York State Museum, Albany. T.L. McCabe.
North Carolina State University, Raleigh.
Oxford University, Oxford.
Texas A&M University, College Station. S.J. Merritt. (TAM)
T.R. Torgersen, USDA, Corvallis, Oregon.
Ukrainian Academy of Sciences, Kiev. S.V. Kononova.
United States National Museum of Natural History, Washington, D.C. P.M. Marsh. (USNM)
Zoological Institute, Leningrad. M.A. Kozlov.
Zoologisk Museum, Copenhagen. B. Petersen.

GENERIC DIAGNOSIS AND SYNONYMY OF *TELENOMUS*

Telenomus Haliday, 1833:271. Type species: *Telenomus brachialis* Haliday. Designated by Ashmead (1893:142.)

Hemisius Westwood, 1833:445. Type species: *Hemisius minutus* Westwood. By monotypy. Synonymized by Masner (1961:166).

Phanurus Thomson, 1860:169, 172. Type species; *Phanurus angustatus* Thomson. Designated by Ashmead (1893:138). Synonymized by Mayr (1879:697).

Dissolcus Ashmead, 1893:164-165. Type species: *Dissolcus nigricornis* Ashmead. By monotypy and original designation. Synonymized by Johnson (1981:73.)

Neonecremnus Brèthes, 1909:57. Type species: *Neonecremnus hyelosiae* Brèthes. By monotypy. Synonymized by Blanchard (in DeSantis 1950:57).

Homophanurus Kieffer, 1912:36-37. Type species: *Telenomus hofmanni* Mayr. By monotypy and original designation. Synonymized by Kieffer (1926:28).

Prophanurus Kieffer, 1912:37-61. Type species: *Teleas phalaenarum* Nees. By original designation. Synonymized by Muesebeck (in Muesebeck et al., 1951:691). Key to European species.

Liophanurus Kieffer, 1912:61-68. Type species: *Telenomus spilosomatis* Ashmead. By original designation. Synonymized by Nixon (1937b:114). Key to European species.

Aholcus Kieffer, 1913b:4. Type species: *Aholcus monticola* Kieffer. By monotypy and original designation. Synonymized by Nixon (1935:75).

Neotelenomus Dodd, 1913b:158,171. Type species: *Neotelenomus anthereae* Dodd. By original designation. Synonymized by Nixon (1937b:114).

Paridris Brèthes, 1917:27-28 (not Kieffer, 1908). Type species: *Paridris chilensis* Brèthes. By monotypy. Synonymized by Muesebeck (*in* Muesebeck et al., 1951:691).

Pseudotelenomus Costa Lima, 1928:52. Type species: *Pseudotelenomus pachycoris* Costa Lima. By monotypy and original designation. NEW SYNONYMY.

Aporophlebus Kozlov, 1970:216. Type species: *Aporophlebus aporus* Kozlov. By original designation. Synonymized by Kozlov and Lê (1977:501).

Pseudophanurus Szabó, 1975b:269-270. Type species: *Pseudophanurus quadriclavatus* Szabó. By original designation. NEW SYNONYMY.

Verrucosicephalia Szabó, 1975b:274. Type species: *Verrucosicephalia depressa* Szabó. By monotypy and original designation. NEW SYNONYMY.

Pseudotelenomoides Szabó, 1975b:276-277. Type species: *Pseudotelenomoides stratiomyidarum* Szabó. By monotypy and original designation. NEW SYNONYMY.

Thomson, 1860:169, key to Swedish species of *Telenomus*.

Mayr, 1879:697-702, key to European species of *Telenomus*.

Ashmead, 1893:138-140, 142-145, key to North American species of *Telenomus* and *Phanurus*.

Ashmead, 1894:201-203, key to species of *Telenomus* of St. Vincent.

Ashmead, 1895c:790-791, key to species of *Telenomus* of Grenada.

Dalla Torre, 1898:512-521, catalog of world species of *Telenomus, Phanurus, Hemisius,* and *Dissolcus*.

Ashmead, 1904a:71-72, key to species of *Telenomus* from Japan.

Kieffer, 1912:9, 21-35, key to European species of *Telenomus*.

Wilcox, 1920:78-81, key to species of *Telenomus* with 10-segmented female antennae.

Kieffer, 1926:24-28, 49-51, 64-68, 91-95, 117-119, 124, 131, keys to world species of *Telenomus, Phanurus, Liophanurus, Microphanurus, Aholcus, Neotelenomus, Dissolcus,* and *Hemisius*.

Nixon, 1935:74-77, key to African species of *Telenomus*.

Nixon, 1937a:387, key to African species of *Telenomus* with 10-segmented female antennae.

Nixon, 1937b:113-117, key to Asian species of *Telenomus* with 10-segmented female antennae.

Nixon, 1937c:445-448, key to Asian species of *Telenomus*.

Nixon, 1940:497-501, key to Asian species of *Telenomus*.

Muesebeck, *in* Muesebeck et al., 1951:691-694, catalog of the species of *Telenomus* and *Dissolcus* in America north of Mexico.

Kozlov, 1967:361-375, key to Palearctic species of *Telenomus*.

Kozlov, 1973:910-911, key to world species of *Platytelenomus*.

Szabó, 1975a:178, key to Palearctic species of *Platytelenomus* known to the author.

Szabó, 1975b:265-266, key to world genera of Telenominae known to the author.

Kozlov and Lê, 1976:348-351, key to Palearctic species of *Aporophlebus*.

Masner, 1976:75-76, key to world genera of Telenominae.

Szabó, 1976:176-177, key to species of *Asolcus* known to the author.

Kozlov and Kononova, 1977a:50-51, key to world species of *Telenomus* with 10-segmented female antennae (incomplete).

Kozlov, 1978:638-646, key to species of *Telenomus* and *Platytelenomus* of the European USSR.
Szabó, 1978:220-221, key to species of *Telenomus* known to the author.
Muesebeck, *in* Krombein et al., 1979:1167-1170, catalog of the species of *Telenomus* and *Dissolcus* in America north of Mexico.
Masner, 1980:9-10, key to genera of Telenominae of the Holarctic.

The subfamily Telenominae, as conceived here, is made up of two groups of genera. *Trissolcus* Ashmead and the closely related *Protelenomus* Kieffer, *Phanuropsis* Girault, *Psix* Kozlov and Lê and *Archiphanurus* Szabó compose one group. *Telenomus* along with its satellite genera *Aradoctonus* Masner, *Platytelenomus* Dodd, *Nirupama* Nixon, *Eumicrosoma* Gahan, *Phanuromyia* Dodd, *Phlebiaporus* Kozlov and *Issidotelenomus* Pélov compose the other. The vast majority of species of *Telenomus* may be separated from *Trissolcus* and its allies by the following combination of characters: female antennal clava with five or fewer segments (in *Trissolcus* always six); frons smooth; cheeks without fanlike striae arising from mandibles; compound eyes setose; notauli absent; length of second metasomal tergite greater than width. The remaining genera are essentially made up of species that have been excluded from *Telenomus* on the basis of a few, sometimes striking morphological peculiarities. The erection of genera for these species has resulted in a number of small monophyletic groups, and one large paraphyletic complex of species, *Telenomus.* The sister species groups of some of these small genera are clearly visible within *Telenomus. Eumicrosoma* is merely an extreme form of the *T. floridanus* species group; *Platytelenomus,* the *T. californicus* complex; and *Issidotelenomus* probably should be in the *T. crassiclava* species group. The relationships of *Aradoctonus, Nirupama, Phanuromyia,* and *Phlebiaporus* are unclear.

The majority of *Telenomus* species may be characterized as follows: female antennae 11-segmented (10-segmented in some species of the *T. californicus* complex), male antennae 12-segmented (11-segmented in *T. pachycoris)* antennal clava of female 5-segmented (6-segmented in some *T. podisi* group species, 4 in some *T. laricis* group species, sometimes clava limits indistinct); frons smooth medially (sculptured throughout in some species of the *T. floridanus* and *T. crassiclava* groups); eyes hairy (appearing glabrous in some species of the *T. phymatae* and *T. crassiclava* groups); head nearly quadrate to strongly transverse in dorsal view; notauli absent (present in the *T. floridanus* group and a few other species); scutellum smooth (coriaceous in some *T. floridanus* group species); fore wings clear (infuscate throughout or banded in some species of the *T. longicornis* and *T. crassiclava* groups); marginal vein shorter than stigmal; postmarginal vein longer than stigmal (shorter in *"Aporophlebus"* species *sensu* Kozlov); hind wing narrow to broad; first metasomal tergite with one or more pairs of sublateral setae; second tergite as long as or longer than wide; body dark brown to black (yellow in whole or in part in *T. xanthosoma,* male *T. tabanivorus* group, *T. melanogaster,* and some species of the *T. arzamae, T. floridanus,* and *T. crassiclava* groups; mesosoma metallic blue or green in some species of the *T. longicornis* group).

I have included all of the Nearctic genera of Telenominae in the key at the end of this paper. Masner (1976, 1980) has recently provided keys to the genera of Scelionidae; together, these can be used to identify all of the known temperate zone genera of Telenominae. Identification of tropical genera is more uncertain. The generic placement of many unusual species from the Neotropical, Ethiopian, Oriental, and Australasian regions is problematical. Until the genera of the subfamily are revised on a worldwide level these are probably best left in *Telenomus.*

The early history of the study of telenomine taxonomy may be characterized as a series of attempts to refine the concept of the genus *Trissolcus.* Thomson (1860) was the first to recognize the possibility of distinguishing between what are now considered the genera *Telenomus* and *Trissolcus.* The species he included under the name *Telenomus,* with one exception *(T. punctiventris),* are now placed in *Trissolcus.* All of the species included in his new genus *Phanurus* are considered to be *Telenomus.* Unfortunately, the characters he used to define *Phanurus,* the presence of sculpture on the frons and exsertion of the ovipositor, are highly variable. Mayr (1879) recognized this, and his synonymization of *Phanurus* with *Telenomus* again lumped all telenomines together under a single generic name.

In 1893 William H. Ashmead described the genus *Trissolcus,* based upon his belief that the presence or absence of notauli constituted an acceptable basis for generic distinction. He retained several species without notauli within *Telenomus* that are now considered as members of *Trissolcus.* J.J. Kieffer (1912, 1913, 1926) described several new telenomine genera, most of them based on highly variable or even nonexistent combinations of characters. The validity of these genera was discussed by Nixon (1937b) and I refer the reader to his paper for further details. Kieffer (1926) did separate from *Telenomus* those species of *Trissolcus* lacking notauli. He placed these, along with some true *Telenomus,* in the genus *Microphanurus.*

Gilbert E.J. Nixon (1935-40), in his series of papers on the Ethiopian and Oriental Telenominae, provided the greatest step toward the refinement of the generic concept of *Trissolcus* (his *Microphanurus*). His ideas form the basis of the diagnostic characters used here to separate the two genera. The concept of *Trissolcus* has been further modified by Masner (1959, 1964, 1976, 1980) in recognizing the intraspecific variability in the development of the notauli, and in the synonymization of *Microphanurus* and *Asolcus* with *Trissolcus.*

A common trend among species of *Telenomus* is toward a dorsoventral compression and general elongation of the body. Ashmead's concept of Thomson's genus *Phanurus* was made up of these species. Alan P. Dodd (1914a) described the genus *Platytelenomus* for a strongly flattened species of lepidopteran egg parasite. This macrohabitual trend appears to occur independently in the *T. floridanus, T. laricis,* and *T. tabanivorus* species groups of *Telenomus* (see below), and therefore, by itself, cannot form the basis for defining genera. I have refrained from formally synonymizing *Platytelenomus* because I have not seen specimens of the type species *planus* Dodd. I have, however, transferred all species of *Platytelenomus* whose type specimens I have examined to *Telenomus.*

Reduction in the number of antennomeres has also often been used as a basis for generic distinction. Kieffer's genus *Aholcus* and Dodd's *Neotelenomus* were erected to recognize those species with 10-segmented female antennae. Nixon (1937b) recognized that this secondary sexual character was the only one by which these species differed from the rest of *Telenomus.* He therefore synonymized these names with *Telenomus. Pseudotelenomus* in turn was based only on the partial fusion of the third and fourth antennomeres of the male. I agree with Nixon in considering that secondary sexual characters alone form an insufficient basis upon which to erect new genera, and so I have synonymized *Pseudotelenomus* with *Telenomus.*

Kieffer (1912) described the genus *Homophanurus* to contain those species in which the female antennal clava is indistinctly developed. Actually, the

width of the clavomeres in relation to the width of the funicle is quite variable, and no distinct gap in this ratio exists between the so-called "clubless" and "clavate" species. Kieffer apparently recognized this and synonymized the genus himself in 1926.

Szabó (1975b, 1976, 1978) has continued to recognize *Asolcus, Homophanurus, Aholcus,* and *Neotelenomus* as valid names. He has not presented any evidence to support his resurrection of these names from synonymy. His concept of *Asolcus* includes those species that have a relatively stout habitus (the plesiomorphic condition for the subfamily) and that lack notauli (a commonly convergent character). Therefore, the species he includes under the name *Asolcus* are considered here to belong to *Telenomus* and *Trissolcus.* In 1975 Szabó also described the new genera *Pseudophanurus, Verrucosicephalia,* and *Pseudotelenomoides.* I have examined the holotypes of the type species of the two former genera and paratypes of the last, and have decided to synonymize them with *Telenomus.* These genera correspond to the *T. californicus* complex, the *T. laricis* species group, and the *T. tabanivorus* species group respectively. My reasons for synonymizing them are discussed in detail in the sections dealing with these groups.

I strongly suspect that *Phanuromyia* and *Issidotelenomus* are synonyms of *Telenomus.* The described characters upon which they are based occur commonly and are highly variable throughout the subfamily. I was unable to study either the types or other specimens of the type species of these genera identified by the original author, and so have refrained from taking this step.

SPECIES LIST

In the nearly 150 years since Alexander H. Haliday described *Telenomus,* over 500 species names have been placed in the genus. I have listed all these names to summarize the status of these species and to try to forestall the further description of homonyms. All names that have ever been referred to *Telenomus* are included here. Synonymies are indicated by the name, followed by an = sign, the senior synonym, and the authority in parentheses. A generic transfer is indicated by the species name followed by "to" and the current generic assignment. If a species was described outside of *Telenomus,* the genus in which it was originally described is indicated in parentheses. All known names published before September 1980 are included.

abava Kozlov and Kononova, 1978a:105.
abdominalis Ishida, 1931:539, 543 *(Phanurus)* = *dignoides* (Yasumatusu, 1950).
abdominalis Kozlov, 1971:44.
aberrans Kozlov, 1967:369.
abitus Johnson, new species.
abnormis Crawford, 1912a:270
abruptus Johnson, new species.
acamas Kozlov and Kononova, 1977a:51.
acares Johnson, new name for *minimus* (Dodd).
acarnas Kozlov and Kononova, 1977a:53.
acrobates Giard, 1895:77.
adelphus Perkins, 1910:619.
adenyus Nixon, 1937b:122.
adrastea Kozlov and Kononova, 1977b:54.
aegeus Dodd, 1914h:124.
aegicerophalus Dodd 1914i:11 *(Neotelenomus).*
aethra Walker, 1836:354.

affinis Ashmead, 1894:200 *(Phanurus).*
ajax Dodd, 1914h:125.
albagniris Marelli, 1952:1.
albitarsis Ashmead, 1895c:795.
alcon Walker, 1836:352.
alecto Crawford, 1914:85 *(Prophanurus).*
aleus Nixon, 1935:81.
almanzori Marelli, 1937:164 = *hyelosiae (teste* DeSantis, 1968).
alpestris Kieffer, 1909:269 to *Trissolcus.*
alsophilae Viereck, 1924:111.
amazonicus Cameron, 1891:190.
amymone Kozlov and Kononova, 1977b:56.
anates Nixon, 1937a:388.
andria Walker, 1836:348.
angulatus Johnson, 1981:77.
angustatus Thomson, 1860:172 *(Phanurus).*
antennalis Fouts, 1934:104.
antennalis Kozlov, in Kononova 1973:622 *(Platytelenomus).*
anthereae Dodd, 1913b:171 *(Neotelenomus).*
anwari Mani, 1939:94.
apitius Walker, 1843:48.
aporus Kozlov, 1970:216 *(Aporophlebus).*
aradi Kozlov, 1967:366.
ariadne Kozlov and Lê, 1976:355 *(Aporophlebus).*
arminon Walker, 1838:457.
arzamae Riley, *in* Ashmead 1893:157.
ashmeadi Morrill, 1907:419 = *utahensis* (Muesebeck, *in* Muesebeck et al., 1951).
asperus Kozlov and Kononova, 1978b:81.
astrictus Johnson, new species.
atamiensis Ashmead, 1904a:72.
ater Haliday, 1833:271.
athanasowi Szabó, 1959b:198.
atomus Johnson, new name for *minutus* Ratzeburg.
atratus Johnson, new name for *niger* Dodd.
atripes Cameron, 1913:134.
atropos Kozlov and Kononova, 1977b:52.
attaci Nixon, 1937c:456.
atys Nixon, 1935:86 to *Trissolcus.*
australis Dodd, 1913c:86 *(Neotelenomus).*
bakeri Kieffer, 1906:261.
barrowi Dodd, 1919:356 to *Trissolcus.*
basalis Wollaston, 1858:25 to *Trissolcus.*
basandzhabi Mineo and Szabó, 1979:53.
beatus Dodd, 1913c:85 *(Neotelenomus).*
belenus Walker, 1836:352.
benefactor Crawford, 1911:439.
beneficiens Zehnter, 1896:487 *(Ceraphron).*
bicolor Dodd, 1914c:251 to *Paratelenomus* (?).
bifidus Riley, 1887:531.
biproruli Girault, 1926:137.
bisulcatus Szabó, 1978:234.
bombycis Mayr, 1879:711 = *tetratomus* (Thomson) (Kozlov, 1967).
brachialis Haliday, 1833:271.
brachypterus Szabó and Mineo, 1978:148.
brevis Thomson, 1860:173 *(Phanurus).*
brimo Nixon, 1935:778.
busseolae Gahan, 1922a:23.
caesaris Girault, 1939:149 *(Neotelenomus).*
californicus Ashmead, 1893:150.
calvus Johnson, new species.
capito De Santis and Loiácono, *in* De Santis et al., 1980:199.
carinifrons Cameron, 1912:105 *(Immsia)* to *Trissolcus.*
carnifex Johnson, new name for *ovivorus* Dodd.
casamencensis Risbec, 1957:525.
catacanthae Ashmead, 1904b:284 to *Trissolcus.*

catalpae Muesebeck, 1935:279.
cebes Kozlov and Lê, 1976:357 *(Aporophlebus).*
charmus Walker, 1839:59 to *Anteris.*
chilensis Brèthes, 1917:28 *(Paridris).*
chilocolus Wu and Chen, *in* Wu et al., 1979:396.
chloropus Thomson, 1860:173 *(Phanurus).*
chrysolaus Walker, 1839:80 to *Gryon.*
chrysopae Ashmead, 1893:159.
chrysopae Vasiliev, 1915:7 = *ferganae,* new name.
cirphivorus Liu, 1959:158.
cleostratus Walker, 1836:350.
clisiocampae Riley, in Ashmead, 1893:160.
closterae Wu and Chen, 1980:83.
clotho Kozlov and Kononova, 1977b:50.
coccivorus Mayr, 1879:714 = *angustatus* (Kozlov, 1966).
codrus Nixon, 1935:83.
coelodasidis Ashmead, 1893:159.
coilus Walker, 1836:346.
colemani Crawford, 1912b:2 to *Trissolcus.*
coloradensis Crawford, 1909:206.
colotes Walker, 1836:353.
comes Kozlov and Lê, 1976:359 *(Aporophlebus).*
comopterygi Risbec, 1950:633.
comperei Crawford, 1912b:1 to *Trissolcus.*
confusus Ashmead, 1894:204.
connectans Ashmead, 1895c:792.
consimilis Ashmead, 1895c:796.
convergens Ashmead, 1895c:795 = *consimilis,* new synonym.
convolvuli Risbec, 1950:561
coranii Risbec, 1950:561.
coreiphagus Risbec, 1950:565.
corniger Johnson, new name for *longicornis* (Dodd).
cosmopeplae Gahan, 1926:67 to *Trissolcus.*
costalimai Ortiz and Alvarez, 1959:373.
crassiclava Nixon, 1940:501.
cristatus Johnson, new species.
cteatus Walker, 1839:60 to *Idris.*
cubiceps Ashmead, 1894:206.
cubiceps Szabó, 1978:221.
cultratus Mayr, 1879:703 = *flavipes* Thomson (Kozlov 1968).
cyanae Kozlov and Lê, 1976:351 *(Aporophlebus).*
cybele Nixon, 1935:77.
cyrus Nixon, 1937c:448.
dalmanni Ratzeburg, 1844:185 *(Teleas).*
danaus Kozlov and Kononova, 1977b:57.
darwinensis Dodd, 1914i:7.
dazhulanensis Chen and Wu, 1980:427.
debessa Kozlov and Kononova, 1978a: 106.
demodoci Nixon, 1936:564.
dendrolimi Matsumura, 1925:44 *(Holcaerus).*
dendrolimusi Chu, 1937:60 = *dendrolimi* (Hirose et al., 1968).
dentatus Johnson, new species.
depressigaster Szabó and Mineo, 1978:147.
depressus Dodd, 1914i:8 *(Phanurus).*
depressus Szabó; 1975b:274 *(Verrucosicephalia),* new combination.
despiciendus Perkins, 1910:618.
dicaeus Walker, 1839:80 to *Gryon.*
diemenensis Dodd, 1914h:123.
difformis Ashmead, 1894:205.
dignoides Nixon, 1937c:463.
dignus Gahan, 1925a:108 *(Phanurus).*
dilophonotae Cameron, 1913:133.
dimmocki Ashmead, 190la:155 = *podisi,* new synonym.
dion Kozlov and Kononova, 1977a:55.
dissolcus Kozlov, 1966:95.

distinctus Kozlov, 1967:372.
diversicornis Ogloblin, 1937:31.
diversus Wollaston, 1858:26 to *Gryon.*
divisus Wollaston, 1858:25 to *Gryon.*
doddi Johnson, new name for *girault*i Dodd.
dolabella Kozlov, 1972:667.
dolichocerus Ashmead, 1887b:100 *(Teleas).*
dorsennus Walker, 1836:348.
doves Kozlov and Lê, 1976:354 *(Aporophlebus).*
droozi Muesebeck, 1978:91.
edessae Brèthes, 1915:407.
eetion Dodd, 1914i:13.
egeria Dodd, 1914i:4.
eleleus Dodd, 1914i:5.
elpenor Dodd, 1914i:4.
embolicus Kozlov, 1967:370.
emersoni Girault, 1916:150 *(Phanurus).*
emersoni Girault, 1932:6 *in* Gordh et al., 1979:298 = *olsenni,* new name.
endymion Dodd, 1914i:6.
ephyra Dodd, 1914i:7.
erdoesi Szabó, 1978:224.
erigone Dodd, 1914i:8.
eris Walker, 1836:345.
eteocles Dodd, 1914i:5.
etiellae Kozlov, 1967:370.
euander Dodd, 1914i:7 to *Trissolcus.*
euphorbiae Risbec, 1950:562.
euproctidis Wilcox, 1920:79.
euproctiscidis Mani, 1939:95 *(Aholcus).*
eurydemae Vasiliev, 1915:16 *(Aphanurus).*
eurystylusi Risbec, 1955a:192.
exilis Johnson, new species.
eximus Dodd, 1914b:121 *(Neotelenomus).*
fariai Costa Lima, 1927:450.
fasciatus Kozlov, 1967:371.
ferganae Johnson, new name for *chrysopae* Vasiliev.
fimbriatus Kieffer, 1904:539 = *podisi,* new synonym.
fiskei Brues, 1910:106 = *dalmanni* (Wilcox, 1920).
flavescens Dodd, 1914i:4.
flavicephala Risbec, 1956:832.
flavicornis Wollaston, 1858:26 to *Idris.*
flavicornis Ashmead, 1894:210 = *fulvicornis* (Dalla Torre, 1898, replacement name).
flavicorpus Gahan, 1925a:104 *(Prophanurus).*
flavipes Thomson, 1860:170 to *Trissolcus.*
flavipes Ashmead, 1893:141 *(Phanurus).*
flaviventris Ashmead, 1895c:795.
flaviventris Kozlov and Kononova, 1978b:80.
flavopetiolatus Ashmead, 1894:270.
flavus Dodd, 1914g:350 *(Phanurus).*
floridanus Ashmead, 1893:140 *(Phanurus).*
fodori Szelényi, 1941:158 *(Dissolcus).*
frenchi Dodd, 1919:357.
frontalis Thomson, 1860:170 = *grandis* (Kozlov, 1968).
fulvicornis Dalla Torre, 1898:515.
funingensis Chen and Wu, 1980:427.
fuscicornis Ashmead, 1895c:794.
fuscipennis Ashmead, 1894:210.
galba Kozlov, 1972:671 *(Aporophlebus).*
geometrae Ashmead, 1893:157.
gifuensis Ashmead, 1904a:73, new status.
giraudi Kieffer, 1905b:51.
*girault*i Dodd, 1913b:159 *(Phanurus).*
*girault*i Dodd, 1914d:161 = *doddi,* new name.
glabriscrobus Girault, 1926:138.

gloriosus Dodd, 1913c:84.
gnophaelae Ashmead, 1893:149.
goliathus Johnson, new species.
gomola Kozlov, 1972:666.
goniopis Crawford, 1913a:243.
gossypiicola Ashmead, 1893:156.
gowdeyi Crawford, 1911:441.
gracilicornis Ashmead, 1893:149.
gracilis Mayr, 1879:713 = *tetratomus* (Thomson) (Kozlov, 1967).
grandis Thomson, 1860:169 to *Trissolcus*.
graptae Howard, 1889:1896.
grenadensis Ashmead, 1895c:791.
guangdongensis Chen and Liao, *in* Wu et al., 1979:397.
guancheri Hedqvist, 1979:79.
gynaephorae Chen and Wu, 1979:471.
hackeri Dodd, 1913a:337 *(Phanurus)*.
hakonensis Ashmead, 1904a:73.
harpyiae Mayr, 1879:711.
heliothidis Ashmead, 1893:152.
hemerocampae Wilcox, 1920:78.
heracleicola Brues, 1906:148 = *podisi*, new synonym.
hersei Risbec, 1950:564.
heteropterus Haliday, 1833: 271.
heydeni Mayr, 1879:706.
hilli Dodd, 1914b:119 *(Phanurus)*.
hofmanni Mayr, 1879:172.
horus Walker, 1836:349.
hubbardi Ashmead, 1893:146.
hullensis Harrington, 1899:182 to *Trissolcus*, new combination.
hungaricus Szabó, 1975b:272 *(Pseudophanurus)*, new combination.
hungaricus Szabó, 1975b:275 *(Homophanurus)*, new combination.
hyalinatus Thomson, 1860:174, new status.
hyelosiae Brèthes, 1909:57 *(Neonecremnus)*.
hyperion Nixon, 1935:81.
hysteropteri Bin, 1975:184.
iapyx Walker, 1839:60.
ichthyurae Ashmead, 1893:154.
impressus Ashmead, 1894:204
incommodus Nixon, 1937b:123.
indicus Subba Rao and Chacko, 1961:813 *(Allophanurus)* to *Trissolcus*.
infuscatipes Ashmead, 1887b:100 *(Teleas)*.
insularis Ogloblin, 1957:434.
iphias Nixon, 1935:91
ixion Kozlov and Kononova, 1977a:56.
javae Girault, 1917b:8 *(Neotelenomus)*, *in* Gordh et al., 1979:67.
javensis Dodd, 1914e:163.
jugoslavicus Szabó, 1975b:271 *(Pseudophanurus)*, new combination.
kingi Crawford, 1911:440.
koebelei Ashmead, 1893:147.
kolbei Mayr, 1879:713.
konoi Ishii, 1939:187.
kuboi Yasumatsu, 1962:260.
lachensis Kozlov and Kononova, 1977b:52.
laeviceps Förster, 1861:40, *in* Dalla Torre, 1885.
laeviscutellatus Förster, 1861:40, *in* Dalla Torre, 1885.
laeviusculus Ratzeburg, 1844:182 *(Teleas)*.
laricis Walker, 1936:347.
laticeps Dodd, 1914i:10 *(Neotelenomus)*.
latifrons Ashmead, 1895c:793.
latisulcus Crawford, 1913a:244 to *Trissolcus*.
lavernae Ashmead, 1893:158.
leai Dodd, 1913b:172 *(Neotelenomus)*.
lelus Nixon, 1937c:450.
lemoleae Nixon, 1936:558 *(Microphanurus)*.
lineolatus Kozlov, 1967:364.

linnei Nees, 1834:288 *(Teleas)* = *truncatus* (Mayr, 1879).
longiabdominalis Szabó, 1978:227.
longiceps Kozlov, 1970:216 *(Aporophlebus).*
longiclavatus Ashmead, 1895c:792.
longiclavatus Szabó, 1978:232.
longicornis Ashmead, 1901b:586.
longicornis Dodd, 1913b:160 *(Phanurus)* = *corniger,* new name.
longicorpus Dodd, 1913b:161 *(Phanurus).*
longifuniculus Szabó, 1978:228.
longipennis Dodd, 1913b:160 *(Phanurus).*
longistriatus Kozlov, 1967:366.
longiusculus Kozlov, 1973: 912 *(Platytelenomus),* new combination.
longiventris Cameron, 1913:132.
longulus Kozlov, 1967:367.
longus Kozlov, 1973:913 *(Platytelenomus),* new combination.
lopicida Silvestri, 1932:562.
lucullus Nixon, 1937c:451.
luteipes Ashmead, 1895c:793.
lymantriae Kozlov, 1967:366.
macroceps Szabó, 1957:259.
maculatus Förster, 1840:44 *(Teleas).*
maculipennis Ashmead, 1893:155.
maderensis Wollaston, 1858:25 = *basalis* (Nixon, 1935).
magniclavatus Dodd, 1914b:122 *(Neotelenomus).*
magniclavus Ashmead, 1894:205.
mahensis Kieffer, 1910:294.
majorosi Mineo and Szabó, 1979:54.
maletta Kozlov and Kononova, 1978a:108.
manolus Nixon, 1937c:454.
manteroi Kieffer, 1909:268 to *Trissolcus.*
mataieaensis Fouts, 1939:155.
matsumurai Ishida, 1931:543 *(Phanurus)* = *dignus* (Yasumatsu, 1950).
mayri Sokolov, 1904 = *chloropus* (Kozlov, 1968).
mayri Kieffer, 1912:51 *(Prophanurus)* = *nitidulus* (Kozlov, 1967).
medius Ashmead, 1894:207.
megacephalus Ashmead, 1894:212 = *basalis* (Nixon, 1935).
melanogaster Cameron, 1891:189.
menes Kozlov and Lê, 1976:357 *(Aporophlebus).*
mentes Walker, 1838:458.
meridionalis Ashmead, 1894:208.
mesillae Cockerell, 1897:25 *(Hadronotus)* = *utahensis* (Muesebeck, *in* Muesebeck et al., 1951).
microceps Szabó, 1978:231.
microclavatus Szabó, 1978:235.
minimus Ashmead, 1893:152.
minimus Dodd, 1913b:172 *(Neotelenomus)* = *acares* new name.
minimus Kozlov, 1967:369.
minutissimus Ashmead, 1895a:220.
minutus Westwood, 1833:445 *(Hemisius).*
minutus Ratzeburg, 1848:143 *(Teleas)* = *atomus* new name.
mitsukurii Ashmead, 1904a:72 to *Trissolcus.*
moczari Szabó, 1978:227.
molorchus Nixon, 1937b:117.
monilicornis Ashmead, 1894:203 new status.
monodactylus Liu, 1959:159.
montanus Dodd, 1913b:159 *(Phanurus).*
monticola Kieffer, 1913b:4 *(Aholcus).*
mormideae Costa Lima, 1935:10.
mumfordi Fouts, 1939:154.
myrmidon Kieffer, 1910:294.
nakagawai Watanabe, 1954:17.
nanus Sundholm, 1970:364.
narolus Nixon, 1937a:389.
nauplius Walker, 1836:353 to *Gryon.*
nawai Ashmead, 1904a:72.
necopinatus Dodd, 1916:32 *(Phanuromyia).*

nelsonensis Dodd, 1913b:160 *(Phanurus).*
nephele Nixon, 1935:88.
niger Dodd, 1913b:158 *(Phanurus).*
niger Dodd, 1913b:172 *(Neotelenomus)* = *atratus* new name.
nigriclavatus Ashmead, 1895c:794.
nigricornis Ashmead, 1893 *(Dissolcus).*
nigricorpus Dodd, 1913b:160 *(Phanurus).*
nigripes Thomson, 1860:170 = *grandis* (Kozlov, 1968).
nigriscapus Ashmead, 1893:147.
nigrita Thomson, 1860:171 = *grandis* (Kozlov, 1968).
nigrocoxalis Ashmead, 1894:211.
nioba Kozlov and Kononova, 1977b:57.
nitens Kozlov, 1972:664.
nitidulus Thomson, 1860:174 *(Phanurus).*
noctuae Ashmead, 1893:145.
nomas Förster, 1861:41, *in* Dalla Torre, 1885.
nonnitens Szabó, 1978:231.
numitor Nixon, 1935:79.
oaxes Dodd, 1914b:120.
obliteratus Dodd, 1914h:122.
ochus Nixon, 1938b:590.
ocnus Dodd, 1914b:120.
octerus Kieffer, 1912 *(Prophanurus)* = *tetratomus* (Thomson) (described as subspecies).
oculeus Johnson, new species.
odyssea Dodd, 1913b:162.
oeagrus Dodd, 1913b:163.
oechalia Dodd, 1913c:83.
oecleoides Dodd, 1914h:122.
oecleus Dodd, 1913b:163.
oedipus Dodd, 1913b:164.
oeneus Dodd, 1913b:164.
oenone Dodd, 1913b:165.
oenopion Dodd, 1913b:165.
oeta Dodd, 1914c:252.
ogyges Dodd, 1913b:166.
olsenni Johnson, new name for *emersoni* Girault.
olympus Dodd, 1913b:166.
olynthus Nixon, 1938b:586.
omphale Dodd, 1913b:166.
oophagus Nikol'skaya, 1948:730.
opacus Howard, 1888:268 *(Thoron).*
ophion Dodd, 1913b:167.
ophiusa Dodd, 1913c:84.
opis Dodd, 1913c:84.
oreas Dodd, 1913b:180.
orestes Dodd, 1913b:167.
orgyiae Fitch, 1865:197 = *dalmanni* (Muesebeck, *in* Muesebeck et al., 1951).
oriplanus Kieffer, 1913:18 *(Phanurus).*
orithyia Dodd, 1913b:180.
ormenis Dodd, 1913b:181.
orodes Dodd, 1913b:181.
orontes Dodd, 1914b:120.
orpheus Dodd, 1913b:181.
orphne Walker, 1836:350.
osiris Dodd, 1913b:180.
ossa Dodd, 1914b:119.
ostriniae Chen and Wu, *in* Wu et al, 1979:396.
otho Dodd, 1914c:252.
othonia Walker, 1836:350.
othus Haliday, 1833:271.
otones Nixon, 1940:510.
ovivorus Rondani, 1870:13 *(Anaphes) (teste* Bouček 1974).
ovivorus Ashmead, 1893:140 *(Phanurus).*
ovivorus Dodd, 1913b:172 *(Neotelenomus)* = *carnifex* new name.
ovulorum Linnaeus, 1758:568 *(Ichneumon) (teste* Bouček, 1981).

ovulorum Bouché, 1834:177 *(Teleas)* = *terebrans* (Mayr, 1879).
ovulorum Thomson, 1860:171 = *semistriatus* (Mayr, 1879).
oxycareni Girault, 1934:2, *in* Gordh et al., 1979:307.
pachyclavatus Szabó, 1975b:276 *(Homophanurus)* = *hungaricus* (described as subspecies) new combination.
pachycoris Costa Lima, 1928a:51 *(Pseudotelenomus)* new combination.
pacificus Gahan, 1925a:104 *(Prophanurus)*.
pallidicornis Dodd, 1913c:86 *(Neotelenomus)*.
pallidipes Thomson, 1860:174 *(Phanurus)*.
pallidithorax Dodd, 1914i:10 *(Neotelenomus)*.
pallidiventris Dodd, 1913c:86 *(Neotelenomus)*.
pamphilae Ashmead, *in* Harrington, 1899:182.
pappi Szabó, 1978:234.
paractias Perkins, 1910:619.
paraothus Szabó and Mineo, 1978:148.
parnarae Wu and Chen, *in* Wu et al. 1979:395.
parvulus Dodd, 1914i:12 *(Neotelenomus)*.
pectoralis Ashmead, 1894:206.
pegasus Nixon, 1940:508.
pennsylvanicus Ashmead, 1893:160 to *Gryon*.
pentatomae Rondani, 1874:135 *(Teleas)*.
pentatomus Thomson, 1860:173 *(Phanurus)*.
pentatomus Kieffer, 1906:261 = *zeli* new name.
penthimiae Lichtenstein, 1880:206.
pentopherae Mayr, 1879:706.
periparetus Nixon, 1938b:588.
perniciosi Soyka, 1942:177 *(Neotelenomus)*.
perplexus Girault, 1906:65 = *podisi* new synonym.
perplexus Nixon, 1937c:470.
perrisi Kieffer, 1905b:52 to *Trissolcus*.
persimilis Ashmead, 1893:150.
phalaenarum Nees, 1834:287 *(Teleas)*.
phegeus Nixon, 1938a:284.
phylias Walker, 1836:348.
phymatae Masner and Johnson, 1979:1115.
piceipes Dodd, 1919:354 = *basalis* (Nixon, 1935).
pictus Kozlov, 1972:661.
pilumnus Walker, 1836:352.
platythorax Szabó, 1976:181 *(Asolcus)* new combination.
podisi Ashmead, 1893:158.
poeta Girault, 1920:178.
politus Thomson, 1860:173 *(Phanurus)*.
polla Kozlov, 1972:666.
polycrates Nixon, 1935:79.
polymorphus Costa Lima, 1943:225.
pontus Nixon, 1937c:469.
praetabani Szabó, 1978:232.
procas Nixon, 1935:78.
proditor Nixon, 1937c:456.
prolatus Johnson, new species.
prolixus Johnson, 1981:77.
promachivorus Gahan, 1925b:21 *(Phanurus)*.
psammicola Szabó, 1978:228.
pseudoclavatus Dodd, 1913c:87 *(Neotelenomus)*.
pseudocorani Risbec, 1957:522.
pseudothus Szabó, 1978:226.
pulcherrimus Dodd, 1914b:121.
pulchricornis Cameron, 1913:133 = *grenadensis* new synonym.
pulchricornis Dodd, 1914i:9 *(Neotelenomus)*.
pumilio Nees, 1834:288 *(Teleas)* to *Gryon*.
punctatissimus Ratzeburg, 1844:182 *(Teleas)*.
punctatulus Ratzeburg, 1844:182 *(Teleas)* = *nitidulus* (Kozlov, 1967).
punctiventris Thomson, 1860:172.
punctulosus Kozlov, 1973:911 *(Platytelenomus)*.
pusillus Ashmead, 1893:146.

puticulus Johnson, new species.
pygmaeus Ashmead, 1894:208.
pylades Nixon, 1935:89.
pylus Nixon, 1935:83.
pyramus Nixon, 1935:86.
quadriclavatus Szabó, 1975b:270 *(Pseudophanurus)* new combination.
quaintancei Girault, 1906:63.
rabinovichi De Santis and Vidal, *in* De Santis et al., 1980:198 (described as subspecies).
remus Nixon, 1937c:471.
reynoldsi Gordh and Coker, 1973:1407.
rileyi Howard, 1889:1896.
rondotiae Wu and Chen, 1980:82.
rowani Gahan, 1925a:106 *(Phanurus).*
rubriventris Szabó, 1959a:169 = *rufiventris* (Kozlov, 1968).
rudis Kozlov, 1972:663.
rufiventris Mayr, 1907:158 to *Trissolcus.*
rufoniger Provancher, 1889:403 to *Conostigmus.*
saakowi Mayr, 1903:397 to *Trissolcus.*
saccharalis Dodd, 1914f:293.
saccharicola Mani, 1941:26.
sacchi Ogloblin, 1930:41.
sagana Kozlov, 1972:662.
sagei Mani, 1936:335.
samueli Mani, 1942:153 *(Liophanurus)* new combination.
sanctivincenti Ashmead, 1894:211.
scaber Ashmead, 1894:208.
schrottkyi Brèthes, 1915:406.
sciron Nixon, 1935:84.
scirpophagae Wu and Chen, *in* Wu et al., 1979:395.
scutellaris Thomson, 1860:171 to *Trissolcus.*
semistriatus Nees, 1834:290 to *Trissolcus.*
sesamiae Wu and Chen, *in* Wu et al., 1979:393.
seychellensis Kieffer, 1910:294.
sidneyi Girault, 1932:5, *in* Gordh et al. 1979:297.
simoni Mayr, 1879:705 to *Trissolcus.*
simulans Dodd, 1914i:11 *(Neotelenomus).*
sirphidi Risbec, 1950:635.
sitius Walker, 1836:351.
smithii Ashmead, 1894:209.
sokolovi Mayr, 1897 = *chloropus* (Kozlov, 1967).
solarii Kieffer, 1905b:14.
sorus Nixon, 1937c:458.
sphingis Ashmead, 1887a:19 *(Teleas).*
spilosomatis Ashmead, 1893:151.
splendens Sundholm, 1970:366.
spodopterae Dodd, 1914e:164.
stenoceps Szabó, 1978:233.
sterope Kozlov and Lê, 1976:356 *(Aporophlebus).*
stratiomyidarum Szabó, 1975b:277 *(Pseudotelenomoides),* new combination.
striatulus Kozlov, *in* Masner and Kozlov, 1965:290 *(Platytelenomus),* new combination.
stigis Nixon, 1937b:125.
stilpo Walker, 1836:349.
strelzovi Vasiliev, 1949:109.
striaticeps Dodd, 1919: 355 to *Psix.*
striatus Risbec, 1950:564.
striatus Kononova, 1973:45.
stygicus Provancher, 1889:180 to *Megaspilus.*
sulculus Johnson, new species.
subfasciatus Wollaston, 1858:25 to *Gryon.*
szelenyii Muesebeck, 1974: 135 = *podisi* new synonym.
tabani Mayr, 1879:713 = *angustatus* (Kozlov, 1966).
tabanivorus Ashmead, 1895b:274 *(Phanurus).*
tabanocida Crawford, 1913b:344.
tacita Kozlov, 1972:670 *(Aporophlebus).*

tainancusis Ishida, 1931:539, 543 *(Phanurus)* = *rowani* (Yasumatsu, 1950).
talaus Nixon, 1937b:127.
tananarivensis Risbec, 1955b:365.
tanymerides Johnson, new species.
tauricus Kononova, 1979:149.
taurus Johnson, 1980:785.
tenuicornis Thomson, 1860:174 *(Phanurus).*
terebrans Ratzeburg, 1844:182 *(Teleas).*
tetratomus Thomson, 1860:174 *(Phanurus).*
tętratomus Kieffer, 1906:261 = *pentatomus* Kieffer new synonym.
texanus Brues, 1902:372.
thais Crawford, 1914:86.
theophilae Wu and Chen, 1980:81.
theste Walker, 1838:457 to *Trissolcus.*
thestor Nixon, 1935:79.
thoas Nixon, 1935:78.
tirathabae Ferrière, 1933:106.
tischleri Nixon, 1939:129 = *chloropus* (Kozlov, 1967).
tityrus Nixon, 1935:85.
tolli Risbec, 1950:634.
transsylvanicus Szabó, 1976:180 *(Asolcus)* new combination.
transversiceps Nixon, 1940:506.
triptus Nixon, 1937c:452.
tritia Walker, 1836:349.
trophonius Walker, 1836:351.
truncativentris Dodd, 1919:351 = *seychellensis* (Nixon, 1935).
truncatus Nees, 1834:289 *(Teleas).*
tuberculus Kozlov and Kononova, 1977b:58.
tumidus Mayr, 1879:703 to *Trissolcus.*
turbatae Nixon, 1937b: 121.
turesis Walker, 1836:353.
ullyetti Nixon, 1936:563.
ulusalus Nixon, 1937b:119.
umbripennis Mayr, 1879:712.
unilineatus Szabó, 1975a:177 *(Platytelenomus)* new combination.
upoluensis Fullaway, 1939:219.
urios Nixon, 1938b:59.
usipetes Nixon, 1938b:584.
utahensis Ashmead, 1893:148 to *Trissolcus.*
vandergooti Dodd, 1914e:164.
vassilievi Mayr, 1903:399 to *Trissolcus.*
verticillatus Kieffer, 1917:342 = *tetratomus* (Thomson) (Kozlov, 1967).
vibius Walker, 1838:458.
viggianii Mineo, 1978:39.
vinicius Walker, 1836:350.
vulcanus Perkins, 1910:619.
wengyuanensis Chen and Wu, 1980:428.
wilsoni Dodd, 1930:28.
wullschlegeli Mayr, 1879:711.
xanthosoma Johnson, 1980:781.
zeli Johnson, new name for *pentatomus* Kieffer.
zethos Walker, 1836:347.
zetterstedti Ratzeburg, 1844:185 *(Teleas)* = *truncatus* (Mayr, 1879).
zygaenae Kieffer, 1913a:379.

BIOLOGY

Telenomus species parasitize the eggs of a wide variety of insects in the orders Lepidoptera, Hemiptera, Diptera, and Neuroptera. With one known exception, all species are primary parasites. Viktorov (1966) reported that *Telenomus chloropus* (as *T. sokolovi)* is a facultative hyperparasite of *Eurygaster integriceps* (Hemiptera: Scutelleridae) through *Trissolcus semistriatus.* However, Viktorov also found that the mortality of the immature stages of *T. chloropus* is then greatly increased. It has not been shown that *T. chloropus* is a true hyperparasite, i.e., parasitic on the egg or larva of *Trissolcus semistriatus.* It seems more likely that it is only able to eliminate the *Trissolcus semistriatus* larva, and then feed on the host egg itself.

The host range for the genus as a whole is quite broad; individual species' host ranges, however, are not predictable. For example, *Telenomus clisiocampae* appears to be restricted to hosts of the genus *Malacosoma* (Lepidoptera: Lasiocampidae). *Telenomus alsophilae,* on the other hand, has been reared in the laboratory from 17 genera of Geometridae and Noctuidae (Lepidoptera) (Fedde, 1977; personal observation). I know of no cases in which the host range for a single species crosses ordinal boundaries.

Kozlov (1967) stated that all known hosts of *Telenomus* lay their eggs in masses. Undoubtedly, the vast majority of species do so; many, however, lay very small masses or oviposit single eggs, e.g., the saddled prominent, *Heterocampa guttivitta* (Lepidoptera: Notodontidae) (Allen, 1972). The effect of egg parasitism on oviposition characteristics of the host and the reciprocal effect of host egg mass size on aspects of the biology of the parasite (e.g., inbreeding, mating behavior, and sex ratio) are intriguing, but largely unexplored areas.

The immature stages of all scelionids are spent within a single host egg. The vast majority of species of *Telenomus* are solitary, i.e., one parasite develops per host egg. Those species that are gregarious, e.g., *T. monilicornis, T. dendrolimi,* and *T. fariai,* attack large-sized hosts. In these cases usually five to ten wasps complete development within an egg, in contrast to the much larger numbers found in some gregarious species of *Trichogramma* (Hymenoptera: Trichogrammatidae) (Zeledón, 1957; Jahn, 1964; Hirose, et al. 1968; Rabb and Bradley, 1968; Benedek, 1969; Katanyukul and Thurston, 1973, Bosque and Rabinovich, 1979).

The summary account of the life history of *Telenomus* below is based on studies of the following species: *T. alsophilae* (Fedde, 1977), *T. arzamae* (Levine and Chandler, 1976), *T. californicus* (Mason, 1976), *T. chloropus* (Jermy, 1962, as *sokolovi), T. coelodasidis* (Ticehurst and Allen, 1973), *T. costalimai* (Gerling et al., 1976), *T. dalmanni* (Wellenstein and Fabritius, 1973), *T. dendrolimi* (Hirose et al., 1968), *T. dignus* (Rothschild, 1970), *T. droozi* (Kaya and Dunbar, 1972, as *T. alsophilae), T. emersoni* (Parman, 1928), *T. euproctiscidis* (Narayanan et al., 1959), *T. fariai* (Zeledón, 1959; Rabinovich, 1971; Bosque and Rabinovich, 1979), *T. gifuensis* (Hidaka, 1958), *T. heliothidis* (Winburn and Painter, 1932), *T. ichthyurae* (Harris and Pravia, 1977), *T. mormideae* (Panizzi and Smith, 1976), *T. nakagawai* (Hokyo and Kiritani, 1963; Hokyo et al., 1966), *T. nawai* (Pemberton, 1933), *T. ochus* (Schneider, 1940), *T. phegeus* (Grobler, 1957), *T. polymorphus* (Costa Lima, 1943, 1944a, 1944b), *T. quaintancei* (Cory, 1913; Peterson, 1923), *T. remus* (Gerling and Schwartz, 1974; Schwartz and Gerling, 1974), *T. rowani* (Rothschild, 1970), *T. seychellensis* (Anderson, 1919; Dry, 1921, as *T. truncativentris), T. monilicornis* (Katanyukul

and Thurston, 1973 as *T. sphingis), T. "sphingis"* (probably *T. ichthyurae,* Russell, 1913), *T. tabanivorus* (Dukes and Hays, 1971), *T. terebrans* (Tadić, 1965), *T. ullyetti* (Jones, 1937; Parsons, 1940), *Telenomus* spp. (Malhotro and Krishnaswami, 1962; Kulshreshtha et al., 1967; Phalak and Raodeo, 1967; Hummelson, 1974; Ahmad et al., 1977; Parsons and Ullyett, 1934).

Males emerge from the host egg first and usually wait on or near the egg mass for the females to emerge. In most species the male-male interactions do not appear to be agonistic, but some *(T. gifuensis,* Hidaka, 1958; *T. ochus,* Schneider 1940) show territorial behavior similar to that described in *Trissolcus* species (Safavi, 1968; Wilson, 1961). In these cases the resident male (usually the first one to emerge) actively excludes all other males from an egg mass containing females. Thus, he alone inseminates most of the females. Newly emerging males are driven away as they are discovered.

Males are attracted to females as soon as they begin to chew through the chorion of the host egg. As a female pulls herself onto the surface of the egg mass the males attempt to mount and copulate. Schwartz and Gerling (1974) have shown that in *Telenomus remus* the males are attracted by an odor produced by the female during the last two days of pupal life. The odor appears to consist of at least three chemicals.The attractiveness is lost within a few minutes after emergence, after which the males will not attempt to copulate even if the female remains unmated and receptive.

Males of all species are polygamous: one male will copulate with at least three to five females (Dry, 1921; Jones, 1937; Ticehurst and Allen, 1973; Kulshreshtha et al. 1967). The time spent in copulation varies widely among species, from approximately 5 sec. to more than 10 min. (Hidaka, 1958; Schwartz and Gerling, 1974; Ticehurst and Allen, 1973; Jones, 1937; Phalak and Raodeo, 1967). In the laboratory females normally mate only once, although sometimes with continued exposure to males they will mate again (Jones, 1937; Schwartz and Gerling, 1974). Dreyfus and Breuer (1944) claimed that in the gregarious species *Telenomus fariai,* copulation normally took place within the egg of their triatomine hosts (Heteroptera: Reduviidae). Bosque and Rabinovich (1979) and Zeledón (1957), however, stated that mating occurs only after emergence in that species.

The longevity of females under natural conditions is unknown. Laboratory studies have given a life span of 3-54 days. These results are strongly affected by the experimental conditions: feeding of females, exposure to hosts, caging with other females (see Schwartz and Gerling, 1974 concerning this last point). Some species, when fed on a honey-water solution, can maintain egg production for weeks with no external source of protein. Females do not feed on the host. The natural source of carbohydrates in the field is unknown, but Safavi (1968) has suggested that *Trissolcus* species feed on primarily honeydew and also on nectar.

The influence of host age on the ability of *Telenomus* species to successfully complete development varies widely. Parman (1928) reported that tabanid eggs more than 6 hr. old were not accepted for oviposition by *Telenomus emersoni. Telenomus gifuensis,* on the other hand, can successfully develop in pentatomid eggs up to 5 days old (out of a total incubation period of 7 days for the host) (Hidaka, 1958). *Telenomus californicus* parasitizes both freshly laid and overwintered eggs of the Douglas-fir tussock moth, *Orgyia pseudotsugata* (Lepidoptera: Lymantriidae) (Mason, 1976). This fact, along with the observation that cooling greatly extends the period during which eggs

are acceptable (Grobler, 1957), strongly suggests that the degree of development of the host embryo is the critical factor.

Fedde (1977) exposed females of *Telenomus alsophilae* to eggs of *Abbotana clemataria* (Lepidoptera: Geometridae) of different ages. He found that the wasps would readily oviposit in host eggs of all age classes; however, the survival rate of the larvae was highest in 1-day old eggs and significantly lower in eggs 5-days old. The inability to discriminate on the basis of host age has also been reported by Schwartz and Gerling (1974). Fedde (1977) also found that *T. alsophilae* would parasitize unfertilized eggs, but only 45 per cent of the eggs laid produced adult wasps, compared with over 88 per cent in fertilized eggs. Several other authors (Schneider, 1940; Phalak and Raodeo, 1967; Ticehurst and Allen, 1973) have indicated that *Telenomus* will parasitize infertile eggs; none, however, mention an increase in larval mortality.

Since the survival rate of the immature parasites rapidly decreases with increasing host age, *Telenomus* females must have highly efficient host-finding behavior. The mechanisms, however, are almost entirely unknown. In laboratory cultures females do not appear to be attracted to newly introduced eggs; they seem to find them by a process of trial and error. Buleza (1973) stated that females of *Trissolcus viktorovi* orient to the host over long distances by means of chemical stimuli produced by the hosts, *Eurydema* spp. (Heteroptera: Scutelleridae). Viktorov et al. (1975) found that females of *Trissolcus viktorovi, Trissolcus grandis,* and *Telenomus chloropus* intensify their host searching efforts in areas impregnated with methylene chloride extracts of *Eurygaster integriceps.* Sower and Torgersen (1979) reported that the levels of egg parasitism of the Douglas-fir tussock moth were not affected by the field application of the moth's sex pheromone.

Three species are phoretic on the adults of their hosts: *"T. beneficiens"* (Van Vuuren, 1935, reared as a parasite of the pyralid *Schoenobius bipunctifer*), *T. calvus* (Buschman and Whitcomb, 1980, as *Telenomus* species 2), and *T. dignus* (Fernando, 1971). The female parasites usually attach themselves with their mandibles to the wings and anal tufts of the moths. The females of *calvus* apparently cling to the dorsum of their pentatomid hosts with their tarsal claws. No obvious morphological specializations of either the mandibles or claws are known. Van Vuuren (1935) reported that the phoretic parasitoids were rather common; he observed an average of 1.6 wasps per moth (total sample size = 25 moths).

Once a female has found an egg mass she closely antennates each potential host. The factors determining acceptance are only now beginning to be investigated. Buleza and Mikheev (1978) reported that both the egg shape and surface-borne chemicals are important factors in host acceptance of *Eurygaster integriceps, Eurydema ventralis,* and *Eurydema spectabilis* by the parasites *Trissolcus viktorovi* and *Trissolcus grandis.*

Once an egg is accepted for oviposition the female settles on an adjacent egg or on the substrate, and inserts her ovipositor either near the base of the egg or into the side. Females rarely attempt to drill through the operculum. If the egg mass is covered by hairs or scales, the females of some species will burrow through the covering, come out, and then back down the tunnel in order to oviposit (Hummelson, 1974; Levine and Chandler, 1976). Once drilling begins the female becomes quiescent. Occasionally pumping movements of the head or metasoma can be seen. The entire oviposition process takes 0.5-8.0 min. (Russell, 1913; Winburn and Painter, 1932; Pemberton, 1933; Jones, 1937;

Grobler, 1957; Phalak and Raodeo, 1967; Rothschild, 1970; Ticehurst and Allen, 1973; Parman, 1928; Hidaka, 1958; Wellenstein and Fabritius, 1973).

After oviposition, the females of several species of *Telenomus* have been observed to wipe the extruded ovipositor over the chorion of the host egg (Russell, 1913; Costa Lima, 1928b; Winburn and Painter, 1932; Grobler, 1957; Malhotro and Krishnaswami, 1962; Javahery, 1967, as cited in Bosque and Rabinovich, 1979; Phalak and Raodeo, 1967; Gerling and Schwartz, 1974; Fedde, 1977). This behavior was not observed in *T. coelodasidis* (Ticehurst and Allen, 1973) or *T. nawai* (Pemberton, 1933). Rabb and Bradley (1970) and Bosque and Rabinovich (1979) have shown that by this action the female places a water soluble chemical(s) on the host egg. Females rarely reoviposit into an egg that they themselves have marked. They also usually do not oviposit in eggs marked by other females. Females that have never oviposited, however, are much more likely to superparasitize eggs than are experienced ones. Rabb and Bradley (1970) suggested that females must oviposit in order to be in the proper physiological condition to receive and to respond to the chemical. Bosque and Rabinovich (1979) suggested that inexperienced females can detect the mark, but do not refrain from oviposition.

Many authors have hypothesized that the ultimate function of host marking is the avoidance of superparasitism. In other words, they suggest that the marking by one female is done for the benefit of others that later find the same egg. I believe that this apparent altruistic behavior may be better explained in terms of a selective advantage to the original female, i.e., females mark in order to themselves avoid superparasitism of hosts already containing their *own* eggs. That other females refrain from ovipositing in these hosts is a fortuitous side-effect and does not explain why the first female marked the egg. This interpretation is consistent with the otherwise curiously poor ability of inexperienced females to recognize marked eggs as such. They have never oviposited; therefore, they cannot yet superparasitize their own progeny. Gerling and Schwartz (1974) noted that although females of *Telenomus remus* go through the marking behavior, superparasitism is common. The females apparently do not recognize even their own marks. A satisfactory explanation for this observation has not yet been suggested. It may be only an artifact of the laboratory conditions.

Often more than one female of *Telenomus* can be found ovipositing into the same egg mass. The females largely ignore one another, even when disturbed while laying an egg (Rothschild, 1970). Female *T. gifuensis,* however, actively try to exclude other females from an egg mass they have discovered (Hidaka, 1958). This is similar to the behavior reported in *Trissolcus* by Safavi (1968) and Wilson (1961).

The vast majority of species of *Telenomus* are bisexual. However, *T. nakagawai* and *T. terebrans* have been reported to have sex ratios with an extreme female bias, greater than 90 per cent (Hokyo and Kiritani, 1963; Hokyo et al., 1966; Tadić, 1965). These species appear to be primarily thelytokous.

Costa Lima (1943, 1944a, 1944b) discovered an unusual Neotropical species parasitic in the eggs of *Heza insignis* (Heteroptera: Reduviidae) that produces three male forms: a normal, black, winged morph; a yellow-winged form; and a yellow one with reduced wings, mesosoma, eyes and antennae, and greatly enlarged head and mandibles. The morphs of males produced in this species, appropriately named *T. polymorphus,* are apparently determined solely by their genetic constitution. Costa Lima was unable to shed much light on the

find, and *T. polymorphus* has not been collected since the original experiments were carried out.

The immature stages of *Telenomus* have been described for only few species (Pemberton, 1933; Bakkendorf, 1934; Jones, 1937; Principi, 1947; Boldaruyev, 1956; Grobler, 1957; Hidaka, 1958; Narayanan et al., 1959; Subba Rao and Chacko, 1961; Hokyo et al., 1966; Phalak and Raodeo, 1967; Rothschild, 1970, Gerling, 1972; Ticehurst and Allen, 1973; Gerling et al., 1976). The descriptions that follow are based on these papers.

The egg is stalked (Fig. 1); the tail is about the same length as the body. The cytoplasm of the main part of the egg is finely granular, that of the tail clear. As incubation proceeds the body of the egg swells, becomes spherical, and the tail shrivels. At this point the developing embryo breaks through the chorion and, surrounded by the serosa, floats within the host egg. In the multivoltine species that have been studied, this incubation period is short, generally less than 24 hours.

The first instar is teleaform (Fig. 2) with no visible segmentation and the body is divided into two tagmata, the head and the trunk (or abdomen) separated by a distinct constriction. The head bears two long, downcurved mandibles, caudad of which are the oral opening and a projection that is referred to as the labium. The mandibles move vertically, and, with the caudal appendage (see below), have been suggested to function in the disruption of the host embryonic tissues, homogenization of the egg contents, locomotion, and the elimination of supernumary parasitoids. Around the anterior portion of the trunk is a ring of long delicate spines that are also capable of movement; these are thought to aid in locomotion. At the caudal end of the trunk is a bifurcated appendage. One branch is very long, and is believed to interact with the mandibles. The second is much shorter and variable in structure (but see Narayanan et al., 1959). The first instar is apneustic; respiration is apparently cuticular. The alimentary canal ends in a blind sac and can be greatly distended. One pair of malpighian tubules has been observed. As the first instar feeds it changes shape and becomes nearly spherical, with the mandibles, spines, caudal appendage, and perhaps the labium only barely protruding (Fig. 3). At this point it is essentially immobile.

The second instar is more typically hymenopteriform, but lacks both body segmentation and a tracheal system.The mandibles are small and unsclerotized. The stadium is usually short, lasting from 0.5-3 days in multivoltine species. A second instar has not been observed in some studies (Pemberton, 1933; Gerling, 1972). This has usually been attributed to either inadequate sampling or to the inability to distinguish it from the third instar. The failure of Gerling to detect it in *Telenomus remus* indicates some variation in larval development within the genus.

The third instar is hymenopteriform (Fig. 4): the body is distinctly divided into a head and 13 segments, although 12 have also been reported. The tracheal system is well developed, and the larva is holopneustic, but some authors have not found a mesothoracic spiracle. The fine structure of the spiracular opening and of the tracheae leading to it is quite variable (Gerling 1972; Gerling et al., 1976). The mouthparts are similar to those of the preceding stage, with small mandibles and palpal knobs discernible.

As larval development proceeds the host egg of many species, viewed externally, becomes dark brown or black. Safavi (1968) has shown that *Trissolcus* larvae produce this color by depositing a pigmented membrane just beneath the chorion of the host. He stated that in those cases in which the

chorion does not change color, the membrane is nevertheless laid down; it is simply not pigmented. It is not known if a membrane is deposited by the larvae of those species of *Telenomus* that do not cause a color change in the host. The function of the membrane is unknown.

The meconium is deposited as a yellowish-green to black amorphous mass beneath the mesosoma and the anterior portion of the metasoma. The pharate pupa then spins a very thin cocoon before ecdysis.

The pupa is at first completely white, but the compound eyes and ocelli soon turn red. The pigmentation of the body then proceeds, with the legs and antennae the last structures to become colored. After the adult emerges from the pupal cuticle it remains within the egg for a period of time, often several days. The generation time for multivoltine species varies from 10-25 days.

Gerling and Orion (1973) have noted the presence of giant cells produced by the embryo of *Telenomus remus*. In other species of parasitic Hymenoptera it has been postulated that these cells serve some sort of trophic function. They did not know if this was true in this species, but noted that the appearance of these giant cells coincided with the breakdown of the host embryo.

Kochetova (1966), working with *Trissolcus semistriatus,* believed that there are four or even five larval instars. This hypothesis is based on a study of internal structures such as the labial gland, Malpighian tubules, and tracheae. No one has since studied either *Telenomus* or *Trissolcus* in sufficient detail to be able to corroborate this hypothesis.

The only study on spermatogenesis, oogenesis, and karyotypes in the superfamily Proctotrupoidea is that of Dreyfus and Breuer (1944) on *Telenomus fariai.* The haploid number of chromosomes is ten in this species. Females are unusual in that one pair of homologous chromosomes consists of an equal-armed V-shaped member (their X) and an unequal-armed V (their Y). No such Y chromosome was found in the haploid male karyotype. In the study of spermatogenesis, Dreyfus and Breuer claimed that prior to meiosis the spermatogonia undergo an unequal mitotic division from which one daughter cell receives a normal X chromosome and the other an unequal-armed Y. They postulate that the Y is derived from an X in which part of one of the arms has been lost. The cell containing the X apparently always degenerates; therefore, all spermatogonia have only the Y chromosome. From these observations Dreyfus and Breuer inferred that after oogenesis all eggs have only an X chromosome, the Y having been relegated to a polar body. Thus, males developing from unfertilized eggs have only the X contributed by the mother, and fertilization results in XY females. This report has been reviewed with some skepticism by White (1973) and Crozier (1975) and needs to be corroborated.

MORPHOLOGY AND MEASUREMENTS

In the Suborder Apocrita the tergum of the first true abdominal segment (propodeum) is fused to the thorax and usually separated from the second by a distinct constriction. A great deal of inconsistency appears in the literature concerning the terms used to refer to the resulting tagmata. A survey of recent papers on the taxonomy of Apocrita shows that they are variously referred to as the (1) thorax and abdomen; (2) trunk (or alitrunk) and gaster; (3) mesosoma and metasoma; or some combination of these sets.

The use of the pair *thorax-abdomen* is clearly inappropriate and confusing, inasmuch as the word thorax has come to be specifically defined as postcephalic segments (PCS) 1-3 and abdomen, 4-14. The problem is compounded when using these terms to identify specific sclerites because few authors indicate how they number the segments of the derived "abdomen." Thus "abdominal segment 3" could refer to either PCS 6 or PCS 7.

A second pair of terms has arisen to alleviate this difficulty. *Trunk* and *gaster* are widely used by myrmecologists, the reasons for which are summarized by Brown (1975, 1982). No generally accepted definition of the word gaster exists as used in entomology. In the literature it is used to refer to all segments posterior to the propodeum (PCS 5-14), all segments posterior to the petiole (PCS 6-14), or to all segments posterior to the postpetiole (PCS 7-14). Again, the numbering system is rarely specified. Brown (1982) has suggested that the word gaster be restricted to refer only to those segments of the hind tagma that house and protect the reproductive and digestive organs. The connective segments that confer mobility, the petiole and postpetiole, are thereby excluded from the gaster. The limits of the gaster, even using this definition, are still ambiguous for some taxa, for example, the braconid genus *Meteorus.* It is of course possible to indicate within a paper which segments are considered to comprise the gaster. However, this defeats the purpose of a specialized terminology, that of providing a word with a specific and consistent definition in order to eliminate ambiguity.

The third pair of terms, *mesosoma-metasoma*, was introduced to hymenopteran morphology by Michener (1944). The difficulties with the use of mesosoma have been emphasized by Brown (1975). His three major objections are that the word *mesosome* is already used in the terminology of the male genitalia of nematocerous Diptera; that both mesosoma and metasoma are used in a different sense to refer to nonhomologous tagmata of arachnids; and that since the set trunk-gaster was introduced into use years before mesosoma-metasoma, they should have priority.

The widely recognized etymology of these two terms makes their definitions almost self-explanatory. "Meso" from the Greek *mesos* = middle; "meta" from the Greek *meta* = after or hind; and "soma" from the Greek *soma* = body. Together they then refer to the "middle body" or middle tagma and the "after body" or posterior tagma. I personally doubt that much confusion has been generated by the similarity between the words mesosome and mesosoma. I will also contend that mesosoma-metasoma are used in exactly the same sense in both arachnid and apoccritan morphology, that is, to refer to the body tagmata by their relative positions. The fact that the tagmata are probably not homologous should not restrict the use of these terms any more than it does the terms head, trunk, and gaster.

The word metasoma has consistently referred to PCS 5-14 since its introduction. It includes the petiole and postpetiole when these are developed, thus avoiding the problems associated with gaster. Therefore, since the words metasoma and gaster are not synonymous, the issue of priority of usage is irrelevant. I feel that the combination mesosoma-metasoma has the least number of disadvantages and some very strong advantages over the other two available choices for use as a reference system. I also feel that the magnitude of the undesirable qualities does not warrant either the introduction of a new set of terms or the mixing of terms.

Several abbreviations are used in text and they are listed here:
A1, A2 . . . A12: Antennomeres 1, 2, . . . 12
DCI: Dorsal Cephalic Index = head width/dorsal head length (see below)
FCI: Frontal Cephalic Index = head width/frontal head length
TL: Total Length = dorsal head length + Weber length + metasomal length (see below)
T1, T2: Metasomal tergites 1 and 2.

Most of the morphological terms used in this paper are those defined and illustrated by Masner (1979a, 1979b, 1980). Some of the more specialized terms are illustrated in Figures 5-18. Some require additional comments.

In general, the words length (L) and width (W) refer to the maximum value obtainable by rotating the specimen. This will avoid parallax problems encountered when measuring three dimensional objects through a microscope.

Dorsal head length (DHL): Since there is no distinct break between the dorsal and frontal aspects of the head, an arbitrary definition for DHL is used. The head is viewed from above and rotated so that the frons turns toward the observer until the interantennal prominence comes into view. The specimen is then turned in the opposite direction until the prominence just disappears. DHL is taken as the maximum measurable length (i.e., including the temples) from this position. **Hyperoccipital carina:** Transverse carina on the vertex, continuous with the posterior orbits and running behind the lateral ocelli (Figs. 5-6). **Frons width:** The shortest distance between the eyes. **Ocellar setae:** One or more pairs of setae below, or sometimes beside the median ocellus; when present, usually forming two parallel lines separated from each other by two to three ocellar diameters (Fig. 5-6). **Orbital bands:** coriaceous sculpture along the inner orbits of the eyes, often interrupted near mid point of eye (Fig. 7). **Frontal pit:** the curious hole beneath the median ocellus, discovered and described by Bin (1977) (Fig. 9).

Acetabular field: patch of coriaceous sculpture on the mesepisternum near the dorsal apex of the acetabular carina (Figs. 13, 16). **Intercoxal space:** ventral portion of the mesepisternum between the fore and mid coxae (Figs. 14, 16). **Episternal foveae:** deep punctures marking off a narrow triangular area at the anterior edge of the mesepisternum; especially prominent in the *T. crassiclava* species group (Fig. 14). **Dorsellum:** medial expansion of the metanotum (Figs. 13, 18, 47-54). **Metapleural carina:** longitudinally directed carina dorsally on the metapleuron, distinctly below the propodeal spiracle (Figs. 14, 17). **Weber length:** A myrmecological term, referring to the distance from the posteroventral corner of the metapleuron to the anteriormost part of the mesoscutum, measured in lateral view. Since the specimen can be rotated with the Weber length continually increasing until it is no longer in lateral view, this measurement is arbitrarily made at the point where the corner of the metapleuron is closest to the observer *and* both endpoints of the line to be measured are in focus.

Length of T1, T2: Taken as the medial length. T2 is measured from the anterior edge of the basal costae; the acrotergite is not included. **Width of T1:** Taken as the distance between the two apical points of T1. **Width of T2:** Includes the flexion of the laterotergite, and is therefore quite variable. This is the widest point of the metasoma in all species dealt with here. The ratio of length: width of the metasoma is also quite variable, and is used only as a rough estimate of the degree of elongation of the metasoma. **Sublateral setae:** one or more pairs of posteriorly directed setae on T1 (Fig. 10).

The antennal **clava** of the female is defined as being made up of those segments in which the apical surface is curved concave to closely match the basal convex surface of the following segment (the terminal antennomere is of course also included). The relative sizes of the segments is *not* taken into consideration. In only a very few species are the limits of the clava ambiguous; these are stated as such.

The terminology of the male genitalia follows Snodgrass (1941) and is illustrated in Figure 55.

Measurements were made at 100X on a Wild M5 stereomicroscope with a 20 x 20 ocular grid, providing an accuracy of 13 μm. Therefore, small measurements, such as the length of T1 and the width of the hind wing fringe, are subject to appreciable error. Drawings of antennae, wings, and male genitalia were made by mounting the structures on slides in balsam, Hoyers, or glycerine jelly and tracing with the aid of a microprojector. In the case of unique holotypes the antennae were drawn from the intact specimens by means of a camera lucida mounted on the stereomicroscope.

Specimens of *Telenomus* can be air-dried for mounting. They are relatively hard-bodied; only rarely do the eyes collapse. I prefer to mount specimens on the tips of triangular card points so as to maximize the surface area available for observation. For scanning electron microscope work a piece of double-sided cellophane tape was placed over the head of an aluminum stub. The specimens were then placed on the tape and sputter-coated with gold or gold-palladium for 4 min.

SPECIES GROUPS OF NEARCTIC *TELENOMUS*

The study of the systematics of any group should be founded on as broad a geographical basis as possible, ideally the world fauna. The genus *Telenomus,* however, includes such a large number of species and encompasses such a wide range of variation that a worldwide revision at the species level is impractical. Focusing one's attention on a single biogeographical realm decreases the magnitude of the problem, but does not solve it. In the Nearctic alone there are probably at least 200-300 species of *Telenomus.*

Therefore, in order to make the genus more easily accessible for systematic research some sort of classification of species is needed. So far all of the attempts to subdivide *Telenomus* (see especially Kieffer, 1912 and Szabó, 1975b) have failed to stand up when applied to the world fauna. Most of the genera of Kieffer and Szabó succeed in breaking off only a few morphologically extreme species from the bulk of *Telenomus.* Their attempts to subdivide the real heart of the genus are based on a few superficial characters and on a limited knowledge of the range of variation in the subfamily as a whole.

I present below an outline for a classification of the species of *Telenomus.* The classes are intended to be applied only to the Nearctic fauna, and therefore some groups that occur only outside of this region are not included. However, the characters used in the diagnoses and key will work for most of the species of the world.

Hennig (1966) has convincingly argued that biological classifications should be based on a reconstruction of the cladogenetic (his "phylogenetic") history of the group. The empirical evidence comparing different means of classification in terms of their stability, predictive ability, and information content is meager, but does support this position (Mickevich, 1978). This is the approach used here.

Hypotheses of character polarity (ancestral *versus* derived; or plesiomorphic *versus* apomorphic) form the basis upon which hypotheses of relationship are made. I have used two criteria to postulate character polarity. First, the character states in question are compared with the corresponding states found in other species of *Telenomus,* those in other genera of Telenominae, and, where homologies can be confidently identified, in the other subfamilies of Scelionidae. I have assumed that within the Telenominae common equals ancestral. This assumption represents an attempt at an out-group comparison but is only an approximation because of the uncertain relationships among species and genera. Secondly, I have started from the general assumption that evolution usually proceeds in the direction of reduction. That is, if one character state may be interpreted as a reduction (or an elaboration) of another, whether in terms of meristic characters or in the degree of expression of a character (e.g., deeply impressed *versus* shallow punctation), the reduced state is initially hypothesized to be derived. Neither of these criteria is an infallible indicator of polarity. But at least they provide a position from which to start asking testable questions about the relationships of taxa. The characters important in species group recognition and their postulated plesiomorphic and apomorphic states are listed in Table 1.

I have tried to de-emphasize the value of characters of the habitus in postulating relationships between large species groups. I am referring here to such things as the degree of elongation or depression of the body. With few exceptions, all scelionids are solitary egg parasites, completely consuming their host. The possibility that the size and shape of the host egg may influence the general size and shape of the parasite cannot be ignored.

In the Nearctic I recognize 11 groups that I believe to be monophyletic *sensu* Hennig. Each of these is referred to as a *species group* and is individually identified by adding the name of an included species, for example, the *T. podisi* species group. I have chosen to work at the nomenclatorially informal species group level in order to avoid creating a new set of genus-group names; to facilitate, even to encourage revision of these groups in the future; and because the morphological gaps separating groups are often bridged by species with either character states or combinations of characters intermediate between two groups. These groups should be considered as nothing more than hypotheses of relationship, to be discarded if further evidence so dictates.

The characters used to define each group are outlined in the diagnoses below. In addition to these monophyletic groups, there are two complexes of species whose relationships are unknown. These species may be grouped together on the basis of plesiomorphic characters. I have avoided naming these species groups so as not to imply that they are monophyletic. Of the two paraphyletic species groups, one appears to be primarily parasitic in the eggs of Heteroptera, the other in Lepidoptera.

Most of the species of the bug parasite species group may be recognized as such by the transverse-quadrate head, the triangular, punctate-reticulate dorsellum, and the two or more pairs of sublateral setae on the first metasomal tergite. Otherwise, they are morphologically diverse, and I have not been able to find characters upon which to form hypotheses about their interrelationships. In general the heteropteran parasitoids appear to be most diverse in the tropics; the temperate zone fauna probably represents only the tip of the iceberg. A study of the Neotropical fauna promises to provide a great deal more information concerning these species of *Telenomus.*

The other paraphyletic species group is parasitic in the eggs of Lepidoptera. I believe that this group, together with the *Telenomus californicus, T. arzamae, T. dalmanni* and *T. tabanivorus* species groups form a monophyletic complex. I place the *T. californicus, T. arzamae,* and *T. dalmanni* groups together on the basis of the long thick digital teeth of the male genitalia (Figs. 55, 56, 58). The remaining species of the paraphyletic species group (all with small digital teeth, see Figs. 57, 59, 61) are added because of the common possession of a rectangular dorsellum (i.e., about as long medially as laterally) that is punctate dorsally and smooth or striate ventrally (Figs. 18, 50). Finally, the *T. tabanivorus* group is included in this clade, even though it is superficially very distinct, because the morphological gap so apparent in the Nearctic fauna is almost completely bridged by species parasitic in the eggs of rice borers (Lepidoptera: Pyralidae) from the Oriental region. The *T. tabanivorus* species group is characterized by the elongate habitus of the female, the depressed mesoscutum, male xanthism, and the reduction of the male midbasitarsal segment. All of these characters are found in some species of rice borer parasitoids in forms identical to those found in *T. tabanivorus* and its allies. In other species these characters are found in forms intermediate between typical moth parasitoids and those of tabanid parasitoids. Some of these rice borer parasite species were described by Gahan in the genera *Phanurus* and *Prophanurus.* I therefore suggest that the *T. tabanivorus* group and the moth parasites share a recent common ancestor. This hypothesis is corroborated by the observation that both host groups are found mainly in aquatic habitats. The monophyletic group made up of the parasites of Lepidoptera and Diptera will be referred to as the *T. californicus* complex.

The relationships of the *T. nigrocoxalis* group are ambiguous. The structure of the laminae volsellares and the penis valves of the male genitalia suggest a close relationship with the *T. laricis* group (compare Figs. 63 and 65), even though the two are very dissimilar in external morphology. On the other hand, the clypeus of the species of the *T. nigrocoxalis* group is, at least sometimes, weakly dentate, similar to the condition found in the *T. phymatae* group (compare Figs. 44 and 46).

I can say little else about the interrelationships of species groups. Convergence in the characters used here tends to obscure all but the most obvious of affinities.

I did not use host records as characters in recognizing species groups. Nevertheless, it appears that each group is at least broadly host-specific: *T. tabanivorus* - Diptera; *T. californicus, T. arzamae,* and *T. dalmanni* - Lepidoptera; *T. podisi* - Pentatomoidea; *T. laricis* - Miridae; *T. nigrocoxalis* - Rhopalidae; *T. phymatae* - Reduvioidea; *T. floridanus* - Lygaeidae; *T. crassiclava* - Fulgoridae. This specificity suggests that each group represents a radiation of species specializing on a particular taxon of hosts. The primitive host appears to have been a heteropteran. The group of scelionines most similar morphologically to the Telenominae is the Gryonini. The species of this tribe are parasitic in the eggs of Pentatomoidea and Coreidae. This corroborates the suggestion that the Gryonini and Telenominae are sister groups.

Telenomus crassiclava species group

(Figs. 14, 22, 32)

Description. Female antennal clava 5-segmented; A9-A10 transverse; head weakly transverse, DCI usually about 1.8; frons width less than or equal to eye height; eyes bare; occipital carina simple or crenulate, complete or incom-

plete medially; dorsellum longest medially, not overlapping propodeum, finely punctate-reticulate; episternal foveae present (Fig. 14), rarely absent; metapleural carina present (Fig. 14) or absent; basal vein not pigmented; hind wing variable in width relative to width of fringe; T1 with one or rarely two pairs of sublateral setae; metasoma usually less than twice as long as wide; digital teeth small; laminae volsellares rodlike, parallel, weakly sclerotized; aedeagal lobe short.

Diagnostic Characters. Antennal scrobe strongly reduced to two small depressions just above antennal insertions; clava often enlarged; episternal foveae present (Fig. 14); body sculpture usually weak.

Host Family. Fulgoridae (Hemiptera: Homoptera).

Included Nearctic Species. *T. infuscatipes, T. maculipennis, T. sphingis.*

Other Species Included. Neotropical: *T. crassiclava, T. impressus, T. taurus.* Palearctic: *T. aradi(?), T. cyane, T. flaviventris* Kozlov and Kononova, *T. jugoslavicus, T. longiceps, T. minimus* Kozlov, *T. nioba, T. pictus.* Oriental: *T. periparetus* (?).

Remarks. The species of this group tend to have finely coriaceous body sculpture (one undescribed species from the West Indies has entirely lost all background sculpture). The occipital carina is often interrupted medially; the wings are sometimes banded; some species have a horn on T1.

The most unusual character for this group, the well developed episternal foveae, is probably plesiomorphic for the subfamily. Another group of species is found in the Neotropics (of which only *T. longiventris* has been described) that also has these foveae, but is otherwise very different. The description and illustrations of *Issidotelenomus* (Pélov 1975) fit the *T. crassiclava* group very well. However, I hesitate to include these two species groups under *Issidotelenomus* until some synapomorphic characters are found.

In 1887 W. H. Ashmead described *Teleas sphingis,* a wasp reared from "sphingid" eggs. As a result of this host record, all subsequent rearings from *Manduca* species (Lepidoptera: Sphingidae) have been referred to the name *T. sphingis.* Gahan (1930) correctly recognized that *Telenomus monilicornis* and *T. sphingis* auctorum are conspecific, and so synonymized *T. monilicornis* as a junior synonym of the latter.

I have recently re-examined the type of *T. sphingis* and have found it to be a typical *T. crassiclava* group species, and not the common *Manduca* parasite. The original host record was undoubtedly an identification mistake that has been repeated through the years simply because no one, apparently not even Gahan, ever checked Ashmead's type-specimen. As a result, *Telenomus monilicornis* must be considered the correct name for the species of *Telenomus* parasitic in the eggs of *Manduca.* Such mistakes are common; see, for example, the discussion of *Telenomus szelenyii* below under *T. podisi.* Uncorroborated host records should be viewed with suspicion.

Telenomus floridanus species group

(Figs. 15, 28, 29, 36, 37, 49, 51, 64, 114)

Description. Female antennal clava 5-segmented; A9-A10 usually longer than wide; head quadrate to weakly transverse, DCI usually less than 1.75; frons width usually greater than eye height; eyes setose; occipital carina simple or crenulate, complete or incomplete medially (sometimes absent altogether); dorsellum either: longest medially, not overlapping propodeum, punctate-reticulate (Fig. 49), or, very weakly developed, smooth or with very weak

longitudinal striae (Fig. 15, 51); episternal foveae absent; notauli sometimes present; metapleural carina absent; basal vein not pigmented; hind wing usually narrow, greatest width less than twice width of fringe at that point; T1 usually with one pair of sublateral setae; metasoma often elongate, its length more than two times width; digital teeth small; laminae volsellares rodlike, parallel, weakly sclerotized, or in the form of a weakly defined ventral plate; aedeagal lobe short (Fig. 64).

Diagnostic Characters. A9 and A10 longer than wide (a few exceptions) (Fig. 114); dorsellum often completely smooth (Fig. 15, 51); body often strongly depressed (Figs. 28, 29); notauli present or absent.

Host Families. Lygaeidae (Heteroptera).

Included Nearctic Species. *T. flavipes, T. floridanus, T. nigricornis, T. ovivorus* (Ashmead), *T. reynoldsi.*

Other Species Included. Neotropical: *T. angulatus, T. prolixus.* Palearctic: *T. adrastea, T. antennalis, T. asperus, T. fodori, T. lineolatus, T. longistriatus, T. longiusculus, T. longus, T. minutus* (Westwood) (?), *T. punctiventris, T. punctulosus, T. rudis.* Ethiopean: *T. mahensis.*

Remarks. The species of the *T. floridanus* group tend to be elongate and depressed in form. Trends appear toward a loss of body sculpture and for the mandibles to arise subapically and to be directed posteriorly (see Figs. 36, 37, and, for the extreme development of this character, *Eumicrosoma,* Fig. 35).

The quadrate mesal lobes of the propodeum in *T. ovivorus* (Ashmead) and *T. floridanus* is an apomorphic character shared with the genus *Eumicrosoma.* This unusual genus demonstrates the extremes to which the general trends of this group can be taken (see Figs. 27, 35). The hosts of *Eumicrosoma* species are also lygaeids, all in the subfamily Blissinae.

The *T. floridanus* group makes up the bulk of species of *Phanurus sensu* Ashmead. The type species of *Phanurus, P. angustatus,* is a member of the *T. tabanivorus* species group. *Phanurus* historically had been made up of the elongate depressed species that in this paper are placed in the *T. floridanus, T. tabanivorus,* and *T. laricis* groups on the basis of other characters. This case demonstrates the unreliability of characters of the macrohabitus in determining relationships.

The type species of the genus *Hemisius, H. minutus,* may belong to this group. However, the type specimen is in too poor condition to make a definite assignment.

I have decided to include here those species that I have recently treated as the *T. nigricornis* species group *(T. nigricornis, T. prolixus, T. angulatus)* (Johnson, 1981). The apomorphic character defining this group, the coarse vertexial and mesonotal sculpture, is apparently only one extreme of a continuous range of variation in surface sculpture within the *T. floridanus* group as a whole. I believe that the remaining characters used to define the *T. nigricornis* group are either plesiomorphic (e.g., notauli) or indicate a common ancestry with the other members of the *T. floridanus* group. Therefore, I think that the species of the *T. nigricornis* group are best considered to belong here.

Telenomus laricis species group
(Figs. 30, 33, 34, 63)

Description. Female antennal clava 4- or 5-segmented; A9-A10 usually transverse, rarely elongate; head quadrate, DCI less than 1.75; frons width less that eye height; eyes hairy; occipital carina simple, complete medially; dorsellum longest medially, not overlapping propodeum, finely punctate-reticulate; episternal foveae absent; no metapleural carina; basal vein not pigmented; hind wing narrow, greatest width less than twice width of fringe at that point; one pair of sublateral setae on T1; metasoma often more than twice as long as wide; digital teeth small; laminae volsellares in form of a narrow ventral plate; aedeagal lobe short (Fig. 63).

Diagnostic Characters. Temples strongly widened below mid point of eye (Figs. 33, 34); clava with 4-5 segments; male genitalia gray to black (rather than yellow to brown); aedeago-volsellar shaft narrowed basally (Fig. 63).

Host Family. Miridae (Hemiptera: Heteroptera).

Included Nearctic Species. None described.

Other Species Included. Neotropical: *T. affinis.* Palearctic: *T. abdominalis* Kozlov, *T. andria, T. depressus* (Szabó), *T. laricis, T. longulus, T. politus, T. strelzovi (sensu* Kozlov 1967).

Remarks. Some general trends are recognizable within the *T. laricis* group: species often have coarse, raised pustulae on the frons and vertex; a distinct frontal ledge is sometimes developed; the basal clavomeres are often reduced, therefore the clava appears to have fewer than five segments (but sometimes with a true 4-segmented clava); several species have a horn on T1; the metasoma, especially apically, may be laterally compressed; otherwise, the body is generally elongate and depressed (Fig. 30).

Szabó (1975b) described the genus *Verrucosicephalia,* distinguished by the "Stirn zwischen den Augen stark erhöht, mit vielen unregelmässigen verstreuten, kleinen Zähnchen" (see Fig. 34). The frontal ledge and associated sculpture of the type species, *V. depressa,* is indeed unusual, but there are many obviously closely related species that lack these characters (compare Figs. 33 and 34). To separate out a few species only on the basis of these characters adds little to our understanding of the subfamily. I believe it is better to recognize the relationship of the species of *Verrucosicephalia* to the rest of the species included here in the *T. laricis* group, rather than to isolate them. *(Telenomus laricis,* described by Francis Walker in 1836, has the same cephalic sculpture as *V. depressa,* and the two may very well be conspecific.)

Telenomus longicornis species group
(Figs. 26, 41, 52, 62)

Description. Female antennal clava 5-segmented; clavomeres transverse to elongate, sometimes expanded ventrally so as to apppear serrate; head transverse, DCI greater than 1.75; frons width greater than eye height; eyes hairy; occipital carina simple or crenulate, complete medially; dorsellum either longest medially, not overlapping propodeum, punctate-reticulate, or, as long laterally as medially, weakly longitudinally striate (Fig. 52); no episternal foveae; no metapleural carina; basal vein strongly pigmented; hind wing strongly narrowed, greatest width less than twice width of fringe at that point; T1 with one or two pairs of sublateral setae; metasoma less than twice as long as wide; digital teeth small; laminae volsellares rodlike, parallel; aedeagal lobe short (Fig. 62).

Diagnostic Characters. Basal vein pigmented; wings usually infuscate.

Host Family. Unknown.

Included Nearctic Species. *T. longicornis.*

Other Species Included. None described, but I have seen specimens of species belonging to this group from the Neotropics and the Palearctic.

Remarks. Some species are metallic in coloration (!), have greatly enlarged tarsal claws, or have serrate antennae. A loss of body sculpture seems to be a general tendency. The wings are usually either strongly infuscate throughout, or are banded.

This group is superficially similar to the scelionine genus *Tiphodytes,* the species of which are parasitic in the eggs of Gerridae (Heteroptera). Species of the *T. longicornis* group are also found near water, and have even been collected in aquatic emergence traps. The actual host remains unknown, but I suspect that it is also an aquatic heteropteran.

Telenomus nigrocoxalis species group

(Figs. 23, 45, 46, 65)

Description. Female antennal clava 5-segmented; A9-A10 transverse; head weakly transverse, DCI about equal to 1.8; frons width less than eye height; eyes setose; occipital carina simple, complete; clypeus weakly dentate medially (Fig. 46); dorsellum longest medially, not overlapping propodeum, punctate-reticulate; no episternal foveae; no metapleural carina; basal vein not pigmented; hind wing broad, greatest width more than twice width of fringe at that point; T1 with one pair of sublateral setae; metasoma less than twice as long as broad; digital teeth small; laminae volsellares in the form of a narrow ventral plate; aedeagal lobe short (Fig. 65).

Diagnostic Characters. Malar space usually elongate (Fig. 45); frons width less than eye height; clypeus weakly dentate (Fig. 46).

Host Family. Rhopalidae (Hemiptera: Heteroptera).

Included Nearctic Species. None described.

Other Species Included. Neotropical: *T. nigrocoxalis.* Palearctic: *T. aberrans.*

Remarks. This group is not particularly well defined in external morphology. The extreme forms with the elongate malar space are easy enough to separate, but many more moderate specimens are placed here with reservations. The clypeal tooth is very difficult to see. I discovered it only when examining specimens with the SEM. Dissection of the male genitalia is usually necessary to determine membership in this group. Unfortunately, males are uncommon, even in reared samples. Some species are probably thelytokous.

The records in the literature for *Telenomus nigrocoxalis* as a parasitoid of *Erinnyis ello* (Lepidoptera: Sphingidae) are in error. I have examined Ashmead's type-specimen, and it is not conspecific with the specimens reared from this lepidopteran.

Telenomus phymatae species group

(Figs. 40, 43, 44, 48, 69, 70)

Description. Female clava 5-segmented; A9-A10 transverse to quadrate; DCI usually less than 1.8; frons width less than eye height; eyes bare or setose; occipital carina simple or crenulate, complete medially; dorsellum longest medially, usually not overlapping propodeum, punctate-reticulate (Fig. 48); no episternal foveae; no metapleural carina; basal vein not pigmented; hind wing broad, greatest width two or more times width of fringe at that point; T1

with one or two pairs of sublateral setae; metasomal length variable, usually less than twice as long as wide; digital teeth small; laminae volsellares rodlike, parallel, weakly sclerotized; aedeagal lobe short (Figs. 69, 70).

Diagnostic Characters. Clypeus dentate medially (Fig. 44); temples often with a superficial groove arising from malar sulcus (Fig. 40.).

Host Families. Reduviidae, Phymatidae (Heteroptera).

Included Nearctic Species. *T. phymatae, T. sulculus, T. zeli.*

Other Species Included. Palearctic: *T. clotho(?).*

Remarks. Several species of this group, including *T. sulculus,* have strongly developed sexual dimorphism. I do not know if *Telenomus polymorphus* belongs here. As discussed by Masner and Johnson (1979) the clypeal tooth may sometimes be difficult to see.

Telenomus podisi species group

(Figs. 5, 6, 8, 10, 11, 16, 17, 21, 39, 47, 54, 59, 66-68)

Description. Female antennal clava 5- or 6- segmented; A9-A10 transverse or quadrate; head transverse, DCI usually 1.9-2.0; frons width equal to eye height; eyes hairy; occipital carina crenulate or simple, complete medially; dorsellum longest medially, overlapping propodeum, coarsely punctate-reticulate (Fig. 47); episternal foveae reduced in *T. grenadensis,* elsewhere absent; metapleural carina present (Fig. 17); basal vein not pigmented; hind wing broad, greatest width usually more than twice width of fringe at that point; two or more pairs of sublateral setae on T1 (Fig. 10), rarely with only a single pair; metasoma less than twice as long as wide; digital teeth small; laminae volsellares in the form of two weakly sclerotized parallel rods; aedeagal lobe short (Figs. 59, 66-68).

Diagnostic Characters. Two or more pairs of sublateral setae (Fig. 10); large triangular dorsellum overlapping propodeum (Fig. 47); head transverse (DCI about equal to 2.0); frons smooth; metapleural carina present (Fig. 17).

Host Families. Pentatomidae, Scutelleridae (Hemiptera: Heteroptera).

Included Nearctic Species. *T. astrictus, T. calvus, T. cristatus, T. goliathus, T. grenadensis, T. persimilis, T. podisi, T. sanctivincenti, T. scaber.*

Other Species Included. Neotropical: *T. latifrons, T. longiclavatus* Ashmead. Palearctic: *T. chloropus, T. gifuensis, T. heydeni.* Ethiopian: *T. seychellensis.* Oriental: *T. cyrus, T. triptus.*

Remarks. The species of this group are often confused with the genus *Trissolcus.* The diagnostic characters cited above will separate these species from even the unusual hairy-eyed *Trissolcus.*

Telenomus tabanivorus species group

(Figs. 12, 24, 38, 53, 60, 88, 89)

Description. Antennal clava 5-segmented; A9-A10 transverse; head transverse to weakly transverse-quadrate, DCI ranging from 1.7-2.0; frons width greater than eye height; eyes hairy; occipital carina simple, complete medially; dorsellum longest medially, not overlapping propodeum, punctate-reticulate (Fig. 53); no episternal foveae; no metapleural carina; basal vein not pigmented; hind wing usually narrow, greatest width usually less than twice width of fringe at that point; T1 with one, or rarely two pairs of sublateral setae; metasoma elongate, length usually more than twice width; digital teeth small; laminae volsellares rodlike, parallel; aedeagal lobe short (Fig. 60).

Diagnostic Characters. Body elongate; head transverse to weakly transverse-quadrate; A2 longer than A3, even in large specimens; horn sometimes developed on T1; males xanthic: head and mesosoma yellow to yellowish-brown; male mid basitarsus reduced, legs short and stout.

Host Families. Tabanidae, Asilidae, Stratiomyidae (Diptera).

Included Nearctic Species. *T. tabanivorus, T. emersoni* (Girault 1916), *T. goniopis.*

Other Species Included. Neotropical: *T. tabanocida.* Palearctic: *T. angustatus, T. oophagus, T. promachivorus.* Ethiopian: *T. benefactor, T. kingi.*

Remarks. Females of this species group are often difficult to separate from other members of the *T. californicus* complex. The elongate habitus, the somewhat quadrate head, and the relatively short A3 will help to identify them.

In most species of *Telenomus* the ratio of length A2 to length A3 is typically greater than one only in small species, and less than one in large species. Therefore, it is unusual that even in the large specimens of this group A2 is longer than A3. This suggests to me that the ancestor of the *T. tabanivorus* group was small, and living species show a secondary increase in size as a direct reflection of the size of their hosts.

Pseudotelenomoides was described by Szabó (1975b) as lacking all venation in the fore wing: "Vorderflügel ohne oder nur mit Spuren von Adern." Examination of the paratypes reveals that the wing veins are indeed present and typically telenomine, but they are very faintly pigmented as a result of long storage of the specimens in alcohol. The species *T. stratiomyidarum* is a junior synonym of *T. angustatus,* the type-species of C.G. Thomson's genus *Phanurus.* Therefore, if at some time in the future this group is raised to generic status, and I do not recommend it, the correct name would be *Phanurus* and not *Pseudotelenomoides.*

Telenomus californicus, T. arzamae, and T. dalmanni species groups

(Figs. 7, 13, 18, 25, 31, 50, 55, 56, 58)

Description. Female antennal clava 5-segmented; A9-A10 transverse to quadrate; head strongly transverse (especially so in large species of the *arzamae* species group), DCI greater than or equal to 2.0; frons width greater than eye height; eyes hairy; occipital carina simple, complete medially; dorsellum about as long laterally as medially, punctate above, striate or smooth below (Figs. 18, 50); no episternal foveae; no metapleural carina; basal vein not pigmented (rarely so in males); hind wings, except in very small species, broad, greatest width more than twice width of fringe at that point; T1 with one pair of sublateral setae; metasoma usually less than twice as long as wide. These three groups can be confidently separated only on the basis of male genitalia. *T. californicus* species group: digital teeth long and thick; laminae volsellares in the form of two well-sclerotized ventral rods, closely approaching one another medially, or even fused for part of their length; aedeagal lobe short or moderately long (Fig. 55). *T. arzamae* species group: digital teeth long and stout; laminae volsellares in the form of a large strongly sclerotized ventral plate; aedeagal lobe short and broad (Fig. 56). *T. dalmanni* species group: digital teeth long and rather narrow; laminae volsellares rodlike, widely separated; aedeagal lobe strongly elongate (Fig. 58).

Diagnostic Characters. Structure of male genitalia (see above); rectangular, punctate-striate dorsellum (Figs. 18, 50); 10-segmented antennae of some *T. dalmanni* group species.

Host Families. *T. californicus* group: Geometridae, Noctuidae, Lymantriidae, Arctiidae, Lasiocampidae, Sesiidae, Saturniidae, Nymphalidae (Lepidoptera). *T. arzamae* group: Noctuidae, Notodontidae, Sphingidae (Lepidoptera). *T. dalmanni* group: Lymantriidae, Geometridae. Rest of *T. californicus* complex: Noctuidae, Sphingidae, Lycaenidae, Papilionidae, Megathymidae (Lepidoptera).

Included Nearctic Species: *T. californicus* group: *T. alsophilae, T. californicus, T. clisiocampae, T. coloradensis, T. droozi, T. geometrae, T. quaintancei. T. arzamae* group: *T. arzamae, T. coelodasidis, T. noctuae, T. catalpae, T. ichthyurae. T. dalmanni* group: *T. dalmanni, T. hemerocampae.*

Unplaced Nearctic *T. californicus* Complex Species. *T. bakeri, T. bifidus, T. gnophaelae, T. gossypiicola, T. gracilicornis, T. graptae, T. heliothidis, T. koebelei, T. lavernae, T. minimus, T. nigriscapus, T. pamphilae, T. rileyi, T. monilicornis, T. spilosomatis.*

Other Species Included. *T. californicus* group: *T. gynaephorae* (Palearctic). *T. arzamae* group: *T. usipetes* (Oriental). *T. dalmanni* group: *T. closterae, T. dalmanni, T. pallidipes, T. parnarae* (Palearctic); *T. narolus* (Ethiopian); *T. monodactylus* (Oriental).

Other Unplaced Species of the *T. californicus* Complex. Neotropical: *T. alecto, T. atripes, T. dilophonotae, T. flavopetiolatus, T. medius, T. pygmaeus.* Palearctic: *T. acamas, T. acarnas, T. ariadne, T. bombycis, T. brevis, T. cebes, T. cleostratus, T. dollabella, T. eris, T. etiellae, T. euproctidis, T. galba, T. gomola, T. hofmanni, T. hyalinatus, T. hydroeciae, T. laeviceps (sensu* Kozlov, 1967), *T. menes, T. atomus (sensu* Kozlov, 1967), *T. nitens, T. nitidulus, T. pentatomus, T. pentopherae, T. phalaenarum (sensu* Mayr, 1879), *T. pilumnus, T. polla, T. punctatissimus (sensu* Kozlov, 1967), *T. quadriclavatus, T. sterope, T. tacita, T. tenuicornis, T. terebrans (sensu* Mayr, 1879), *T. tetratomus, T. trophonius, T. unilineatus.* Ethiopian: *T. aleus, T. anates, T. brimo, T. codrus, T. demodoci, T. gowdeyi, T. hyperion, T. myrmidon, T. nephele, T. phegeus, T. polycrates, T. procas, T. sciron, T. thestor, T. thoas, T. ullyetti.* Oriental: *T. adenyus, T. attaci, T. beneficiens (sensu* Nixon), *T. dignoides, T. dignus, T. incommodus, T. lelus, T. molorchus, T. otones, T. pegasus, T. proditor, T. remus, T. rowani, T. sorus, T. stigis, T. talaus, T. tirathabae, T. transversiceps, T. turbatae, T. ulusalus, T. usipetes.* Australasian: *T. frenchi, T. pontus.*

Remarks. The species of the *T. californicus* complex appear to be especially abundant in the temperate Holarctic. In external morphology the species are very similar; I have been unable to find characters with which to separate females. Males, on the other hand, are usually easily distinguished with genitalic characters, especially in the size and shape of the aedeago-volsellar shaft and the size and number of digital teeth.

The genus *Aholcus*, based on females with 10-segmented antennae, was synonymized with *Telenomus* by Nixon (1935), who nevertheless regarded it as a valid subgenus. Insofar as the *T. dalmanni* group is characterized by the genitalic characters described above, then within it are included species with both 10- and 11-segmented female antennae. The diversity in genitalic morphology illustrated by Nixon (1935, and following papers) for his *T. (Aholcus)* species suggests that the species with 10-segmented female antennae do not form a monophyletic group, and may be polyphyletic.

Kozlov (1967) synonymized *Telenomus hyalinatus* with *T. dalmanni*, stating that it had 10-segmented antennae. I have examined Kozlov's lectotype of *T. hyalinatus*. The antennae definitely have eleven segments. It is not conspecific with *T. dalmanni*.

Szabó (1975b) described the genus *Pseudophanurus* which he claimed could be distinguished from *Archiphanurus* by the smooth face, and from all other telenomine genera by the 4- or 5-segmented antennal clava of the female. He did not specify how the limits of the clava are to be determined, although I assume he refers to the relative size of the antennomeres. Even so, such a 4- or 5-segmented clava is the state found in almost all species of *Telenomus* (as the genus is considered here), and so does not distinguish *Pseudophanurus* at all. I have studied the holotype of the type species, *Pseudophanurus quadriclavatus*. It is a *Telenomus* species of the *T. californicus* complex. The strongly transverse head suggests that it may belong to the *T. arzamae* species group. I can find no other characters to warrant distinction of this species at the generic level; therefore I propose that *Pseudophanurus* be considered a synonym of *Telenomus*.

Unplaced Nearctic Species

The following species were not placed in any of the preceding species groups of *Telenomus: T. abitus, T. abruptus, T. chrysopae, T. consimilis, T. dentatus, T. dolichocerus, T. exilis, T. oculeus, T. prolatus, T. puticulus,* and *T. tanymerides.*

Table 1. Species group characters.

Character	Ancestral	Derived
Number of Antennomeres		
a. Female	11	10
b. Male	12	11
Number of Clavomeres	6	5-4
Length/Width A9, A10	<1	>1
DCI	>2.0	<2.0
Frons Width/Eye Height	>1	<1
Eyes	setose	bare
Occipital Carina	crenulate	simple
	complete	*interrupted*
Malar Space	short	elongate
Clypeal Margin	straight	dentate
Notauli	present	absent
Dorsellar Shape	triangular	"rectangular"
	overlapping propodeum	not overlapping propodeum
Dorsellar Sculpture	punctate	smooth
Episternal Foveae	present	absent
Metapleural Carina	present	absent
Basal Vein	not pigmented	pigmented
Hind Wing	broad	narrow
Sublateral Setae	>1 pair	1 pair
Horn on T1	absent	present
Length/Width Metasoma	<2	>2
Digital Teeth	small	large
Aedeago-volsellar Shaft	widest basally	narrowed basally
Laminae Volsellares	rodlike	platelike
Aedeagal Lobe	*short*	*elongate*
Genitalic Pigmentation	yellow-brown	gray-black
Body	robust	depressed
Color	black-brown	yellow; metallic

SPECIES DESCRIPTIONS

The species descriptions below are in alphabetical order. The sample numbers in each section on measurements, e.g., sample: 10-5, refer to ten specimens measured from five localities. In selecting specimens to measure I have tried to maximize the geographical area covered, rather than to try to take a random sample of the already biased collection available. Therefore, the measurements are expressed as ranges of values and not, for example, as means, standard deviations, or modes. In addition to the *T. phymatae* and *T. podisi* groups, several unplaced species are described.

Telenomus abitus new species

(Figs. 78, 113)

Holotype Female. TL: 1.18 mm; DCI: 1.58; FCI: 1.20; frons W/eye height: 0.88; W/L T1: 4.3; L/W T2: 0.96; L/W metasoma: 1.63; sample: 1-1.

Color. Head and body black; all coxae dark brown; femora and tibiae, except bases and apices, dark brown; legs otherwise yellowish-brown; radicle and extreme base of A1 brown; antennae otherwise dark brown.

Head. Vertex smoothly, but abruptly rounded onto occiput; no hyperoccipital carina, shallowly and evenly coriaceous; occiput with same sculpture as vertex extending to occipital carina; occipital carina crenulate, complete medially, frons shallowly coriaceous throughout; frontal pit present; ocellar setae absent; frontal depression weakly developed; frons not bulging between antennal insertions and inner orbits; eyes setose; inner orbits rounded at level of lateral ocelli; malar space with same sculpture as frons extending to malar sulcus; temples bulging, without groove, with shallowly impressed coriaceous sculpture extending from posterior orbits to occipital carina.

Mesosoma. Mesoscutum depressed (Fig. 78), coriaceous, setal bases weakly pustulate; scutellum smooth, setose; dorsellum only slightly longest medially, not overlapping propodeum, finely punctate; acetabular carina simple; episternal foveae not indicated; width of intercoxal space greater than length of fore coxae, densely setose; anterior margin of mid coxal cavity not expanded, simple; acetabular field large, reaching, but not entering mesopleural furrow and intercoxal space; mesopleural furrow well developed; mesopleural carina absent; posterodorsal corner of metapleuron strongly expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 1 pair of sublateral setae, 3 pairs of lateral setae; length of basal costae on T2 less than medial length of T1.

Appendages. Antennae (Fig. 113) short, 11-segmented; clava 5-segmented; L A2>A3; A6 transverse; A9-A10 transverse; L, W A7<A8. Wings clear, barely surpassing apex of metasoma; fore wing with basal vein not pigmented, postmarginal vein longer than stigmal; hind wing broad, greatest width more than twice width of fringe at that point.

Male and host unknown.

Material. Holotype female: FLORIDA: Duval Co., St. John's Bluff, 30-VIII-1976; E.E. Grissell (FSCA).

Remarks. This species is probably most likely to be confused with *Telenomus zeli*, from which it may be distinguished by the large acetabular field and the possession of a well developed frontal pit.

The habits of *T. abitus* are unknown, but the relatively large tarsal claws, excavate posterior margin of the head (reminiscent of *Protelenomus)*, and the short antennae suggest that the females of this species may be phoretic on their host.

The fine sculpture on the frons of the single known specimen may be only a residue of a preservative or killing agent.

Telenomus abruptus new species
(Figs. 83, 109)

Female. TL: 1.43-1.58 mm; DCI: 1.63-1.71; FCI: 1.03-1.09; frons W/eye height: 0.60-0.70; W/L T1: 3.00 (n = 1); L/W T2 not measureable; L/W metasoma: 1.26-1.61; sample: 5-5.

Color. Head and body black; fore coxae yellowish-brown, mid and hind coxae yellow; legs otherwise yellow; antennae either with radicle, A1-A6 yellow and A7-A11 dark brown, antennae distinctly bicolored (specimens from Florida and Louisiana); or radicle, A1, A2 yellow, A3-A11 dark brown (Mexican, Panamanian, Venezuelan specimens).

Head. Vertex rounded throughout, not sharply angled, but dropping off abruptly onto occiput, alutaceous around lateral ocelli and inner orbits, otherwise smooth; hyperoccipital carina absent; occiput alutaceous near eyes, elsewhere smooth; occipital carina crenulate, incomplete medially; frons with narrow alutaceous bands along inner orbits, otherwise smooth; no frontal pit; ocellar setae absent; frontal depression well developed; frons not bulging between antennal insertions and inner orbits; eyes very sparsely setose, nearly glabrous; inner orbits angled at level of lateral ocelli; malar space smooth; temples not bulging, falling off sharply to occipital carina, not grooved, with narrow bands of finely coriaceous sculpture along posterior orbits not reaching occipital carina.

Mesosoma. Mesoscutum convex, alutaceous-pustulate, pustulae sometimes strongly developed and closely spaced, thereby giving the impression of coarse reticulations; scutellum smooth, setose, setal bases pustulate; dorsellum weakly produced medially, not overlapping propodeum, punctate-reticulate, punctures sometimes elongate; acetabular carina simple; episternal foveae absent; width of intercoxal space slightly greater than length of fore coxae; anterior margin of mid coxal cavity weakly expanded, crenulate; mesopleural furrow well developed; mesopleural carina developed only at ventral extreme; acetabular field small, not reaching intercoxal space or mesopleural furrow; posterodorsal corner of metapleuron weakly expanded; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 5 pairs of lateral setae; greatest length of basal costae on T2 about equal to medial length of T1.

Appendages. Antennae (Fig. 109) 11-segmented; clava 5- or 6-segmented, limits indistinct; L A2<A3; A6 quadrate or slightly longer than wide; A9-A10 transverse; L, W A7 equal to A8. Wings clear, surpassing apex of metasoma; fore wing with basal vein not pigmented, postmarginal vein longer than stigmal; hind wing broad, greatest width three times width of fringe at that point.

Male and host unknown.

Material. Holotype female: LOUISIANA: Lake Bistineau State Park; IV-1972; G. Heinrich; Malaise trap (CNC). Paratypes. FLORIDA: Columbia Co., O'Leno State Park; 1-III-1958; F. W. Mead; at *Quercus,* 1 female (FSCA). Duval Co., St. John's Bluff; 30-VIII-1976; E. E. Grissell, 1 female (FSCA). MEXICO: Sinaloa, Mazatlan; 6-VIII-1964; W.R.M. Mason, 1 female (CNC). PANAMA: Ft. Clayton, Canal Zone, XII-1946, N.L.H. Krauss, 1 female (USNM). VENEZUELA: San Esteban, XI-1939, Pablo Anduze, 2 females (USNM).

Remarks. Distinguished from *T. tanymerides* by the lack of a clypeal lamella and the smooth vertex; from *T. dentatus* by the lack of a tooth on the occipital

carina; from *T. dolichocerus* by the two or more pairs of sublateral setae on T1; from *T. consimilis* by the broadly incomplete occipital carina.

Telenomus astrictus new species

(Fig. 100)

Female. TL: 1.19-1.33 mm; DCI: 1.85-2.00; FCI: 1.30-1.41; frons W/eye height: 1.11-1.31; W/L T1: 3.14 (n=2); L/W T2: 0.85-0.90 (n=2); L/W metasoma: 1.12-1.41; sample: 10-3.

Color. Head and body black; fore coxae dark brown; mid and hind coxae and legs yellow; radicle, A1 yellow to brownish-yellow; A2-A11 brown to dark brown.

Very similar to *T. podisi,* differing only in the following: Vertex sharply angled behind lateral ocelli, rounded medially; occipital carina weakly crenulate: occiput smooth; frontal depression weakly developed; frons distinctly bulging between antennal insertions and inner orbits; L of A2 subequal to L of A3; mesoscutum with setal bases pustulate, background sculpture in anterior half finely coriaceous, posterior half smooth; setal bases on scutellum not pustulate; dorsellum only slightly longest medially, barely overlapping propodeum; acetabular carina finely, closely crenulate; intercoxal space extremely narrow, width less than length of setae arising from its surface, acetabular carina nearly meeting anterior edge of mid coxal cavity; greatest length of basal costae on T2 less than medial length of T1.

Male and host unknown.

Material. Holotype female: FLORIDA: Alachua Co., Gainesville, Pine Hill Estates, 27-IX-1973; H.V. Weems, Jr.; Malaise (FSCA). Paratypes: 2 females with same data as holotype, collected 19, 29-IX-1973 (FSCA). FLORIDA: Alachua Co., Gainesville; 9-IX-1972; Dodge, 1 female (FSCA). Alachua Co., S9-T10S-R18E, Pierce's Homestead; 9-V-1974, 2-X-1973, 24-IX-1973; W.H. Pierce; Malaise trap, 4 females (FSCA). Charlotte Co., Punta Gorda; 12-IV-1952; O. Peck, 1 female (CNC). Pasco Co., Elfers; 16-IV-1952; O. Peck, 1 female (CNC).

Remarks. *Telenomus astrictus* is very similar to *T. podisi,* and may be distinguished from it by the extremely narrow intercoxal space and the finely coriaceous mesoscutum.

This species has been collected only sporadically from central Florida. It was surprisingly not captured in pan traps run year round in Gainesville by Dr. E. E. Grissell, even though *T. podisi* was well represented.

Telenomus calvus new species

(Figures 54, 60, 72, 99, 118)

Female. TL: 0.95-1.01 mm; DCI: 1.82-1.88; FCI: 1.25-1.35; frons W/eye height: 1.00-1.07; W/L T1: 5.00 (n=2); L/W T2: 0.92 (n=2); L/W metasoma: 1.15-1.36; sample: 10-1.

Color. Head and body black; all coxae dark brown to black; femora and tibiae predominantly brown; bases and apices, trochanters, tarsi brownish-yellow to yellowish-brown; radicle and extreme base of A1 yellowish-brown; antennae otherwise dark brown.

Head. Vertex smoothly rounded onto occiput, coriaceous throughout; hyperoccipital carina absent; occiput with shallow coriaceous sculpture nearly reaching occipital carina; occipital carina complete medially, crenulate; orbital bands

broad, complete, frons otherwise smooth; no ocellar setae; frontal pit absent; frontal depression weakly developed; frons not bulging between antennal insertions and inner orbits; eyes hairy; inner orbits angled at level of lateral ocelli; malar space coriaceous, but sculpture not reaching malar sulcus; temples bulging, not grooved, with broad band of coriaceous sculpture along posterior orbits, sculpture not reaching occipital carina.

Mesosoma. Mesoscutum strongly flattened (Fig. 72), evenly coriaceous, with regularly spaced deep setigerous punctures; scutellum smooth, almost completely glabrous, submarginal foveae fine, smaller than dorsellar punctures; dorsellum weakly triangular, only slightly longest medially, punctate-reticulate, raised surfaces between punctures flattened (Fig. 54); acetabular carina simple, strongly developed; episternal foveae absent; width of intercoxal space subequal to length of fore coxae; anterior margin of mid coxal cavity not expanded, finely crenulate; mesopleural furrow well developed; mesopleural carina absent; acetabular field large, reaching mesopleural furrow, but not intercoxal space; posterodorsal corner of metapleuron expanded; metapleural carina present, but weak.

Metasoma. T1 with 2 pairs of sublateral setae, 3 pairs of lateral setae; greatest length of basal costae on T2 subequal to medial length of T1.

Appendages. Antennae (Fig. 99) 11-segmented; clava 5-segmented; L of A2>A3; A4-A6 subequal in size, all transverse; A9-A10 transverse; length, width A7<A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width three times width of fringe at that point.

Male. TL: 0.95-1.01 mm; DCI: 1.82-1.94; FCI: 1.30-1.41; frons W/eye height: 1.00-1.07; W/L T1: 4.5-5.0 (n=3); L/W T2: 0.88-1.00 (n=3); L/W metasoma: 1.0-1.36 (n=8); sample 10-1.

Identical to the female, differing only in the normal secondary sexual characters: antennae (Fig. 118): L A2=A3, A3-A5 slightly longer than wide; A6-A11 moniliform; genitalia, see Figure 60.

Host. *Podisus maculiventris* (Heteroptera: Pentatomidae).

Material. Female holotype: FLORIDA: Alachua Co., Gainesville, Soybeans, 27-VIII-1975, Plot G, Lawrent L. Buschman; Host: *Podisus maculiventris* (FSCA). Paratypes: 18 females, 17 males, all from Gainesville, Florida. Collected 14-VI-1974; 23-VI, 26-VIII-1975; many are lab reared F1 generation of field collected adults. Host: *Podisus maculiventris, Podisus* sp. One female collected 26-VIII-1975 indicated as phoretic on the host. Other material: 18 females, 5 males, from the same series as above; one female collected 11-X-1974; host: *P. maculiventris, P.* sp. Two females collected 11-X-1974 and 26-VIII-1975 phoretic on the host.

Remarks. This species is distinguished from the others of the *T. podisi* group by the more quadrate head (DCI = 1.82-1.88), the glabrous scutellum, and the flattened mesoscutum; from other species of *Telenomus* with a glabrous scutellum *(T. ovivorus* group) by the two pairs of sublateral setae on T1 and the presence of a metapleural carina.

Buschman and Whitcomb (1980) have reported this species (as *Telenomus* species 2) to be phoretic on its host. The flattened mesoscutum and short antennae are probably adaptations for this behavior. Surprisingly though, there are no other obvious morphological adaptations of the mandibles, legs, tarsal claws, or wings that would suggest that *T. calvus* is phoretic.

Telenomus chloropus

(Figs. 8, 101)

Phanurus chloropus Thomson, 1860:173, female. Type locality: Glimakra, northeastern Skåne, Sweden. Host: Unknown. [Syntypes in collection of Lund University.]
Telenomus sokolowi Mayr, 1897:442-443, male, female. Type locality: Kharkov, S. Russia (Ukrainian SSR). Host: *Eurygaster maura* (Heteroptera: Scutelleridae).
Telenomus chloropus: Kieffer, 1926:29, Fig. 48.
Telenomus sokolowi: Kieffer, 1926:34-35.
Telenomus tischleri Nixon, 1939:129-130, Fig. 1, 2a, 3g, male, female. Type locality: Sensburg, E. Prussia (now Mragowo, Poland). Host: *Dolycoris baccarum* (Heteroptera: Pentatomidae).
Telenomus chloropus: Kozlov, 1967:364, 371, Fig. 4, 17.
Telenomus chloropus: Kozlov, 1968:217-218.
Telenomus truncatus: Javahery, 1968:431-434, Figs. 12, 13a, 15a.
Telenomus sokolovi: Javahery, 1968:434-436, Fig. 13b-d, 14a-f, 15b-d.

Female. TL: 1.23-1.29 mm; DCI: 2.06-2.18; FCI: 1.32-1.41; frons W/eye height: 0.89-1.00; W/L T1: 3.5-4.8 (n=12); L/W T2: 0.97-1.06 (n=12); L/W metasoma: 1.30-1.52; sample: 20-1 (Japanese uniparental form; see "Remarks,").

Color. Head and body black; all coxae dark brown to black; legs otherwise yellowish-brown to brown, femora and tibiae darker medially; base of A1 brownish-yellow; antennae, including radicle, otherwise dark brown.

Head. Vertex rounded onto occiput, coriaceous throughout, with scattered superimposed setigerous punctures, with wide shallow grooves (postocellar furrows) behind lateral ocelli, grooves usually widely separated from one another (Fig. 8); no hyperoccipital carina; occiput coriaceous near vertex, smooth along occipital carina; occipital carina complete, simple; orbital bands broadly interrupted near midpoint of eye, frons otherwise smooth; 2-3 pairs of ocellar setae present, sometimes widely separated or weakly developed; no frontal pit; frontal depression weakly developed; frons not bulging between antennal insertions and inner orbits; eyes hairy; inner orbits angled at level of lateral ocelli; malar space smooth; temples not bulging, dropping off sharply to occipital carina, not grooved, coriaceous sculpture along posterior orbits extending, at most, one-third distance to occipital carina.

Mesosoma. Mesoscutum convex, coriaceous-pustulate; scutellum smooth, setose, submarginal foveae and dorsellar punctures subequal in size; dorsellum longest medially, slightly overlapping propodeum, punctate-reticulate, acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface; mesopleural furrow well developed; mesopleural carina absent; acetabular field very small, reaching neither mesopleural furrow nor intercoxal space; posterodorsal corner of metapleuron expanded, lamellate, notched just above metapleural carina; metapleural carina well developed only in posterior half of sclerite.

Metasoma. T1 with 1, rarely 2 pairs of sublateral setae, 3-4 pairs of lateral setae; greatest length of basal costae on T2 about equal to medial length of T1; finer wrinkles extending at most over basal half of T2.

Appendages. Antennae (Fig. 101) 11-segmented; clava 5-segmented; L A2<A3; A6 quadrate; A9-A10 transverse; L, W A7<A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width 2.1-2.3 times width of fringe at that point.

Male. See below.

Host. The only reared specimens I have seen were collected from the eggs of *Nezara viridula* (Heteroptera: Pentatomidae). Kozlov (1968) recorded the following pentatomoids as hosts in Europe: *Aelia furcula, A. rostrata, Carpocoris*

fuscispinus, Dolycoris baccarum, Eurygaster austriacus, E. integriceps, E. maura, Graphosoma lineatum, Palomena prasina, P. viridissima.

Material. I have seen all of the specimens labelled as *T. chloropus* from Thomson's collection at the University of Lund: they are all conspecific. However, none, including the specimen considered by Kozlov (1967) to be the lectotype, bear the locality data cited by Thomson (1860). Other Material. FRANCE: Gallia, Pyr. orient., Collioure, 17-XII-1966, Gyllensvard leg., 1 female (Lund University). HUNGARY: Ungern. Nagykovacsi, Gebirge Pilis., 2-VIII-1961, A. Sundholm, 1 female (Lund). Budapest, Huvosvolgy, 30-VII-1961, A. Sundholm, 1 female (Lund). Kisoroszi, Szentendrei. Sziget., 2-VIII-1961, A. Sundholm, 4 females (Lund). JAPAN: Shikoku, Geisei Village, Kochi Prefecture, Aki District, 21-VIII-1979, K. Ikebe; ex: *Nezara viridula* on rice, em. 6-IX, Stoneville [Mississippi]. SPAIN: Galicia, Pontevedra, 23-VIII-1979, M. Sharkey. Grenada, 10-VII-1960, 700 m., J. R. Vockeroth, 10 females (CNC). SWEDEN: Blekinge, Brakne-Hoby, Sjoarp, 5-VII-1959, coll. A. Sundholm, 1 female (Lund). Blekinge, Hallaryd, 27-VII-1955, coll. A. Sundholm, 1 female (Lund). Blekinge, Ronneby, 19-IX-1956, coll. A. Sundholm, 1 female (Lund). TENERIFE: Agua garcia, Tacoronte, 600 m, 27-IV-1967, N. Gyllevsvard, leg., 1 female (Lund).

Remarks. Distinguished from all other species of the *T. podisi* group by the single pair of sublateral setae on T1; similar to many species of the *T. californicus* complex, separated from them by the triangular punctate-reticulate dorsellum and the presence of distinct postocellar furrows.

This species is the most common Palearctic *Telenomus* parasitizing pentatomids. I have included it because it is being introduced into the southern United States in an attempt to control the Southern green stink bug, *Nezara viridula* (W. A. Jones, personal communication). The form being introduced originated in Japan and is thelytokous.

The biological species concept is clearly inapplicable to thelytokous animals because each individual female is reproductively isolated from all others. I hesitate at the suggestion that thelytokous forms be formally named in the absence of any distinguishing characters other than thelytoky itself. I can find no morphological basis upon which to separate this Japanese form from the bisexual European strain. The dilemma caused by the use of the same word, species, to represent the elementary unit of both classification and evolution has long been recognized (see, for example, Sonneborn 1957), but has yet to be resolved. I have therefore decided to continue to refer to the thelytokous form as *T. chloropus,* while stressing the fact that under this name both bisexual and unisexual forms exist.

The name *Telenomus nakagawai* has been used in the past to refer to a thelytokous Japanese pentatomid egg parasite. I have not seen the types of this "species," and therefore cannot determine if the uniparental *T. chloropus* I have can be distinguished from it. Kozlov (1967) synonymized the name *T. gifuensis* under *T. chloropus.* I have seen the lectotype and several paralectotypes of *gifuensis* in the collection of the USNM. All of the females have two pairs of sublateral setae on T1. In view of the rarity of this character state in all other *T. chloropus* I have seen, I do not believe that the two are conspecific.

One final nomenclatural problem. C. G. Nees ab Esenbeck described the species *Teleas truncatus* in 1834. His original description is worthless for identification, but he did maintain a collection. Gustav Mayr was the last to see his collection and to publish redescriptions of the species before its

destruction. On the basis of identified specimens in Mayr's collection in Vienna I have little doubt that *T. truncatus* is synonymous with Thomson's *T. chloropus*. Unfortunately, Mayr did not consider all of Thomson's species in his 1879 revision, and therefore did not formally synonymize *T. chloropus* under *T. truncatus*.

Mayr's redescription of *T. truncatus* does not refer to the diagnostic postocellar furrows, but rather to the weak "Querleiste" defined by those grooves. Furthermore, he used the same term to refer to the hyperoccipital carina of *T. heydeni*. For some reason, in the 88 years following Mayr's paper the name *T. truncatus* has been used only rarely, even though Kieffer (1926) included it in the keys and descriptions in his scelionid monograph. The name *T. chloropus*, on the other hand, has been widely used.

Kozlov (1967, 1968) repeated Mayr's error by redescribing *T. chloropus* in detail, but failing to deal with the name *T. truncatus*. As a result, *T. chloropus* has come into even wider use in the past decade.

Szabó (1978) redescribed *T. truncatus* on the basis of material identified by Mayr, and then designated a neotype from Mayr's collection (the specimens of which lack locality data), even though Nees himself did not indicate where his original material was collected. In his redescription of *T. truncatus*, Szabó stated that there is a "Querkiel" running between the compound eyes across the vertex. Neither *T. chloropus* of Thomson nor any of the other specimens of *T. truncatus* identified by Mayr have a carina on the vertex. *Telenomus heydeni* is the only European species I know with a hyperoccipital carina. Szabó (1978), in his diagnosis of *T. heydeni*, stated that it is: "wie *Telenomus truncatus*, nur der Kopf mit einer Querkante . . ." (spelled Querkannte in the description). I interpret the distinction between the German Kiel and Kante as the latter being more rounded and less sharply defined, just the opposite of what one finds in *T. chloropus* and the lectotype of *T. heydeni* designated by Kozlov (1967). I was unable to resolve this contradiction by reference to the specimens upon which Szabó based his redescriptions because, when I arrived in Vienna, I found that the *T. truncatus* neotype had been destroyed.

Therefore, because (1) no reviser has ever dealt with both of the names *T. truncatus* and *T. chloropus*, (2) *T. chloropus* has been much more widely used in the literature, (3) Szabó's redescription of *T. truncatus* does not appear to agree with the rest of Mayr's specimens, and (4) the neotype of *T. truncatus* has been lost, I propose *T. chloropus* be considered the valid name for this species. *Telenomus truncatus* should be considered as a *nomen dubium*.

Telenomus consimilis

(Figs. 74, 107)

Telenomus consimilis Ashmead, 1895c: 796, female. Type locality: Balthazar (windward side), Grenada. Host: Unknown. [Holotype in British Museum (Natural History)].
Telenomus convergens Ashmead, 1895c:795-796, male, female. Type locality: Balthazar, Grenada. Host: Unknown. NEW SYNONYMY. [Lectotype in British Museum (Natural History)].
Liophanurus convergens: Kieffer, 1912:61.
Liophanurus convergens: Kieffer, 1926:83.
Microphanurus consimilis: Kieffer, 1926:108.
Telenomus consimilis: Masner, 1965:111.
Telenomus convergens: Masner, 1965:111.

Female. TL: 0.81-1.05 mm; DCI: 1.36-1.69; FCI: 1.10-1.21; frons W/eye height: 0.69-0.92; W/L T1: 2.8-4.7 (n=5); L/W T2: 1.11-1.47 (n=6); L/W metasoma: 1.55-2.67; sample: 17-3.

Color. Head and body dark brown to black; fore coxae brownish-yellow; mid and hind coxae, legs yellow; radicle, basal half of A1, underside of A2 yellow; A1 distally yellowish-brown; dorsum A2, A3-A11 brown to dark brown, darkening distally.

Head. Vertex smoothly rounded onto occiput, shallowly coriaceous throughout; no hyperoccipital carina; occiput with same sculpture as vertex; occipital carina complete medially, crenulate; frons with orbital bands broken near mid point of eyes, otherwise smooth; no frontal pit; ocellar setae present; frontal depression well developed; frons not bulging between antennal insertions and inner orbits; eyes hairy; inner orbits rounded at level of lateral ocelli; malar space smooth; temples weakly bulging, not grooved, coriaceous sculpture along posterior orbits reaching occipital carina.

Mesosoma. Mesoscutum distinctly flattened (Fig. 74), coriaceous, setal bases not or only weakly pustulate; scutellum smooth, setose, submarginal foveae fine, subequal in size to dorsellar punctures; dorsellum weakly produced medially, barely overlapping propodeum, finely punctate above, striate below; acetabular carina finely crenulate; episternal foveae absent; width of intercoxal space about equal to length of fore coxae; anterior margin of mid coxal cavity weakly expanded, crenulate; mesopleural furrow well developed; mesopleural carina absent; acetabular field large, reaching, but not extending into mesopleural furrow, not reaching intercoxal space; posterodorsal corner of metapleuron expanded, lamellate; metapleural carina present.

Metasoma. T1 with 2 pairs of sublateral setae, 2-3 pairs of lateral setae; greatest length of basal costae on T2 less than medial length of T1.

Appendages. Antennae (Fig. 107) 11-segmented; clava 5-segmented; L A2 greater than or equal to L A3; A6 transverse; A9-A10 transverse; L, W A7<A8. Wings clear, or with faint brownish tinge, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing narrow, greatest width less than twice width of fringe at that point.

Male and host unknown.

Material. Holotype female: Grenada: Balthazar (windward side), H. H. Smith, 40; *Telenomus consimilis* Ashm. ♀ Type; W. Indies, 99-331 (British Museum). Other material: FLORIDA: Alachua Co., Gainesville, 5-9-V, 22-IX-3-X, 13-19-X, 1-5-XII, 8-12-XII-1975; E. E. Grissell, 12 females (CNC, NFJ). MARYLAND: Montgomery Co., Cabin John, 28-VIII-1917, 24-IX-1917; R.M. Fouts, 2 females (LACM). Montgomery Co., Glen Echo; VII, IX-1924, summer 1923; R.M. Fouts, 3 females (LACM). GRENADA: Balthazar (Windward side), W.I., H.H. Smith, 20; W. Indies, 99-331; Lectotype L.M., *Telenomus convergens* Ashm. ♀ Type; Selected as lectotype of *T. convergens* Ashm. by L. Masner 1961 (British Museum).

Remarks. Most similar to *T. dolichocerus,* distinguished from it by the compact antennomeres (compare Figures 104, 105, and 107), the strongly developed occipital carina, and the two pairs of sublateral setae on T1.

Telenomus cristatus new species

(Figs. 68, 95, 117)

Female. TL: 1.18-1.38 mm; DCI: 1.95-2.10; FCI: 1.40-1.43; frons W/eye height: 1.06-1.21; W/L T1: 3.8 (n=1); L/W T2: 1.03 (n=1); L/W metasoma: 1.30-1.48; sample: 5-3.

Color. Head and body black; fore coxae varying from yellow with faint

darkening basally to completely dark brown; mid and hind coxae dark brown, lighter apically; legs otherwise yellow to brownish-yellow; antenna variable, either with radicle yellow, A1 brownish-yellow, A2-A11 brown to dark brown, becoming darker distally; or radicle, A1-A4 yellow, A5 brownish-yellow, A6-A11 dark brown; antennae not sharply bicolored.

Similar to *Telenomus podisi,* except for the following: hyperoccipital carina present; occiput coriaceous near hyperoccipital carina, otherwise smooth; frontal depression well developed; frons slightly bulging between antennal insertions and inner orbits; ocellar setae absent; antennae (Fig. 95): L A3 distinctly greater than L A2; A6 quadrate or slightly longer than wide; L, W A7 subequal to A8; scutellum with submarginal foveae smaller than dorsellar punctures; greatest length of basal costae on T2 less than medial length of T1.

Male. TL: 1.10 mm (n=1); DCI: 1.95-2.00; FCI: 1.37-1.41; frons W/eye height: 1.11-1.29; W/L T1: 3.7 (n=1); L/W T2: 0.89 (n=1); L/W metasoma: 1.26 (n=1); sample: 2-2.

Differing from the female only in the following: antennae (Fig. 117) either with radicle, A1, venter A2 yellow, dorsum A2, A3-A12 brown; or, radicle, A1-A5 yellow, A6-A12 brown; L A3 distinctly greater than A2; A3-A5 much longer than wide; A6-A11 slightly longer than wide, length less than two times width; genitalia, see Figure 68.

Host. *Nezara viridula* (Heteroptera: Pentatomidae).

Material. Holotype female: FLORIDA: Duval Co., St. John's Bluff; 30-VIII-1976, E. E. Grissell (FSCA). Paratypes: FLORIDA: Baker Co., Macclenny; 17-IX-1975, Reese I. Sailer; ex *Nezara viridula,* 2 females, 1 male (FSCA). Ft. Pierce, 23-IX-1954, A.G. Selhime; 10205; ex pentatomid eggs on orange, 1 female, 1 male (USNM). TRINIDAD, W.I.: St. Augustine, VIII-1962, F. D. Bennett, 350; ex ova *Nezara viridula* on *Crotolaria*; C.I.E. Coll. No. 18635, 1 female (British Museum).

Remarks. Distinguished from *Telenomus podisi* by the presence of a hyperoccipital carina; from *T. scaber,* aside from color characters, by the absence of ocellar setae and the lack of longitudinal elements in the mesoscutal sculpture; from *T. goliathus* by the yellow scape.

This species is close to *T. goliathus.* Further collecting in northern Mexico is needed to assess the validity of my distinction between the two.

Telenomus dentatus new species

(Figs. 81, 108)

Female. TL: 1.15-1.23 mm; DCI: 1.37-1.39; FCI: 0.81-0.84; frons W/eye height: 0.94-1.00; W/L Tl: 3.20 (n=2); L/W T2: 1.00-1.04 (n=2); L/W metasoma: 1.54-1.62; sample: 4-2.

Color. Head and body black; fore coxae dark brown; mid and hind coxae and legs otherwise yellow; radicle and extreme base of A1 yellowish-brown; antennae otherwise dark brown.

Head. Vertex smoothly rounded onto occiput, narrow area extending from median ocellus to occipital carina smooth, laterad from this area with deeply impressed coriaceous sculpture; occiput with narrow smooth band along occipital carina, otherwise coriaceous; occipital carina complete medially, strongly angled and produced laterally, forming a tooth (Fig. 81), strongly crenulate; orbital bands present, frons otherwise smooth; ocellar setae absent; frontal pit absent; frontal depression weakly developed, shallow; frons not bulging between

antennal insertions and inner orbits; eyes hairy; inner orbits weakly angled at level of lateral ocelli; malar space smooth; temples bulging, not grooved, coriaceous sculpture along posterior orbits below tooth extending three-fourths the distance to the occipital carina, above tooth sculpture reaching occipital carina.

Mesosoma. Mesoscutum weakly depressed, coriaceous-pustulate, background sculpture fading posteriorly; scutellum smooth, setose, submarginal foveae about equal in size to dorsellar punctures; dorsellum longest medially, punctate-reticulate, raised surfaces between punctures flattened (as in *T. calvus)*, overlapping propodeum; acetabular carina crenulate; episternal foveae absent; width of intercoxal space slightly less than length of fore coxae; anterior margin of mid coxal cavity weakly expanded, crenulate; mesopleural furrow well developed; mesopleural carina absent except at ventral extreme; acetabular field large, reaching, but not entering mesopleural furrow, not reaching intercoxal space; posterodorsal corner of metapleuron expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 4 pairs of lateral setae; greatest length of basal costae on T2 less than medial length of T1.

Appendages. Antennae (Fig. 108) 11-segmented; clava 5-segmented; L A3>A2; A6 quadrate; A9-A10 transverse; L, W A7 subequal to A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing rather broad, greatest width twice width of fringe at that point.

Male and host unknown.

Material. Holotype female: FLORIDA: [Highlands Co.], Archbold Biol. Sta., 6-II-1958; H.A. Denmark (FSCA). Paratypes: 2 females with same data as holotype (FSCA). FLORIDA: Martin Co.; 5-XI-1954; H.V. Weems, Jr., 1 female (FSCA). Holotype with antenna mounted on slide.

Remarks. Differs from other species of *Telenomus* with transverse-quadrate heads (DCI<1.7) and effaced vertexial sculpture *(T. dolichocerus, T. abruptus, T. consimilis)* by the dentate occipital carina and the small FCI (<1.00).

Telenomus dolichocerus

(Figs. 71, 75, 84, 104, 105, 121)

Teleas dolichocerus Ashmead, 1887b:100, male. Type locality: Florida. Host: Unknown. [Holotype in USNM.]
Telenomus dolichocerus: Ashmead, 1893:145-146.
Telenomus dolichoceras: Dalla Torre, 1898:515.
Liophanurus dolichoceras: Kieffer, 1926:72.
Telenomus dolichocerus: Masner and Muesebeck, 1968:63.

Female. TL: 0.94-1.29 mm; DCI: 1.44-1.74; FCI: 1.04-1.21; frons W/eye height: 0.61-0.81; W/L T1: 2.6-5.0 (n=14); L/W T2: 1.04-1.28 (n=13); L/W metasoma: 1.35-2.17; sample: 25-15.

Color. Head and body brown to black; fore coxae brown to yellow; legs otherwise yellow; radicle, A1 yellow; A2, A3 brownish-yellow to brown; A4-A11 brown to dark brown.

Head. Vertex broadly rounded throughout, not sharply angled, but dropping off abruptly to occiput, finely coriaceous near eyes, smooth medially; hyperoccipital carina absent; occiput smooth; occipital carina incomplete medially, crenulate (crenulae may be very fine); frons, except for orbital bands, smooth; subocellar setae present or not, usually not distinctly developed; frontal pit

absent; frontal depression well developed; frons not or only slightly bulging between antennal insertions and inner orbits; eyes very sparsely setose; inner orbits rounded or weakly angled at level of lateral ocelli; malar space smooth; temples slightly bulging, not grooved, coriaceous sculpture along posterior orbits extending three-fourths distance to occipital carina.

Mesosoma. Mesoscutum slightly flattened, coriaceous-pustulate, background sculpture fading posteriorly; scutellum smooth, setose, submarginal foveae smaller than dorsellar punctures; dorsellum weakly produced medially, slightly overlapping propodeum, punctate-reticulate; acetabular carina simple; episternal foveae absent; width of intercoxal space subequal to length of fore coxae; anterior margin of mid coxal cavity not expanded, crenulate; mesopleural furrow well developed; mesopleural carina not developed; acetabular field entering mesopleural furrow, not reaching intercoxal space; posterodorsal corner of metapleuron expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 1 pair of sublateral setae, 4 pairs of lateral setae; greatest length of basal costae on T2 about 1.5 times medial length of T1.

Appendages. Antennae (Figs. 104, 105) 11-segmented; clava 5-segmented; L A2<A3; A6 longer than wide; A9-A10 as long as or longer than wide; L, W A7<A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing: greatest width 1.8-2.3 times width of fringe at that point.

Male. TL: 0.90-1.29 mm; DCI: 1.44-1.63; FCI: 1.10-1.23; frons W/eye height: 0.92-1.00; W/L T1: 3.3 (n=2); L/W T2: 1.00-1.16 (n=2); L/W metasoma: 1.42-1.79; sample: 4-3.

Color. Head and body dark brown to black; fore coxae yellowish-brown; legs otherwise yellow; radicle and base of A1 yellow; antennae otherwise brown to dark brown. Otherwise very similar to the female; antennae (Fig. 121); genitalia, see Figure 71.

Host. *Emesaya brevipennis* (Heteroptera: Reduviidae).

Material. CANADA. NEW BRUNSWICK: Kouchibouguac Natl. Park, 12-IX-1977, G.A. Calderwood, Code-5948T, 1 female (CNC). NOVA SCOTIA: Aldershot, 18-VIII-1950, A. McPhee, apple tree, N. Sawler 1 female (CNC). N. Sawler, 7-VII, 31-VIII-1951, 5-VII-1952, K.H. Sanford, taken on apple, 2 females, 1 male (CNC). ONTARIO: Golden Lake, 30-V-1964, R. Richards, 1 female (CNC). Marmora area, 25-VIII-1959, L.K. Smith, 3 females (CNC). One Sided Lake, 31-VII-1960, S.M. Clark, 1 female (CNC). Ottawa, 25-X-1977, L. Masner, 1 female (CNC). QUEBEC: Papineau, Buckingham Twp., 1-VIII-1962, L.K. Smith, 1 female (CNC). Old Chelsea, 27-VIII-1959, J.R. Vockeroth, summit of King Mtn., 1159 ft., 1 female (CNC). USA. FLORIDA: Levy Co., Manatee Spring State Park, 3-5-VI-1978, N.F. and J.B. Johnson, 1 female. Collier Co., Collier-Seminole State Park, 25-26-V-1978, N.F. and J.B. Johnson, 1 female. Alachua Co., Gainesville, 13-19-IX, 29-IX-3-X, 4-10-X-1975, E.E. Grissell, 7 females. MARYLAND: Montgomery Co., Glen Echo, 9-VI-1927, 13-IX-1925, R.M. Fouts, 1 male, 1 female (LACM). OKLAHOMA: Marshall Co., 26-VI-1963, D.W. Lollis, ex: *Emesaya b. brevipennis,* 2 males, 2 females (USNM). TENNESSEE: East Ridge, 6-V-1952, O. Peck, 1 female (CNC). CUBA: Soledad, 25-II-1925, G. Salt, 2 females (CNC).

Remarks. Differs from most other *Telenomus* by the combination of a medially smooth vertex and elongate A9-A10; distinguished from species of the *T. floridanus* group by the fact that A3 is much longer than A2.

Floridean specimens of what I consider to be this species tend to be larger and more robust than their counterparts in either the northern United States and Canada or in the Caribbean (compare Figs. 75 and 84).

Telenomus exilis new species

(Figs. 73, 112)

Female. TL: 0.94-1.09 mm; DCI: 1.53-1.62; FCI: 1.11-1.21; frons W/eye height: 0.85-0.91; W/L T1 not measureable; L/W T2: 1.44 (n=1); L/W metasoma: 2.12-2.39; sample: 4-2.

Color. Head and body dark brown to black; coxae, femora, and exterior face of tibiae brown, except at bases and apices; legs otherwise brownish-yellow; radicle, base of A1, and underside of A2 yellowish-brown; antennae otherwise brown.

Head. Vertex smoothly, broadly rounded onto occiput, with shallowly impressed coriaceous sculpture throughout; hyperoccipital carina not developed; occiput with same sculpture as vertex continuing to occipital carina; occipital carina complete medially, not or only very finely crenulate; orbital bands present, frons otherwise smooth; ocellar setae absent; frontal pit absent; frontal depression weakly developed, wide and shallow; frons not bulging between antennal insertions and inner orbits; eyes hairy; inner orbits rounded at level of lateral ocelli; orbital bands nearly reaching malar sulcus, malar space otherwise smooth; temples bulging, especially below eyes, not grooved, coriaceous sculpture along posterior orbits extending to occipital carina.

Mesosoma. Mesoscutum depressed (Fig. 73), coriaceous, setal bases not pustulate; scutellum smooth, setose, submarginal crenulae extremely fine; dorsellum weakly produced medially, not overlapping propodeum, finely punctate near scutellum, striate below; acetabular carina simple; episternal foveae absent; width of intercoxal space about equal to length of fore coxae; anterior margin of mid coxal cavity not expanded, crenulate; acetabular field large, reaching, but not entering mesopleural furrow, not reaching intercoxal space; mesopleural furrow well developed, mesopleural carina absent; posterodorsal corner of metapleuron strongly expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 2 pairs of lateral setae; T2 with deep costae basally, fine longitudinal striae apically; greatest length of costae about equal to medial length of T1; striae extending 2-2.5 times medial length of T1 from base of T2.

Appendages. Antennae (Fig. 112) 11-segmented; clava 5-segmented: L A2>A3; A6 transverse; A9-A10 transverse; L, W A7<A8. Wings clear, just surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing narrow, greatest width less than 1.5 times width of fringe at that point.

Male and host unknown.

Material. Holotype female; FLORIDA: Leon Co., Tall Timbers Res. Sta.; 2-IX-1969; D.L. Harris; D-Vac, Rep. 1-B (FSCA). Paratypes: 2 females with same data as holotype, except that they were collected 4-IX-1969, Rep. 1-B, and 24-IX-1969, Rep. 3-D (FSCA). Other Material: 1 female: ONTARIO: Marmora area; 25-VIII-1959; L.K. Smith (CNC).

Remarks. This species may be distinguished from *Telenomus zeli* by the lack of mesoscutal pustulae and the elongate metasoma; from species of the *T. laricis* group by the two pairs of sublateral setae.

The ventrally expanded temples and elongate, depressed habitus (Fig. 73) suggest that *T. exilis* may be closely related to the species of the *T. laricis* group. If so, this would imply that this group may have lost the second pair of sublateral setae independently of the *T. californicus* complex and the *T. nigrocoxalis* and *T. floridanus* species groups.

Telenomus goliathus new species

(Fig. 94)

Female. TL: 1.71-1.80 mm (n=3); DCI: 2.08-2.17; FCI: 1.31-1.39; frons W/eye height: 1.18-1.23; L/W metasoma: 1.61-1.69 (n=3); tergites covered by wings and not measurable; sample: 4-1.

Similar to *T. podisi,* differing as follows: all coxae black; femora, except bases and apices, dark brown; legs otherwise yellowish-brown; radicle brown; antennae otherwise dark brown; hyperoccipital carina present; occiput smooth, setal bases distinctly pustulate; orbital bands narrowed near mid point of eye, but not broken; ocellar setae absent; frontal scrobe well developed; frons strongly bulging between antennal insertions and inner orbits; coriaceous sculpture along posterior orbits extending over three-fourths distance to occipital carina; mesopleural carina indicated for short distance ventrally on mesepisternum; acetabular field very small, reaching neither mesopleural furrow nor intercoxal space; T1 with 2 pairs of short sublateral setae, 4-5 pairs of lateral setae; antennae (Figure 94): length A2<A3, A6 quadrate.

Male and host unknown.

Material. Holotype female: ARIZONA, Cochise Co., Chiricahua Mts, Southwest Research Station; 5400' [1646 m], 16-IX-1979, V. Roth (CNC). Paratypes: 3 females with same data as holotype, collected 8-31-VIII, 16-IX-1979 (CNC).

Remarks. Separated from *T. podisi* by the possession of the hyperoccipital carina; from *T. scaber* and *T. cristatus* by the darkened coxae and antennae.

Given the rarity of *T. podisi* in the southwestern United States I was doubtful of the validity of this species until I received both in a sample collected by Dr. V. Roth at the Southwestern Research Station, Portal, Arizona. Further collections from northern Mexico are needed to assess the validity of my distinction of *T. goliathus* from the smaller eastern species *T. cristatus.*

Telenomus grenadensis

(Figs. 67, 92, 116)

Telenomus grenadensis Ashmead, 1895c:791-792, female. Type locality: Mount Gay Estate (leeward side), Grenada. Host: Unknown. [Lectotype in British Museum (Natural History).]
Telenomus pulchricornis Cameron, 1913:133, female. Type locality: British Guiana [Guyana]. Host: "Plant bug." NEW SYNONYMY [Holotype in British Museum (Natural History).]
Microphanurus grenadensis: Kieffer, 1926:108-109.
Telenomus grenadensis: Masner, 1965:114 (lectotype designation).
Telenomus pulchricornis: Masner, 1965:120.

Female. TL: 1.38-1.48 mm; DCI: 1.83-2.05; FCI: 1.17-1.26; frons W/eye height: 0.83-0.95; W/L T1: 3.0-3.7 (n=8); L/W T2: 0.91-1.00 (n=6); L/W metasoma: 1.31-1.55; sample; 16-6.

Color. Head and body black; legs, including all coxae, pale yellow; radicle, A1-A6 yellow; A7-All either completely dark brown and antennae distinctly bicolored, or brownish yellow to brown, darkening distally.

Otherwise similar to *T. podisi,* but differing in the following respects: vertex sharply angled laterally, rounded medially; occipital carina strongly crenulate; occiput smooth; frons with 1 pair of ocellar setae; temples almost completely smooth, only an extremely narrow band of coriaceous sculpture along posterior orbits; antennal clava 6-segmented (Fig. 92); L A3>A2; A6 quadrate or slightly longer than wide; L, W A7=A8; mesoscutal pustulae sometimes strongly developed, sculpture then best described as punctate-reticulate on an alutaceous background, varying from this condition to that normal for *T. podisi;* submarginal crenulae on scutellum larger than dorsellar punctures; acetabular carina strongly crenulate; episternal foveae present, but shallow; anterior margin of mid coxal cavity strongly expanded, crenulate; mesopleural carina present ventrally; posterodorsal corner of metapleuron strongly expanded, lamellate; T1 with 2-3 pairs of sublateral setae, 4-5 pairs of lateral setae; greatest length of basal costae on T2 less than medial length of T1.

Male. TL: 1.30-1.34 mm; DCI: 1.90-2.00; FCI: 1.24-1.28; frons W/eye height: 0.95-1.05; W/L T1: 3.3 (n=1); L/W T2: 1.00 (n=1); L/W metasoma: 1.20-1.40; sample: 3-3.

Very similar to the female, differing only in the following: antennae (Fig. 116): radicle, A1-A5 yellow; A6-A12 yellowish-brown to brown; fore coxae sometimes brownish-yellow; L A2<A3; A3-A5 longer than wide; A6-A12 longer than wide, but length less than two times width; vertex sometimes more broadly rounded onto occiput; mesopleural carina sometimes well developed; genitalia (Fig. 67).

Host. *Euschistus* sp., *Edessa meditebunda* (Heteroptera: Pentatomidae).

Material. Lectotype female: GRENADA: Mount Gay Est. (leeward side), H.H. Smith, 31; W. Indies 99-331; *Telenomus grenadensis;* ♀ Type Ashm.; Lectotype L.M.; selected as lectotype of *T. grenadensis* by L. Masner 1961 (British Museum). Other material: USA. FLORIDA: Brevard Co., Cocoa, 30-IX-1976, T.S. Smith, ex eggs on lemon, 1 male, 1 female, 12 unemerged adults (FSCA). Coral Gables, XI-1955, N.H.L. Krauss, ex eggs on leaf of *Lantana camara,* 5 females, 1 male (USNM). BRITISH WEST INDIES [Trinidad]. St. Augustine, 13-X-1952, F.J. Simmonds, ex ova *Euschistus,* 52-12577, 5 females, 1 male (USNM). DOMINICA: X-1962, F.D. Bennett, ex egg *Edessa meditebunda,* CIE 18854 378, 3 females, 1 male (British Museum). JAMAICA. Try., Good Hope, 8, 22-VIII-1966, H.F. Howden, 3 females (CNC). GRENADA. Mount Gay Estate (leeward side), H.H. Smith, 1 female (paralectotype) (British Museum). GUYANA: From eggs of plant bug, 3114; P. Cameron Coll. 1914-110; *Telenomus pulchricornis* Cam. Type; Br. Guiana, ex eggs of bug, 2 females, including holotype (British Museum). TRINIDAD. Curepe, 29-XII-1977, W. & E. Mason, 1 female (CNC).

Remarks. Distinguished from *T. scaber* by the lack of a hyperoccipital carina; from *T. sanctivincenti* by the episternal foveae, the usually bicolored antennae, and the coarse mesoscutal sculpture.

This species shows some variation in the degree to which the strength of the mesoscutal sculpture and the distinctness of the contrast in color between A6 and A7 are expressed. The pale, almost transluscent yellow of the legs and antennae is, however, distinctive. *Telenomus grenadensis* is a common Neotropical species; the Florida peninsula appears to be the northern limit of its range.

Telenomus oculeus new species

(Figs. 85, 111)

Female. TL: 0.93-0.96 mm; DCI: 1.88-1.93; FCI: 1.32-1.36; frons W/eye height: 0.71; W/L T1: 3.8 (n=1); L/W T2: 0.92 (n=1); L/W metasoma: 1.38-1.45; sample: 2-2.

Color. Head and body dark brown; fore coxae yellowish-brown; mid and hind coxae brownish-yellow; legs otherwise yellow; radicle yellow; A1 brownish-yellow basally, brown apically; A2-A11 yellowish-brown to dark brown, gradually darkening distally.

Head. Vertex smoothly rounded onto occiput, coriaceous except for a narrow smooth area extending from median ocellus to occiput; no hyperoccipital carina; occiput coriaceous near vertex, otherwise smooth; occipital carina complete medially, finely crenulate; frons smooth except for orbital bands; ocellar setae absent; no frontal pit; frontal depression well developed; frons not bulging between antennal insertions and inner orbits; eyes extremely large, hairy; inner orbits angled at level of lateral ocelli; malar space coriaceous near antennal insertions, otherwise smooth; temples not bulging, not grooved, coriaceous sculpture along posterior orbits reaching only halfway to occipital carina.

Mesosoma. Mesoscutum convex (Fig. 85), finely coriaceous-pustulate; scutellum smooth, setose, submarginal foveae about equal in size to dorsellar punctures; dorsellum triangular, overlapping propodeum, finely punctate reticulate; acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface; anterior margin of mid coxal cavity expanded, lamellate, strongly crenulate; mesopleural furrow well developed; mesopleural carina absent, except at ventral extreme of mesepisternum; acetabular field small, indistinct; posterodorsal corner of metapleuron not expanded; metapleural carina absent.

Metasoma. T1 with 1 pair of sublateral setae, 3 pairs of lateral setae; greatest length of basal costae on T2 about two times medial length of T1.

Appendages. Antennae (Fig. 111) 11-segmented; clava 5-segmented; L A2 about equal to A3; A6 transverse; L, W A7<A8; A9-A10 transverse. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing narrow, greatest width only slightly greater than width of fringe at that point.

Male and host unknown.

Material. Holotype female: FLORIDA: Leon Co., Tall Timbers Research Station, 26-IX-1969, D.L. Harris, D-Vac Rep 3-B (FSCA). Paratype: TEXAS: Brewster Co., Big Bend National Park, 19-VII-1977, L. Masner, lowland desert springs, 1 female, (CNC).

Remarks. Similar in habitus and in dorsellar structure to the *T. podisi* species group; distinguished from them by the single pair of sublateral setae on T1 and the size of the eyes. Distinguished from species of the *T. californicus* complex with large eyes (usually males) by the triangular punctate-reticulate dorsellum.

I have seen males of several species of the *T. californicus* complex from the collection of the University of Arizona that also have huge compound eyes. Most of these were collected at light traps, indicating nocturnal habits. In addition to the size of the compound eyes as a whole, these species also have enormous individual ommatidia and ocelli, five to four times the normal size. The ocelli and ommatidia of *T. oculeus*, on the other hand, are very small, and, therefore, this species may not be nocturnal.

Telenomus persimilis

(Fig. 98)

Telenomus persimilis Ashmead, 1893:150, female. Type locality: Arlington, Virginia. Host: Unknown.
Microphanurus persimilis: Kieffer, 1926:107.
Telenomus persimilis: Masner and Muesebeck, 1968:69.

Female. TL: 1.18-1.36 mm; DCI: 1.91-2.14; FCI: 1.26-1.39; frons W/eye height: 1.05-1.21; W/L T1: 3.8-4.5 (n=5); L/W T2: 0.85-1.00 (n=5); L/W metasoma: 1.11-1.44; sample: 16-9.

Color. Head and body black; all coxae dark brown; legs otherwise yellow to brownish-yellow; radicle yellowish-brown; A1-A11 brown.

Very similar to *T. podisi,* differing in the following: vertex sharply angled throughout, but without hyperoccipital carina; occiput smooth; frontal depression well developed; frons distinctly bulging between antennal insertions and inner orbits; temples with a narrow band of coriaceous sculpture only along lower fourth of posterior orbits; mesoscutum coriaceous-pustulate, posteriorly pustulae aligned to form longitudinal elements; acetabular carina strongly crenulate; mesopleural carina absent, except at ventral extreme of mesepisternum; posterodorsal corner of metapleuron weakly expanded; greatest length of basal costae on T2 less than medial length of T1.

Male unknown.

Host. Pentatomidae (Heteroptera).

Material. FLORIDA: Ft. Pierce, 23-IX-1954, A.G. Selhime, ex pentatomid eggs on orange, 1 female (USNM). GEORGIA: Forsyth, 8-22-IX-1970, F.T. Naumann, Malaise trap, 1 female (CNC). ILLINOIS: Algonquin, 20-V-1896, 6737 [identified by W.H. Ashmead], 5 females (USNM, Illinois Natural History Survey). IOWA: Sioux City, 21-VIII-1921, C.N. Ainslie, ex hemip eggs on sunflower, 3 females (USNM). MISSOURI: Williamsville, 16-26-VI-1969, J.T. Becker, Malaise trap, 1 female (CNC). OHIO: Lawrence Co., 21-VI-1934, J.B. Polivka, 2 females (USNM). TENNESSEE: Knoxville, C.C. Hill, ex Pentatomid, Knoxville No. 16338, Webster No. 12390, 5 females (USNM). Lexington, Natchez Trace State Park, 20-26-VI-1972, G. Heinrich, Malaise trap, 1 female (CNC). SOUTH CAROLINA: Myrtle Beach, 13-IV-1966, E.G. Munroe, 2 females (CNC).

Remarks. This species is distinguished from *T. podisi* by the longitudinal elements in the mesoscutal sculpture and by the fact that the vertex is sharply angled throughout; *T. persimilis* may be separated from *T. grenadensis* and *T. scaber* by the dark antennae and coxae.

The type material of *T. persimilis* has been lost. The identity of this species is based upon specimens from Illinois and Michigan identified by Ashmead himself.

Telenomus persimilis is the only *T. podisi* group species sympatric with *T. podisi* throughout most of the United States. It is in general much rarer than *T. podisi* and appears to be restricted to the southeastern and midwestern states. The males of *T. podisi* are so variable that I have not been able to confidently identify male *T. persimilis* in the absence of reared specimens.

Telenomus phymatae

Telenomus phymatae Masner and Johnson, 1979:1115-1119, fig. 1-11, male, female. Type locality: Geneva, New York. Host: *Phymata* sp. (Heteroptera: Phymatidae). [Holotype in USNM.]

This species has recently been described in detail (Masner and Johnson 1979), and I will not repeat that information here. Since the original description,

T. phymatae has been collected in places that begin to fill in the gaps in its distribution: NORTH CAROLINA: Cherokee, 4-VI-1979, M. Sharkey and N. F. Johnson, 5 females. ONTARIO: Leitrim, Ottawa, 5-7-VII-1977, Malaise trap, L. Masner and G.A.P. Gibson, 2 males (CNC). TEXAS: Brewster Co., Big Bend National Park, 18-VII-1977, L. Masner, window trap, 1 male.

Telenomus podisi

(Figs. 10, 11, 16, 17, 21, 39, 47, 66, 77, 96, 97, 119)

Telenomus podisi Ashmead, 1893:158-159, male, female. Type locality: St. Louis, Missouri. Host: *Podisus spinosus [maculiventris]* (Heteroptera: Pentatomidae). [Lectotype in USNM.]
Telenomus dimmocki Ashmead, 1901:155-156, male, female. Type locality: Canobie Lake, New Hampshire. Host: Hemipteran. NEW SYNONYMY. [Lectotype in USNM.]
Telenomus fimbriatus Kieffer, 1904:539, female. Type locality: Wisconsin. Host: Unknown. NEW SYNONYMY. [Holotype in Naturhistoriska Riksmuseet, Stockholm.]
Telenomus heracleicola Brues, 1906:148, male, female. Type locality: Pullman, Washington. Host: Lepidopteran. NEW SYNONYMY. [Holotype in Museum of Comparative Zoology, Cambridge, Mass.]
Telenomus perplexus Girault, 1906:65-66, male, female. Type locality: Zanesville, Ohio. Host: *Brochymena* sp. (Heteroptera: Pentatomidae). NEW SYNONYMY. [Lectotype in USNM.]
Telenomus podisi: Kieffer, 1926:41.
Telenomus heracleicola: Kieffer, 1926:47.
*Microphanurus fimbriatus:*Kieffer, 1926:106.
Microphanurus perplexus: Kieffer, 1926:107.
Telenomus dimmocki: Masner and Muesebeck, 1968:63.
Telenomus perplexus: Masner and Muesebeck, 1968:69.
Telenomus podisi: Masner and Muesebeck, 1968:69.
Telenomus szelenyii Muesebeck, 1974:135-137, fig., female. Type locality: South Bellingham, Washington. Host: Egg [sic] of *Stilpnotia salicis* (L.) (Lepidoptera: Liparidae). NEW SYNONYMY. [Holotype in USNM.]

Female. TL: 0.95-1.40 mm; DCI: 1.75-2.06; FCI: 1.22-1.42; frons W/eye height: 0.94-1.13; W/L T1: 3.1-4.3; L/W T2: 0.86-1.06; L/W metasoma: 1.23-1.48; sample: 20-20.

Color. Head and body dark brown to black (older specimens usually at lighter end of range); fore coxae yellowish-brown to dark brown, never entirely yellow in Nearctic specimens; mid and hind coxae yellow to black; legs otherwise usually yellow, occasionally femora yellowish-brown to dark brown, with femoral tips, tibiae, trochanters, tarsi yellow to yellowish-brown; radicle, A1, underside of A2 usually yellow; A1 sometimes yellowish-brown to brownish-yellow, with apex and base yellow; dorsum of A2, A3-A11 brown to dark brown, antennae not sharply bicolored.

Head. Vertex smoothly rounded onto occiput at least medially, rounded or angled behind lateral ocelli, evenly coriaceous; hyperoccipital carina not developed; occiput coriaceous, sculpture reaching occipital carina; occipital carina complete medially, crenulate; orbital bands present, frons otherwise smooth; ocellar setae present or not; frontal depression weakly developed; frons slightly bulging between antennal insertions and inner orbits; eyes hairy; inner orbits angled at level of lateral ocelli; malar space smooth; temples not bulging, usually falling off sharply behind eyes to occipital carina (sometimes temples weakly rounded just behind eye), not grooved, bands of coriaceous sculpture along posterior orbits not reaching occipital carina (Fig. 39).

Mesosoma. Mesoscutum strongly convex (Figs. 21, 77), coriaceous-pustulate, without longitudinal elements in sculpture, background sculpture fading posteriorly; scutellum smooth, setose, setal bases pustulate, submarginal foveae about equal in size to dorsellar punctures; dorsellum broadly triangular, overlapping propodeum, coarsely punctate-reticulate (Fig. 47); acetabular carina

crenulate; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface (Fig. 16); anterior margin of mid coxal cavity weakly expanded, crenulate; acetabular field small, reaching neither mesopleural furrow nor intercoxal space; mesopleural furrow well developed; mesopleural carina absent; posterodorsal corner of metapleuron not strongly expanded; metapleural carina present, though sometimes indistinct anteriorly (Fig. 17).

Metasoma. T1 with 2-3 pairs of sublateral setae, 3-4 pairs of lateral setae (Fig. 10); greatest length of basal costae on T2 greater than medial length of T1, less than half length of T2.

Appendages. Antennae (Figs. 96, 97) 11-segmented; clava 5-segmented; L A2 less than or equal to L A3; A6 transverse; L, W A7<A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width 3 times width of fringe at that point.

Male. TL: 0.94-1.66 mm; DCI: 1.73-2.17; FCI: 1.26-1.44; frons W/eye height: 0.94-1.25; W/L T1: 3.4-4.3; L/W T2: 0.77-1.04; L/W metasoma: 1.10-1.67; sample: 20-18.

Differing from the female only in the following: antennae (Fig. 119): radicle, A1 brownish-yellow, A2-A12 brown, to A1-A5 yellow, A6-A12 brown; L A2<A3; A3-A5 longer than wide, A6-A12 moniliform; T1 sometimes with only a single pair of sublateral setae; dorsellum sometimes only weakly expanded; genitalia, see Fig. 66.

Hosts. *Banasa dimidiata, Chlorochroa sayi, Cosmopepla bimaculata, Cosmopepla carnifex, Diolcus chrysorrhoeus, Euschistus impictiventris, E. servus, E.* sp. probably *E. tristigmus, E. variolarius, Mormidea poecila, Nezara viridula, Peribalus limbolarius, Podisus maculiventris, Podisus placidus, Solubea pugnax, Trichopepla semivittata, Thyanta custator* (Heteroptera: Pentatomidae, Scutelleridae).

Distribution. CANADA: Alberta, British Columbia, Manitoba, New Brunswick, Ontario, Québec. USA: Alabama, Arizona, Arkansas, California, Colorado, Connecticut, District of Columbia, Florida, Georgia, Kansas, Kentucky, Louisiana, Maryland, Mississippi, Missouri, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, Tennessee, Texas, Virginia, Washington. MEXICO: Chiapas, Mexico, Michoacan, Morelos, Nuevo Leon. Other countries: Brasil (São Paulo), Cuba, Grenada, Grand Cayman Is., Guyana, Nicaragua, St. Vincent.

Remarks. *Telenomus podisi* is the most common Nearctic species of the *T. podisi* species group, and, throughout the northern United States and all of Canada, appears to be the only species. It may be distinguished from *T. sanctivincenti, T. scaber,* and *T. grenadensis* by the darkened fore coxae; from *T. cristatus* and *T. goliathus* by the lack of a hyperoccipital carina; from *T. calvus* by the setose scutellum; from *T. persimilis* by the lack of longitudinal mesoscutal sculpture; from *T. chloropus* by the two pairs of sublateral setae on T1 and by the lack of postocellar furrows; from *T. astrictus* by the coarse mesoscutal sculpture and the wider intercoxal space.

I have seen many specimens from throughout the Neotropics that I would place in this species. However, the diversity of the *T. podisi* group is much greater in the tropics, and I am less confident of the value of the diagnostic characters. Within the Nearctic this is a highly variable species, as is suggested by the length of the synonymic list. Specimens from the northern part of the

range usually differ from those in the southern part in the ratio of the lengths of A2 to A3 (<1 in the north, >1 in the south), the size of A7 in relation to A8 (subequal to A8 in the north, definitely smaller in the south, compare Figs. 96 and 97), general coloration of the appendages (yellow is more common in the south), and in overall size (generally larger in the north). All of these characters show a relatively smooth transition from one extreme to the other in the central part of the range, even the time-honored antennomere characters.

The high degree of morphological variability may, in part, be related to the presumed polyphagous nature of the species. I have reported host records only for specimens I have personally examined. I have, of course, had to accept the host identifications accompanying the specimens, an assumption that may often be wrong. Brues (1906) cited the host of *Telenomus heracleicola* as a lepidopteran. I have not seen the eggs from which the specimens were reared, and so can only conclude from the abundance of other records that this was a misidentification. Muesebeck's host record of *Leucoma salicis* for *T. szelenyii* resulted from the abbreviation of the collection data to fit on the label. The original Hopkins record, brought to my attention by Dr. T. R. Torgersen, states that the type series was reared from the hibernacula of the satin moth, and not the eggs. The data on the specimens reads simply "ex *Stilpnotia salicis.*" Significantly, the type series is made up only of females. It seems clear that the hibernacula of this moth represent the overwintering site and not the host.

Given the widespread nature of this species in the New World, two facts about its geographical distribution are outstanding. First, *T. podisi* is extremely rare in the arid southwestern United States. I have seen less than a half dozen specimens from New Mexico, Arizona, and southern California, even though extensive collections have been made in cultivated areas (the contiguous Mexican states of Baja California, Chihuahua, and Sonora are too poorly collected to draw any conclusions). Perhaps not coincidentally, this area corresponds to the distribution of the single Nearctic species of *Psix,* also a pentatomid egg parasite. Secondly, *T. podisi* is entirely absent from Europe, where it is replaced by *T. chloropus* and *T. heydeni.* I have found through study of European collections that very few species of *Telenomus* parasitic in the eggs of Hemiptera have Holarctic distributions.

Telenomus prolatus new species

(Figs. 79, 110)

Female. TL: 1.34 mm; DCI: 1.94; FCI: 1.21; frons W/eye height: 1.00; W/L T1: 4.5; L/W T2: 1.04; L/W metasoma: 2.00; sample: 1-1.

Color. Head and body dark brown; legs, including all coxae, yellow; radicle yellow; A1, A2 brownish-yellow; A3-A11 brown.

Head. Vertex smoothly rounded onto occiput, finely coriaceous along orbits, smooth elsewhere; no hyperoccipital carina; occiput smooth; occipital carina complete, finely crenulate; orbital bands finely coriaceous, not broken, frons otherwise smooth, with two widely spaced rows of setae parallel to inner orbits; ocellar setae absent; no frontal pit; frontal depression well developed; frons not bulging between antennal insertions and inner orbits; eyes glabrous; inner orbits angled at level of lateral ocelli; area between lower half of eye and antennal insertions coriaceous, malar space elsewhere smooth; temples not bulging, falling off sharply behind eyes to occipital carina, not grooved, bands of coriaceous sculpture along posterior orbits extending only one-third distance to occipital carina.

Mesosoma. Mesoscutum convex, anterior two-thirds finely coriaceous, posterior third smooth, setal bases not pustulate; scutellum smooth, sparsely setose, submarginal foveae small; dorsellum longest medially, not overlapping propodeum, irregularly carinate; acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface; anterior margin of mid coxal cavity not expanded, crenulate; mesopleural furrow well developed; mesopleural carina indicated only at ventral extreme of mesepisternum; acetabular field small, reaching neither mesopleural furrow nor intercoxal space; posterodorsal corner of metapleuron expanded; metapleural carina indicated only at posterior extreme.

Metasoma. T1 with 1 pair of sublateral setae, 4 pairs of lateral setae; greatest length of basal costae on T2 about equal to medial length of T1.

Appendages. Antennae (Fig. 110) 11-segmented; clava 5-segmented; L A2>A3; A6 transverse; A9-A10 transverse; L, W A7<A8. Wings clear, reaching or just surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width three times width of fringe at that point.

Male and host unknown.

Material. Holotype female: FLORIDA: Levy Co., 3-IV-1954, H.V. Weems, Jr. (FSCA).

Remarks. Distinguished from other species of *Telenomus* with a smooth vertex, *T. dolichocerus, T. abruptus,* and *T. dentatus,* by the combination of the transverse head (DCI=1.94), the elongate metasoma (twice as long as wide), and the single pair of sublateral setae on T1.

Telenomus puticulus new species

(Figs. 76, 115)

Female. TL: 1.14 mm; DCI: 2.18; FCI: 1.42; frons W/eye height: 1.06; W/L T1: 4.5; L/W T2: 0.82; L/W metasoma: 1.41; sample: 1-1.

Color. Head and body dark brown to black; fore coxae yellowish-brown; legs otherwise yellow; radicle and A1 yellow; A2-A6 yellowish-brown to brown, darkening distally; A7-A11 brown.

Head. Vertex smoothly rounded onto occiput medially, angled behind lateral ocelli, evenly coriaceous; no hyperoccipital carina; occiput smooth; occipital carina complete medially, simple; orbital bands complete, frons otherwise smooth; ocellar setae absent; frontal pit present; frontal depression very weakly developed; frons not bulging between antennal insertions and inner orbits; eyes extremely hairy; inner orbits angled at level of lateral ocelli; malar space smooth; temples neither bulging nor grooved, with narrow band of coriaceous sculpture along posterior orbits, sculpture not reaching occipital carina.

Mesosoma. Mesoscutum strongly convex (Fig. 76), alutaceous-pustulate, background sculpture fading posteriorly; scutellum smooth, setose, submarginal foveae fine, but larger than dorsellar punctures; dorsellum rectangular, as long laterally as medially, finely punctate above, striate below (similar to *T. californicus,* Fig. 18); acetabular carina simple; episternal foveae absent; width of intercoxal space about equal to length of fore coxae; anterior margin of mid coxal cavity not expanded, crenulate; mesopleural scrobe well developed; mesopleural carina absent; posterodorsal corner of metapleuron not expanded; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 3 pairs of lateral setae; greatest length of basal costae on T2 less than medial length of T1.

Appendages. Antennae (Fig. 115) 11-segmented; clava 5-segmented; L A2>A3; A6 transverse; A9-A10 transverse; L, W A7 subequal to A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width 3.5 times width of fringe at that point.

Male and host unknown.

Material. Holotype female: FLORIDA: [Seminole Co.], Casselberry, 4-III-1975, W.R.M. Mason (CNC).

Remarks. Differentiated from the only other known Nearctic species of *Telenomus* with a frontal pit, *T. abitus,* by the more transverse head (DCI=2.18). Otherwise, *T. puticulus* closely resembles many species of the *T. californicus* complex, and may be distinguished from them by the possession of the frontal pit and two pairs of sublateral setae on T1.

Most of the characters through which *T. puticulus* appears to be similar to the *T. californicus* complex seem to be plesiomorphic, but the resemblance in the structure of the dorsellum may indicate that the two form a monophyletic group. If so, this suggests that the *T. californicus* complex may have evolved from an ancestral species with a frontal pit and two pairs of sublateral setae independently of the *T. laricis, T. nigrocoxalis, T. floridanus,* and *T. longicornis* species groups.

Telenomus sanctivincenti

Telenomus Sancti-Vincenti Ashmead, 1894:211, male, female. Type locality: St. Vincent. Host: Unknown. [Lectotype, present designation, in British Museum (Natural History).]
Liophanurus St Vincenti: Kieffer, 1912:61.
Liophanurus sancti-vincenti: Kieffer, 1926:80.

Female. TL: 1.41 mm; DCI: 2.05; FCI: 1.30; frons W/eye height: 1.10; W/L T1: 3.7; L/W T2: 1.00; L/W metasoma: 1.33; sample: 1-1.

Color. Head and body black; legs, including all coxae, yellow; radicle and A1 yellow; A2-A11 yellowish-brown basally, brown apically, antennae gradually darkening toward apex.

Very similar to *T. podisi,* but differing in the following: orbital bands broad, continuing nearly to malar sulcus; ocellar setae present; occiput smooth; frontal depression weakly developed; frons not bulging between antennal insertions and inner orbits; L A2=A3; A6 quadrate; mesoscutum without pustulae, anterior two-thirds finely coriaceous, posterior third smooth; dorsellum, compared with *T. podisi,* laterally compressed.

Male and host unknown.

Material. Lectotype female (here designated): St. Vincent, W.I., H.H. Smith; *Telenomus sancti vincenti* Ashm., ♀ Type; Lectotype, *Telenomus sanctivincenti* Ashmead, desig. N.F. Johnson, 1981 (British Museum). FLORIDA: Charlotte Co., Punta Gorda, IV-1952, O. Peck (CNC).

Remarks. Distinguished from *T. podisi* by the yellow fore coxae and the fine mesoscutal sculpture; from *T. scaber* and *T. grenadensis* by the lack of distinctly bicolored antennae and the finely coriaceous mesoscutum.

I know this species only from the lectotype and the specimen described above, both poorly mounted. Further study of the Neotropical species of the *T. podisi* group may dictate that this species be synonymized with *T. podisi.* The male described by Ashmead (1894) is not conspecific with the female.

Telenomus scaber

(Fig. 93)

Telenomus scaber Ashmead, 1894:208-209, female. Type locality: St. Vincent. Host: Unknown. [Holotype in British Museum (Natural History).]
Liophanurus scaber: Kieffer, 1926:77.

Female. TL: 1.14-1.51 mm; DCI: 1.86-2.09; FCI: 1.31-1.42; frons W/eye height: 1.00-1.11; W/L T1: 3.1-3.9 (n=6); L/W T2: 0.91-1.00 (n=6); L/W metasoma: 1.22-1.48; sample: 17-3.

Color. Head and body black; legs, including all coxae, yellow; radicle, A1-A6, excluding dorsum A2-A4, yellow; A2-A4 brown above; A7-A11 dark brown, antennae distinctly bicolored.

Similar to *T. podisi,* but differing in the following: hyperoccipital carina present; occipital carina simple; occiput smooth; orbital bands narrow; ocellar setae present; frontal scrobe well developed; frons bulging between antennal insertions and inner orbits; antennae (Fig. 93): L A2<A3; L, W A7 subequal to A8; clava 5- or 6-segmented; mesoscutum with pustulae aligned to form longitudinal elements posteriorly, background coriaceous sculpture not fading posteriorly; acetabular carina indistinctly crenulate or simple; width of intercoxal space about equal to length of setae arising from its surface; greatest length of basal costae on T2 less than medial length of T1.

Male and host unknown.

Material. Holotype female: ST. VINCENT: W.I., H.H. Smith, 210; type; No. 2518 U.S.N.M.; *Telenomus scaber* Ashm., ♀ Type, Unique (British Museum). Other material: FLORIDA: Pinellas Co., Clearwater, 6-12-IV-1977, N.F. Johnson, pan traps, 4 females. Columbia Co., O'Leno State Park, 1-III-1958, F.W. Mead, at *Quercus,* 1 female (FSCA). Elfers, 16-IV-1952, O. Peck, 1 female (CNC). Tarpon Springs, 17-IV-1952, J.R. Vockeroth, 1 female (CNC). TEXAS: Brazos Co., College Station, 18-III-1969, Veryl V. Board, 12 females (USNM).

Remarks. Distinguished from *T. podisi* and *T. persimilis* by the presence of a hyperoccipital carina; from *T. cristatus* by the presence of ocellar setae and longitudinal elements in the mesoscutal sculpture; from *T. goliathus* by the yellow coxae and scape.

The strength of the longitudinal elements in the mesoscutal sculpture is fairly variable: in some specimens the mesoscutum appears to be entirely striate; in others the striae are expressed only near the scuto-scutellar sulcus.

Telenomus sulculus new species

(Figs. 40, 43, 44, 48, 70, 86, 87, 90, 91, 103, 122)

Female. TL: 1.24-1.73 mm; DCI: 1.72-2.00; FCI: 1.07-1.23; frons W/eye height: 0.88-1.11; W/L T1: 4.0-6.3 (n=11); L/W T2: 1.07-1.28 (n=10); L/W metasoma: 1.68-2.46; sample: 20-8.

Color. Head and body black; all coxae dark brown to black; femora and tibiae, except bases and apices, dark brown; legs otherwise yellowish-brown; radicle yellowish-brown; antennae otherwise dark brown.

Head. Vertex smoothly rounded onto occiput, coriaceous throughout; no hyperoccipital carina; occiput with narrow smooth band along occipital carina, elsewhere with same sculpture as vertex; occipital carina complete medially, finely crenulate; frons completely smooth, orbital bands absent (Fig. 43); setae on frons long, insertions large and distinct, although not as large as those of

T. phymatae; ocellar setae absent; frontal pit absent; frontal depression well developed, broad; frons not bulging between antennal insertions and inner orbits; eyes with short, sparse hairs; inner orbits rounded at level of lateral ocelli; malar space smooth; apical margin of clypeus with medial tooth, sometimes somewhat weakly developed (Fig. 44); temples weakly bulging, grooved (Fig. 40), coriaceous sculpture along posterior orbits extending to occipital carina.

Mesosoma. Mesoscutum convex (Fig. 86), or weakly depressed, coriaceous-pustulate, background sculpture fading posteriorly; scutellum smooth, setose, submarginal foveae subequal in size to dorsellar punctures; dorsellum weakly produced medially, not overlapping propodeum, punctate-reticulate (Fig. 48); acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface; anterior margin of mid coxal cavity not expanded, simple; mesopleural furrow well developed; mesopleural carina absent; acetabular field very small, reaching neither mesopleural furrow nor intercoxal space; posterodorsal corner of metapleuron weakly expanded; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 4-5 pairs of lateral setae; basal costae on T2 extremely short, anterior margin appearing crenulate.

Appendages. Antennae (Fig. 103) 11-segmented; clava 5-segmented; L A2>A3; A6 strongly transverse; A9-A10 transverse; L, W A7<A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width three times width of fringe at that point.

Male. TL: 1.05-1.78 mm; DCI: 1.30-1.57; FCI: 1.08-1.20; frons W/eye height: 1.20-1.40; W/L T1: 3.8-7.7 (n=19); L/W T2: 0.57-1.00 (n=18); L/W metasoma: 1.00-1.56; sample: 20-4.

Color. Head and body brown; legs, including all coxae, yellow; antennae brownish-yellow throughout.

Head (Figs. 90, 91) greatly enlarged; vertex broadly rounded onto occiput, smooth; no hyperoccipital carina; occiput smooth; occipital carina complete, simple; frons smooth throughout; no ocellar setae; no frontal pit; marginal setae on frons long, arising from distinct punctures as in female; frontal depression deep, strongly developed, outer margins carinate below; frons not bulging between antennal insertions and inner orbits; eyes reduced, bare; inner orbits rounded at level of lateral ocelli; mandibles very strongly developed, tridentate, apices of mandibles acute, not truncate as in female; clypeus strongly concave, apical margin straight, not dentate; temples strongly bulging, not grooved, smooth.

Mesosoma strongly reduced (Figs. 90, 91); mesoscutum laterally compressed, flattened, smooth, setal bases not pustulate; scutellum smooth, setose; dorsellum weakly developed, finely punctate; acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae; anterior margin of mid coxal cavity not expanded, simple; mesopleural furrow well developed; mesopleural carina absent; acetabular field extremely small, reaching neither mesopleural furrow nor intercoxal space; posterodorsal corner of metapleuron not expanded, posterior margin rounded onto propodeum, ecarinate; legs greatly enlarged and compressed.

Metasoma strongly reduced in size; T1 with 1-3 pairs of sublateral setae, 5 pairs of lateral setae; T1 and T2 fused; T2 without basal costae.

Appendages. Antennae (Fig. 122) 12-segmented; A1 with anterior surface

produced into a tooth; L A2>A3; A3-A11 moniliform. Wings (Fig. 87) strongly reduced, darkened, narrowed and straplike; hind wings very short, not surpassing apex of metasoma.

Hosts. *Zelus rubidus* (Morelos), *Zelus* sp. (Florida, Vera Cruz, Peru) (Heteroptera: Reduviidae).

Material. Holotype female: MEXICO: Vera Cruz, 1959, ex eggs *Zelus* sp. (USNM). Paratypes. 29 females and 16 males with same data as holotype (USNM). FLORIDA: Alachua Co., S9-T10S-R18E; Pierce's Homestead; 31-XII-1973; Malaise trap, W.H. Pierce, 1 female (FSCA). Marion Co., Ocala, 9-IX-1975; L. Viñas; em. 30-IX-1975, ex: *Zelus* eggs, 10 females (FSCA). MEXICO. Mexico City, 1959, 59-3622, 1 male, 1 female (USNM). MORELOS: Cuernavaca; N.T. Osborn, coll., XI-1923; Ex eggs *Zelus rubidus,* 5 males, 5 females (Museum of Comparative Zoology). VERA CRUZ: Cotaxtla, 7-I-1958, ex eggs *Zelus* sp., 2 males, 6 females (USNM). CUBA. Cen. Baragua, 15-II-1926, L. Scaramuzza Coll.; T.P.R.F. no. 3195; ex eggs hemip., 1 male, 8 females (USNM). On eggplant; at quarantine New York, NY, 19-I-1925; D.P. Limber, coll. NY no. 5432, 8 females (USNM). EL SALVADOR. Santa Tecla, Berry 98, 8-VIII-1951-10138, 15 females (USNM). ECUADOR. Portoviejo, 1 male (USNM). PERU. Lambayeque; ex eggs *Zelus* sp., 3 males (USNM).

Remarks. The grooved temples of the female of this species will distinguish it from all other *Telenomus,* except *T. phymatae* and *T. ovivorus* (Ashmead). *Telenomus sulculus* may be separated from *T. phymatae* by means of the elongate metasoma and the lack of large, umbilicate frontal punctures. The punctate-reticulate dorsellum of *T. sulculus* (Fig. 48) contrasts sharply with the smooth one of *T. ovivorus* (Ashmead) (Fig. 51).

Telenomus sulculus is the species with "monster males" from the collection of the Museum of Comparative Zoology mentioned by Masner (1976). He reported that this species had two male morphs, similar to the situation in *T. polymorphus.* However, this series also has two distinctly different females that I believe are not conspecific. The "normal" male corresponds closely with the female of the other species, i.e., it is not *T. sulculus.* From this series alone I would not be able to associate the "monster males" with the female *T. sulculus.* This association is based upon the other reared series in which are found only a single male and female morph. Therefore, at least for this species, I must conclude that there is no male polymorphism. The functional reasons for the peculiar morphology of the males remain speculative, at least until this species can be reared and observed alive.

Telenomus tanymerides new species

(Figs. 42, 80, 106)

Female. TL: 1.35-1.65 mm; DCI: 1.55-1.68; FCI: 1.06-1.10; frons W/eye height: 0.67-0.81; W/L T1: 3.4-3.7 (n=4); L/W T2: 1.10-1.14 (n=4); L/W metasoma: 1.53-2.29; sample: 7-4.

Color. Head and body black; fore coxae yellow to dark brown; legs otherwise yellow; radicle, A1, underside A2 yellow, or A1 yellow only in basal half, brown apically; antennae otherwise dark brown.

Head. Vertex smoothly rounded onto occiput, coriaceous; no hyperoccipital carina; occiput coriaceous throughout; occipital carina incomplete, crenulate, sometimes very finely so; frons with orbital bands narrowed near midpoint of eyes, otherwise smooth; ocellar setae present or absent; no frontal pit; frontal depression well developed; frons slightly bulging between antennal insertions

and inner orbits; eyes glabrous or very sparsely setose; inner orbits angled at level of lateral ocelli; malar space smooth; area of clypeus just below interantennal prominence with a small, protruding lamella, the surface of which is more or less perpendicular to the plane of the interantennal prominence, apical margin of lamella notched medially (Fig. 42); temples bulging, not grooved, coriaceous sculpture along posterior orbits extending over three-fourths distance to occipital carina.

Mesosoma. Mesoscutum flattened, coriaceous-pustulate, pustulae weakly developed; scutellum smooth, setose, submarginal foveae and dorsellar punctures subequal in size; dorsellum only slightly longest medially, not overlapping propodeum, punctate-reticulate; acetabular carina simple; episternal foveae absent; width of intercoxal space subequal to length of fore coxae; posterior margin of mid coxal cavity weakly expanded, crenulate; mesopleural furrow well developed; mesopleural carina absent except sometimes at ventral extreme of mesepisternum; acetabular field small, reaching but not entering mesopleural furrow, not reaching intercoxal space; posterodorsal corner of metapleuron expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 2 pairs of sublateral setae, 4 pairs of lateral setae; greatest length of basal costae on T2 slightly less than medial length of T1.

Appendages. Antennae (Fig. 106) 11-segmented; clava 5-segmented; L A2<A3; A6 longer than wide; A9-A10 transverse; L, W A7 subequal to A8; A3-A6 remarkably elongate; clava relatively short and narrow. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width 2.7 times width of fringe at that point.

Male and host unknown.

Material. Holotype female: ARIZONA: Portal, Southwest Research Station, 19-X-1978, L. Masner & G.A.P. Gibson (CNC). Paratypes. ARIZONA: Oak Crk. Cn. Sedona, 29-VI-1953; W.W. Wirth Collector, 1 female (USNM). MEXICO. CHIAPAS: San Cristóbal de las Casas, 1-3-VI-1969, Malaise trap (CNC). MICHOACAN, Huetamo Hgwy 15, 7-III-1972, F. Parker & D. Miller, 2 females (USNM). NUEVO LEON, 9 mi. S Monterrey, 11-VIII-1972, E. E. Grissell (TAM).

Remarks. Most closely related to *T. abruptus* from which it may be distinguished by the coriaceous vertex and the presence of the clypeal lamella.

The clypeal lamella is an unusual structure, most easily seen in lateral view. Aside from its presence, the clypeus appears to be normal for a *Telenomus*. Its function and homologies are unknown.

Telenomus zeli new name

(Figs. 69, 82, 102, 120)

Telenomus pentatomus Kieffer, 1906:261, (not Thomson 1860) male, female. Type locality: Ormsby, Nevada. Host: Unknown. [Lectotype (here designated) in California Academy of Sciences, San Francisco.]

Telenomus tetratomus Kieffer, 1906:261 (not Thomson 1860), female. Type locality: Ormsby, Nevada. Host: Unknown. NEW SYNONYMY [Holotype in California Academy of Sciences, San Francisco.]

Telenomus tetratomus: Kieffer, 1926:42.

Telenomus pentatomus: Kieffer, 1926:42-43.

Female. TL: 1.15-1.54 mm; DCI: 1.50-1.68; FCI: 1.00-1.17; frons W/eye height: 0.67-0.94; W/L T1: 4.6-5.8 (n=6); L/W T2: 1.04-1.27 (n=8); L/W metasoma: 1.27-2.05; sample: 23-15.

Color. Head and body black; fore coxae yellowish-brown to black; mid and hind coxae dark brown to black; femora, tibiae yellowish-brown to dark brown, bases and apices lighter; trochanters, tarsi brownish-yellow to yellowish-brown; radicle, extreme base of A1, and, rarely, undersides A2, A3 brownish-yellow to yellowish-brown; antennae otherwise dark brown to black.

Head. Vertex broadly rounded onto occiput, evenly coriaceous; no hyperoccipital carina; occiput coriaceous throughout; occipital carina complete medially, crenulate; orbital bands complete, frons otherwise smooth; ocellar setae absent; frontal pit absent; frontal depression weakly developed; frons not bulging between antennal insertions and inner orbits; eyes very sparsely setose, nearly bare; inner orbits angled at level of lateral ocelli; malar space smooth; apical margin of clypeus medially dentate, tooth may sometimes be very weakly developed or hidden by mandibles; temples distinctly bulging, not grooved, coriaceous sculpture along posterior orbits extending to occipital carina.

Mesosoma. Mesoscutum slightly flattened, coriaceous-pustulate; scutellum smooth, setose, submarginal foveae about equal in size to dorsellar punctures; dorsellum longest medially, slightly compressed laterally, weakly triangular, overlapping propodeum, punctate-reticulate; acetabular carina simple; episternal foveae absent; width of intercoxal space less than length of fore coxae, greater than length of setae arising from its surface; anterior margin of mid coxal cavity not expanded, crenulate or simple; mesopleural furrow well developed; mesopleural carina absent; acetabular field reaching neither mesopleural furrow nor intercoxal space; posterodorsal corner of metapleuron expanded, lamellate; metapleural carina absent.

Metasoma. T1 with 1-2 pairs of sublateral setae, 4 pairs of lateral setae; greatest length of basal costae on T2 subequal to medial length of T1, very weak wrinkles may extend further, but not as far as middle of T2.

Appendages. Antennae (Fig. 102) 11-segmented; clava 5-segmented; L A2 subequal A3; A6 transverse; A9-A10 transverse; L, W A7 < A8. Wings clear, surpassing apex of metasoma; basal vein not pigmented; postmarginal vein longer than stigmal; hind wing broad, greatest width more than twice width of fringe at that point.

Male. TL: 1.18-1.45 mm; DCI: 1.48-1.60; FCI: 1.04-1.15; frons W/eye height: 0.67-0.94; W/L T1: 4.6 (n=1); L/W T2: 1.14-1.20 (n=2); L/W metasoma: 1.42-1.64; sample: 6-6.

Color. Head and body brown to black; coxae yellowish-brown to dark brown; legs otherwise brownish-yellow, femora sometimes dark brown medially; radicle, A1-A7 yellow; A8-A12 brown.

Otherwise very similar to the female, differing only in the following: antennae (Fig. 120): length A3 much greater than A2; A3-A5 longer than wide; A6-A11 moniliform; clypeal tooth usually more strongly developed; T1 with 1 pair of sublateral setae; genitalia, see Fig. 69.

Host. *Zelus renardii* (Arizona), *Zelus* sp. prob. *exsanguis* (Ontario), *Zelus* sp. (Wisconsin), reduviid (Arizona) (Heteroptera: Reduviidae).

Material. Lectotype female: Ormsby Co., Nev [NEVADA], July. Baker; 113; *Telenomus pentatomus* Kieff.; California Academy of Sciences Type No. 9718; lectotype *Telenomus pentatomus* Kieffer, 1905, desig. N. F. Johnson 1981; Type of *Telenomus zeli* Johnson, n. name for *T. pentatomus* K. nec Thomson 1860.

Other material. 61 females, 5 males: CANADA: BRITISH COLUMBIA: Oliver (14-VII). NEW BRUNSWICK: Aldershot (18-IX). ONTARIO: Brighton, Perkinsfield, Marmora, Ottawa, Harris Hill, Finland (3, 17, 29-VII; 3, 5, 17, 25, 27-VIII; 14-IX). QUEBEC: Lac Brule (22-VIII). USA: ARIZONA: Cochise, Graham, Maricopas, Pima, Pinal Cos. (30-III; 21-IV; 3-4-V; 7, 20-22, 24-VI; 1, 7, 21, 24-27, 29-VII; 5, 7, 18-VIII; 10-X; 2, 13-XI). FLORIDA: Lake, Pinellas Cos. (18-IV; 20-XII). NEVADA: Ormsby Co. (VII; holotype of *T. tetratomus* Kieffer; paralectotypes of *T. pentatomus* Kieffer [Cornell University]). TEXAS: Brazos, Brewster Cos. (22-VI; 19-VII). WISCONSIN: Dane Co. (25-VI). Specimens in collections of the USNM, University of Arizona, FSCA, CNC, and Texas A&M University.

Remarks. This species may be distinguished from others of the *T. phymatae* group (*T. phymatae* and *T. sulculus*) by the absence of a groove on the temples.

I have tried to rear *Telenomus zeli* from the eggs of *Zelus* collected in New York state. The eggs are relatively easy to find, but I have only succeeded in obtaining a few eupelmids from them. This difficulty in rearing suggests, given the common occurrence of adults of *T. zeli,* that the normal hosts may be reduviids that oviposit in a less conspicuous manner.

KEY TO NEARCTIC TELENOMINAE

The key that follows is based only on the females of Nearctic species. Males, as a rule, tend to be much less common, even in reared material, and much more variable. Nevertheless, except where secondary sexual characters are used, the key, used in conjunction with the species group descriptions, should work for males. Males of Telenominae are recognized by their 12-segmented (rarely 11) filiform antennae; females by their 10- to 11-segmented clavate antennae. All genera of Nearctic Telenominae are included. Only *Telenomus* is continued below the generic level, to species groups where possible. In addition, all species described in this paper are keyed.

1. Notauli well developed 2
1′. Notauli absent 3

2(1). Antennal clava 5-segmented; T1 with at least one pair of sublateral setae ..... ***T. nigricornis*** (Figs. 15, 29, 37)
2′. Antennal clava 6-segmented; T1 with no pairs of sublateral setae ..... ***Trissolcus*** (Fig. 19)

3(1′). Scutellum coriaceous 4
3′. Scutellum smooth 5

4(3). Antennal clava 6-segmented; cheeks not striate; fore coxae distinctly separated from mid coxal cavity (Fig. 19) .. ***Trissolcus***
4′. Antennal clava 5-segmented; cheeks with fanlike striae arising from mandibles; fore coxae almost contiguous with mid coxal cavity (Fig. 20) ..... ***Psix***

5(3′). Metanotum bispinose ..... ***Aradoctonus***
5′. Metanotum never bispinose, either broadly triangular or rectangular (Figs. 47-54) 6

6(5′). T1 with two or more pairs of sublateral setae (Fig. 10) 7
6′. T1 with less than two pairs of sublateral setae 25

7(6′). Metapleural carina present (Fig. 17); DCI > 1.75; temples never grooved; frontal pit absent (the *T. podisi* species group and *T. consimilis)* 8
7′. Metapleural carina absent; DCI usually < 1.75; if not, then temples grooved (Fig. 40), or frontal pit present (Fig. 9) 16

8(7). Fore coxae yellow 9
8′. Fore coxae darkened 11

9(8). A7-A11 dark brown; A1-A6 yellow; frontal scrobe deep, frons bulging between antennal insertions and inner orbits; mesoscutum coarsely sculptured 10
9′. Flagellum gradually darkening toward apex, no abrupt change in color between A6 and A7; frontal scrobe shallow, frons not bulging between antennal insertions and inner orbits; mesoscutum finely coriaceous anteriorly, smooth posteriorly ..... ***T. sanctivincenti***

10(9). Vertex sharply angled, but without hyperoccipital carina; mesoscutum punctate-reticulate; episternal foveae present ..... ***T. grenadensis***

10′. Vertex with hyperoccipital carina (Figs. 5, 6); mesoscutum coriaceous-pustulate; episternal foveae absent ..... ***T. scaber***

11(8′). Vertex either with hyperoccipital carina (Figs. 5, 6), or sharply angled throughout 12

11′. Vertex, at least medially, smoothly rounded onto occiput (Fig. 8) 14

12(11). Mesoscutal sculpture with longitudinal elements throughout; vertex sharply angled, but without hyperoccipital carina; dorsellum laterally compressed; A2 subequal in length to A3; A5 transverse ..... ***T. persimilis***

12′. Mesoscutal sculpture without longitudinal elements; hyperoccipital carina present; dorsellum broadly triangular; A3 distinctly longer than A2; A5 distinctly longer than wide 13

13(12′). Legs and A1 yellow ..... ***T. cristatus***

13′. Appendages dark brown to black ..... ***T. goliathus***

14(11′). DCI less than 1.7; mesoscutum distinctly flattened (Fig. 74); A2 longer than A3; hind wing narrow, greatest width less than two times width of fringe at that point ..... ***T. consimilis***

14′. DCI greater than 1.75; mesoscutum strongly convex (Fig. 77); A3 usually longer than A2; hind wing broad, greatest width usually more than two times width of fringe at that point .. 15

15(14′). Intercoxal space extremely narrow, length less than length of setae arising from its surface, acetabular carina nearly meeting edge of mid coxal cavity; mesoscutum finely coriaceous anteriorly, smooth posteriorly, setal bases not pustulate ..... ***T. astrictus***

15′. Length of intercoxal space greater than length of setae arising from its surface (Fig. 16); mesoscutum coriaceous-pustulate ..... ***T. podisi***

16(7′). Mid and hind coxae brown to black 17

16′. Mid and hind coxae yellow 22

17(16). Temples with a superficial groove arising from malar sulcus and extending dorsally (Fig. 40) (the *T. phymatae* species group) 18

17′. Temples without such a groove 19

18(17). Frons dorsally with large setigerous punctures; with well developed bands of coriaceous sculpture along inner orbits ..... ***T. phymatae***

18′. Frons without such punctures; no sculpture along inner orbits (Fig. 43) ..... ***T. sulculus***

19(17′). Basal vein strongly pigmented .... ***T. longicornis* group** (Figs. 26, 41)

19′. Basal vein not pigmented 20

20(19′). Sculpture along posterior orbits reaching occipital carina; frons width less than eye height; scutellum setose 21

20′. Posterior orbital sculpture not reaching occipital carina; frons width greater than eye height; scutellum glabrous (Fig. 54)..... ***T. calvus***

21(20). Metasoma 1.25-2.05 times as long as wide; greatest length; of basal costae on T2 subequal to medial length of T1; mesoscutum coriaceous-pustulate..... ***T. zeli***

21′. Length of metasoma 2.10-2.40 times width; fine sculpture on T2 extending beyond base 2.0-2.5 times medial length of T1; mesoscutum coriaceous, setal bases not pustulate..... ***T. exilis***

22(16′). Occipital carina simple (Fig. 12)..... 23

22′. Occipital carina crenulate (Figs. 11, 15) 24

23(22). DCI > 2.00; frontal pit present; clypeal lamella absent..... ***T. puticulus***

23′. DCI < 1.70; frontal pit absent; clypeal lamella present (Fig. 42)..... ***T. tanymerides***

24(22′). Occipital carina incomplete medially, not produced laterally; coriaceous sculpture along posterior orbits not reaching occipital carina; eyes nearly glabrous..... ***T. abruptus***

24′. Occipital carina complete medially, dentate laterally (Fig. 81); orbital sculpture reaching occipital carina; eyes distinctly hairy ..... ***T. dentatus***

25(6′). Dorsellum smooth, only very weakly expanded (Figs. 15, 51); basal vein not pigmented; disk of scutellum glabrous; body dorsoventrally depressed (Figs. 27-29)..... 26

25′. Dorsellum expanded, at least in part punctate or striate; if dorsellar sculpture weak (e.g., Fig. 52), then basal vein strongly pigmented; scutellum setose; body usually robust..... 27

26(25). Marginal vein elongate, distinctly longer than stigmal; postmarginal vein absent ..... ***Eumicrosoma*** (Figs. 27, 35)

26′. Marginal vein shorter than stigmal; postmarginal present..... ***T. floridanus*** group (Figs. 28, 36)

27(25′). Both A9 and A10 longer than wide (Fig. 114), or, rarely, clava serrate (if uncertain, go to 30)..... 28

27′. A9-A10 transverse and clava never serrate 30

28(27). Basal vein strongly pigmented; fore wings usually infuscate throughout or banded..... ***T. longicornis*** group (Figs. 26, 41)

28′. Basal vein not pigmented; fore wings clear 29

29(28′). Length of A2 greater than or equal to A3; vertex coriaceous throughout ..... ***T. floridanus*** group

29′. A2 distinctly shorter than A3; vertex usually smooth medially ..... ***T. dolichocerus***

30(27′). Club 6-segmented; frons usually sculptured throughout (Fig. 9)..... ***Trissolcus***

30′. Club with 5 or fewer segments; frons usually smooth medially (Fig. 7)..... 31

31(30′). Episternal foveae present (Fig. 14); frontal depression highly reduced or absent; eyes usually glabrous ..... ***T. crassiclava*** group (Figs. 14, 22, 32)

31′. Episternal foveae absent; frontal depression usually well developed; eyes rarely bare 32

32(31′). Basal vein pigmented; fore wings often banded or infuscate throughout; greatest width of hind wing equal to width of fringe at that point ..... ***T. longicornis*** group (Figs. 26, **41**)

32′. Basal vein rarely pigmented; if so, hind wing much wider than fringe 33

33(32′). DCI < 1.80; temples usually distinctly bulging 34

33′. DCI > 1.80; temples dropping off sharply behind eyes 38

34(33). Occipital carina crenulate (Fig. 11, 15); frons width less than eye height; coriaceous sculpture along posterior orbits extending at least three-fourths the distance to occipital carina 35

34′. Occipital carina simple (Fig. 12); frons width greater than eye height; orbital sculpture extending at most halfway to occipital carina 37

35(34). Mid and hind coxae yellow; occipital carina incomplete (as in Fig. 15), or at least indistinct medially ..... ***T. dolichocerus***

35′. Mid and hind coxae dark brown to black; occipital carina well developed medially 36

36(35′). Frontal pit present below median ocellus (as in Fig. 9); dorsellum weakly expanded medially, not overlapping propodeum ..... ***T. abitus***

36′. Frontal pit absent; dorsellum overlapping propodeum medially ..... ***T. zeli***

37(34′). Head, in lateral view, with temples widest above mid point of eye (Fig. 38); antennal clava always 5-segmented ..... ***T. tabanivorus*** group (Fig. 24)

37′. Temples strongly bulging below mid point of eye (Figs. 33, 34); antennal clava either 4- or 5-segmented ..... ***T. laricis*** group (Fig. 30)

38(33′). Vertex smooth medially; eyes glabrous ..... ***T. prolatus***

38′. Vertex coriaceous throughout; eyes distinctly hairy 39

39(38′). Vertex with a transverse groove behind each lateral ocellus (Fig. 8) ..... ***T. chloropus***

39′. Vertex without such grooves 40

40(39′). Dorsellum about as long laterally as medially (Figs. 18, 50); frons width greater than eye height; malar space not elongate (Fig. 7) ..... ***T. californicus*** complex (Figs. 13, 25, 31)

40′. Dorsellum triangular, distinctly longest medially; frons width less than eye height; malar space often elongate (Fig. 45) 41

41(40′). Legs, excluding coxae, yellow; compound eyes enormous (Fig. 85) ..... ***T. oculeus***

41′. Legs dark; eyes of normal size ..... ***T. nigrocoxalis*** group (Fig. 23, 45, 46)

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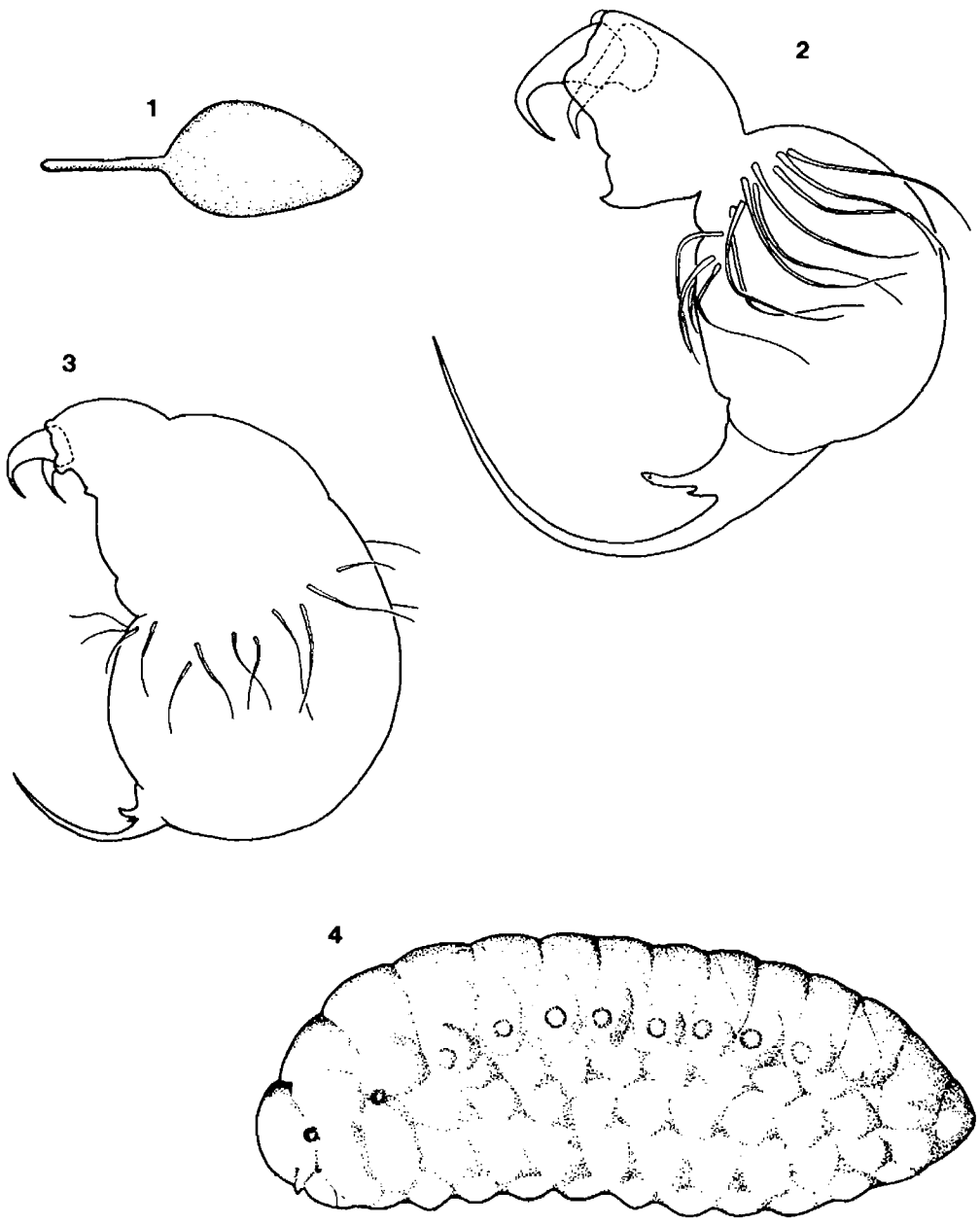
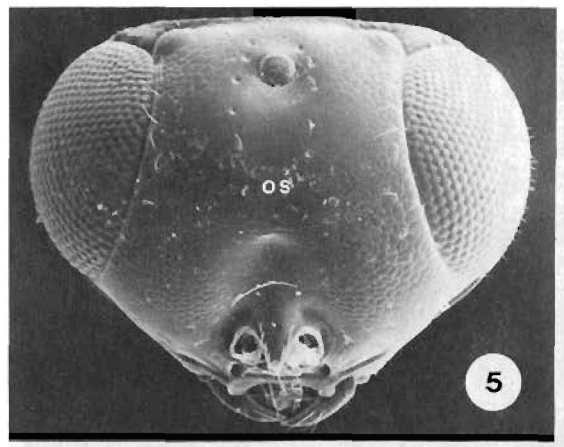
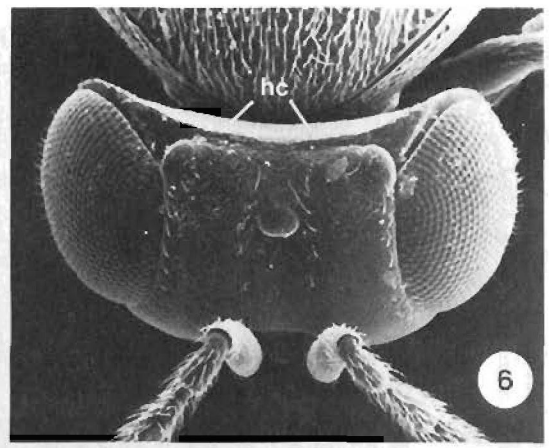
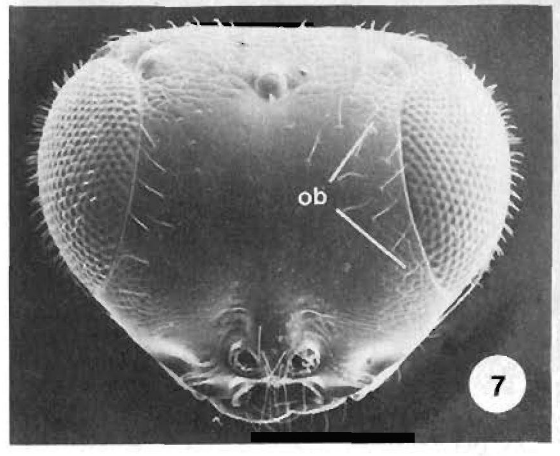
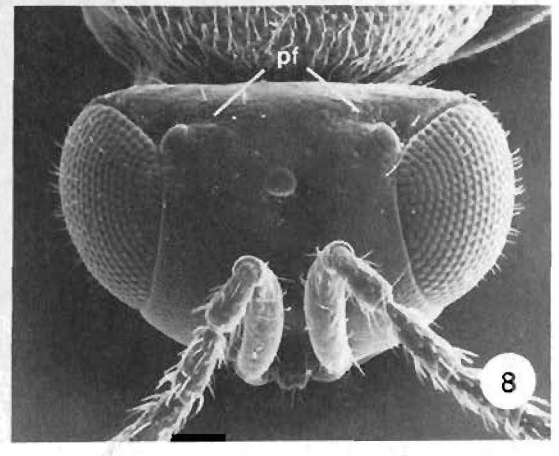


Figures 1-4. Immature stages of *Telenomus acrobates* (from Principi 1947). **1.** Egg. **2.** Early first instar larva. **3.** Late first instar larva. **4.** Final instar larva.

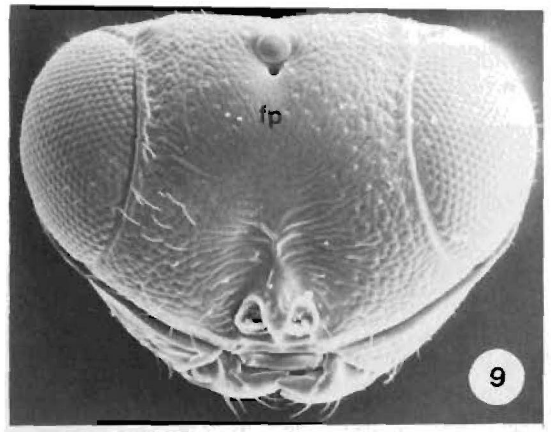


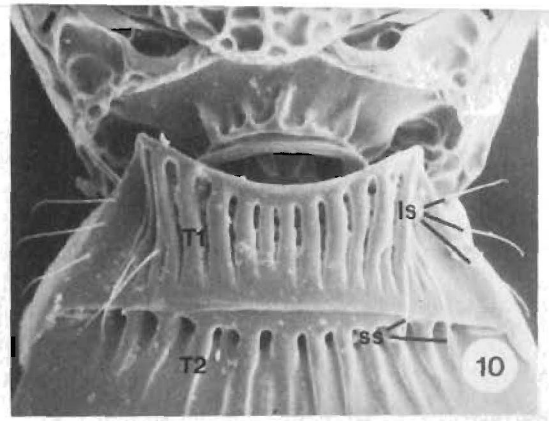


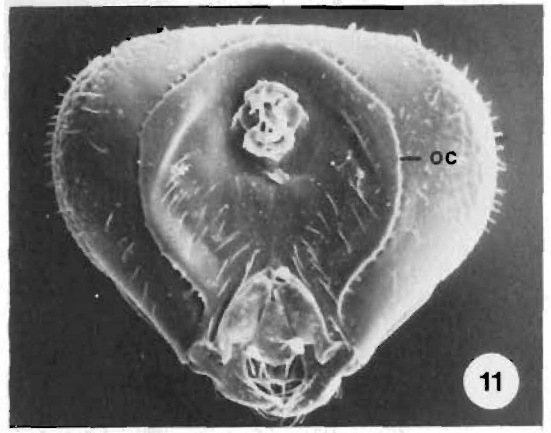


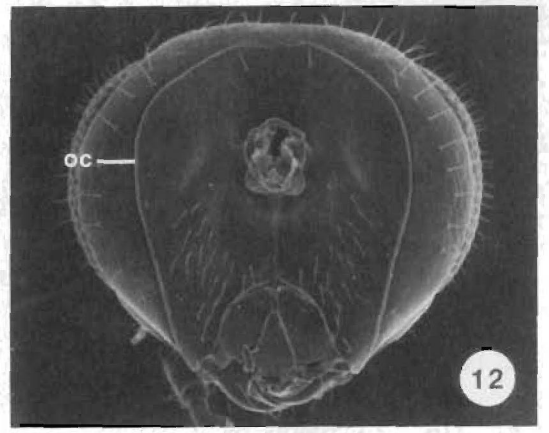


Figures 5-8. Heads of *Telenomus* species. 5. *T. seychellensis,* frontal view; *os:* ocellar setae. **6.** *T. seychellensis,* fronto-dorsal view; *hc:* hyperoccipital carina. **7.** *T. californicus,* frontal view; *ob:* orbital band. **8.** *T. chloropus,* fronto-dorsal view; *pf:* postocellar furrows.









Figures 9-12. 9. *Trissolcus basalis,* head, frontal view; fp: frontal pit. **10.** *Telenomus podisi,* posterior mesosoma-anterior metasoma, dorsal view; *ls:* lateral setae; *ss:* sublateral setae; *T1, T2:* metasomal tergites 1 and 2. **11.** *T. podisi,* head, posterior view; *oc:* occipital carina. **12.** *Telenomus* species, *T. tabanivorus* group, head, posterior view; *oc:* occipital carina.

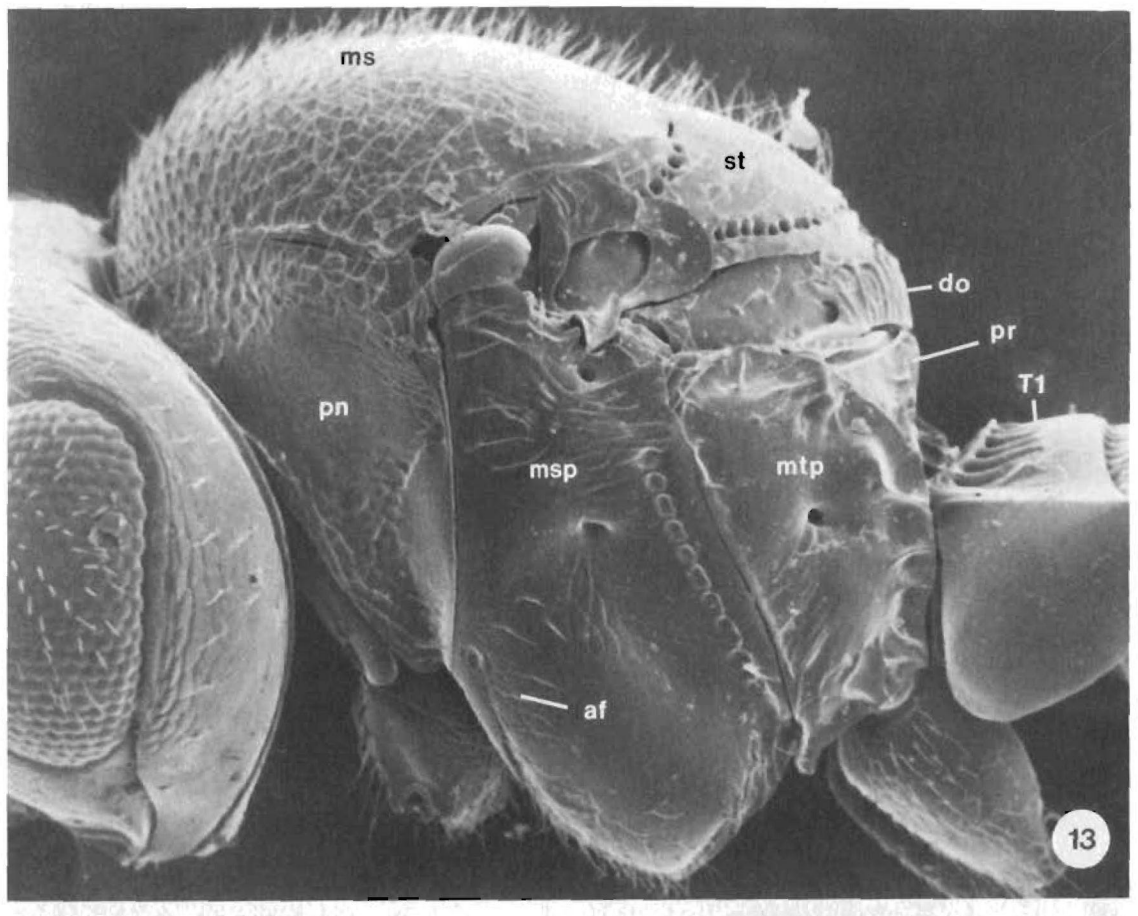


Figure 13. *Telenomus californicus,* mesosoma, lateral view; *af:* acetabular field; *do:* dorsellum; *ms:* mesoscutum; *msp:* mesepisternum; *mtp:* metapleuron; *pn:* pronotum; *pr:* propodeum; *st:* scutellum; *T1:* metasomal tergite 1.

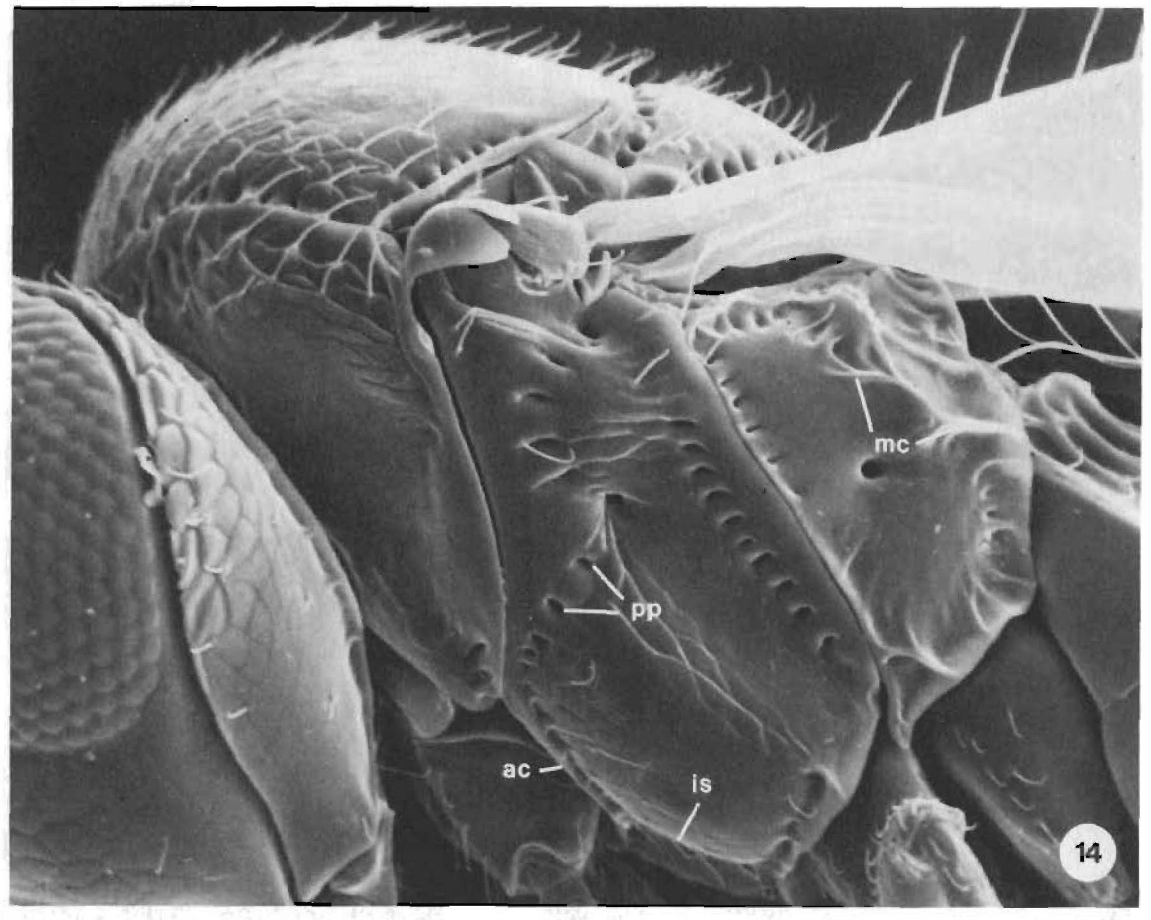
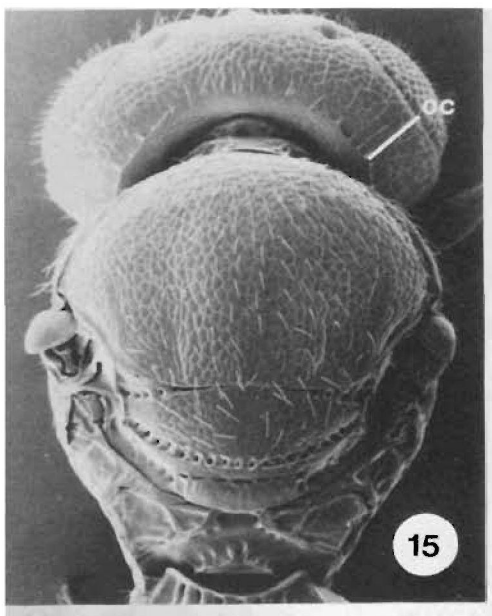
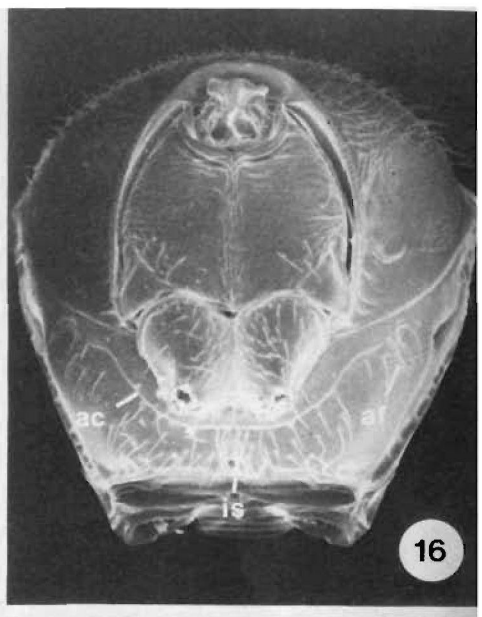
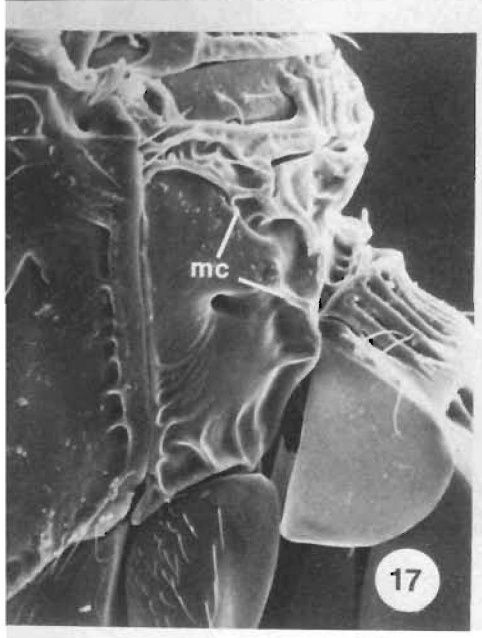


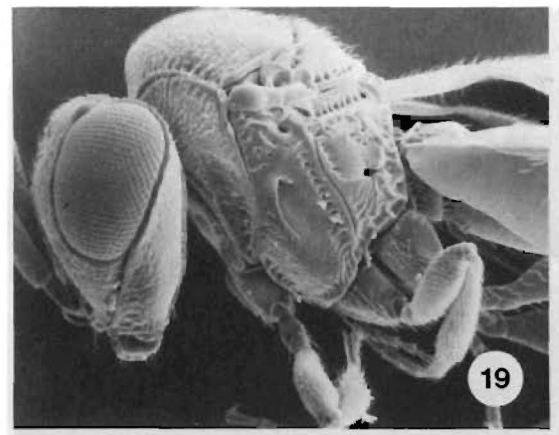
Figure 14. *Telenomus* species, *T. crassiclava* group, mesosoma, lateral view; *ac:* acetabular carina; *is:* intercoxal space; *mc:* metapleural carina; *pp:* episternal foveae.

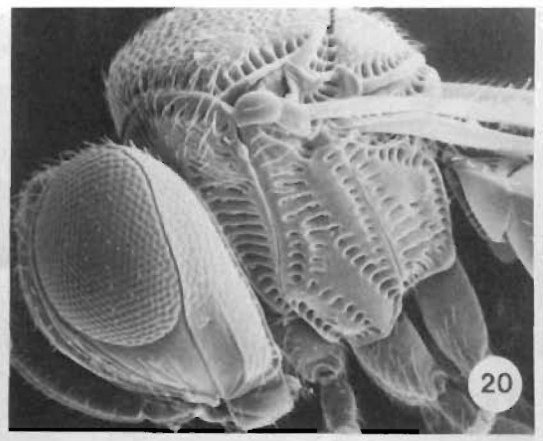


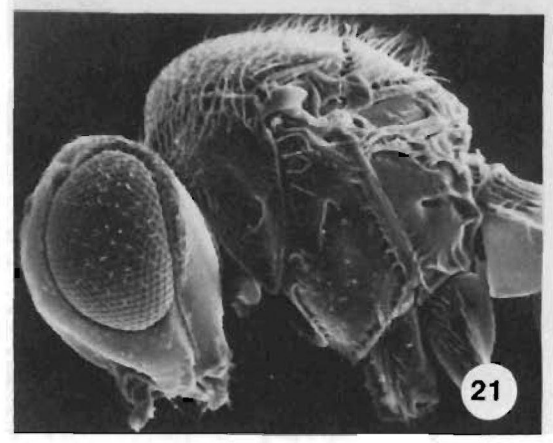


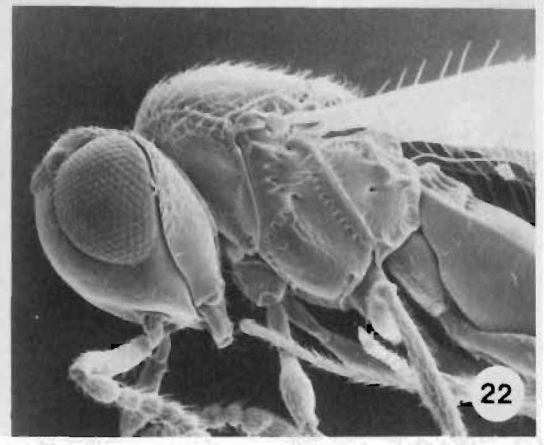


Figures 15-18. 15. *Telenomus nigricornis*, head and mesosoma, dorsal view; *oc:* occipital carina. **16.** *T. podisi*, mesosoma, frontal view; *ac:* acetabular carina; *af:* acetabular field; *is:* intercoxal space. **17.** *T. podisi*, metapleuron, lateral view; *mc:* metapleural carina. **18.** *T. californicus*, mesosoma, posterior view; *do:* dorsellum.

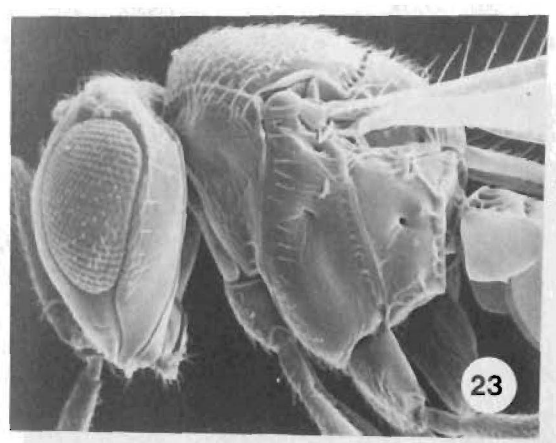


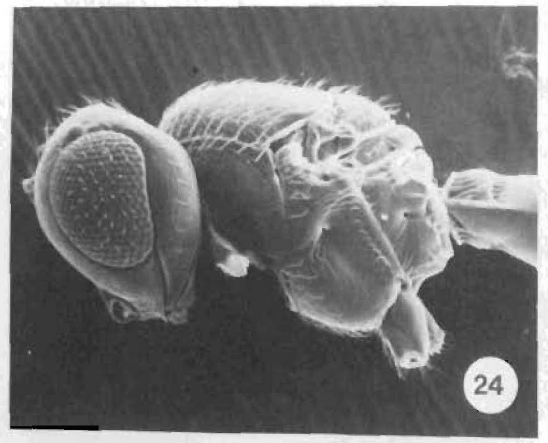


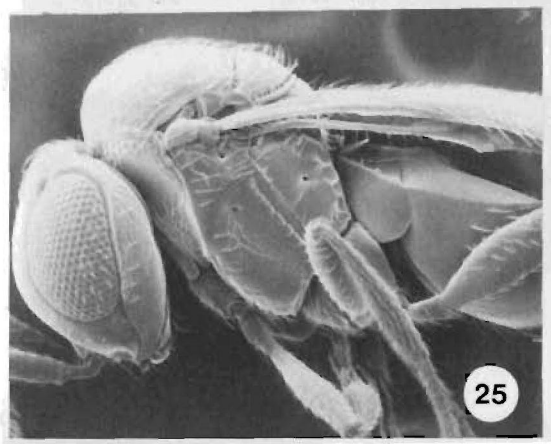


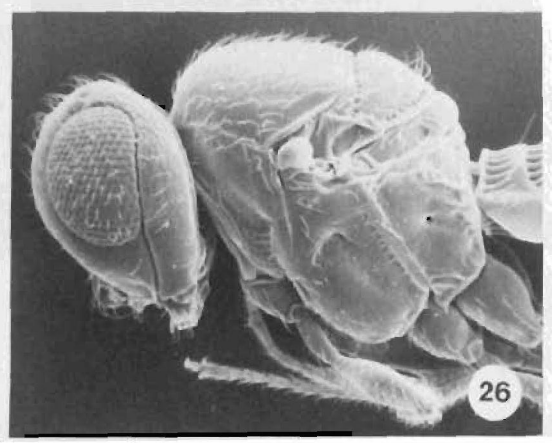


Figures 19-22. Lateral habitus. 19. *Trissolcus basalis.* **20.** *Psix* sp. **21.** *Telenomus podisi.* 22. *Telenomus crassiclava* group species.

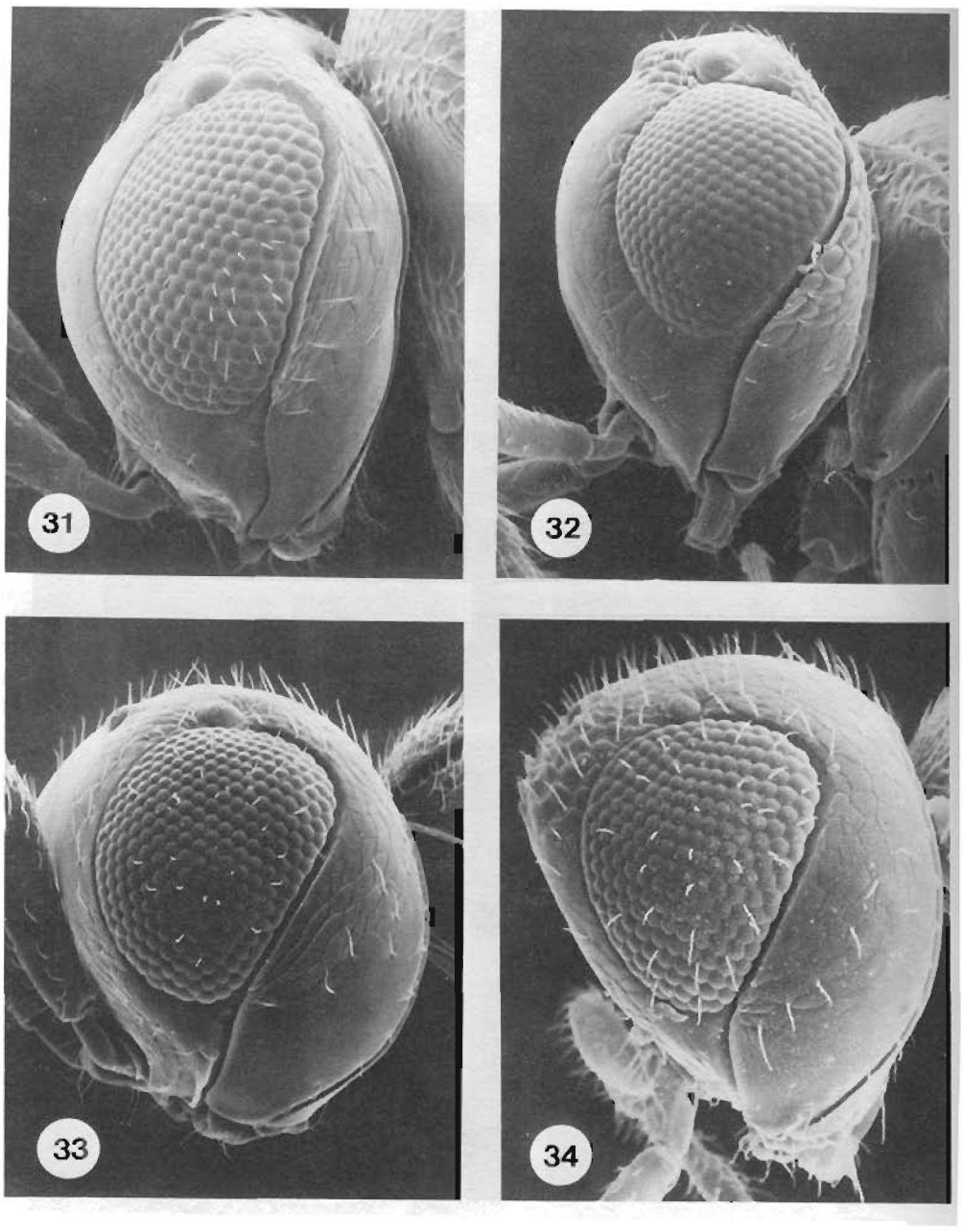




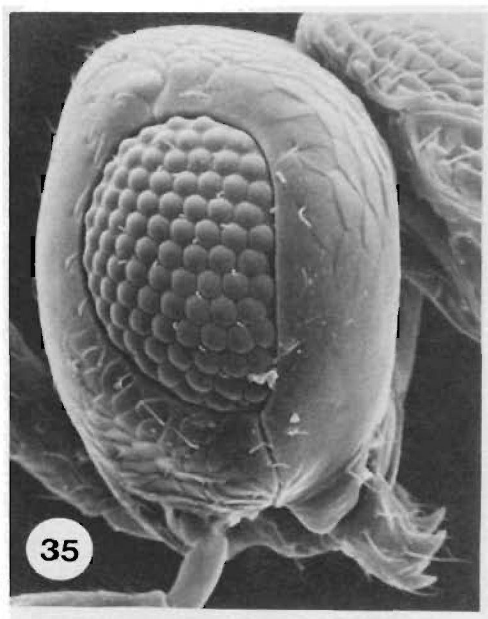


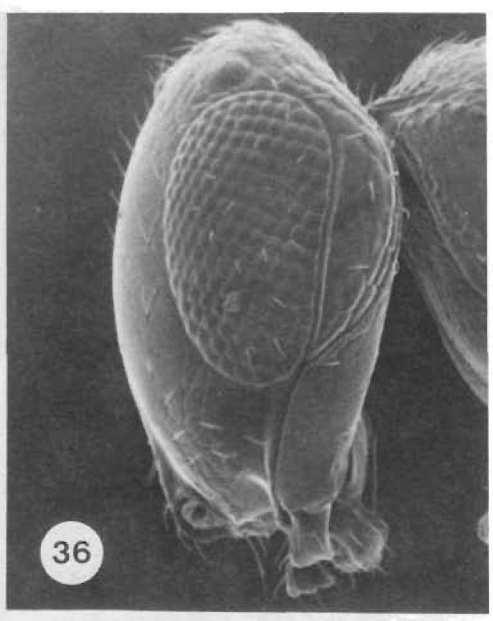


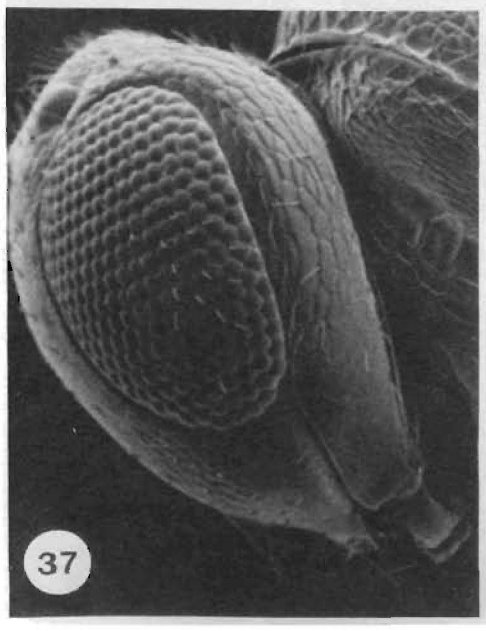
Figures 23-26. Lateral habitus. 23. *Telenomus nigrocoxalis* group species. **24.** *T. tabanivorus* group species. **25.** *T. alsophilae*. **26.** *T. longicornis* group species.

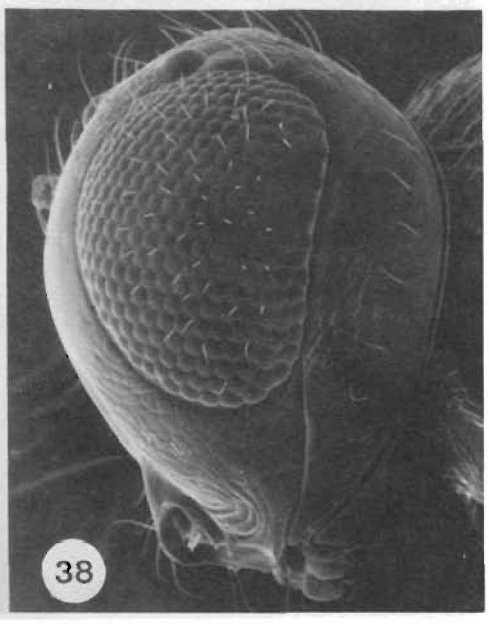


Figures 31-34. Head, lateral view. 31. *Telenomus alsophilae.* **32.** *T. crassiclava* group species. **33.** *T. laricis* group species. **34.** *T. laricis* group species (*Verrucosicephalia sensu* Szabó 1975).

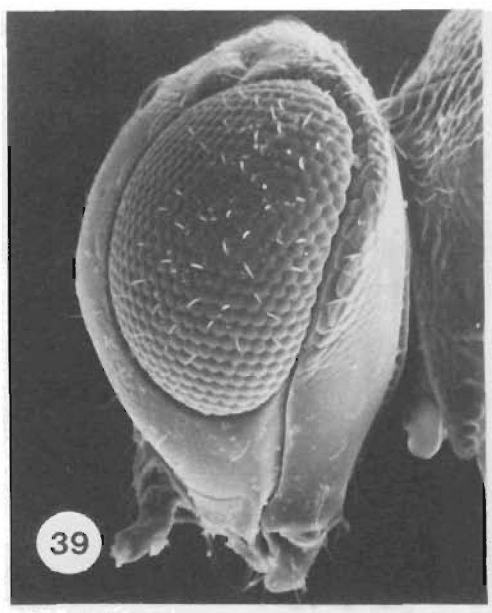


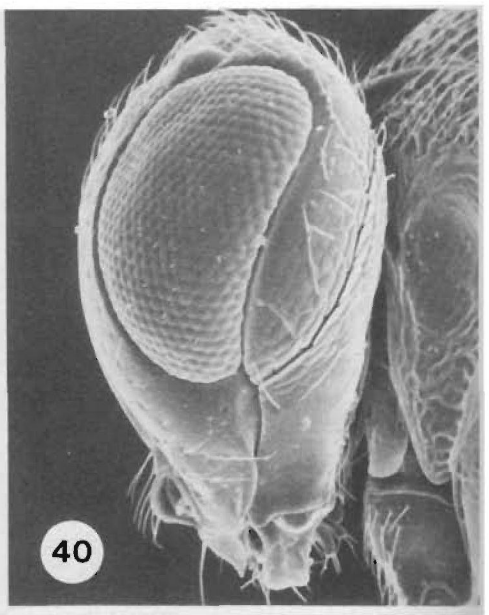


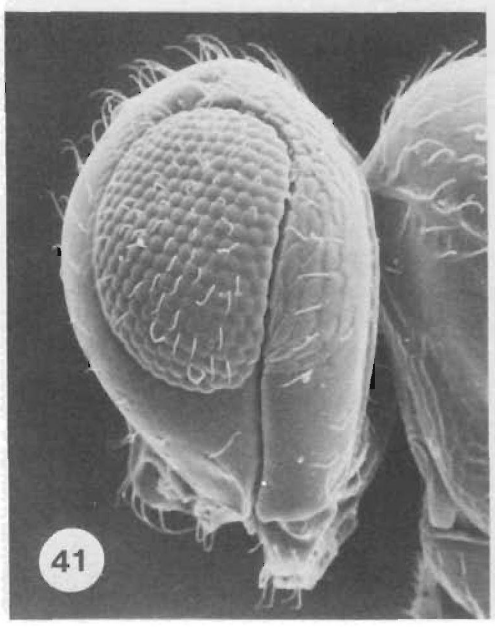


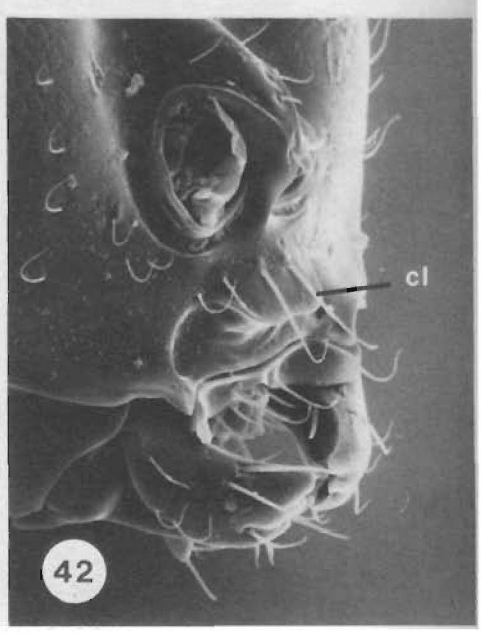


Figures 35-38. Head, lateral view. 35. *Eumicrosoma beneficum.* **36.** *Telenomus ovivorus* (Ashmead). **37.** *T. nigricornis.* **38.** *T. tabanivorus* group species.

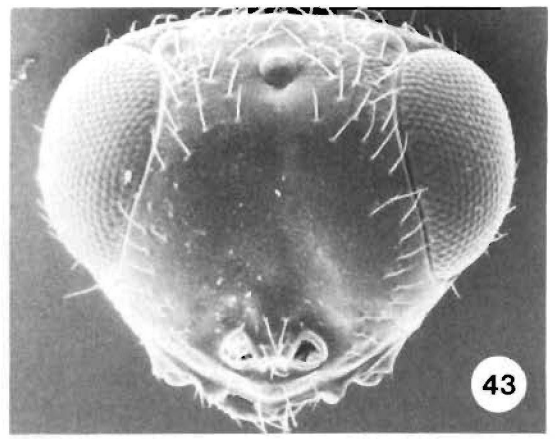


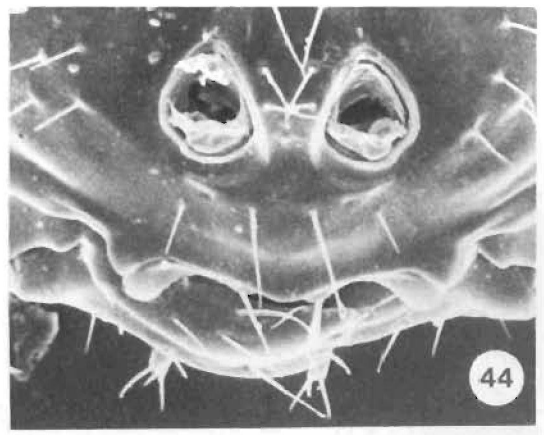


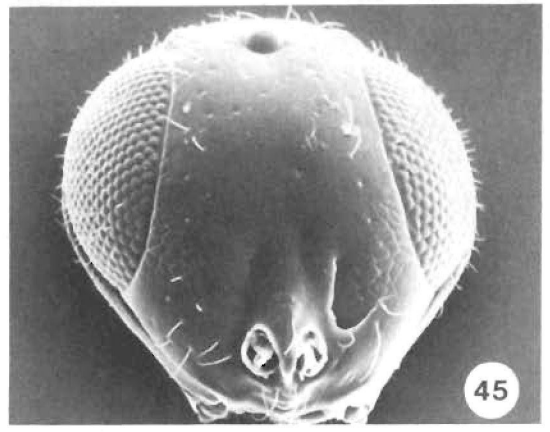


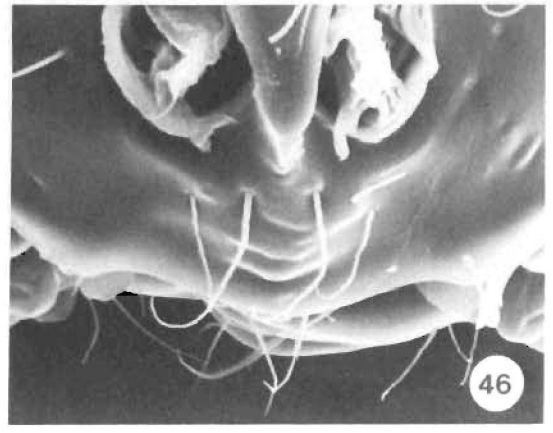


Figures 39-41. Head, lateral view. 39. *Telenomus podisi.* **40.** *T. sulculus,* female. **41.** *T. longicornis* group species. **42.** *T. tanymerides,* ventral portion of head, fronto-lateral view; *cl:* clypeal lamella.

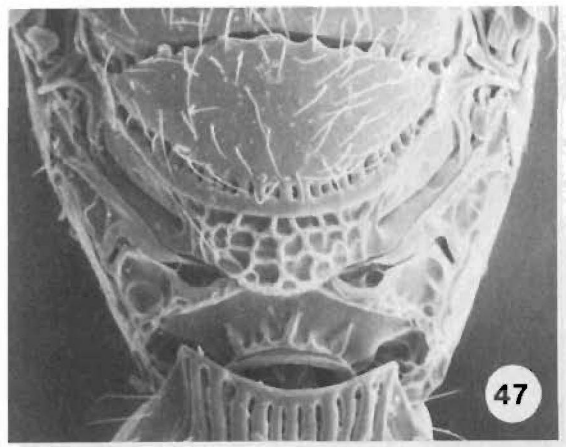


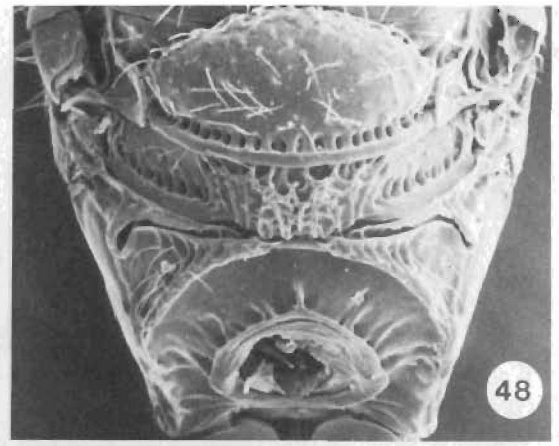


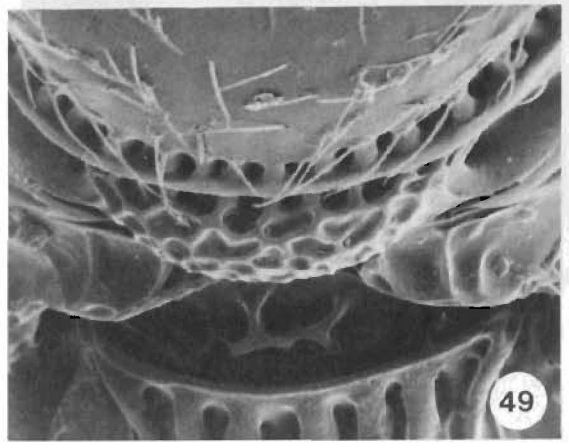


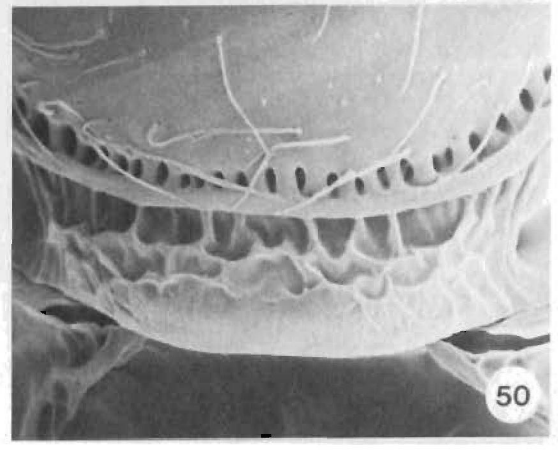


Figures 43-44. ***Telenomus sulculus.*** **43.** Head, frontal view. **44.** Clypeus. **Figures 45-46.** *T. nigrocoxalis* group species. **45.** Head, frontal view. **46.** Clypeus.

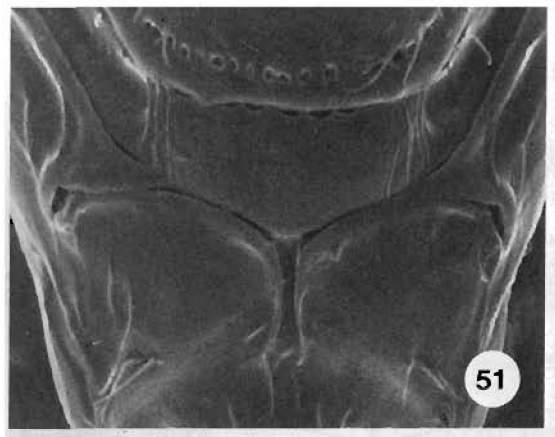


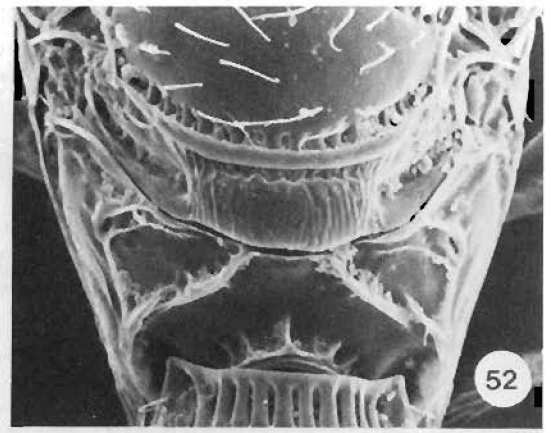


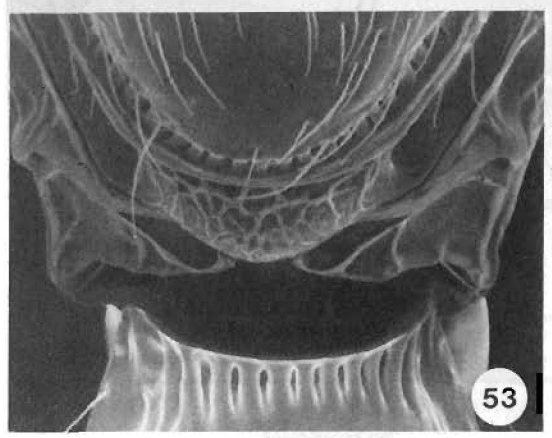


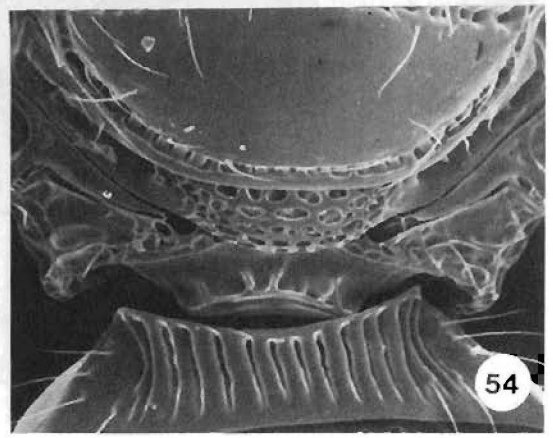


Figures 47-50. Posterior mesosoma, dorsal view. 47. *Telenomus podisi.* **48.** *T. sulculus.* **49.** *T. flavipes.* **50.** *T. dalmanni* group species.









Figures 51-54. Posterior mesosoma, dorsal view. 51. *Telenomus ovivorus* (Ashmead). **52.** *T. longicornis* group species. **53.** *T. tabanivorus* group species. **54.** *T. calvus.*

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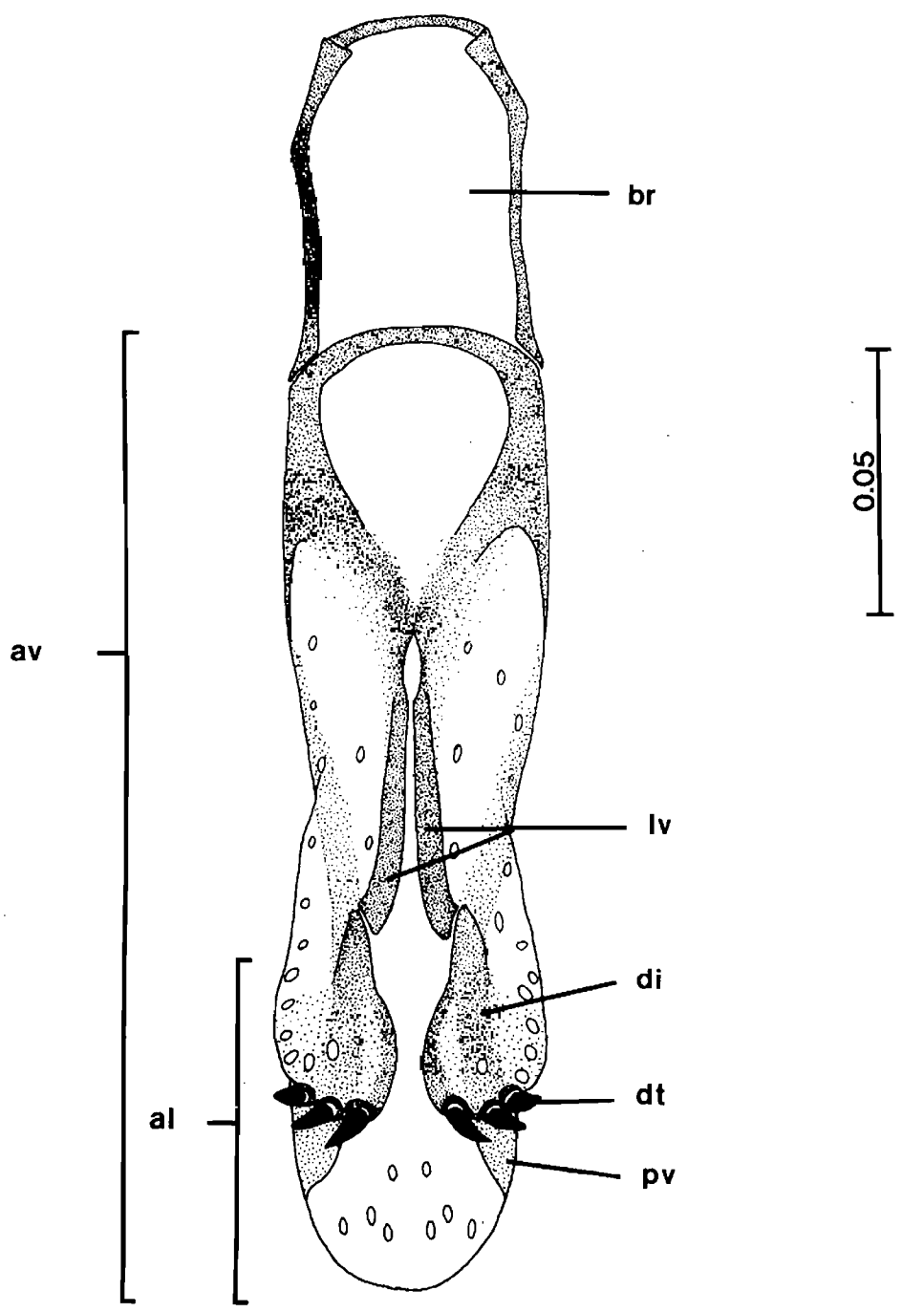
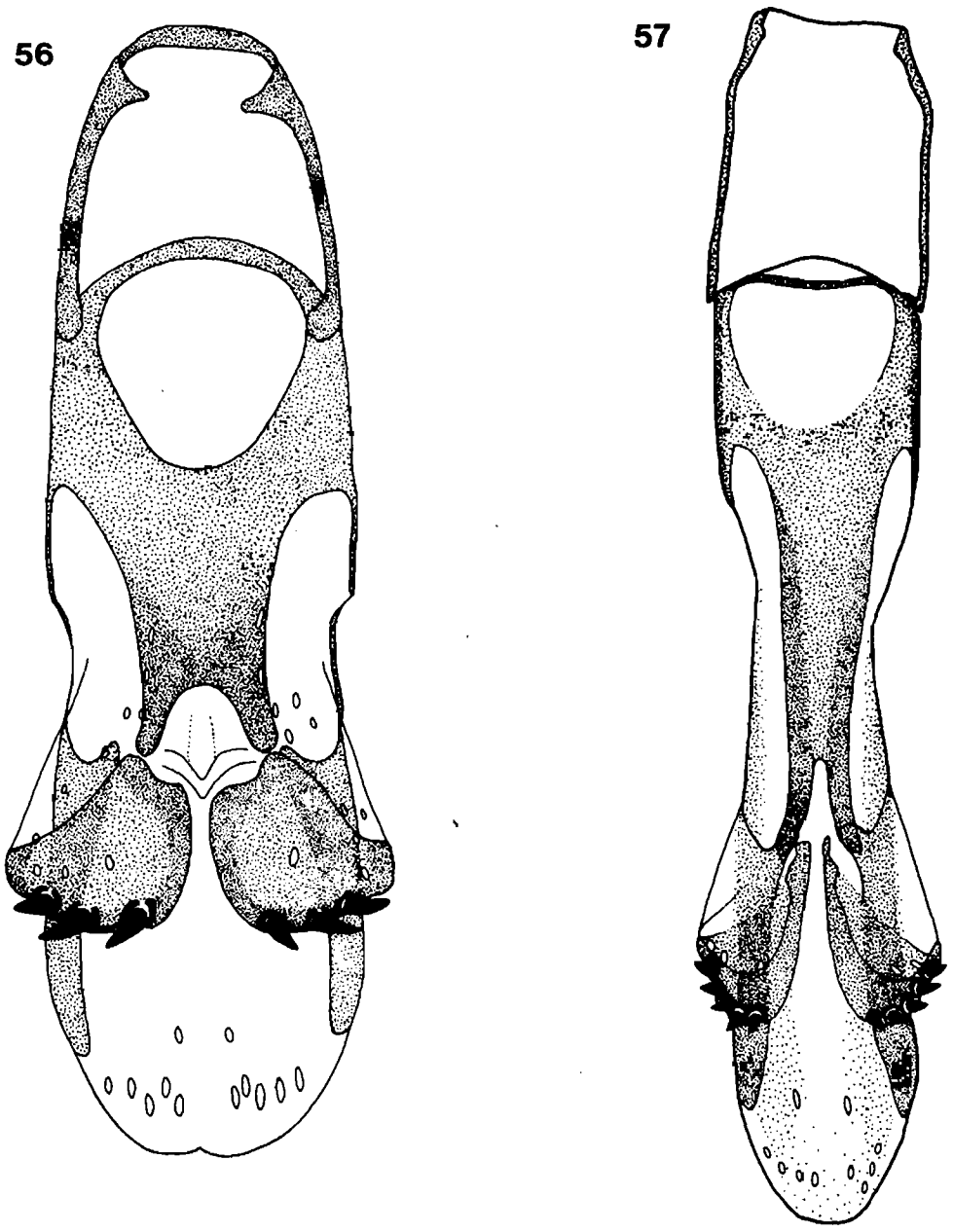
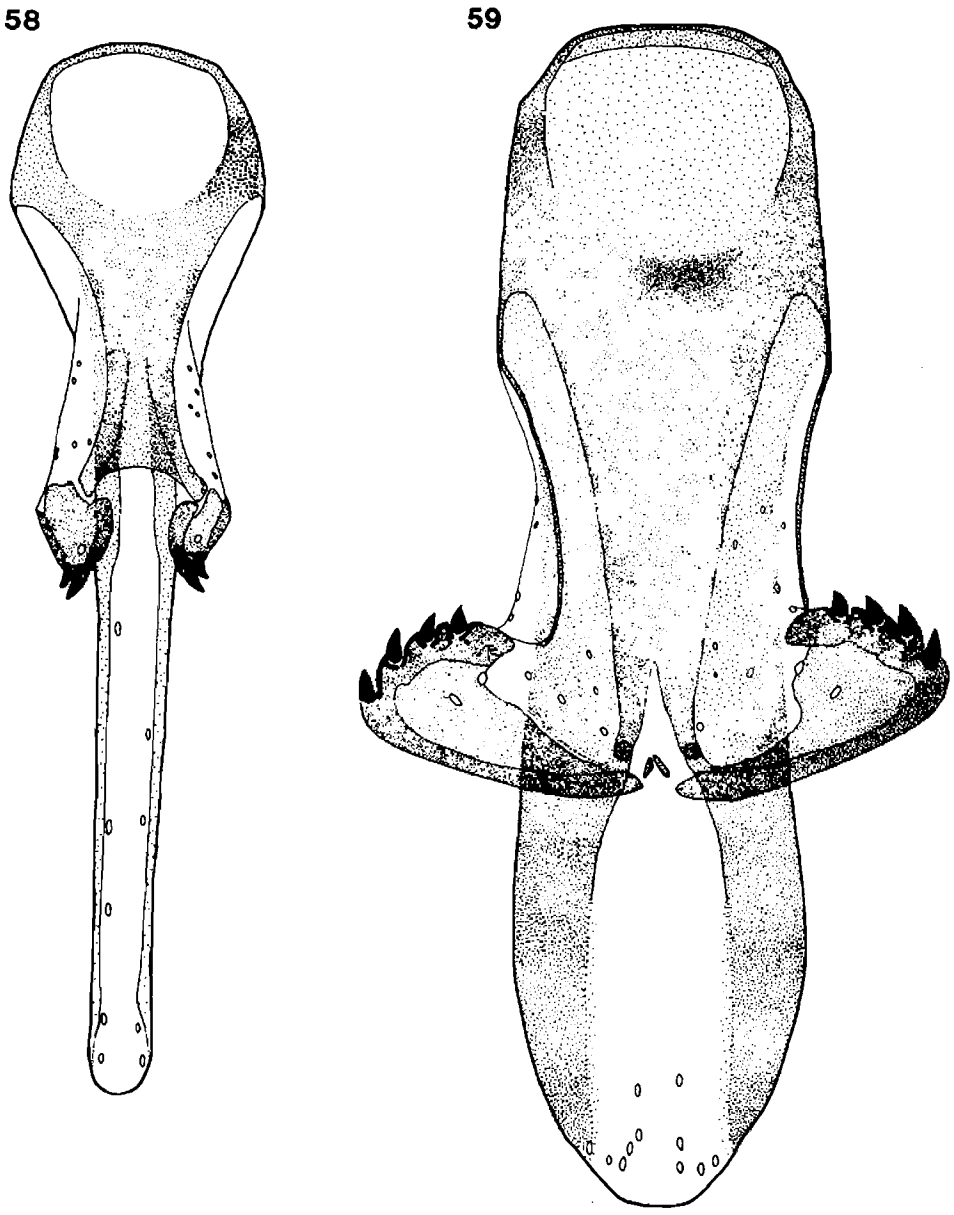


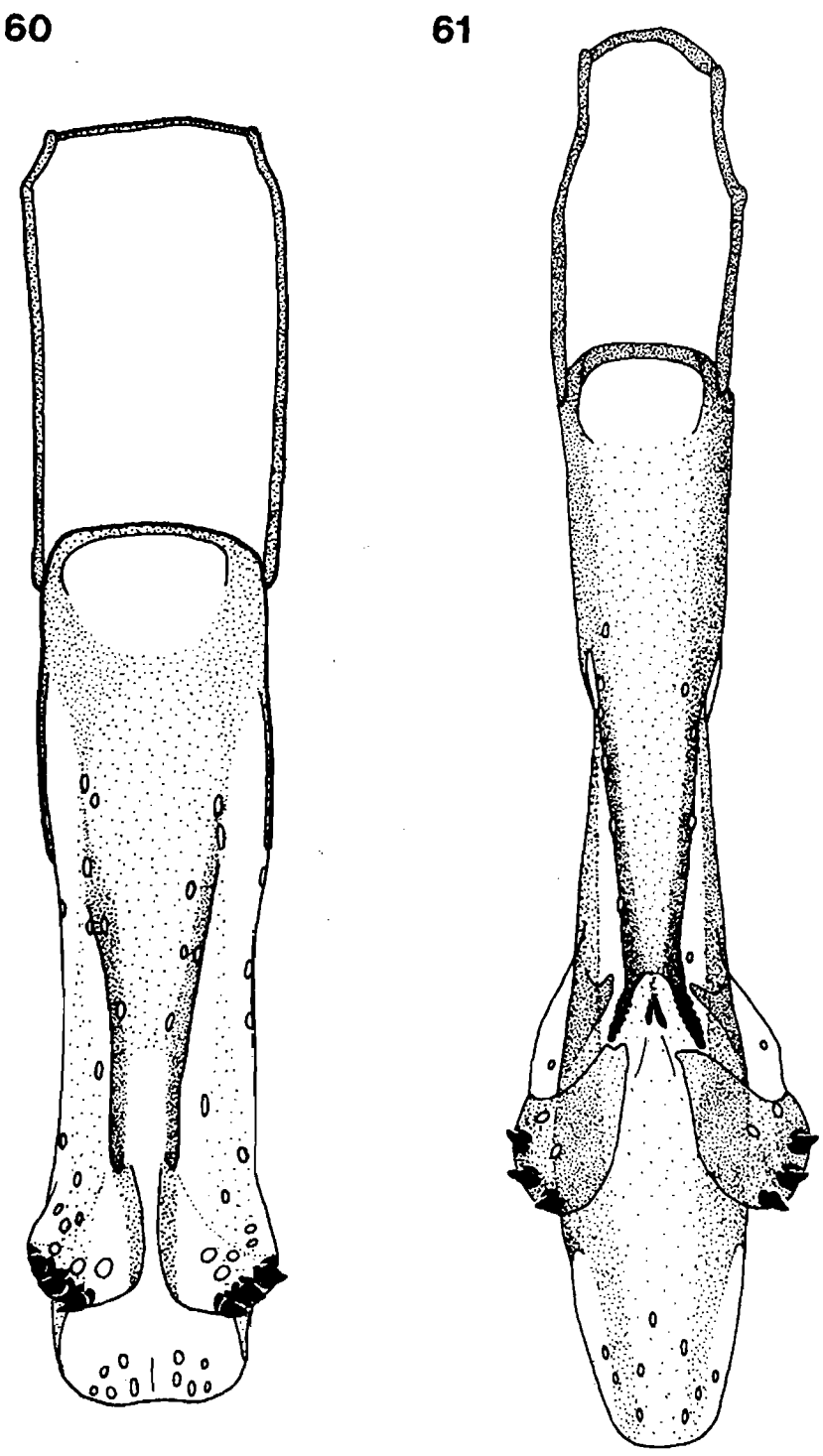
Figure 55. *Telenomus californicus* group species. Male genitalia. Ventral view; *al:* aedeagal lobe; *av:* aedeago-volsellar shaft; *br:* basal ring; *di:* digitus; *dt:* digital teeth; *lv:* laminae volsellares; *pv:* penis valve. Scale in millimeters.



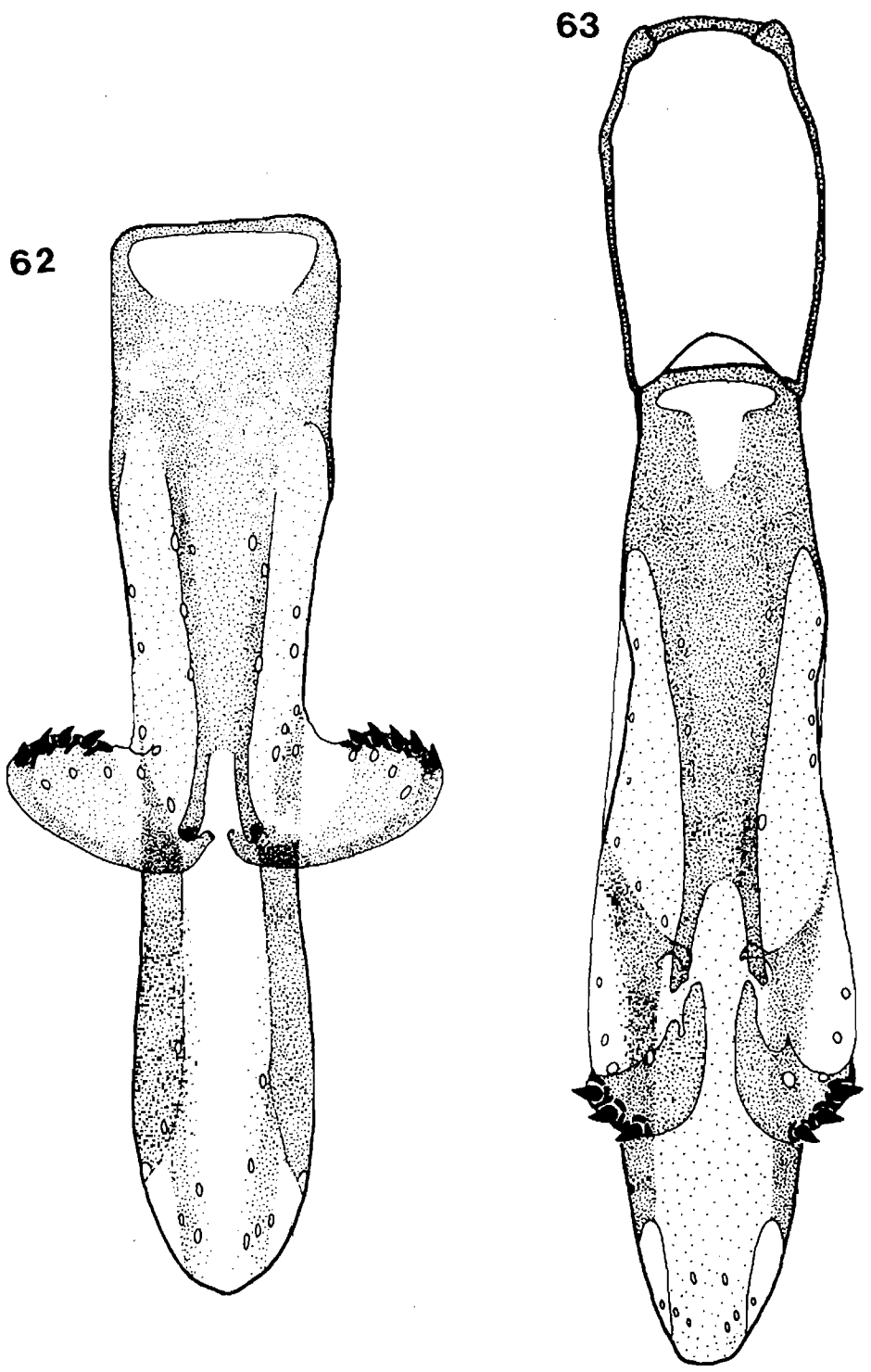
Figures 56-57. Male genitalia, ventral view. 56. *Telenomus arzamae.* **57.** *T. monilicornis.*



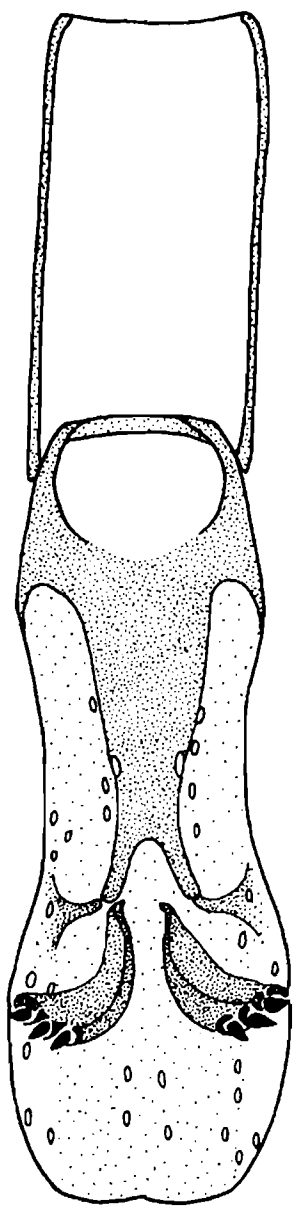
Figures 58-59. Male genitalia, ventral view. 58. *Telenomus dalmanni.* **59.** *T. californicus* complex species.

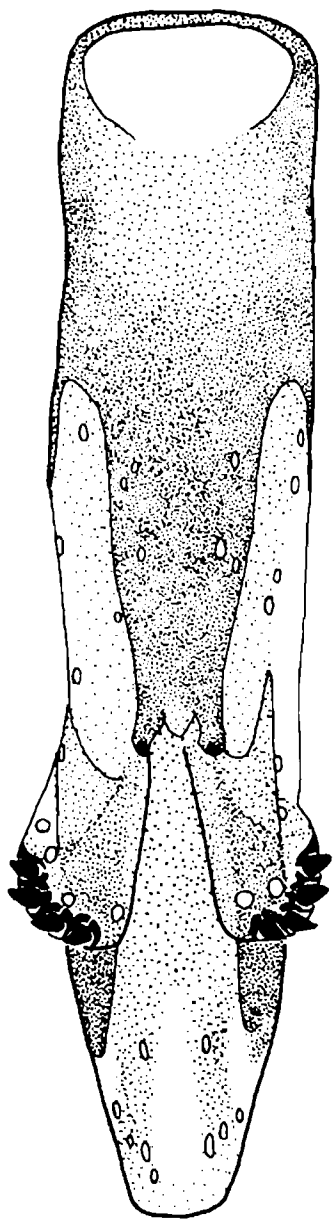


Figures 60-61. Male genitalia, ventral view. 60. *Telenomus calvus.* **61.** *T. tabanivorus* group species.



Figures 62-63. Male genitalia, ventral view. 62. *Telenomus longicornis* group species. **63.** *T. laricis* group species.





Figures 64-65. Male genitalia, ventral view. 64. *Telenomus floridanus.* **65.** *T. nigrocoxalis* group species.

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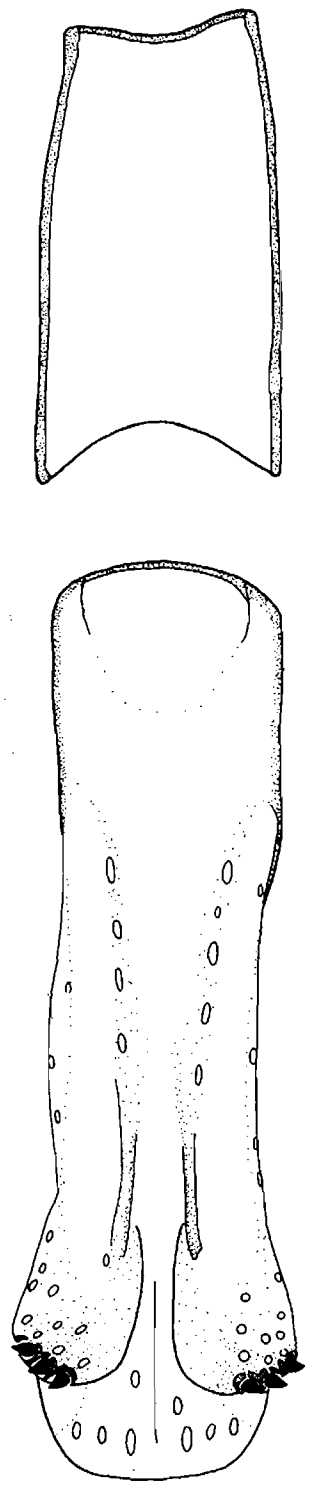

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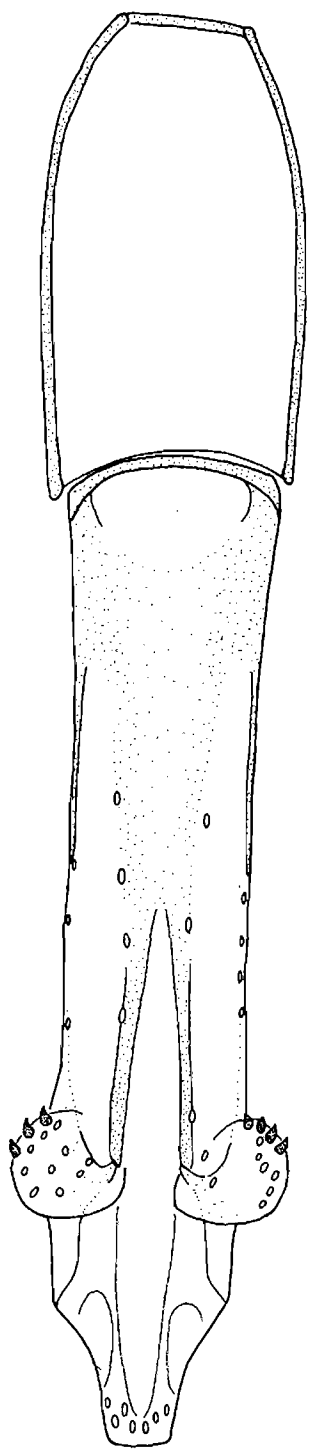
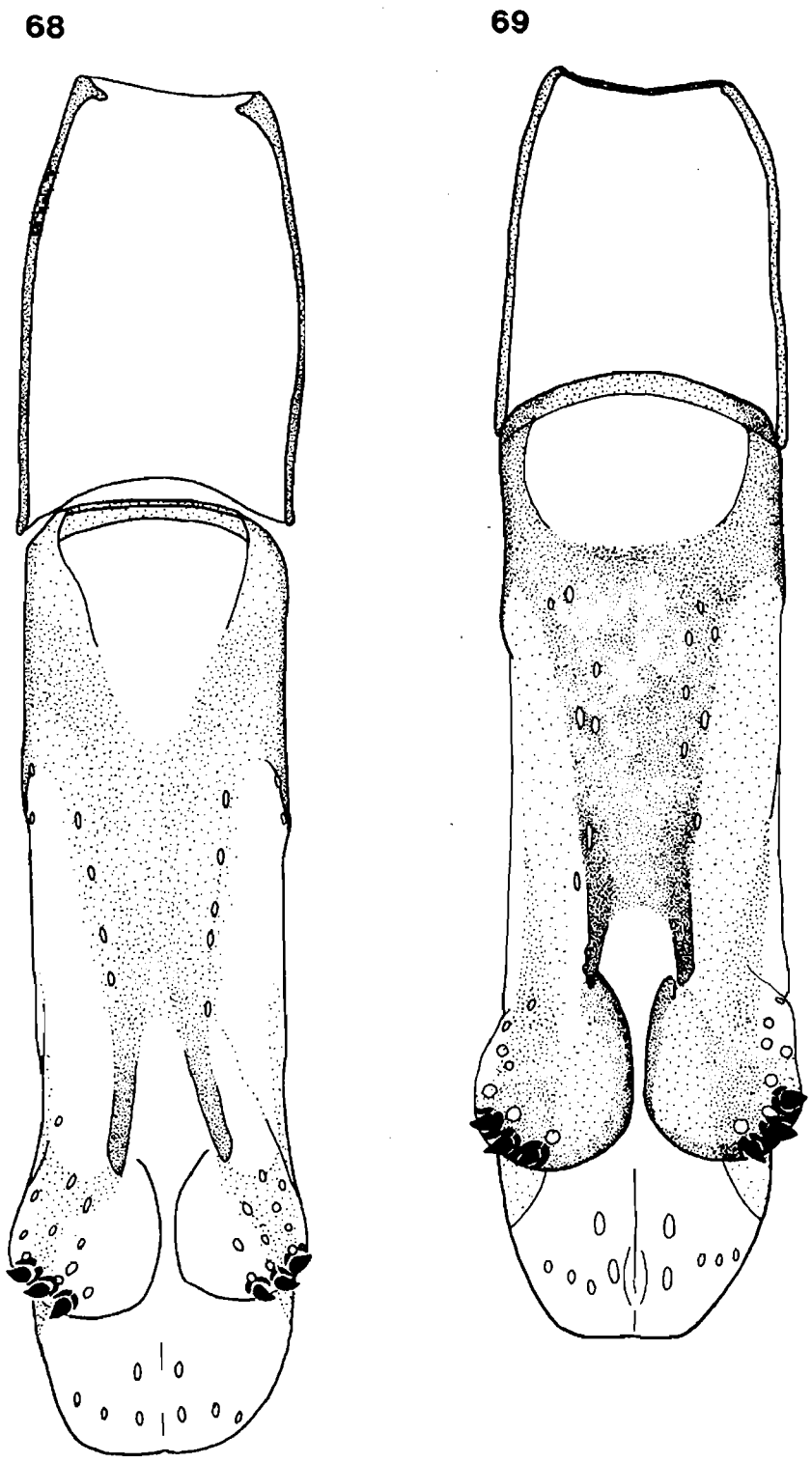
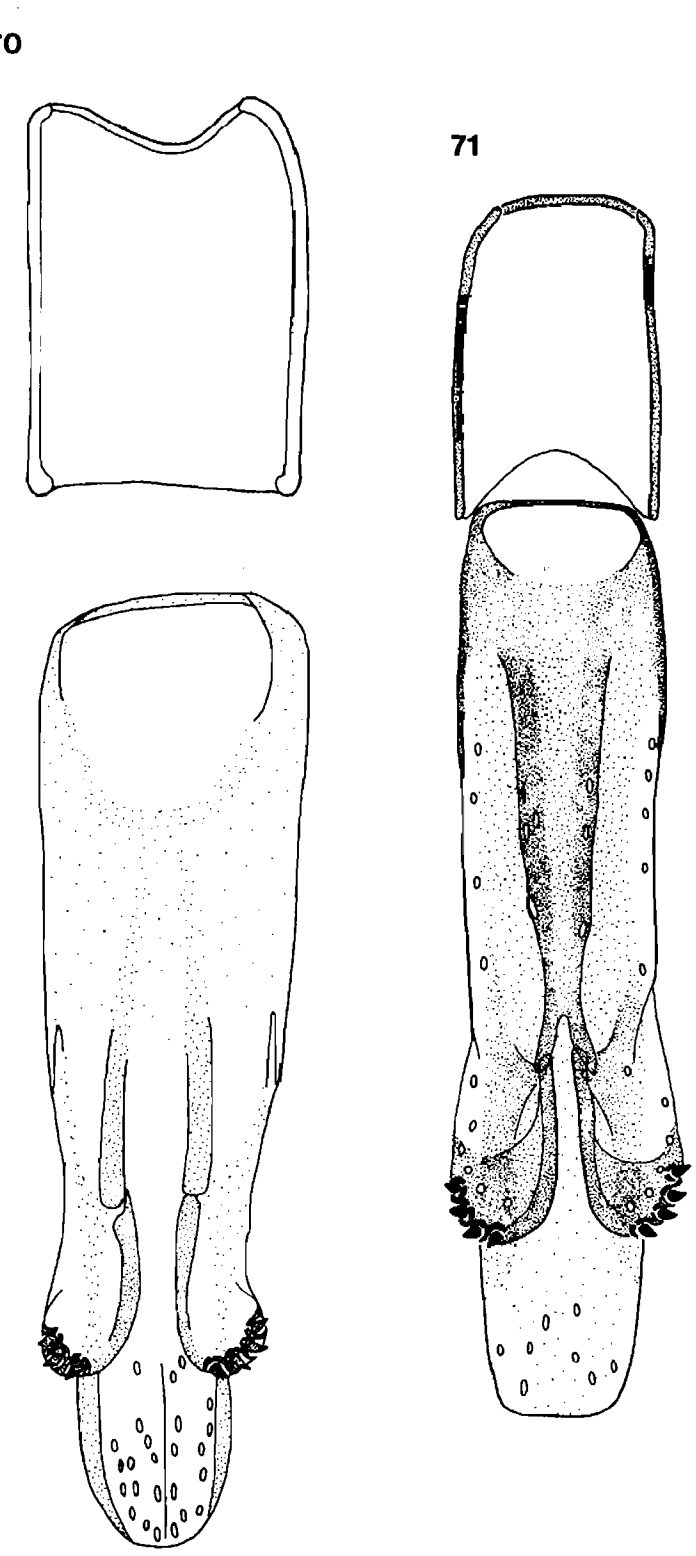


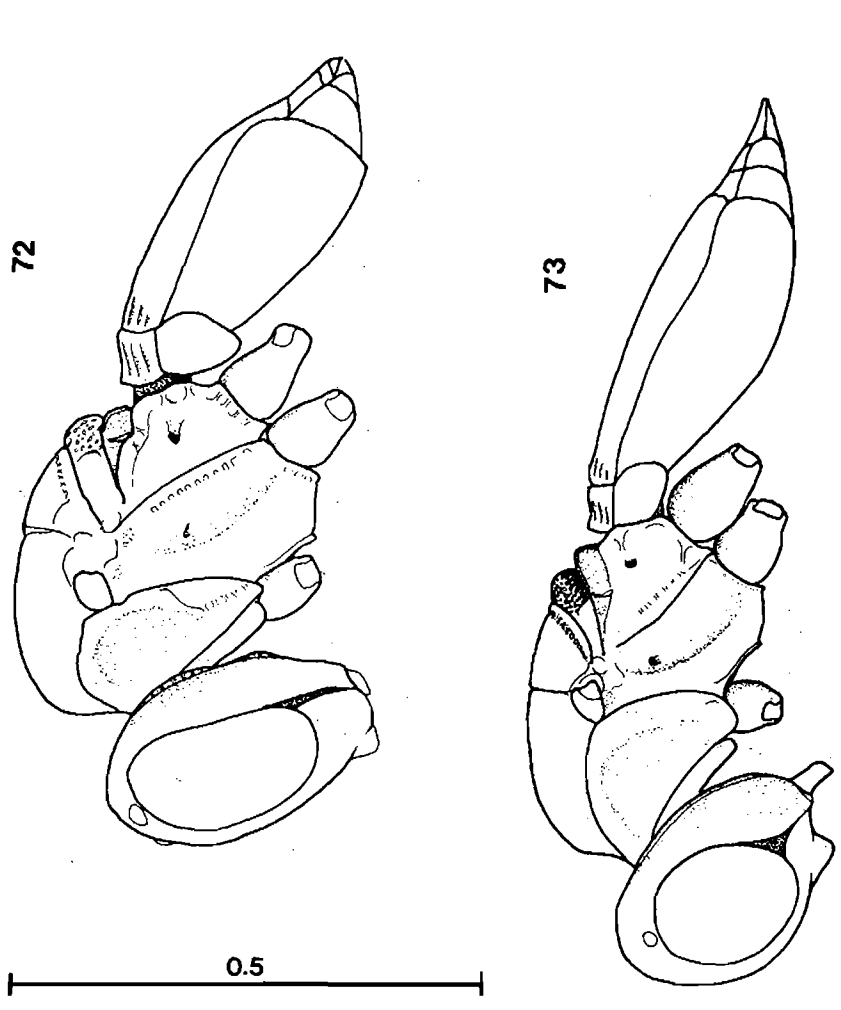
Figures 66-67. Male genitalia, ventral view. 66. *Telenomus podisi.* **67.** *T. grenadensis.*



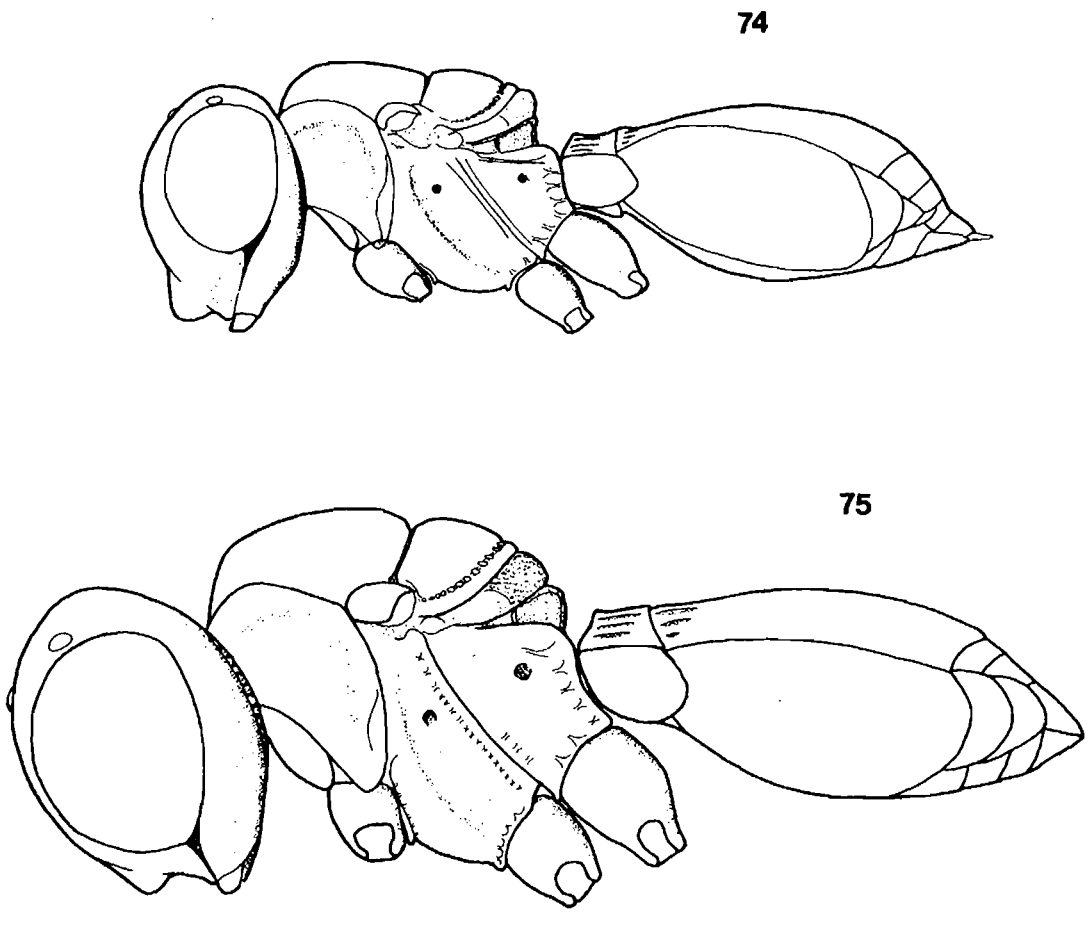
Figures 68-69. Male genitalia, ventral view. 68. *Telenomus cristatus.* **69.** *T. zeli.*



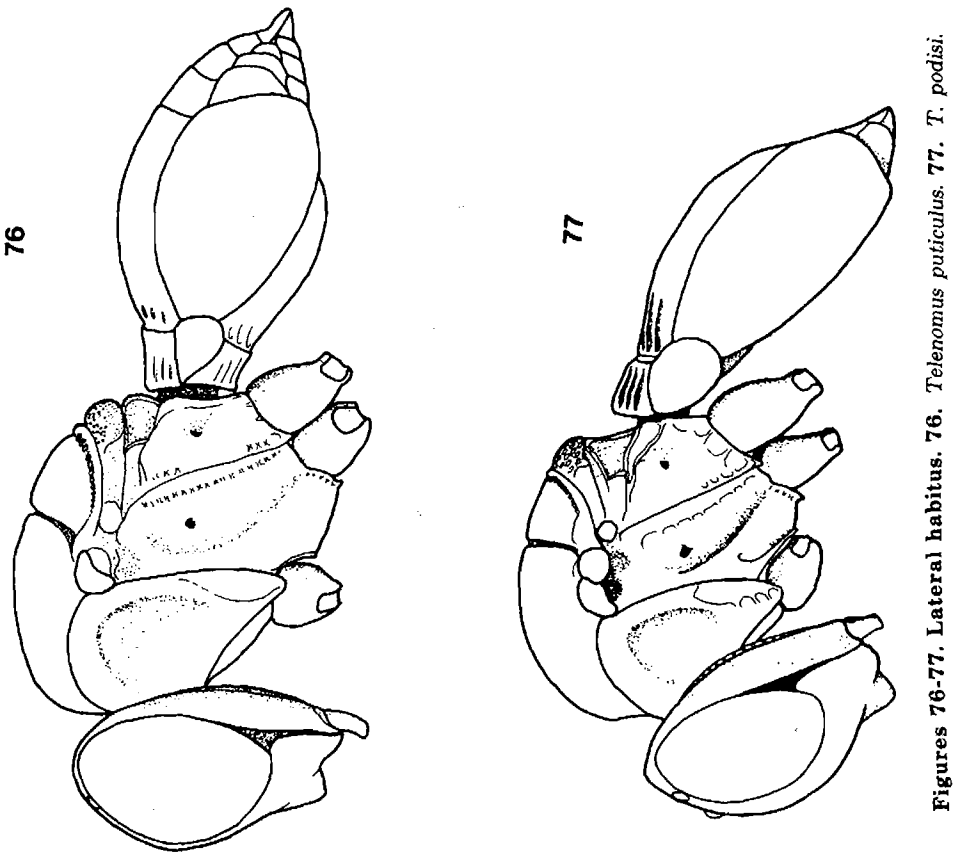
Figures 70-71. Male genitalia, ventral view. 70. *Telenomus sulculus.* **71.** *T. dolichocerus.*



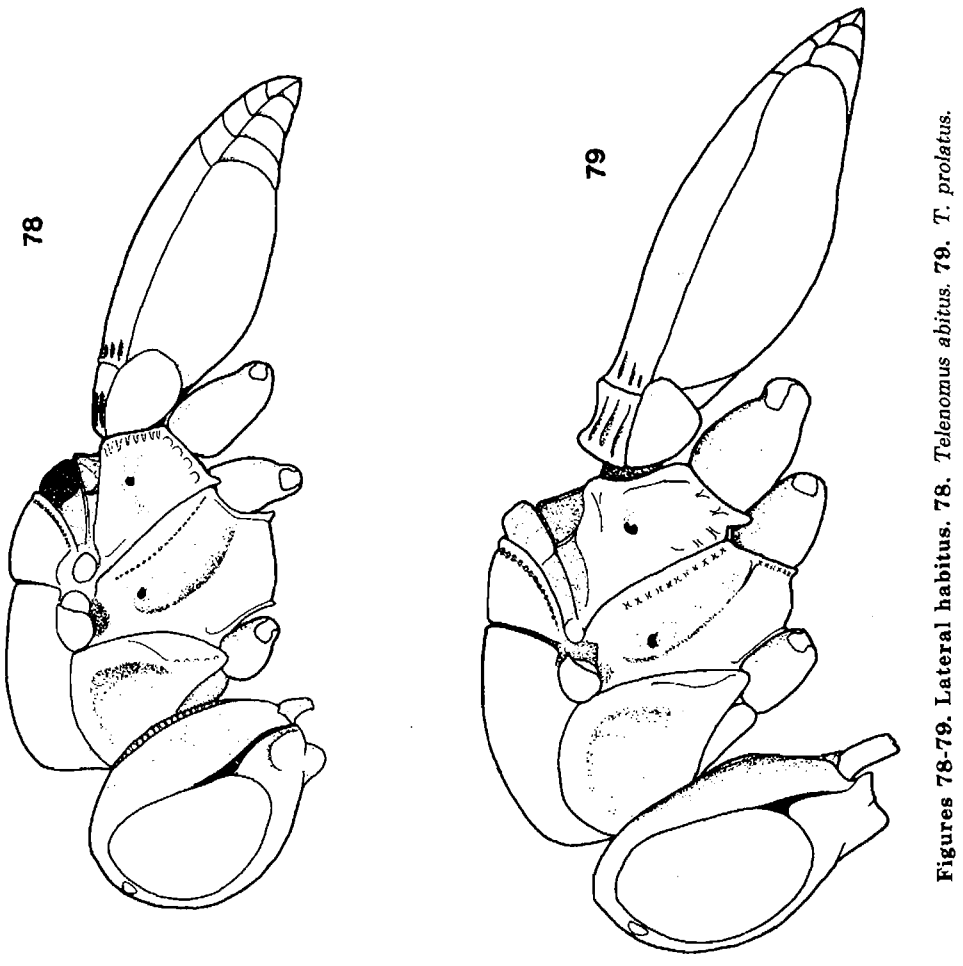
Figures 72-73. Lateral habitus. 72. *Telenomus calvus*. **73.** *T. exilis*. Scale in millimeters.



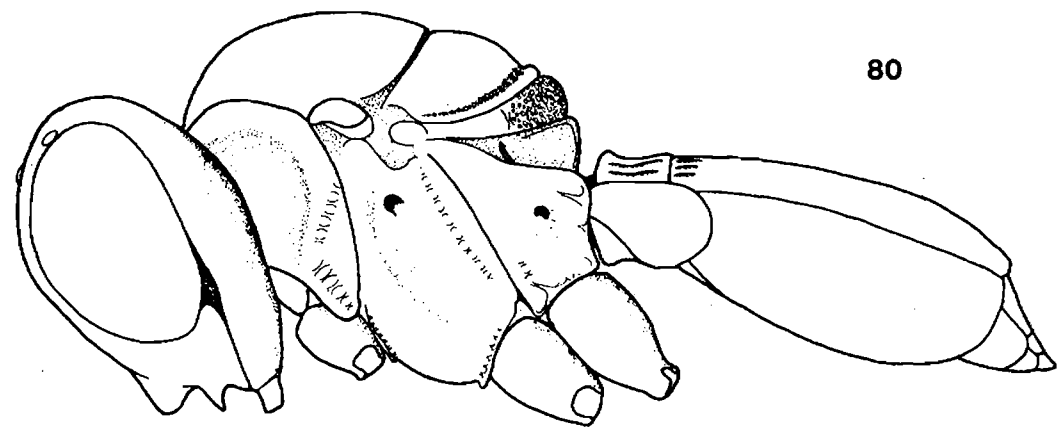
Figures 74-75. Lateral habitus. 74. *Telenomus consimilis.* **75.** *T. dolichocerus* (Floridian specimen).

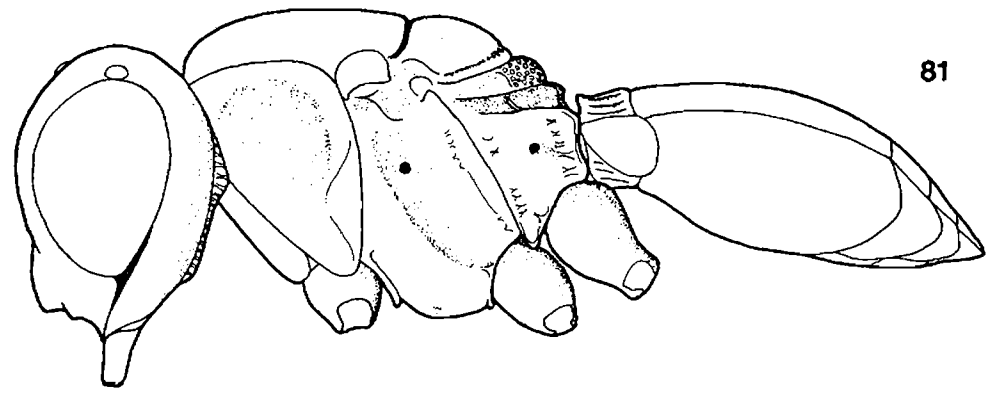


Figures 76-77. Lateral habitus. 76. *Telenomus puticulus*. **77.** *T. podisi*.

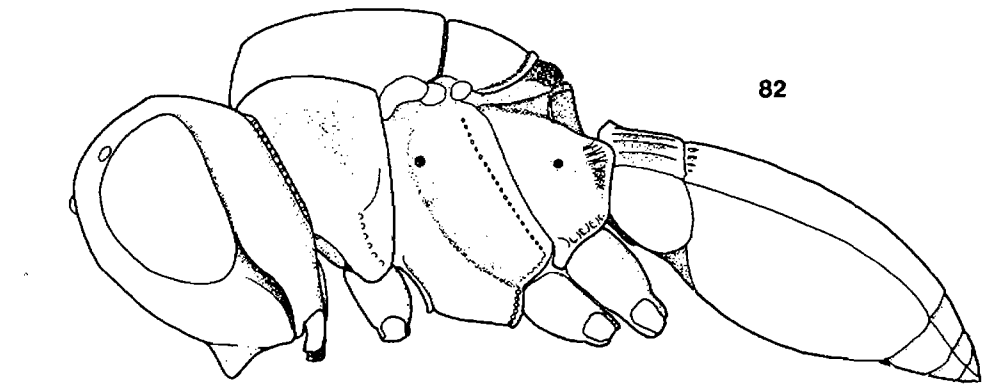


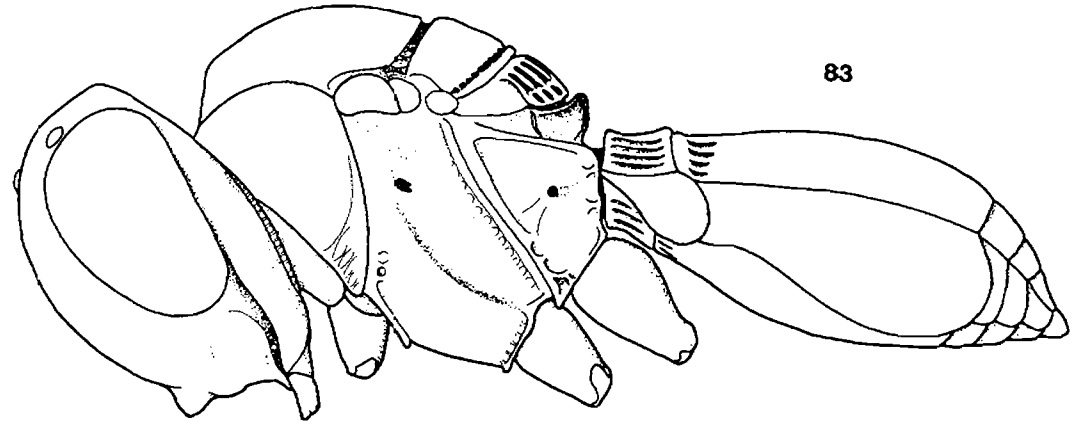
Figures 78-79. Lateral habitus. 78. *Telenomus abitus.* **79.** *T. prolatus.*



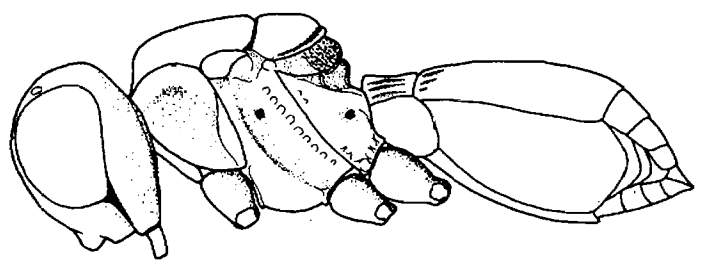


Figures 80-81. Lateral habitus. 80. *Telenomus tanymerides.* **81.** *T. dentatus.*





Figures 82-83. Lateral habitus. 82. *Telenomus zeli.* **83.** *T. abruptus.*



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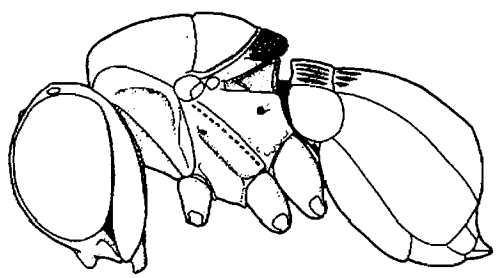

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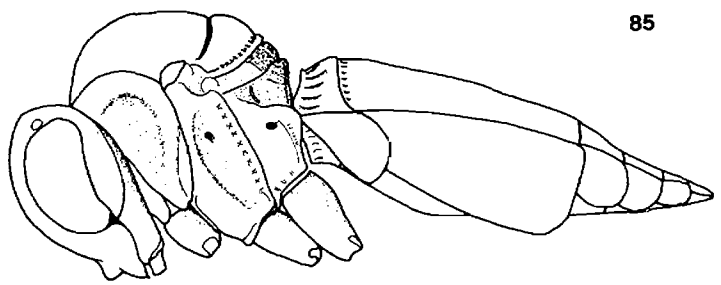

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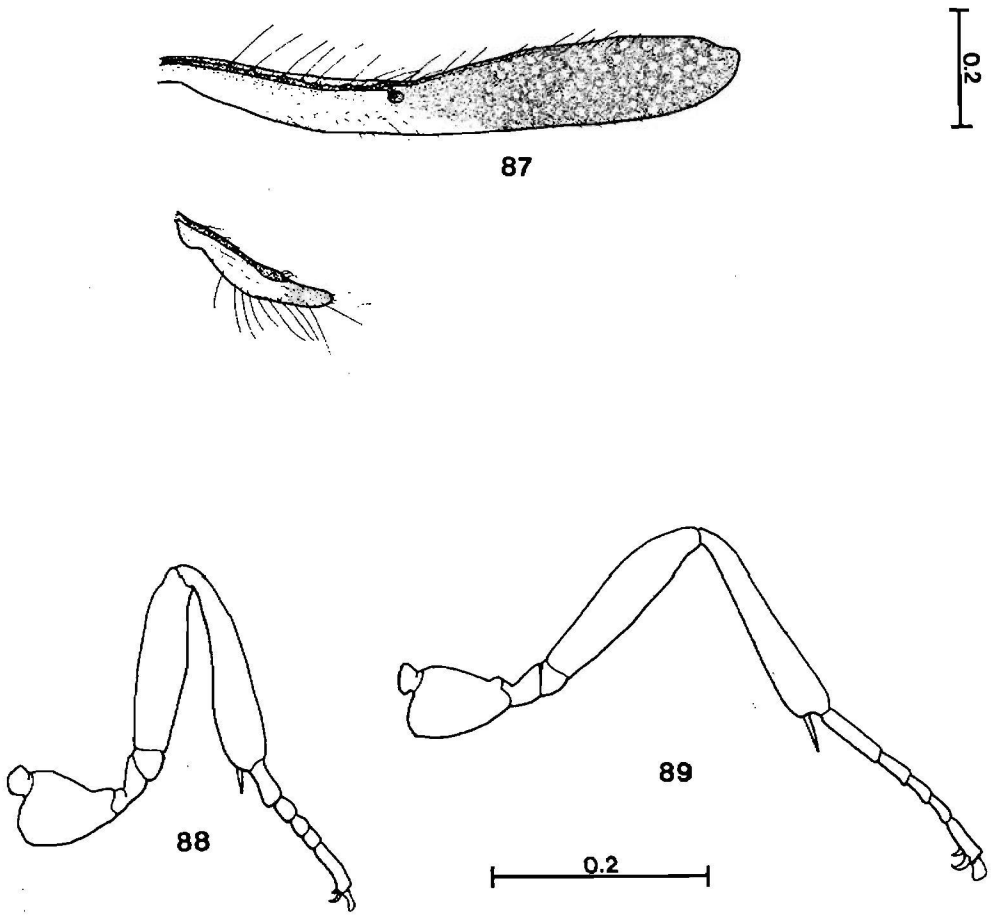
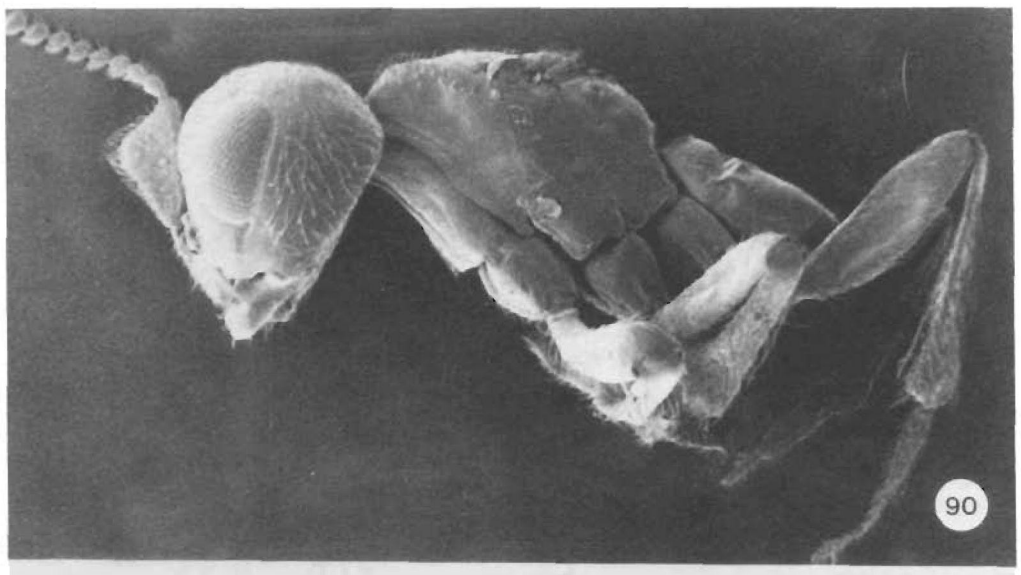
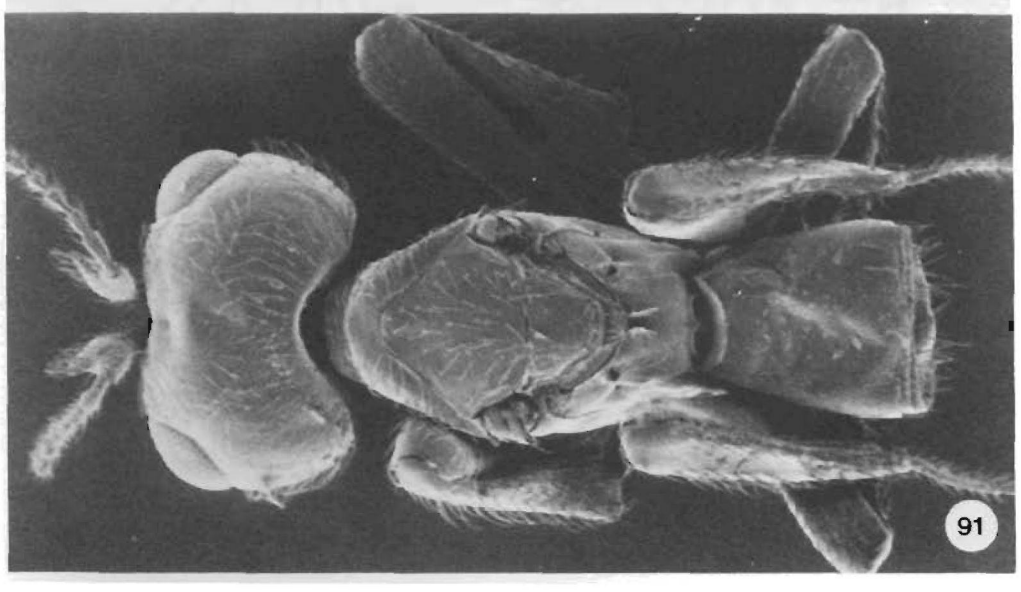
Figures 84-86. Lateral habitus. 84. *Telenomus dolichocerus* (northern specimen). **85.** *T. oculeus.* **86.** *T. sulculus,* female.

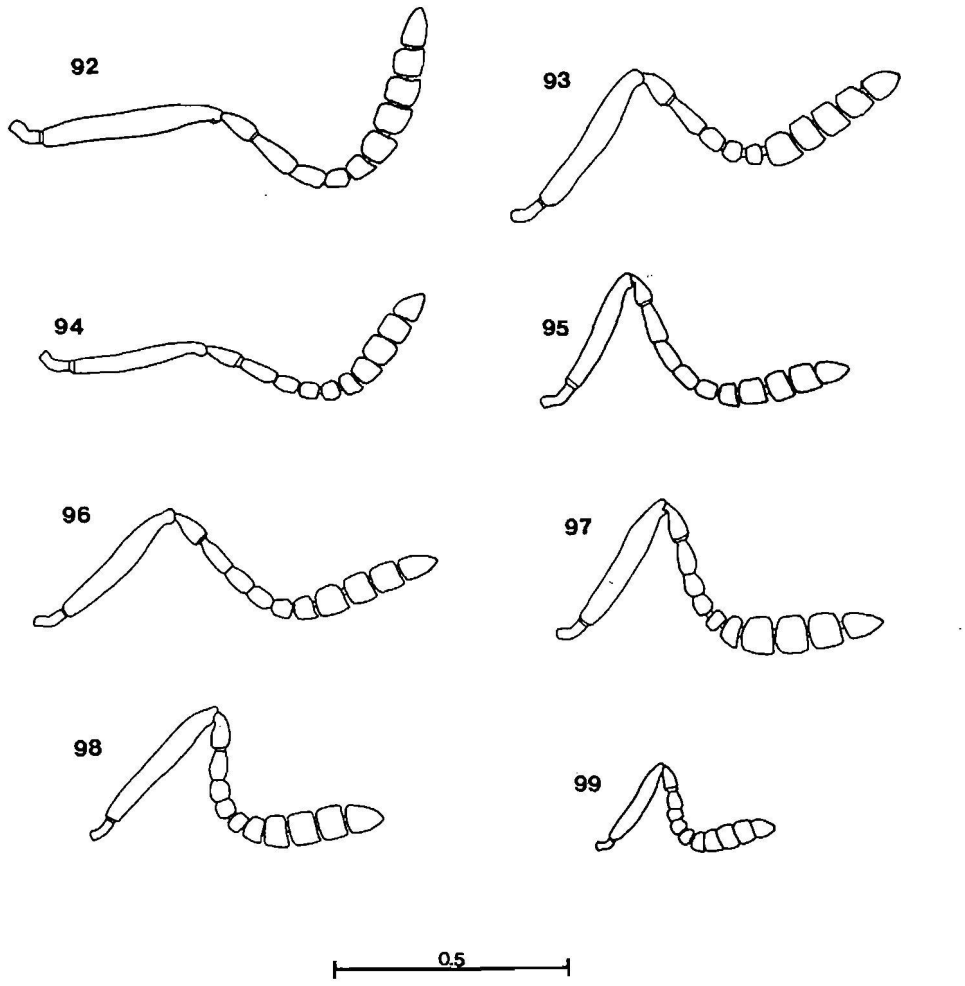


Figures 87. Wings, male *Telenomus sulculus*. Figures 88-89. Middle legs, *T. tabanivorus* group species. 88. Male. **89.** Female. Scales in millimeters.

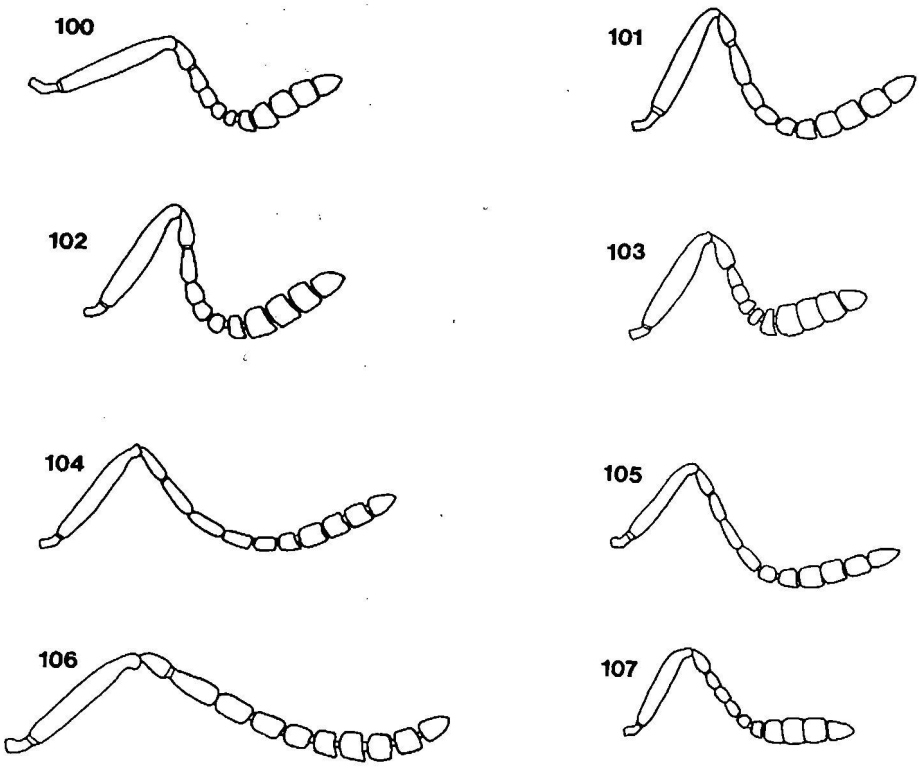




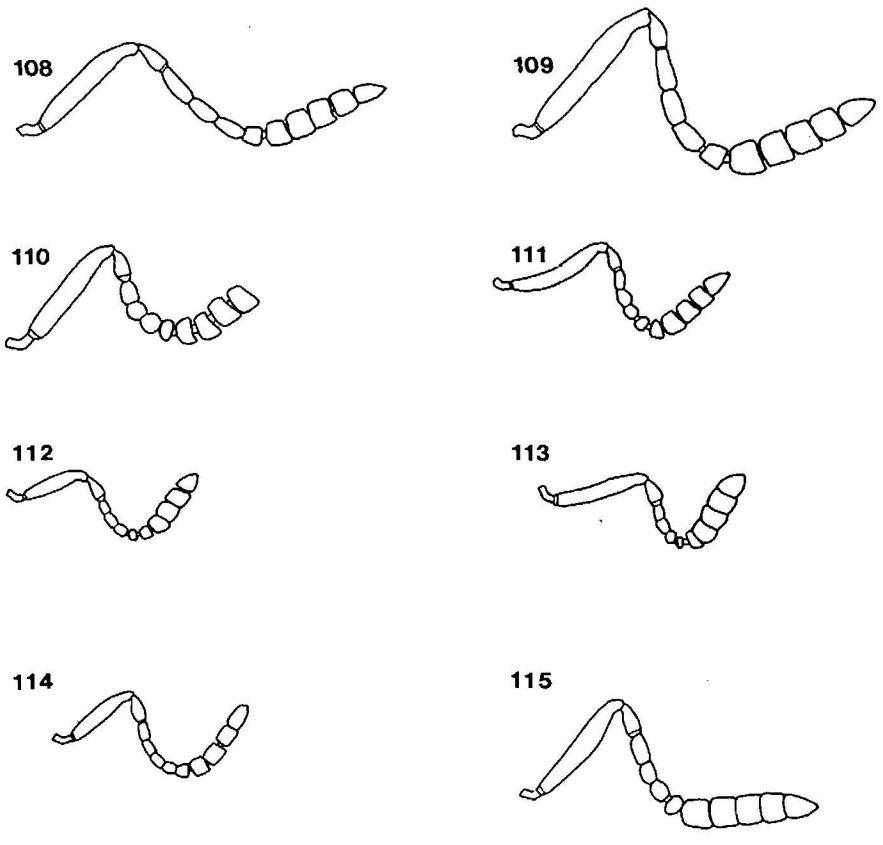
Figures 90-91. ***Telenomus sulculus*****, male. 90.** Lateral habitus. **91.** Dorsal habitus.



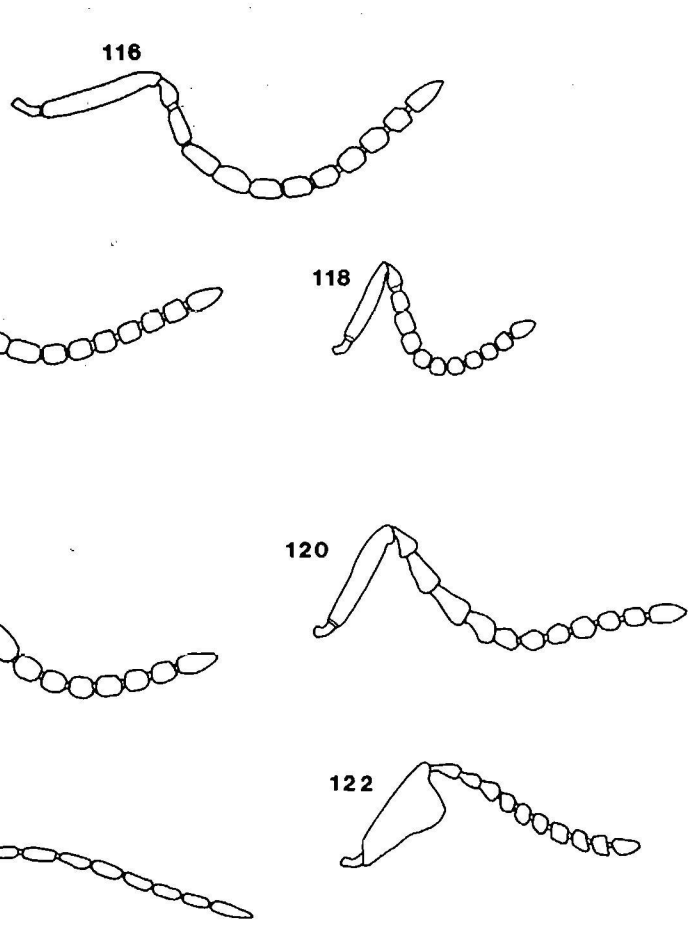
Figures 92-99. Female antenna. 92. *Telenomus grenadensis.* **93.** *T. scaber.* **94.** *T. goliathus.* **95.** *T. cristatus.* **96.** *T. podisi* (northern specimen). **97.** *T. podisi* (southern specimen). **98.** *T. persimilis.* **99.** *T. calvus.* Scale in millimeters.



Figures 100-107. Female antenna. 100. *Telenomus astrictus.* **101.** *T. chloropus* (Japanese thelytokous form). **102.** *T. zeli.* **103.** *T. sulculus.* **104.** *T. dolichocerus* (northern specimen). **105.** *T. dolichocerus* (Floridian specimen). **106.** *T. tanymerides.* **107.** *T. consimilis.*



Figures 108-115. Female antenna. 108. *Telenomus dentatus.* **109.** *T. abruptus.* **110.** *T. prolatus* (apical antennomere broken off). **111.** *T. oculeus.* **112.** *T. exilis.* **113.** *T. abitus.* **114.** *T. ovivorus* (Ashmead). **115.** *T. puticulus.*



Figures 116-122. Male antenna. 116. *Telenomus grenadensis.* **117.** *T. cristatus.* **118.** *T. calvus.* **119.** *T. podisi.* **120.** *T. zeli.* **121.** *T. dolichocerus.* **122.** *T. sulculus.*