

PHYLOGENETIC RELATIONSHIPS OF THE TELENOMINE GENUS *NIRUPAMA* (HYMENOPTERA: SCELIONIDAE)

Norman F. Johnson¹

Abstract. The Afrotropical genus *Nirupama* is most closely related to the genus *Archiphanurus*. *Nirupama*, *Archiphanurus*, and the genus *Psix* form a monophyletic group within the subfamily Telenominae sensu stricto.

Kozlov (1970) and Kozlov & Kononova (1983) recognized 3 tribes in the subfamily Telenominae (Hymenoptera: Scelionidae): Tiphodytini, Aradophagini, and Telenomini. In their concept the subfamily is defined only by the possession of wide laterotergites on the metasoma, a character also found in some Scelioninae and other families of Proctotrupoidea, e.g., Diapriidae and Platygastriidae. Masner (1972, 1976, 1980) transferred the Aradophagini and Tiphodytini to the subfamily Scelioninae. The Telenominae sensu stricto was then defined by Masner as having the combination of (1) wide laterotergites with (2) the loss of laterosternites in the metasoma; (3) 7 terga and 7 sterna in the female metasoma, 8 terga and 8 sterna in the male; (4) 7th sternum in the female and 8th in the male reduced to U-shaped sclerites and invaginated into the metasoma; and (5) sexually heteromerous antennae, with male antennae 12-merous (with 1 known exception) and female antennae usually 11-merous, sometimes 10-merous. I follow Masner's concept of the subfamily here, i.e., including only the nominal tribe. However, a sister-group analysis of the entire family Scelionidae at the tribal level is needed to resolve the question of whether Aradophagini and Tiphodytini should be included in the Telenominae.

I consider the Telenominae to include the following genera: *Aradoctonus* Masner, *Archiphanurus* Szabó, *Eumicrosoma* Gahan, *Latonius* Kononova, *Nirupama* Nixon, *Phanuromyia* Dodd, *Phanuropsis* Girault, *Phlebiaporus* Kozlov, *Platytelenomus* Dodd, *Protelenomus* Kieffer, *Psix* Kozlov & L  , *Telenomus* Haliday, and *Trissolcus* Ashmead. More than 600 species have been described in these taxa. The Old World tropical faunas, however, harbor a number of telenomine species that simply do not fit within these concepts and that may merit the description of new genera.

The genus *Nirupama* was first recognized and described by Nixon (1935) for 2 new species from Ghana, *N. morpheus* and *N. auge*. Nixon made no comments on the relationships of *Nirupama* except to say (Nixon 1935: 93), "Aberrant though the genus undoubtedly is, I freely admit that I would have preferred to include it in

1. Department of Entomology, The Ohio State University, 1735 Neil Avenue, Columbus, Ohio 43210, USA.

Telenomus rather than propose a new name for it, but complete absence of hairs on the eyes would not admit this.”

Masner (1976) suggested that the Telenominae could be divided into 2 groups of genera: one comprising *Telenomus*, *Platytelenomus*, *Eumicrosoma*, *Phanuromyia*, and *Nirupama*; and the other *Trissolcus* and the related *Protelenomus*, *Phanuropsis* and possibly *Aporophlebus* Kozlov. *Aporophlebus* was included on the basis of Kozlov's placement of *Aphanurus graeffei* Kieffer in the genus. This species is now the type-species of *Archiphanurus* and *Aporophlebus* is considered a junior synonym of *Telenomus* (Kozlov & Lê 1977). (With the exception of *Phlebiaporus*, the several genera that I include in the subfamily but that were not discussed by Masner have been described since 1975.) The gracile habitus and smooth frons of *Nirupama* formed the basis for its association with *Telenomus*. Fergusson (1983) repeated the contention that *Nirupama* and *Telenomus* are closely related but cited no shared characters to support his position.

I have recently acquired fresh material of *Nirupama morpheus* collected in Nairobi, Kenya. Study of these specimens and my work on the genera *Telenomus*, *Trissolcus*, *Phanuropsis*, and *Psix*, indicates a substantially different pattern of relationships than has so far been proposed in the literature.

MATERIALS AND METHODS

Specimens upon which this work is based were borrowed from or studied in the following institutions: Australian National Insect Collection, Canberra; Bernice P. Bishop Museum, Honolulu; British Museum (Natural History), London; Canadian National Collection of Insects, Arachnids and Nematodes, Ottawa, Ontario; and Queensland Department of Primary Industries, Indooroopilly. Polarization of character states is based upon comparisons with the following species: *Aradophagus fasciatus* Ashmead (Aradophagini); *Gryon* spp. and *Maruzza senegalensis* Mineo (Gryonini); *Tiphodytes gerriphagus* (Marchal) (Tiphodytini); *Idris* spp. (Idrini); and *Endecascelio* sp. and *Embidobia* sp. (Embidobiini).

RESULTS

The range of morphological variability within the genus *Telenomus* is so great that I have been unable to find any characters common to all its species that do not, at the same time, characterize the entire subfamily Telenominae. Therefore, in the results and discussion that follow I have indicated which segments of *Telenomus* possess the character states under consideration.

Nirupama shares the following apomorphic character states with portions of the genus *Telenomus*: frons without surface microsculpture medially (Fig. 1; almost all *Telenomus*); a distinct diagonal line of foveae on the mesepisternum (ef, Fig. 2: the episternal foveae of Johnson 1984; found in the *Te. crassiclava* group and species related to *Te. longiventris* Cameron); and an elongate, slim body (many species of *Telenomus*). *Trissolcus* and its relatives and *Nirupama* have bare eyes (or at least the

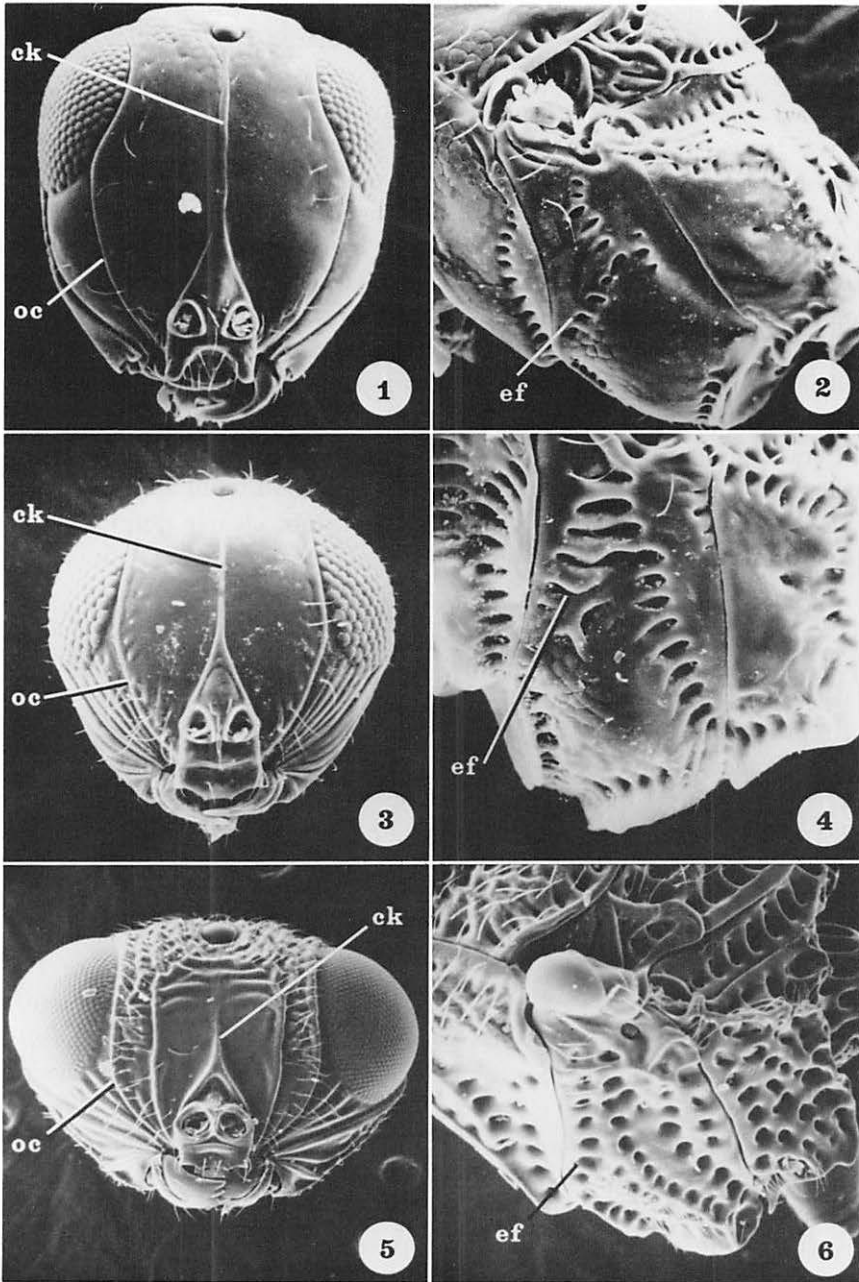


FIG. 1-6. 1-2. *Nirupama morpheus*: 1, head, frontal view (136 \times); 2, mesosoma, lateral view (102 \times). 3-4. *Archiphanurus* sp.: 3, head, frontal view (189 \times); 4, mesosoma, lateral view (309 \times). 5-6. *Psix glabriscribus*: 5, head, frontal view (59 \times); 6, mesosoma, lateral view (80 \times). Abbreviations: ck = central keel; ef = episternal foveae; oc = orbital carina.

setae are extremely short and not visible at less than $100\times$ except for a few exceptions in *Trissolcus*). *Trissolcus thyantae* Ashmead and related species also have the well-developed diagonal line of episternal foveae.

Nirupama, *Psix*, and *Archiphanurus* all have the following synapomorphies: a central keel on the frons that bifurcates above the antennal insertions (ck, Fig. 1, 3, 5); clypeus and labrum fused [Fig. 8–10, compare with *Trissolcus leviventris* (Cameron), Fig. 7]; lateral corners of labrum acute; labrum medially bidentate; either a carina (*Psix* and *Archiphanurus*) or a sulcus (*Nirupama*) connecting the base of the mandibles with the inner orbits of the eye (oc, Fig. 1, 3, 5). Both *Nirupama* and *Archiphanurus* have the malar space elongate, the outer tooth of the mandibles long and acute, the inner tooth distinctly shorter (*Nirupama*) or absent (*Archiphanurus*), and the base of the metasoma xanthic [melanic in 1 Australian species of *Archiphanurus*; Masner (pers. commun.) has informed me that he has seen an Australian species of *Archiphanurus* in which both the mesosoma and metasoma are uniformly golden-yellow].

Both described species of *Nirupama* are distinguished from all other telenomines by the deeply excavate clypeus. This character state clearly defines the genus as monophyletic.

DISCUSSION

Nirupama clearly seems to be the most closely related to *Archiphanurus*, and, together with *Psix*, these genera form a monophyletic group. The characters that they share with *Telenomus* and *Trissolcus* are, I believe, parallel or convergent developments. For example, species of *Psix* and *Archiphanurus* often lack microsculpture on the medial portion of the frons. *Nirupama* has, in my interpretation, also lost the characteristic rugae and carinae shared by the other 2, save for the central keel and orbital carinae (see below). Many *Telenomus* species also have a sculptured frons, e.g., *Te. lauri* (Huggert), or bare eyes, e.g., *Te. seychellensis* Kieffer. Some isolated *Trissolcus* species also have the normal *Telenomus* characters of distinctly hairy eyes, e.g., *Tr. exerrandus* Kozlov & Lê, or smooth frons, e.g., some small specimens of *Tr. euschisti* (Ashmead). The diagonal line of episternal foveae is shared by *Nirupama* (ef, Fig. 2), the *Telenomus crassiclava* group, *Telenomus longiventris* group, the *Trissolcus thyantae* group, and occasional genera of Scelioninae, e.g., *Tiphodytes* and *Harringtonia* Masner. Most other scelionines, most Teleasinae, most *Trissolcus* spp., most *Telenomus* spp., and all *Psix* (Fig. 6) and *Archiphanurus* (Fig. 5) have the apparently homologous chain of foveae running parallel to the pronotal-mesopleural suture. I believe the posterior displacement of part of this line to a diagonal position may be a reflection of a common, but convergently developed, pattern of morphogenesis, possibly associated with some degree of elongation of the mesosoma.

Johnson & Masner (1985) used the term "orbital carinae" to describe the costae running from the base of the mandibles to and along the inner orbits of the eyes (see oc, Fig. 3 and 5). In *Nirupama* a structure similar in position is present but is in the

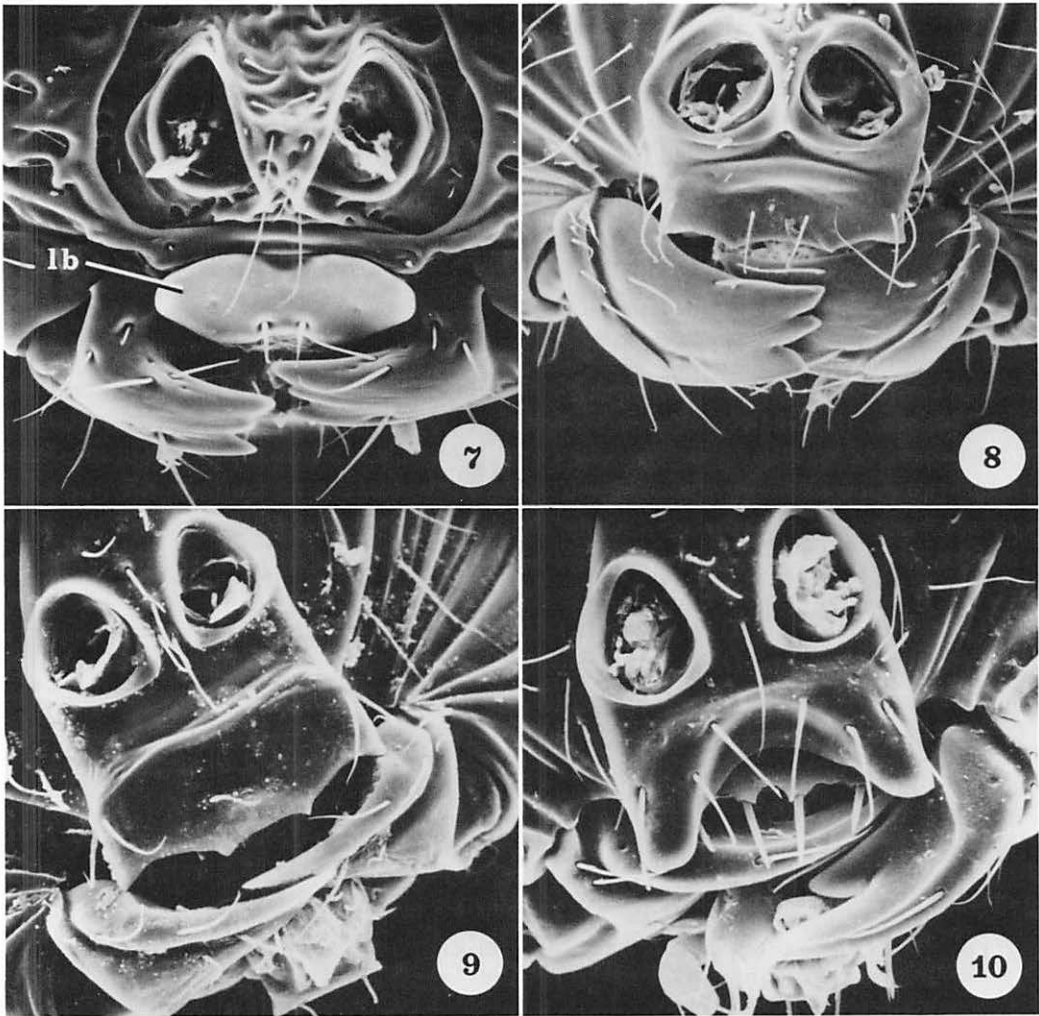


FIG. 7-10. Mouthparts, frontal view: 7, *Trissolcus leviventris* (lb = labrum) (221 \times); 8, *Psix glabriscrobis* (119 \times); 9, *Archiphanurus* sp. (602 \times); 10, *Nirupama morpheus* (565 \times).

form of a sulcus, not a raised carina (Fig. 1). I believe that the 2 structures, nevertheless, are homologous and that they simply represent different external manifestations of an internal costa that serves to brace the head capsule against the forces generated by the mandibular adductor muscles. A sufficient number of specimens of *Nirupama* was not available for dissection, and this hypothesis could not be tested.

Psix, *Nirupama*, and *Archiphanurus* are predominantly Old-World genera. Only a single species, *Psix tunetanus* (Mineo & Szabó), is known from the New World. This distribution may reflect a vicariant event affecting either the wasps themselves, or

possibly, their hosts. Little is known about the host relationships, but *Archiphanurus* seems to parasitize only the eggs of Plataspidae (Heteroptera), a group that is confined to the Old World. Johnson & Masner (1985) suggested that *Psix* may be a relatively early derivation from the telenomine line. I believe now that the subfamily may be subdivided into 2 monophyletic groups of genera, one of which consists of *Psix*, *Archiphanurus*, and *Nirupama*. More work on the phylogeny of the Scelionidae as a whole is needed to better understand the position of the Telenominae within the family and the interrelationships of its genera.

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