A NOVEL NEW NEOTROPICAL *NANOCLADIUS* (DIPTERA: CHIRONOMIDAE), SYMPHORETIC ON *TRAVERELLA* (EPHEMEROPTERA: LEPTOPHLEBIIDAE)

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ABSTRACT

The pupa and larva of *Nanocladius (Plecopteracoluthus) bubrachiatus* sp. nov. (Diptera: Chironomidae) are described from Honduras. This species lives in symphoretic association with the leptophlebiid mayfly *Traverella* sp. This is the first record of a *Nanocladius* living in symphoretic association with a mayfly. The larva is unusual in that it possesses a premento-hypopharyngeal fulcrum with long dorsocaudally directed arms. A key is included for the immature stages of *Nanocladius (Plecopteracoluthus).*

RESUMEN

Se describen la pupa y la larva de *Nanocladius (Plecopteracoluthus) bubrachiatus* sp. nov. (Diptera: Chironomidae) de Honduras. Esta especie vive en asociación sinforética con el leptoflebíido *Traverella* sp. Este es el primer récord de un *Nanocladius* viviendo en associación sinforética con una efímera. La larva es fuera de lo común ya que posee un fulcro del complejo premento-hipofaringeal con brazos largos dirigidos dorsocaudalmente. Se incluye una clave para los estados inmaduros de *Nanocladius (Plecopteracoluthus).*

Larvae of the orthoclad genus *Nanocladius* Kieffer are well known as symphoretic associates of Plecoptera (Steffan 1965, Saether 1977) or Megaloptera (Hilsenhoff 1968, Gotceitas & MacKay 1980). *Nanocladius* is composed of 2 subgenera, *N. (Nanocladius)* and *N. (Plecopteracoluthus).* Saether (1977) considered *Plecopteracoluthus* Steffan to be a subgenus of *Nanocladius* modified for symphoretic life. At least one species of *Nanocladius (Nanocladius)* is also symphoretic on Megaloptera (Gotceitas and MacKay 1980).

Most records of chironomid-mayfly symbiosis deal with parasitic relationships usually involving the chironomid genus *Symbiocladius* Kieffer. Arvy & Peters (1973) provide a detailed account of the chironomids and mayflies involved in such relationships.

I recently examined some mayfly nymphs of *Traverella* Edmunds (Ephemeroptera: Leptophlebiidae) from Honduras which had chironomid larvae attached to their bodies. The mayfly nymphs are similar to *Traverella* sp. A of Allen (1973). This paper describes the larva and pupa of a new species of *Nanocladius (Plecopteracoluthus)* from those nymphs and presents the first record of a symphoretic association between *N. (Plecopteracoluthus)* and a mayfly.

Terminology and abbreviations follow Saether (1980). All measurements are in micrometers unless otherwise stated, and consist of a range, mean, and the number of specimens measured in parentheses if different from the number (n) stated at the beginning of the description. Means are not given for samples of 3 or less. Postmentum length

is measured from the bottom of the division of the median teeth to the caudal margin of the postmentum.

DESCRIPTION

Nanocladius bubrachiatus sp. nov.

PUPA (n = 1).

Color. Light brown.

Total length 3.15 mm.

CEPHALOTHORAX. Thoracic horn elongate-ovate, with small spines (Fig. 1); 76 long, 22 wide at widest point; length/width ratio 3.45. Frontal setae 58 long, on small, low tubercles. Thoracic setal lengths: LAps 35; MAps 78; Pc_1 30; Pc_2 130; Pc_3 105; Dc_1 35; Dc_2 lost; Dc_3 and Dc_4 25; Dc_1 140 anterior to Dc_3, Dc_3 25 anterior to Dc_4.

ABDOMEN (Fig. 2). PSA present on S IV-VII, strongest on IV, becoming progressively weaker. PSB absent. Segment I with 1 L-seta (segment damaged), II and III with 2 L-setae, IV-VI with 3 L-setae, VII with 4 filamentous L-setae, VIII with 4 or 5 filamentous L-setae (one side with 4, the other with 5). T II without prominent caudomesal protuberance; with approximately 73 caudomesal hooklets, the longest 9 long. T III-VI with caudal rows of spines; T IV-VI also with weak median shagreen area; median spine patches absent on all tergites. Lengths and numbers of tergal caudal spines: T III with 150, longest 12; IV with 115, longest 8; T V with 71, longest 12; T VI with 43, longest 14. T VII-VIII with median shagreen patches. Anal lobe with fine anterodorsal shagreen; with 30-31 setae/side. Anal macrosetae weak, about 50 long, 2 wide.

FOURTH INSTAR LARVA (n = 2, unless otherwise stated).

Color. Head capsule light brown with darker posterior margin.

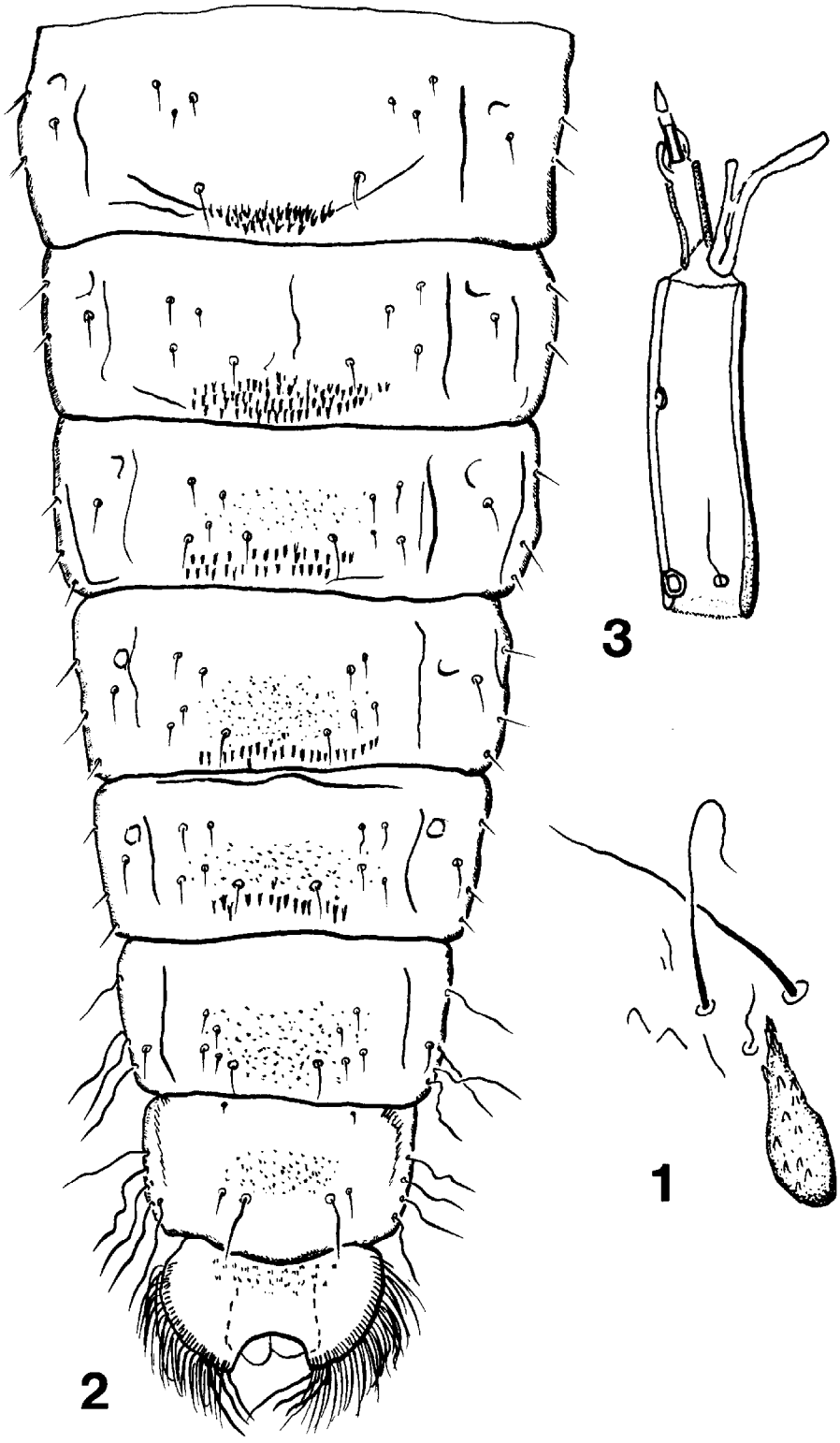
Total length 3.15 mm (1).

HEAD. Postmentum length 135-140. All labral setae simple; pecten epipharyngis of 3 simple, smooth, sharply-pointed spines. Antenna 4-segmented, with 3rd segment distally thinner (Fig. 3). Antennal segment lengths: 48-49; 15-16; 7-8; 4-5. AR 1.66-1.88. Antennal segment I 14-15 wide; apical blade 20-24 long; ring organ 2-3 from base; seta 1 from base; apical setal mark 27-29 from base. Mandible (Fig. 4) 87-96, 91 (4) long. Premandible (Fig. 5) 37-46 (3) long, with sharply bifid apex and 3 inner teeth. Mentum (Fig. 6) with 2 pointed ventromental teeth flanked by 2 anterolateral ventromental teeth, and 6 pairs of darker dorsomental teeth. Ventromental plates elongate and narrow (Fig. 6). Maxilla reduced (Fig. 7). Fulcrum of premento-hypopharyngeal complex with 2 large dorsocaudally directed arms, each arm about 90 μm high (Figs. 10-12).

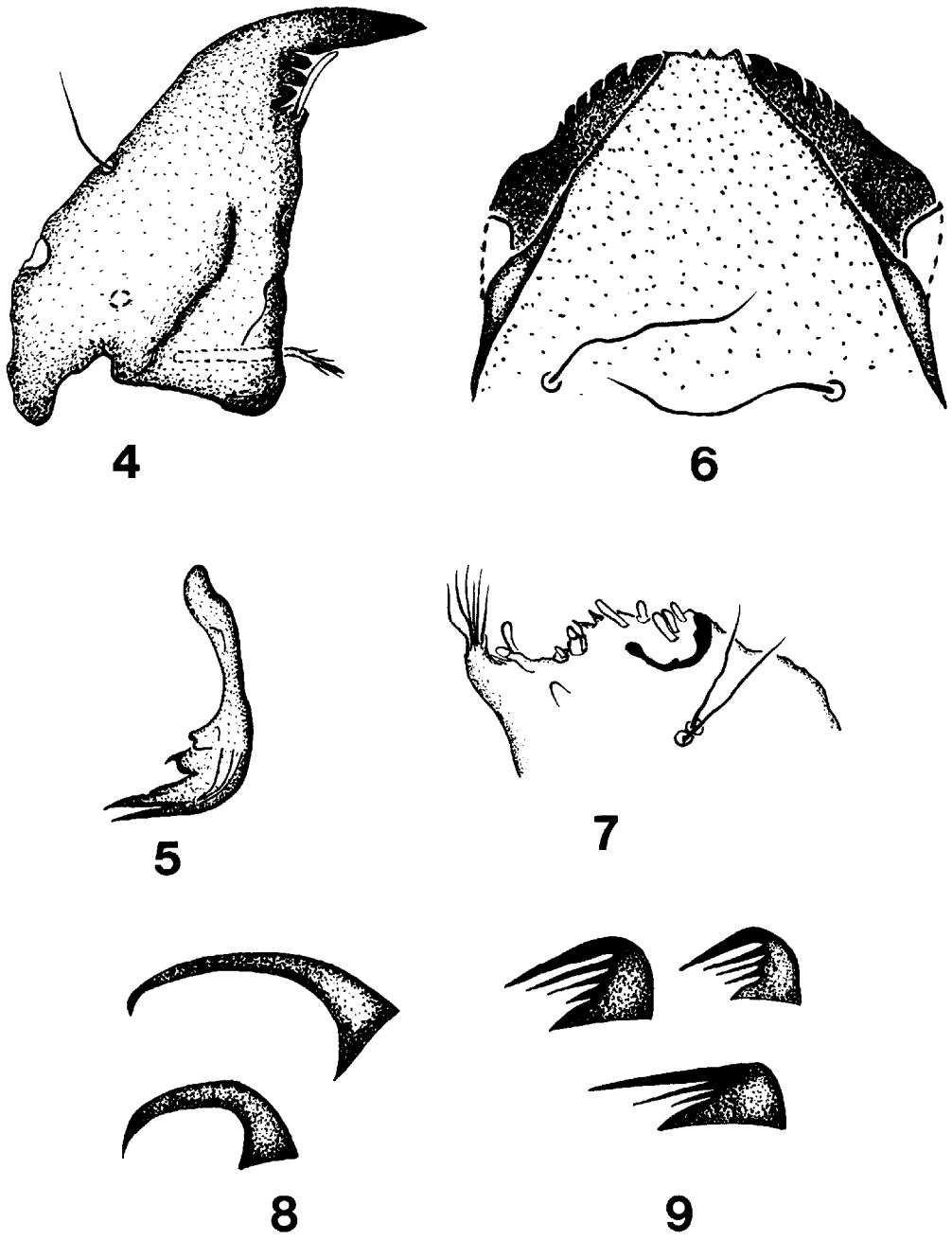
BODY. Distal claws of anterior parapods smooth (Fig. 8), mesal and proximal claws strongly serrated (Fig. 9). Body setae simple. Procercus 7-11 wide, 8-10 high; with 2 small (14-15 long) setae, 2 medium (45-65 long) setae and 3 large (130 long) setae. Dorsal anal tubules appear slightly larger than ventral anal tubules, both with an apparent medial constriction (Fig. 13).

IMAGINES. Unknown.

DIAGNOSIS. The pupa is separated from *N. (P.) branchicolus* Saether and *N. (P.) downesi* (Steffan) by the lack of median spine patches on T III-VII, and by the number of anal lobe setae: 30-31 in *N. (P.) bubrachiatus*, 15-20 in *N. (P.) downesi*, 49 in *N. (P.) branchicolus*. The larva is distinguished by the large dorsal arms of the fulcrum, the shape and number of teeth of the mentum and the 4-segmented antennae. Both larvae and pupae can also be distinguished by their phoretic association with *Traverella* sp.



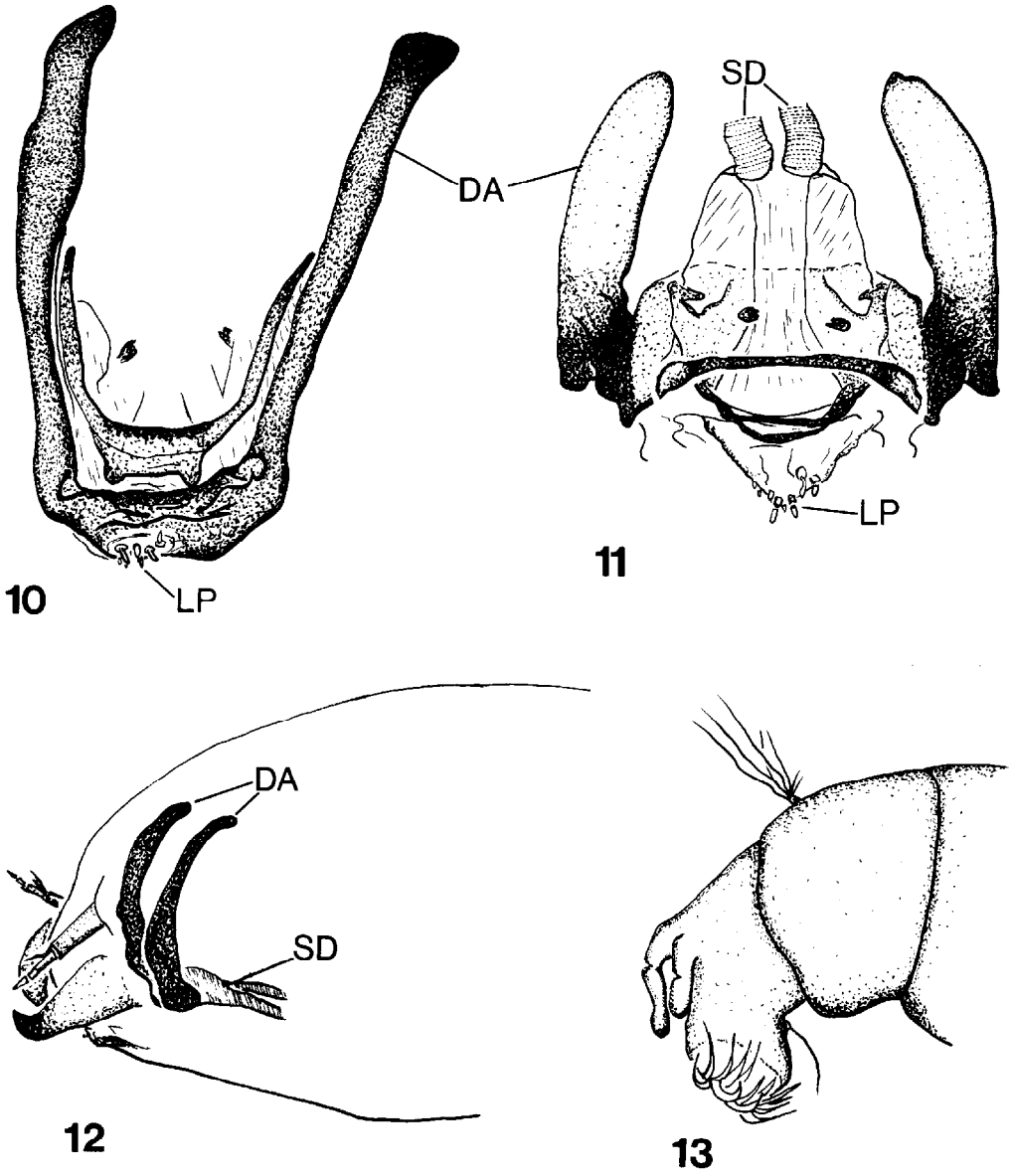
Figs. 1-3. *Nanocladius (Plecopteracoluthus) bubrachiatus:* 1) Pupal thoracic horn and precorneal setae; 2) pupal abdomen, dorsal (segment I missing); 3) larval antenna.



Figs. 4-9. *Nanocladius (Plecopteracoluthus) bubrachiatus,* larval structures: 4) mandible; 5) premandible; 6) mentum; 7) maxilla; 8) distal claws of anterior parapods; 9) proximal and mesal claws of anterior parapods.

ETYMOLOGY. From the Latin *bu,* meaning large, great; and the Latin *brachiatus,* meaning with arms or branches. The name refers to the large dorsolateral arms of the fulcrum of the larval premento-hypopharyngeal complex.

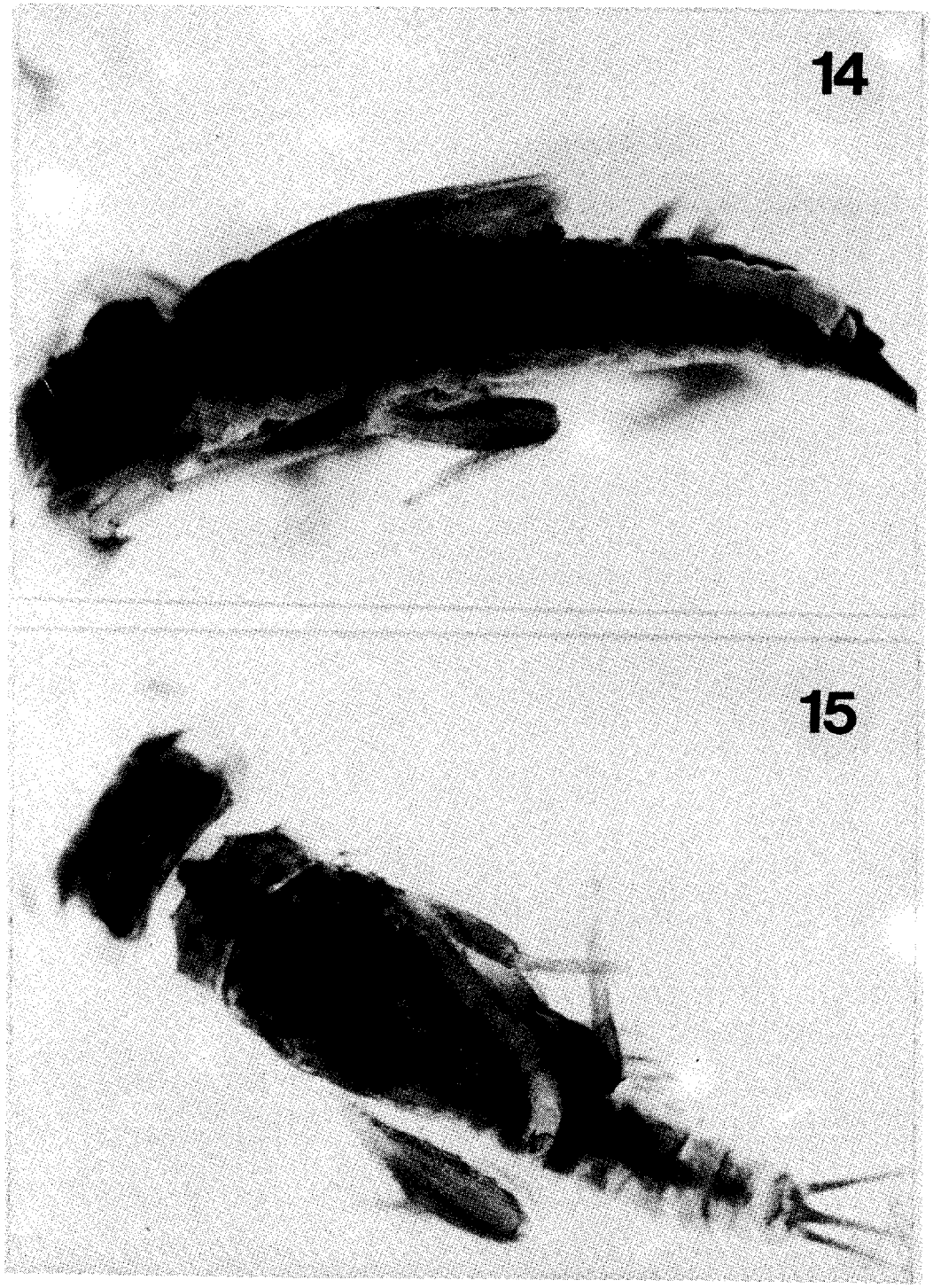
MATERIAL EXAMINED. *Holotype:* female pupa with larval exuviae, HONDURAS: Comayagua; Rio Humuya, 12 km NW Comayagua (milky R., thorn scrub), 19-VII-1977,



Figs. 10-13. *Nanocladius (Plecopteracoluthus) bubrachiatus*, larval structures: 10) premento-hypopharyngeal complex, frontal view; 11) same, dorsal view; 12) slightly oblique lateral view of head capsule, showing position of dorsal arms of fulcrum; 13) anal end (DA, dorsal arms of fulcrum; LP, labial palpi; SD, salivary ducts).

leg. L. B. & C. W. O'Brien, G. B. Marshall [on *Traverella* sp.]. *Paratypes* (4): 4 larvae on *Traverella* sp., same data as holotype.

TYPE INFORMATION. The holotype and one paratype will be deposited in the Florida State Collection of Arthropods, Tallahassee. Paratypes will be placed in my personal collection and in the Zoologische Staatssammlung, Munich, West Germany. One paratype remains attached to its mayfly host, preserved in alcohol; the other specimens are mounted in Euparal on microscope slides.



Figs. 14-15. *Traverella* sp. : 14) nymph with *N. (P.) bubrachiatus* larva attached above gills; 15) nymph with *N. (P.) bubrachiatus* larva attached on outside of wing pad; note empty tube at midline of wing pads.

Biology

The larvae of *N. (P.) bubrachiatus* live in symphoretic association with *Traverella* sp. Five *Traverella* nymphs were examined. Chironomid larvae and one pupa (with its larval exuviae still attached) were found in silken tubes attached to both the outside and inside edges of the nymphal wing pads, along the dorsolateral margin of the abdomen above the gills (Figs. 14-15), and between the hind coxae. Three of the nymphs had one larval tube on each; 2 nymphs had 2. Larvae (and the empty larval tubes) were located on both sides of the nymphs (3 on the right side, 3 on the left, one in the middle). All larvae and the one pupa examined were positioned with their heads facing the caudal end of the mayfly. None of the mayfly nymphs appeared to be damaged or malformed.

Traverella nymphs inhabit the rapids of medium-sized to large rivers, where they live under rocks (Edmunds et al. 1976), a habitat not unlike that of the Plecoptera which are utilized by other members of the subgenus *Plecopteracoluthus*. The "milky R., thorn scrub" listed in the collection site data refers to the milky color of the Rio Humuya where it flows through an area of thorn scrub (C. W. O'Brien, personal communication).

Remarks

The lack of both PSB and a caudomesal projection on T II of the pupa, and the straight elongate caudal apices of the ventromental plates of the larva place *N. (P.) bubrachiatus* in the subgenus *Plecopteracoluthus* as recognized by Saether (1977).

The most striking character distinguishing larval *N. (P.) bubrachiatus* from the other species in the subgenus is the premento-hypopharyngeal complex (Figs. 10-12). From each side of the fulcrum of the premento-hypopharyngeal complex (Saether 1980:25), a heavily sclerotized dorsal arm projects and bows gently caudad (Fig. 12). The arms are apparently not fused with the head capsule, as are the hypopharyngeal suspensorial bars of *Anopheles quadrimaculatus* Say illustrated by Menees (1962: Fig. 21). Hirvenoja (1973: Fig. 24_1) illustrated extended fulcrum arms in *Protanypus* spp. They are, however, much smaller than those in *N. (P.) bubrachiatus*. It was not possible to discern any muscle attachments to this structure in *N. (P.) bubrachiatus*.

The larvae of most *Nanocladius* species possess a ventromentum with 2 pointed median teeth flanked by low, rounded humps or in a planar area which extends to the anterolateral corners of the ventromentum (see Saether 1977: Figs. 10F, 16F, 19D). The ventromentum of *N. (P.) bubrachiatus* has 2 pointed median teeth flanked by another pair of pointed teeth at the anterolateral corners of the mentum (Fig. 6).

The larval antennae in *N. (P.) bubrachiatus* and *N. (P.) downesi* are apparently 4-segmented. In *N. (P.) bubrachiatus* the 3rd and 4th antennal segments appear to have been fused, indicated by a change in the antennal wall; the distal 1/5 of the 3rd segment is thinner than the basal portion (Fig. 3). Indications of a slight ring-like thickening of the antennal wall at this point are evident. Steffan's (1965) figure does not illustrate a similar construction for *N. (P.) downesi*.

Mature adults of *N. (P.) bubrachiatus* were not available. Saether (1977:6) stated: "because there are very few characters to separate the adults, an identification without associated pupae can only be regarded as tentative. The pupae, however, are easily distinguishable . . ." The pupa (and larva) of *N. (P.) bubrachiatus* are easily distinguished from the other described species of *Plecopteracoluthus* (see Diagnosis).

The developing female imago within the pupal skin is not sufficiently mature to examine thoroughly; developing ommatidia and seminal capsules are barely visible. However, the tarsi are sufficiently developed to observe that pulvilli are present. The 2 other species of *N. (Plecopteracoluthus)* possess pulvilli, although Steffan (1965)

stated that pulvilli were absent in *Plecopteracoluthus downesi*. However, his illustration (Steffan 1965: Fig. 7) clearly shows a pulvillus. Saether (1977) described *N. (P.) branchicolus* with pulvilli, and used the lack of pulvilli as a character to separate *N. (P.) downesi* from *N. (P.) branchicolus*. Because both species possess pulvilli, this character should be eliminated from Saether's adult keys; the other characters given in the keys will separate the 2 species.

The following key to the immature stages of *N. (Plecopteracoluthus)* is based on the descriptions of Steffan (1965), Saether (1977) and the present paper.

KEY TO IMMATURE STAGES OF *Nanocladius (Plecopteracoluthus)*

1. Pupae 2
— Larvae 4
2. Abdominal tergites V-VI without median spine patches; 30-31 setae on anal lobe; symphoretic on Leptophlebiidae (Ephemeroptera) ..... *N. (P.) bubrachiatus* sp. nov.
— Abdominal tergites V-VI with median spine patches; either 15-20 or about 50 setae on anal lobe; symphoretic on Perlidae (Plecoptera) 3
3. Anal lobe with 15-20 setae; median spine patches well developed only on T V-VI ..... *N. (P.) downesi* Steffan
— Anal lobe with about 49 setae; median spine patches well developed on T IV-VII ..... *N. (P.) branchicolus* Saether
4. Ventromentum with 4 pointed teeth; premento-hypopharyngeal complex with extremely large dorsocaudally directed fulcrum arms ..... *N. (P.) bubrachiatus* sp. nov.
— Ventromentum with only 2 pointed median teeth; premento-hypopharyngeal complex without extremely large fulcrum arms 5
5. First 2 pairs of dorsomental teeth fused, producing mentum with 11 teeth; antennae 4-segmented, AR about 2.3; living in gelatinous cases . *N. (P.) downesi* Steffan
— Mentum with 13 teeth; antennae 5-segmented, AR about 1.5; living in silken tubes ..... *N. (P.) branchicolus* Saether

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SEX-BIASED SIZE VARIATION IN VELVET ANTS (HYMENOPTERA: MUTILLIDAE)

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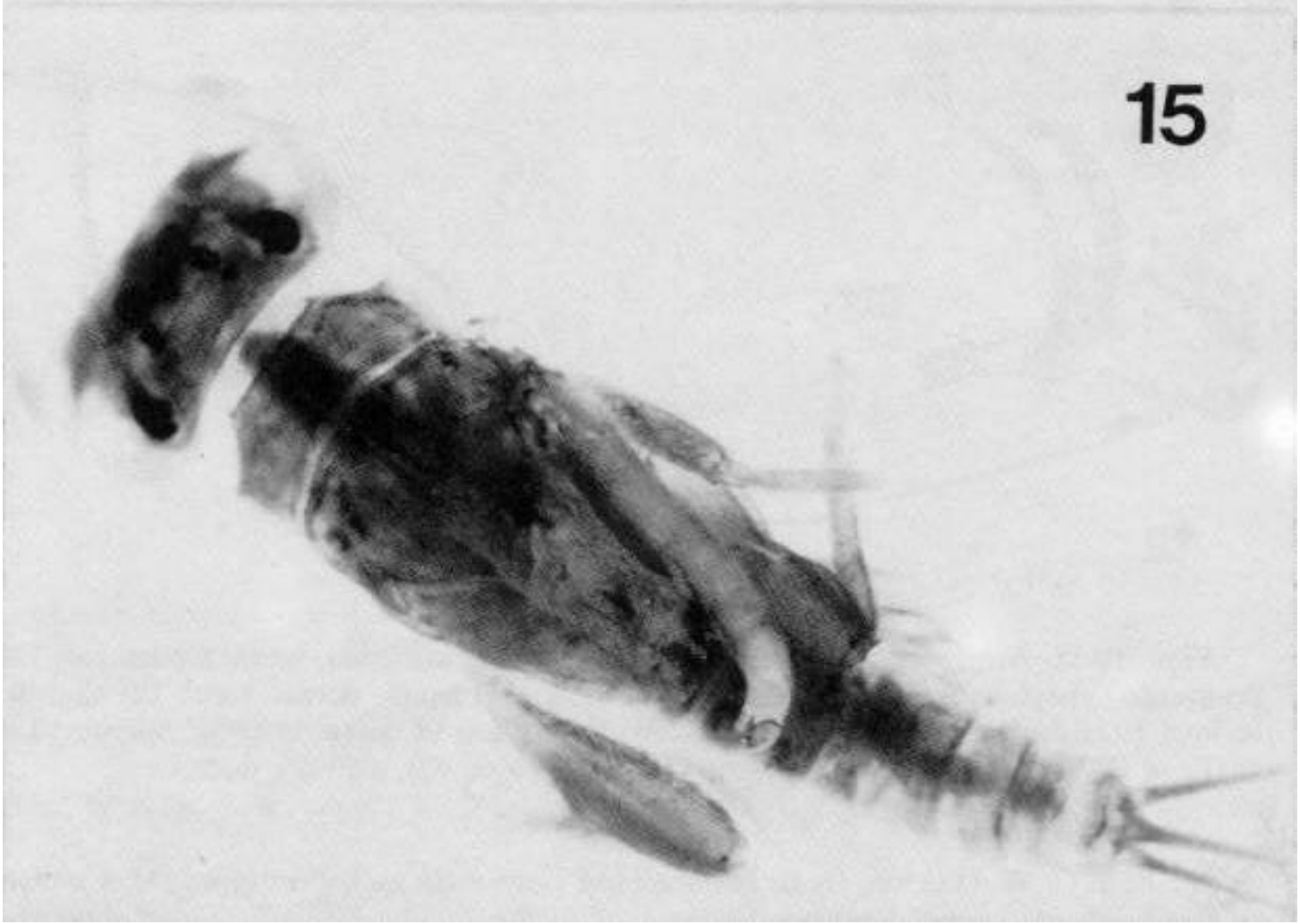
ABSTRACT

The relative sizes of male and female Mutillidae were studied at the Archbold Biological Station in south-central Florida. Females are larger than males in *Dasymutilla pyrrhus* (Fox), *Pseudomethoca sanbornii aeetis* (Fox), and *P. oculata* (Banks). Males are larger than females in *Timulla d. dubitata* (Smith), *T. floridensis* (Blake), *Ephuta f. floridana Schuster, E. m. margueritae* Schuster, *E. s. slossonae* (Fox), *Dasymutilla archboldi* Schmidt and Mickel, and *Photomorphus paulus* (Bradley). There is no significant difference in *Dasymutilla asopus bexar* (Blake), *D. nigripes* (Fabricius), and *D. castor* (Blake). Sex-biased size variation may be associated with courtship behavior or host-seeking behavior.

RESUMEN

Se estudió el tamaño relativo de machos y hembras de Mutillidae en la Estación Biológica de Archbold en el centro-sur de la Florida. Las hembras son más grande que los machos en *Dasymutilla pirrhus* (Fox), *Pseudomethoca sanborinii aeetis* (Fox), y *P. oculata* (Banks). Los machos son más grande que las hembras en *Timulla d. dubitata* (Smith), *T. floridensis* (Blake), *Euphata f. floridana* Schuster, *E. m. margueritae* Schuster, *E. s. slossonae* (Fox), *Dasymutilla archboldi* Schmidt y Mickel, y *Photomorphus paulus* (Bradley). No hay diferencia significante en *Dasymutilla asopus bexar*


14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