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**ASKOLA FROEHLICHI A NEW GENUS AND SPECIES
FROM SOUTHERN BRAZIL (LEPTOPHLEBIIDAE:
EPHEMEROPTERA)¹**

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ABSTRACT

Askola froehlichii, a new genus and species of the Leptophlebiidae from Southern Brazil, is described. The nymphs and adults are reared. Relationships of *Askola* to other genera are discussed.

Among the specimens of mayflies in the collections of Dr. Claudio G. Froehlich, Universidade de São Paulo, are reared specimens of a new genus of the Leptophlebiidae from the coastal mountains of Southern Brazil. Additional nymphs of this genus were collected by me or Sr. Fritz Plaumann in Paraná State and Santa Catarina State, Brazil.

The following terms and procedures used in the generic descriptions of the imagos and nymphs require further explanation. Venational terminology used is as given in Peters and Edmunds (1964). Each segment of the fore legs of the male imagos is compared to the length of the fore tibiae and expressed as a ratio, while the average length in millimeters of the fore tibiae is given in parentheses. In the figure of the labium, the ventral surface is shown on the right hand side of the drawing, and the dorsal surface is shown on the left.

I offer my sincere thanks to Dr. Froehlich for allowing me to study his mayfly collections and to Mrs. William L. Peters for preparation of the illustrations under my supervision.

Genus *Askola*, new genus

(Fig. 1-21).

IMAGO.—Length of male: body 6.4 mm; fore wings 7.0 mm. Length of female: body 6.0 mm; fore wings 6.7 mm. Eyes of male meet on meson of head, lower portion of eyes $\frac{3}{4}$ length of upper portion; eyes of female separated on meson of head by a length 4 times as great as maximum width of an eye. Wings (Fig. 1): vein R_3 of fore wings forked $\frac{1}{5}$ of distance from base to margin; vein MA forked a little more than $\frac{1}{2}$ of distance from base to margin, fork asymmetrical, distal portion of vein MA sagged posteriorly; vein MP forked $\frac{1}{2}$ distance from base to margin, fork symmetrical, distal portion of vein MP a little sagged posteriorly; vein ICu_1 attached at base to vein CuA (Fig. 1); posterior margin of female wings with setae; cross veins numerous. Hind wings absent. Legs: ratios of segments in male fore legs, 0.50: 1.00 (2.7 mm): 0.03: 0.26: 0.26: 0.15: 0.09. Claws of a pair dissimilar, one apically hooked (Fig. 2), other obtuse, pad-like. Male genitalia (Fig. 3-4): segment 2 of forceps a

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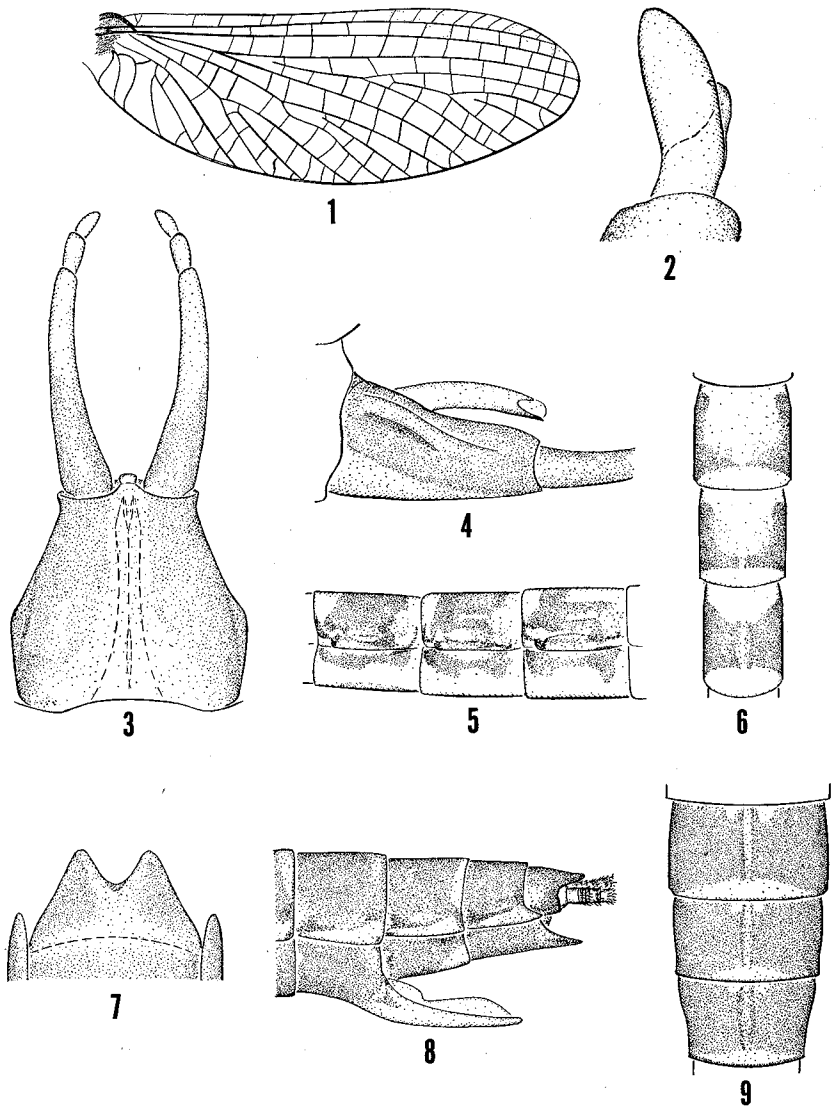


Fig. 1-9. *Askola froehlichii* n. sp., ♂ and ♀ imagos. Fig. 1. Fore wing of ♂ imago. Fig. 2. Fore claw of ♂ imago. Fig. 3-4. Genitalia of ♂ imago: 3. ventral view. 4. lateral view. Fig. 5-6. Abdominal segments 5-7 of ♂ imago: 5. lateral view. 6. dorsal view. Fig. 7. Ninth sternum of ♀ imago. Fig. 8. Lateral view of ovipositor of ♀ imago. Fig. 9. Dorsal view of abdominal segments 5-7 of ♀ imago.

little longer in length than segment 3, segment 2 of forceps $1/6$ length of segment 1, base of forceps broad, its inner margin forming an angular bend near base of forceps; length of styliger plate along median line a

little shorter than maximum width, dorsal surface grooved along median line for penes (Fig. 3-4); penes divided, tubular, slender, apically acute. Ninth sternum of female cleft (Fig. 7). Female with an ovipositor or egg guide extending to posterior margin of segment 9 (Fig. 8). Terminal filament a little longer than cerci.

MATURE NYMPH.—Head prognathous. Antennae 4 times as long as maximum length of head. Mouthparts (Fig. 10-16): dorsal hair on labrum as in Fig. 10; submedian areas of hair and anterior areas of spines ventrally (Fig. 11); 2 large equal sized denticles on anteromedian margination (Fig. 12). Clypeus as in Fig. 10. Left mandible as in Fig. 13. Lingua of hypopharynx with well developed lateral processes (Fig. 15), anterior margin cleft; superlingua of hypopharynx as in Fig. 15, with a row of hair along anterior margin. Segment 2 of maxillary palpi a little longer to $1\frac{1}{4}$ length of segment 1; segment 3 of palpi $\frac{3}{4}$ length of segment 2, triangular; a V-shaped ridge near the ventral, inner anterolateral margin of maxillae; hair on maxillae as in Fig. 14. Labium as in Fig. 16; segment 2 of palpi a little longer to $1\frac{1}{4}$ length of segment 1; segment 3 of palpi a little longer than $\frac{1}{2}$ length of segment 2, triangular; paraglossae ventral to glossae. Short hair on anterolateral margins of prothorax. Legs (Fig. 17, 20-21): apex of claws hooked and narrow, denticles on claws progressively larger apically. Gills (Fig. 18-19): gills 1-7 alike; dorsal and ventral portions of lamellae plate-like, apical half of each portion with margins fringed; main trunk of tracheae along median line of lamellae, tracheae on both sides of main trunk branched, each branch terminated at apex of each filamentous process, tracheae pigmented. Posterolateral spines on abdominal segments 5 or 6-9, spines progressively larger posteriorly. Terminal filament a little longer than cerci.

ETYMOLOGY.—*a*, Gr. meaning without; *skolos*, Gr. meaning spine.

TYPE SPECIES.—*Askola froehlichii*, new species.

Askola froehlichii, new species

(Fig. 1-21).

MALE IMAGO (in alcohol).—Length: body, 6.4 mm; fore wings, 7.0 mm. Upper portion of eyes gray, lower portion black. Head and scape of antennae brown, remainder of antennae paler. Basal half of ocelli dark brown, apical half white. Thorax brown, sutures paler, carinae darker. Coxae of legs brown, remainder of legs light brown; apex of prothoracic tibiae dark brown; basal half and apex of metathoracic femora dark brown. Wings (Fig. 1): longitudinal veins of fore wings light brown, cross veins paler; membrane transparent except apex of cells C and Sc translucent as in Fig. 1. Hind wings absent. Abdomen: segment 1 uniformly brown; terga 2-9 light brown, darker blackish-brown markings as in Fig. 5-6, tergum 10 brown, spiracles and tracheae dark brown; sterna light brown, darker blackish-brown markings as in Fig. 5. Genitalia (Fig. 3-4): styliger plate brown, except paler median, longitudinal band; basal $\frac{1}{3}$ of forceps brown, remainder of forceps and penes paler. Caudal filaments light brown, brown annulations at alternate articulations, annulations faded near apex.

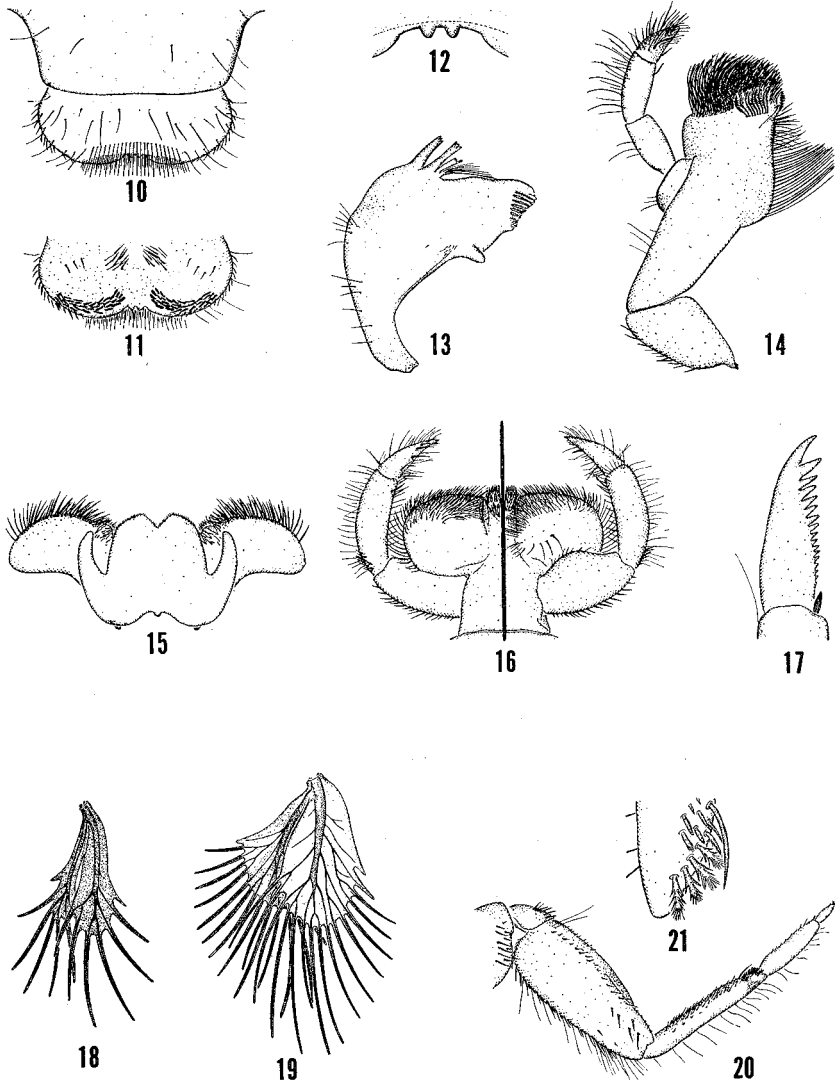


Fig. 10-21. *Askola froehlichii* n. sp., nymph. Fig. 10-12. Labrum: 10. dorsal view. 11. ventral view. 12. enlargement of denticles on antero-median emargination. Fig. 13. Dorsal view of left mandible. Fig. 14. Ventral view of right maxilla. Fig. 15. Hypopharynx. Fig. 16. Labium. Fig. 17. Fore claw. Fig. 18. Gill 1. Fig. 19. Gill 4. Fig. 20. Fore leg. Fig. 21. Enlargement of apex of tibia of fore leg.

FEMALE IMAGO (in alcohol).—Length: body, 6.0 mm; fore wings, 6.7 mm. Eyes black. Head and scape of antennae dark brown, remainder of antennae paler. Basal half of ocelli black, apical half white. Color and

markings of thorax as in male imago. Legs brown, markings as in male imago, except apex of prothoracic femora darker. Wings: longitudinal and cross veins dark brown; membrane transparent, washed uniformly with brown; posterior margin with setae. Hind wings absent. Abdomen: segments 1-10 dark brown, paler markings on terga 2-9 as in Fig. 9, spiracles dark brown, tracheae pale; ovipositor or egg guide extending to posterior margin of segment 9 (Fig. 8), base of ovipositor washed with brown as in Fig. 8, remainder pale. Caudal filament light brown, brown annulations at alternate articulations, annulations faded near apex.

MATURE NYMPH (in alcohol).—Head brown. Clypeus, labrum and venter pale. Thorax brown, anterolateral margins of prothoracic and mesothoracic terga and venter darker. Legs light brown, markings as in male and female imagos but faded. Abdomen: dark brown, markings as in male and female imagos. Gills gray, tracheae black. Caudal filaments light brown.

SPECIMENS.—Holotype ♂ imago, Brazil, São Paulo State, Córrego da pedreira, Estação Biológica de Boraceia, nr. Salesópolis, 23 Sep. 1966; allotype ♀ imago, Brazil, São Paulo State, Estação Biológica de Parana-piacaba, nr. Parana-piacaba, 6 Sep. 1968; paratypes: 1 nymph, same data as holotype; 1 nymph, 10 June 1966, Brazil, São Paulo State, Rio Guaratuba, Estação Biológica de Boraceia, nr. Salesópolis; 2 nymphs, 16 Sep. 1966, 1 ♂ subimago, 30 Sep. 1966, Brazil, São Paulo State, Ribeirão Venerando, Estação Biológica de Boraceia, nr. Salesópolis; 1 ♀ subimago, 13 Dec. 1962, 1 nymph, 17 Feb. 1963, 1 nymph, 6 Aug. 1963, 1 ♂ subimago, 15 Oct. 1963, 1 ♂ subimago, 5 Nov. 1963, 2 ♀ subimagos, 28 Dec. 1963, 2 ♂ subimagos, 2 ♀ subimagos, 17 Jan. 1964, same locality as for allotype. All types collected by Dr. Claudio G. Froehlich and are in alcohol. Association of the nymphs and ♂ imagos is by rearing, while the association of the ♂ and ♀ imagos is based on similarities of the wing venation and color pattern of subimagos collected at the same locality. Holotype, allotype, 1 ♂ subimaginal paratype, 1 ♀ subimaginal paratype, and 2 nymphal paratypes deposited in the collections of the Departamento de Zoologia da Secretaria de Agricultura do Estado de São Paulo. Two ♂ subimaginal paratypes, 2 ♀ subimaginal paratypes, and 2 nymphal paratypes each deposited in the collections of Florida A & M University and the Universidade de São Paulo.

In my collections are 4 additional nymphs of *Askola*—one each collected from: Brazil, Paraná State, small stream on property of Dr. H. Jakobi, 7 km. W. of Curitiba, 13 Feb. 1969, W. L. & J. G. Peters; Brazil, Paraná State, Rio Ipiranga, Estrada do Itupava, 2400 ft., 21-23 Feb. 1969, W. L. & J. G. Peters; Brazil, Paraná State, Rio Catiras, Morretes, 25°26' latitude, 48°52' longitude, Apr. 1965, F. Plaumann; Brazil, Santa Catarina State, Brook 1, Santa Clara, 27°46' latitude, 49°35' longitude, Dec. 1962, F. Plaumann. All 4 specimens appear to be *Askola froehlichii*. The specimens collected by W. L. & J. G. Peters are deposited in the collections of Florida A & M University while those collected by F. Plaumann are deposited in the collections of the University of Utah.

The abdominal color pattern appears to be variable among the types. The darker blackish-brown markings on terga 2-9 of some ♂ subimagos are more extensive and approaching the color markings of the ♀ imago as in Fig. 9. The dark blackish-brown markings on the sterna of other

♂ subimagos are faded to light brown. Several ♀ subimagos have dark brown abdomens. In these specimens the pale color markings are less extensive. Variable abdominal color patterns on the nymphs are the same as the variations described above. The color markings on the legs of younger nymphs are faint or absent.

BIOLOGY.—The nymphs of *Askola froehlichii* are found in small streams to small rivers in the coastal escarpment. Those nymphs collected by me in Paraná State were found in the quiet water along the edge of the stream or river. A description of the streams located in the Estação Biológica de Paranapiacaba is given in Froehlich (1969).

ETYMOLOGY.—Species is named in honor of Dr. C. G. Froehlich.

DISCUSSION.—*Askola* appears to be most closely related to *Hagenulopsis* but can be distinguished from it by the following combination of characters. In the imagos, (1) vein IC_u of the fore wings is attached at base to vein CuA (Fig. 1), (2) subapical, ventral spines are absent on the penes of the male genitalia (Fig. 3-4), and (3) the length of the styliiger plate of the male genitalia is a little shorter than the maximum width (Fig. 3). In the nymphs, (1) abdominal gills 1-7 are alike and plate-like; the apical half of each portion of a gill has a fringed margin (Fig. 18-19), and (2) posterolateral spines occur on abdominal segments 5 or 6-9. The above comparison is based on reared specimens of *Hagenulopsis* and a revision of this genus will be published later. The nymphs of *Hagenulopsis* are as described by Traver (1944) as *Hagenulopsis allyi*.

Askola can be distinguished from all genera of the Leptophlebiidae by the following combination of characters. In the imagos, (1) fork of vein MA of the fore wings is asymmetrical (Fig. 1), (2) the hind wings are absent, (3) the claws of a pair are dissimilar; one is apically hooked, while the other is obtuse, pad-like (Fig. 2), (4) the penes of the male genitalia are divided, tubular, slender, and apically acute (Fig. 3-4), and (5) the female possesses an ovipositor or egg guide extending to the posterior margin of abdominal segment 9 (Fig. 8). In the nymphs, (1) two large equal sized denticles occur on the anteromedian emargination of the labrum (Fig. 10-12), (2) the denticles on the claws are progressively larger apically (Fig. 17), (3) abdominal gills 1-7 are alike; the dorsal and ventral portions of the lamellae are plate-like and the apical half of each portion has the margins fringed (Fig. 18-19), and (4) posterolateral spines occur on abdominal segments 5 or 6-9.

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