Two new species of *Goeldichironomus* Fittkau from southeast Brazil (Diptera, Chironomidae)

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ABSTRACT. Two new species of *Goeldichironomus* Fittkau from southeast Brazil (Diptera, Chironomidae). The adult and immature stages of two new species of *Goeldichironomus* are described and figured. Larvae of *G. luridus* **sp. nov.**, reared in the laboratory from egg masses, are abundant on organically enriched sediments of a chicken slaughter-house effluent treatment lagoon. Larvae of *G. petiolicola* **sp. nov.**, live inside petioles of aquatic macrophytes such as *Eichhornia azurea* and *Pontederia lanceolata*.

KEYWORDS. *Goeldichironomus*; Neotropics, Taxonomy.

RESUMO. Duas novas espécies de *Goeldichironomus* Fittkau do sudeste do Brasil (Diptera, Chironomidae). Os adultos e os estágios imaturos de duas novas espécies de *Goeldichironomus* são descritos e ilustrados. As larvas de *G. luridus* **sp. nov.**, criadas em laboratório para obtenção dos adultos, habitam os sedimentos organicamente enriquecidos de uma lagoa de estabilização de um matadouro de aves. As larvas de *G. petiolicola* **sp. nov.**, vivem no interior dos pecíolos de macrófitas aquáticas como *Eichhornia azurea* e *Pontederia lanceolata*.

PALAVRAS-CHAVE. *Goeldichironomus*, Região Neotropical, Taxonomia.

Goeldichironomus Fittkau, 1965 is a Neotropical genus with so far nine species in Brazil (Spies & Reiss, 1996; Trivinho-Strixino & Strixino, 1998), many of them recorded from the State of São Paulo (Trivinho-Strixino & Strixino, 1999). The genus has a wide distribution in lentic ecosystems of this State (Roque et al. 2004), where the larvae live both on littoral sandy sediments and in/on aquatic macrophytes. Here we describe the immature stages and adults of two new species.

All the material examined was mounted on slides with Euparal or Hoyer´s medium. The morphological terminology follows Sæther (1977, 1980), except for the term 'taeniae' (Langton 1994) used for flattened setae on the pupal abdomen. Measurements are given as the values of the holotype (where applicable) followed by values of the smallest and the largest paratype, respectively.

Goeldichironomus luridus sp. nov.

Etymology. From Latin *luridus,* dirty; refers to the habitat of the larvae.

Types. Holotype: male imago, São Carlos, SP, Brazil, 01/VI/2004. Paratypes: 2 male imagoes with respective pupal exuviae and 2 male imagoes, 12/VI/2004; 1 female, 1/VI/2004; 2 pupal exuviae, 17/VI/2004; 2 4th instar larvae, 12/IV/2004; 1 4th instar larva, 8/IX/2004. All material stems from laboratory rearings of egg masses collected in a chicken slaughter-house effluent treatment lagoon. The holotype and most paratypes are deposited in the Laboratório de Entomologia Aquática collection, Universidade Federal de São Carlos, SP, Brazil (UFSCar). One male paratype is deposited in the Museu de Zoologia, USP, SP, Brazil.

Diagnosis. The male hypopygium of *Goeldichironomus luridus* **sp. nov.** is similar to those of *G. natans* Reiss, 1974 and *G. fluctuans* Reiss, 1974, differing by the shape and orientation of the superior volsella**.** The female genitalia of *G. luridus* differ from that of *G. amazonicus* (Fittkau, 1968) by the number of setae on segment X. The pupa of *G. luridus* resembles thouse of *G. amazonicus* and *G. natans* in the shape of the anal comb, but differs by the absence of shagreenation on the sternites and on tergites VII and VIII. The 4th instar larva of *G. luridus* differs from all these species, except *G. amazonicus*, by the design of the mental teeth and by the length of the ventral tubules, which are longer in *G. natans* and absent or rudimentary in *G. fluctuans*. The partially consolidated 4th labral sclerite of *G. luridus* larvae matches the condition in *G. xiborena* Reiss, 1974.

Description

Adult male.

Total length 4.20 mm (4.00 - 4.25). Color greenish yellow.

Head. Frontal tubercles small, about 6 µm long. Antenna 1.16 mm long (1.12, 1.23); AR = 2.64 (2.35, 2.52). Palpomeres$_{2\text{-}5}$ = 28, 62, 87, 125 µm (31, 34; 62; 93, 95; 137, 140). Clypeus with 10 setae (10, 12).

Thorax setal count: 15-17 acrostichals, 10-12 dorsocentrals, 5 prealars, 1 supraalar and 3-4 scutellars.

Wing. Length 1.84 mm (1.77, 2.06), membrane transparent, without setae. R, R_1 and R_{4+5} setose. VR = 1.23 (1.18, 1.22). Squama with 7-9 long setae.

Leg segment lengths in µm and LR:

	Fe	Ti	Ta_1	Ta_2
I	815	662	954	477
	765, 892	661, 708	953, 1092	461, 538
II	754	692	369	215
	754, 861	692, 815	369, 477	215, 277
III	846	954	600	338
	846, 985	923, 1108	615, 708	369, 415

	Ta_3	Ta_4	Ta_5	LR
	415	292	169	1.44
	446	307, 354	169, 200	1.44, 1.54
	185	138	92	0.53
	200	108, 154	92, 108	0.53, 0.58
	292	185	108	0.63
	278, 338	185, 231	108,123	0.67, 0.64

Hypopygium (Fig. 1). Anal point slender with apex slightly bent to ventral. Superior volsella bent at 90 degrees, distal part orientated obliquely toward median, paralleling posterior margin of anal tergite; basal section short and microtrichia-covered. Inferior volsella more or less parallel-sided and not clubbed apically, bearing 14-15 long setae. Gonostylus narrowed at apex.

Adult female. Total length 4.0 mm. Coloration as male.

Head. Frontal tubercles small, about 7 µm long. Antennal flagellomeres $_{1-5}$ = 112, 71, 77, 84, 152 µm. AR = 0.29. Palpomeres $_{2-5}$ = 28, 77, 91, 143 µm. Clypeus with 17 setae.

Thoracic setal count: 17 acrostichals, 22 dorsocentrals, 5 prealars, 1 supraalar, 6 scutellars.

Wing. Length 2.03 mm, width 0.68 mm. VR = 1.23.

Leg segment lengths in µm and LR:

	Fe	Ti	Ta_1	Ta_2	Ta_3	Ta_4	Ta_5	LR
I	754	600	938	431	369	292	154	1.56
II	692	708	385	185	154	123	61	0.54
III	846	954	554	323	277	169	123	0.58

Genitalia. Sternite VIII bearing more than 40 irregularly distributed setae on each side. Seminal capsule ovoid, about 120 µm long, with short neck. Spermathecal duct straight. Gc IX without setae. Segment X with 5-6 setae on each side. Postgenital plate relatively large, triangular.

Pupa

Exuviae grayish. Abdomen length 3.25-3.75 mm. Cephalic tubercles small, conical and apically pointed; frontal setae inserted subapically (Fig. 2). Hook row 340 µm about ¾ width of segment II. Pedes spurii B present on segment II. Pedes spurii A present on sternite IV. Patches of small spines in the posterolateral corners of paratergites V-VII small and inconspicuous. Sternites bare. Tergite I without shagreen; II-VI extensively covered with shagreenation; VII and VIII bare. Segment VIII with posterolateral yellowish brown anal comb of 4-5 marginal teeth and many short additional overlapping ventral teeth (Fig. 3). Anal lobe with complete fringe of ca 60-65 taeniae and 1 dorsal taenia on each side. Abdominal setation: segments I - IV = 1, 3, 3, 3 L setae; V- VIII = 4, 4, 4, 5 lateral taeniae.

4th instar larva.

Total length 6.1–7.6 mm. Color reddish; head white with dark brown ventral occipital margin and triangulum occipitale. Head: width 469 µm, length 627 µm. Labral sclerites 3 and 4 present; 4 partially consolidated (fig. 4). Premandible with 2 teeth. Pecten epipharyngis simple, with 14-15 unequal teeth (fig. 5). Antennal segment lengths = 81, 25, 20, 16, 6 µm; AR= 1.21. Mandible about 200 µm long, teeth and seta subdentalis as in Fittkau (1968). Mentum (fig. 6) with slightly notched median and 6 pairs of dark lateral teeth.

Abdomen (Fig. 7) with two pairs of short ventral tubules on 8th segment, measuring about 200 µm. Anal tubules short, about 250 µm.

Ecological Notes

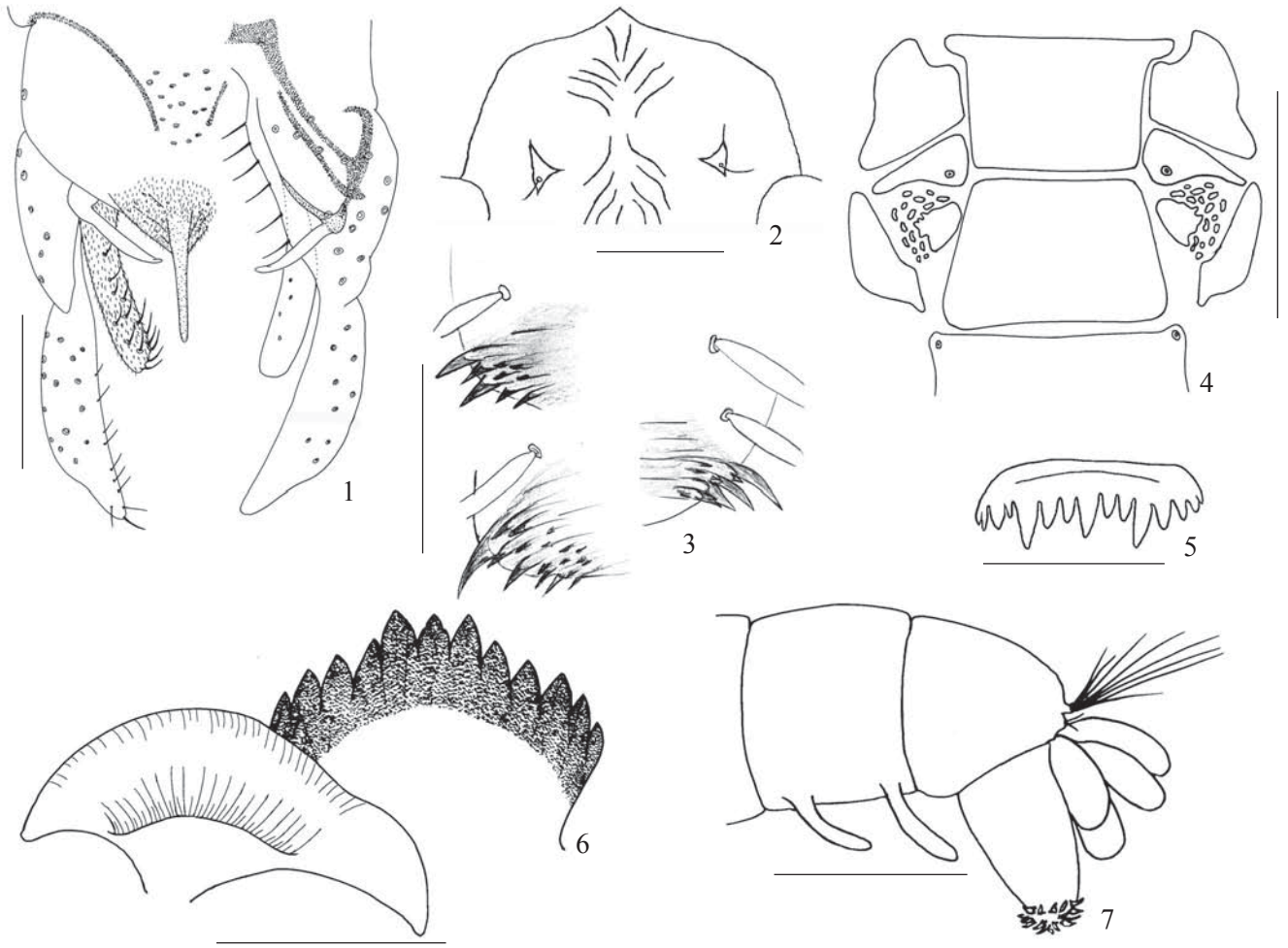
The egg masses of *G. luridus* were collected on the shore of a chicken slaughter-house effluent treatment lagoon. They were maintained in a Petri dish with distilled water until the eclosion of the larvulae that were reared in the laboratory using the technique described by Strixino & Strixino (1982) to obtain the pupae and adults.

According to Epler (2001) different species of the genus *Goeldichironomus* are common and abundant on organically enriched sediments of shallow lentic waters, including waste stabilization lagoons. In these systems the organic material is altered by bacterial action and photosynthesis. The detritus resulting from this process accumulates at the bottom, creating a soft layer of organic sediment, which provides food and substrate for chironomid larvae (Grodhaus, 1967). In the lagoon where we obtained the *G. luridus* egg masses there were also many larvae of *G. holoprasinus* and *G. fluctuans*, and others such as *Chironomus sancticaroli* Strixino & Strixino, 1981.

Goeldichironomus petiolicola sp. nov.

Etymology. From Latin, *petiolus* + - *cola* = petiole-inhabiting; refers to the microhabitat of the larvae inside the petioles of aquatic macrophytes.

Types. Holotype: male imago, São Carlos, SP, Brazil, *campus* UFSCar, Leg. F. Roque, 07/IX/1999. Paratypes: 2 male imagoes; one with pupal exuviae, Luiz Antônio, SP, Lagoa do Diogo, E. E. de Jataí, Leg. L. C. Correia, 25/VII/2001; 1 male imago, Luiz Antônio, SP, Lagoa do Óleo, E. E. de Jataí. Leg. S. T. Strixino, 07/V/2003; 1 male imago and 1 4th instar larva, in the same slide, Luiz Antônio, SP, Lagoa do Óleo, E. E. de Jataí. Leg. S. T. Strixino, 05/VIII/2003; 1 male imago, Manaus, AM, Igarapé Cururu, Leg. S. Couceiro, 26/III/ 2001; 1 female, Luiz Antônio, SP, Lagoa do Óleo, E. E. de Jataí. Leg. S. T. Strixino, 05/VIII/ 2003; 1 pupa with pharate female and larval exuviae, Lagoa do Diogo, E. E. de Jataí, Leg. L. C. Correia, 25/VII/2001. The holotype and most paratypes are deposited in the Laboratório de Entomologia Aquática collection, Universidade Federal de



Figs. 1-7. *Goeldichironomus luridus* **sp. nov.** 1. Male hypopygium. 2. Pupal frontal apotome and cephalic tubercles. 3. Pupal anal comb variation. 4-7. Larva. 4. Frontal apotome and labral sclerites. 5. Pecten epipharyngis. 6. Mentum and ventromental plate. 7. Posterior abdominal segments. Scale: fig. 5 = 25 µm; 7 = 500 µm; others = 100 µm.

São Carlos, SP, Brazil (UFSCar). One male paratype is deposited in the Museu de Zoologia, USP, SP, Brazil.

Diagnosis. The male hypopygium of *Goeldichironomus petiolicola* **sp. nov.** differs from all other *Goeldichironomus* species by the shape of the gonostylus**.** The female genitalia of *G. petiolicola* differ from those of *G. luridus* **sp. nov.**, *G. holoprasinus* (Goeldi) and *G. amazonicus* (Fittkau) by the shape of the postgenital plate and the number of setae on segment X and on Gc IX. The following combined characteristics distinguish the 4th instar larvae of *G. petiolicola*: consolidated labral sclerites 3 and 4, short ventral tubules and the granulose surface of the pecten epipharyngis.

Description

Adult male.

Total length 5.84 mm (4.68 - 6.29). Color brownish yellow.

Head. Frontal tubercles slightly wider than high, about 9 µm long. Antenna 1.67 mm long (1.46, 1.69); AR = 2.72 (2.24, 2.90). Palpomeres$_{2-5}$ = 44, 112, 137, 162 µm (50, 62; 118, 131; 118, 156; 137, 193). Clypeus with 17 setae (14, 17).

Thorax setal count: 15-17 acrostichals, 7-9 dorsocentrals, 4-7 prealars, 1 supraalar and 7-8 scutellars.

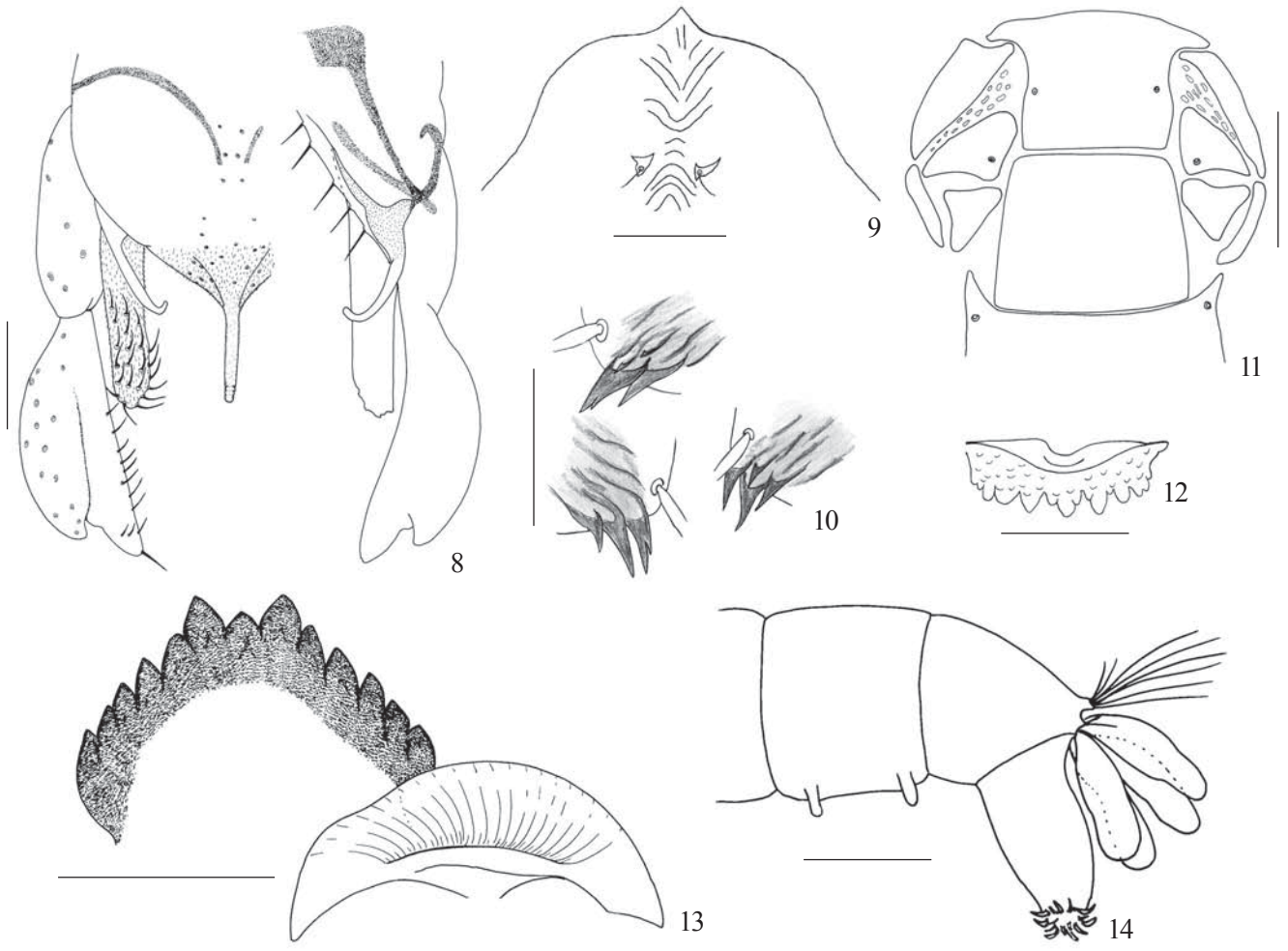
Wing. Length 2.80 mm (2.03, 2.97), width 0.78 mm (0.51, 0.92), membrane transparent, without setae. R, R_1 and R_{4+5} setose. VR = 1.13 (1.08, 1.10). Squama with 10-12 long setae.

Legs. Fore femur yellowish; the other segments brownish. Femur, tibia and tarsomeres 1 and 2 of mid and hind legs yellowish, other tarsomeres brownish.

Segment lengths in µm and LR:

	Fe	Ti	Ta_1	Ta_2
I	1338	1015	1615	830
	923, 1292	1046, 1061	—, 1692	—, 861
II	1185	1061	585	338
	1000, 1246	969, 1123	461, 554	277, 369
III	1354	1538	1046	477
	1138, 1461	1292, 1631	—,969	—,538

	Ta_3	Ta_4	Ta_5	LR
	692	461	261	1.59
	—, 769	—,615	—,292	—, 1.59
	276	185	120	0.55
	261, 277	154, 200	108, 154	0.47, 0.49
	431	308	185	0.68
	—,461	—,292	—,200	—, 0.59



Figs 8-14. *Goeldichironomus petiolicola* **sp. nov.** 8. Male hypopygium. 9. Pupal frontal apotome and cephalic tubercles. 10. Pupal anal comb variation. 11-14. Larva. 11. Frontal apotome and labral sclerites. 12. Pecten epipharyngis. 13. Mentum and ventromental plate. 14. Posterior abdominal segments. Scale: fig. 12 = 25 µm; 14 = 500 µm; others = 100 µm.

Hypopygium (Fig. 8). Anal point slender, apex with short folds, slightly bent to ventral. Superior volsella strongly hook-like. Inferior volsella more or less parallel-sided and not clubbed apically, bearing 20-22 long setae. Gonostylus broad, with a mid-lateral protuberance that is distally separated from the gonostylus apex by a distinct invagination.

Adult female. Total length 5.4 mm. Coloration as male.

Head. Frontal tubercles about 10 µm long. Antennal flagellomeres $_{1-5}$ = 144, 119, 123, 123, 238 µm. AR = 0.29. Palpomeres $_{2-5}$ = 43, 119, 144, 175 µm. Clypeus with 20 setae.

Thoracic setal count: 15 acrostichals, 10 dorsocentrals, 5 prealars, 1 supraalar, 7 scutellars.

Wing. Length 2.95 mm, width 0.95 mm. VR = 1.24.

Leg segment lengths in µm and LR:

	Fe	Ti	Ta_1	Ta_2	Ta_3	Ta_4	Ta_5	LR
I	1307	1000	1569	831	738	615	307	1.57
II	1092	1077	615	323	246	185	154	0.57
III	1308	1569	861	5-7	400	261	200	0.54

Genitalia. Sternite VIII bearing more than 60 irregularly distributed setae on each side. Seminal capsule ovoid, about 180 µm long, with short neck. Spermathecal duct straight. Gc IX with 1-2 setae. Segment X with 11-12 setae on each side. Postgenital plate triangular, pointed at apex.

Pupa.

Exuviae grayish. Abdomen length 5.0 mm. Cephalic tubercles very short; frontal setae inserted subapically (Fig. 9). Hook row 590µm long, about ¾ width of segment II. Pedes spurii B present on segment II. Pedes spurii A present on sternite IV. Posterolateral corners of paratergites V-VII with patches of small spines. Sternites bare. Tergite I without shagreen, II-VI extensively covered with strong shagreenation, VII and VIII each with 2 anterior patches of fine shagreen. Segment VIII with posterolateral brownish anal comb of 2-3 marginal teeth and 2-4 short additional ventral teeth (Fig. 10). Anal lobe with complete fringe of ca 70-80 taeniae and 1 long dorsal taenia on each side. Abdominal setation: segments I - IV = 1, 3, 3, 3 L setae; V- VIII = 4, 4, 4, 5 lateral taeniae.

4th instar larva.

Total length 8.20 mm. Color red; head with dark brown

ventral occipital margin and triangulum occipitale. Head: Width 550 µm, length 700 µm. Labral sclerites 1-5 as in figure 11. Premandible with 2 teeth. Pecten epipharyngis with granulose surface and 14-15 unequal distal teeth (fig. 12). Antennal segment lengths = 85, 92; 31, 40; 20, 24; 18, 24; 7, 9 µm; AR= 1. 09, 0.97. Mandible about 220 µm long; pecten mandibularis well developed. Mentum (fig. 13) 175 µm wide, with slightly notched median and 6 pair of dark lateral teeth; median tooth shorter than first laterals.

Abdomen (Fig. 14) with two pairs of very short ventral tubules on 8th segment, measuring about 80 µm. Anal tubules about 350 µm.

Ecological Notes

The larvae of *G. petiolicola* live inside the petioles of emergent aquatic macrophytes, *Eichhornia azurea* and *Pontederia lanceolata*. Inside the plants, the larvae live in shelters, just below the leaf epidermis. These cases, not much larger than the length of their occupants, are open at both ends, and longitudinally lead into the leaf stalk.

Gut content analysis of some larvae revealed the presence of detritus mixed with algae and plant tissue remains. Thus, *G. petiolicola* should be included in the category of facultative phytophages described by Van der Veld & Hiddinks (1987), in which larvae feed on seston and use the plant solely as a substratum for mining and filter feeding. According to Berg (1950), larvae of this category consume plant tissue incidentally when enlarging their burrows or excavating new ones.

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