

## *Phytotelmatocladius*, A New Genus from Bromeliads in Florida and Brazil (Diptera: Chironomidae: Orthoclaadiinae)

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**ABSTRACT:** *Phytotelmatocladius delarosai*, new genus, new species, is described from bromeliad phytotelmata in southern Florida and Brazil. The larva had previously been keyed and diagnosed as *Metriocnemus* sp. B in Epler (1992, 1995) and Orthoclaadiinae genus H in Epler (2001). The pupa lacks a thoracic horn and pedes spurii A and B, has tergites II-VII and anal lobe mostly covered with shagreen spines, with well developed spinules on the conjunctiva between most tergites and sternites, and has only two macrosetae on each of its truncated anal lobes. The female has bare eyes, scalpellate acrostichals, only one or no seta on the squama, no setae on wing membrane, a long comb of 40+ sensilla chaetica on the mid leg basitarsus and seminal capsules without microtrichia. This new genus shows similarities to *Comptosmittia*, *Limnophyes*, *Paralimnophyes* and *Thienemannia*. Only female adults and pupae have been collected or reared (excepting larvae which can not be sexed), leading one to assume that this taxon may be parthenogenetic.

### INTRODUCTION

Phytotelmata are the small bodies of water impounded by plants, such as bromeliads or pitcher plants. Phytotelmata often contain a variety of invertebrate and vertebrate life forms, among them Chironomidae (Cranston & Kitching, 1995; Epler and Janetzky, 1999; Frank and Fish, 2008; Picado, 1913 and others).

In 1980 I made some collections from arboreal *Tillandsia* (a bromeliad genus native in Florida) phytotelmata that contained two taxa of orthocladine larvae. One of these was represented by a larva and a partially decayed pupa with larval exuviae that I later (Epler, 1992, 1995) called *Metriocnemus* sp. B. The other larval orthoclad taxon is still referred to as *Metriocnemus* sp. A (Epler, 1992, 1995, 2001).

In 1999, while at Riverwoods Field Laboratory at Cornwall, about 30 km east of Sebring, FL, I collected the phytotelmata held by some terrestrial introduced ornamental bromeliads (probably *Billbergia*) that contained larvae of my so-called *Metriocnemus* sp. B. I was successful in rearing several larvae to adulthood. With the pupa and adult in hand, it was obvious that the larvae did not belong in *Metriocnemus*. In my work on the larval Chironomidae of the Southeast US (Epler, 2001) I renamed this taxon Orthoclaadiinae genus H. This taxon is now described below in all known life stages as *Phytotelmatocladius*.

While I was presenting a poster on this new taxon at the XV<sup>th</sup> International Symposium on Chironomidae in Minneapolis, MN, Mr. Humberto Fonseca Mendes recognized the genus from Brazilian material he had collected and reared from bromeliads. He made this material available to me and some of his specimens have been incorporated into the description below.

Morphological terminology and methodology follow Epler (1988) and Sæther (1980). All measurements are in  $\mu\text{m}$  except where noted, and consist of the range and, for samples with more than three specimens, the mean.

*Phytotelmatocladius* Epler new genus

Etymology: from the Greek *phyton*, plant, and the Greek *telma*, standing water or pool; *-cladius* is a typical ending for orthocladine genera. Gender masculine.

Type species: *Phytotelmatocladius delarosai* Epler, by original designation.

**Diagnosis**

**Female imago:** Small species, wing length < 1 mm. Mostly brownish in color.

Eyes reniform, bare. Antenna (Figure 4) with five flagellomeres; pedicel bare; each flagellomere except ultimate with single whorl of setae; each flagellomere with two hyaline sensilla chaetica; ultimate flagellomere without strong subapical seta. Temporal setae uniserial, sparse; postorbitals absent. Palp five-segmented, palpomere 3 with subapical group of four sensilla capitata.

Anteprenotum with or without one seta. Acrostichals scalpellate (Figure 3), beginning near anterior margin; humeral and dorsocentral setae present, sparse, uniserial; prealars present, scutellars uniserial. Humeral pit absent or indistinct.

Wing (Figure 1) membrane without setae; with coarse microtrichia; with fringe of alternating long and short setae. Brachiolum with one seta and with about 8 proximal, 3 medial and 8 distal sensilla campaniformia. Anal lobe not developed. Squama with 0-1 seta. Costa extended. R, R<sub>1</sub> and R<sub>4+5</sub> with setae. Cu<sub>1</sub> sinuate.

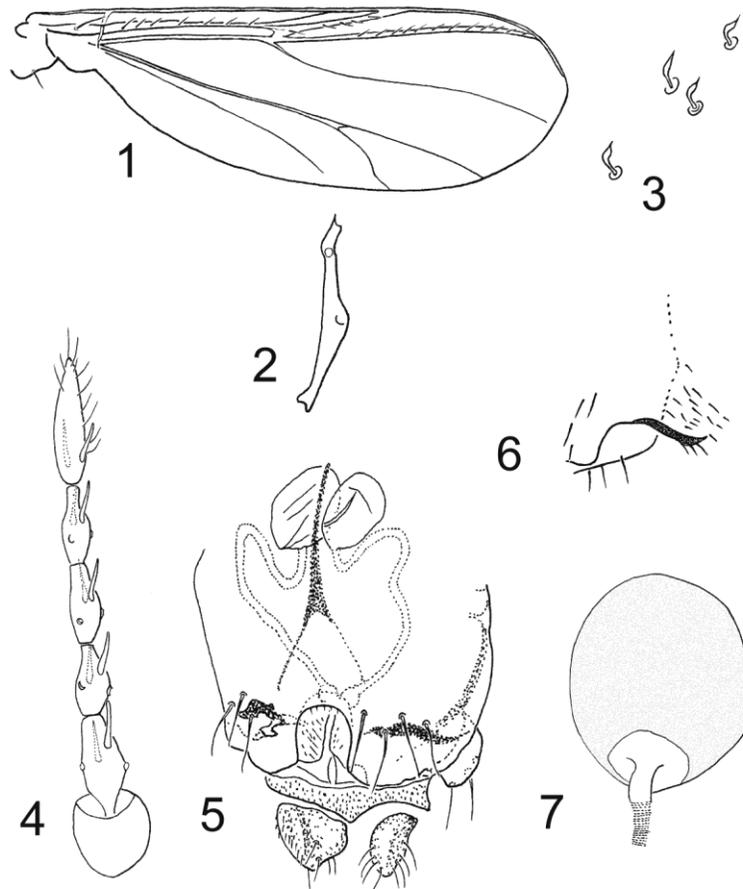
Tibiae with a pair of spurs, those of fore and hind tibiae with one spur about twice the length of other, spurs on mid tibia subequal; spurs mostly simple, with a few small spines near base. Pseudospurs and pulvilli absent. Numerous sensilla chaetica present as row on apical 2/3 of mid leg basitarsus. Hind femur with well developed comb.

Tergite IX apparently undivided; gonocoxite well developed (Figure 5). Seminal capsules (Figure 7) without microtrichia, unsclerotized at junction with spermathecal ducts; ducts with two loops; ducts with bulb before common entrance to vagina. Labia with sparse microtrichia. Gonapophysis VIII with larger ventrolateral lobe and smaller, linear, dorsomesal lobe (Figure 6); apodeme lobe weak. Postgenital plate moderately sized, triangular at center. Cerci small.

**Pupa:** Small pupae, < 3 mm long. Exuviae mostly transparent; weakly infuscated with yellow-brown. Thin frontal setae present on frontal apotome; apotome mostly smooth, with a few small creases (Figure 8). Ocular field with two postorbital and apparently no vertical setae.

Thorax (Figure 9) with 2 subequal median anteprenotal setae. Thoracic horn absent. Weak precorneal tubercle present. Three precorneal setae, one apparently slightly shorter than other two. Dorsocentral setae 1-3 arranged in triangular pattern, Dc4 located further posteriorly. Thorax and wing sheaths smooth. Leg sheaths recurved and not extending beyond wing sheath apex.

Abdomen (Figures 10, 11) tergite I and sternites I-III without shagreen. T II with broadly T-shaped spine patch; T III-VIII with well developed, broadly X-shaped spine patches covering much of tergite; patches comprised of mostly even spines, spines smaller anteriorly and laterally on each tergite; anterior dorsum of anal lobe with broadly V-shaped patch of smaller spines. Tergal conjunctives II-VII with 3-6 rows of fine spinules. Sternites V-VII with weak posterior band of weak spine points; S VIII with wide anterior band of points and paired posterolateral patches of points. Sternal conjunctives IV-VII with 2-3 rows of fine spinules. Pedes spurii A and B absent. Tergite I with 2 lateral setae; T II-VII with 4 lateral setae,



Figures 1-7, female imago. 1. wing; 2. tentorium; 3. acrostichal setae; 4. antenna; 5. genitalia, ventral; 6. ventrolateral and dorsomesal lobes; 7. seminal capsule

second seta much longer and more robust than others, fourth seta very small; T VIII with 3 lateral setae, posteriormost longest. Anal lobes truncate, each with 2 well developed subequal macrosetae; without fringe.

**Larva:** Small larvae, < 3 mm long. S I apically plumose, S II simple, moderately robust; S III simple, thin (Figure 12). Labral lamellae absent. Pecten epipharyngis of three triangular teeth. Antenna (Figure 14) 5 segmented, with blade longer than flagellum. Premandible (Figure 13) apically bifid, without brush. Mandible (Figure 15) with 4 inner teeth, seta subdentalis and seta interna present. Maxilla with pecten galearis. Mentum (Figure 16) with two median teeth and 5 pairs of lateral teeth; ventromental plates vestigial, not extending to lateral margin of mentum; beard absent. Abdominal setae relatively short, less than 1/2 as long as segment bearing them. Procerci weakly developed, with well developed setae; supraanal setae well developed, about 0.7-0.8 length of longest anal (procercal) setae.

**Remarks.** *Phytotelmatocladius* appears to be closely related to *Limnophyes* and *Compterosmittia*. The adult female of *Phytotelmatocladius* lacks setae on the anepisterna, epimeron and preepisternum present in *Limnophyes* and lacks setae on the wing membrane found in the only described female for the genus *Compterosmittia*, the West Indian *C. dentispina* Sæther. The seminal capsules of *Phytotelmatocladius* are conspicuously unsclerotized at the base and lack the microtrichia found on most *Limnophyes* and the single known female of *Compterosmittia*. *Phytotelmatocladius* differs from these two genera in the pupal stage by the absence of the posterior row of fine spines on T II-VIII and in only having two anal macrosetae. The pupa of *Phytotelmatocladius* will key to couplet 94 in Coffman *et al.* (1986) but fits neither part of the couplet. In the larval stage *Phytotelmatocladius* has an apically plumose or pectinate SI (serrate in *Compterosmittia* and *Limnophyes*) and the antennal blade is longer than the flagellum (shorter in the other two genera).

The immature stages of *Compterosmittia* are known only from specimens collected from Australian and Oriental phytelmata (Cranston & Kitching, 1995). In the Nearctic, one species of *Compterosmittia*, *C. nerius* (Curran), is known from the Carolinas and New York (Sæther, 1982, as *C. clavigera* Sæther; Epler, 2001); its immature stages are unknown. *Compterosmittia* is known from Central America (unplaced material from Costa Rica and Nicaragua (M. Spies and T. Andersen, personal communication)) and the West Indies Sæther (1981), but is not yet known from South America. There is a slight possibility that *Ph. delarosai* might represent the undescribed female and immature stages of *C. nerius*. This hypothesis is negated if the currently undescribed immature stages of *C. nerius* are similar to those of its Austro-oriental congeners, or if the unknown female of *C. nerius* is described and found to have setose wings (assuming that the presence or absence of wing membrane setae is a valid character state useful in delimiting genera – which it probably is not!).

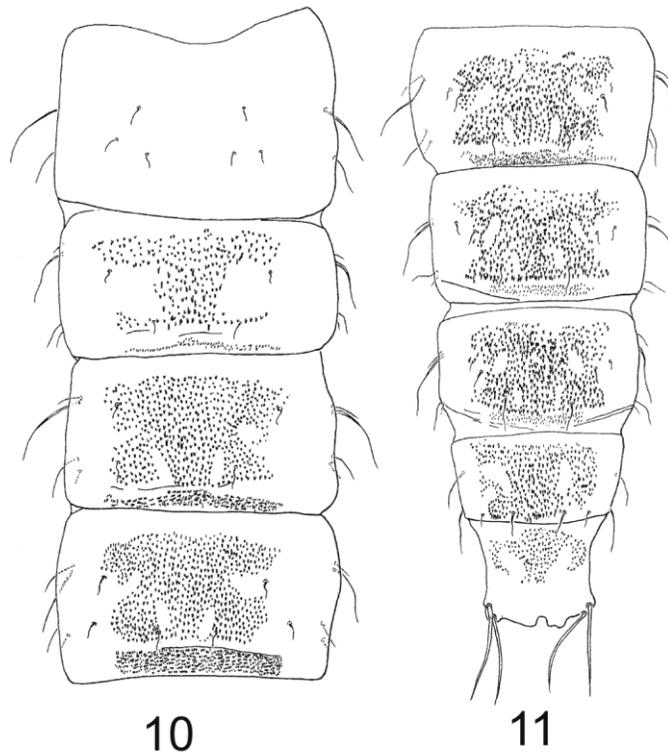
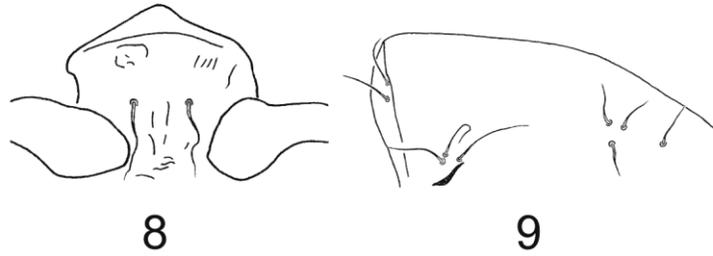
To date, only female adults and pupae of *Phytotelmatocladius* have been found (excepting larvae which can not be sexed), leading one to believe that the species may be parthenogenetic. The single species known is described below.

*Phytotelmatocladius delarosai* Epler, n. sp.

*Metriocnemus* sp. B Epler, Epler 1992: 6.50; Epler 1995: 6.52  
Orthocladiinae genus H Epler, Epler 2001: 7.163

Etymology: I am pleased to name this species for my good friend and colleague, Dr. Carlos de la Rosa.

Type locality: U.S.A., Florida, Highlands County, Riverwoods Field Laboratory at Cornwall.



Figures 8-11, pupa. 8. frontal apotome; 9. thorax, lateral aspect of antero-dorsal area; 10. abdominal tergites I-IV; 11. abdominal tergites V-VIII and anal lobe

Female imago (n= 1-4)

As in generic diagnosis.

Thorax length 0.47-0.57 mm; abdomen length 0.91-1.05 mm; total length ~ 1.48-1.62 mm.

Head: temporal setae 7-8; clypeal setae 14-15; cibarial sensillae 6-7. Lengths of palpomeres 1-5: 20, 25, 53-59, 80-83, 103-110. AR 0.35-0.38, 0.37.

Thorax: anteprenotals 0-1; acrostichals 12-14; humerals 4-6; dorsocentrals 5-14; scutellars 4-5; prealars 3-7 (6).

Wing: length 0.76-0.98, 0.86 mm; width 0.29-0.37, 0.33 mm. Setae: squama 0-1, 1; R 8-11, 9; R<sub>1</sub> 4-7, 6; R<sub>4+5</sub> 9-12, 11. VR 1.35-1.51, 1.44. Costal extension 70-125, 90.

Legs: Tibial spur lengths: fore: 12-13; 21-26; mid: 10-12; 13-14; hind: 13-15; 28-34. Hind tibial comb with 9-10 setae. Basitarsus of mid leg with 42-48 palmate sensilla chaetica. Lengths and proportions of legs (n=4):

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
P1	345-400, 374	350-420, 398	190-230, 216	95-140, 120	70-90, 80	40-55, 49	42-55, 51

LR	BV	SV
0.54-0.55, 0.54	3.13-3.58, 3.32	3.51-3.66, 3.57

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
P2	380-460, 424	355-430, 405	165-205, 188	75-95, 90	55-65, 61	40-50, 44	40-45, 43

LR	BV	SV
0.45-0.48, 0.46	4.20-4.34, 4.28	4.34-4.53, 4.42

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>
P3	380-470, 429	380-480, 446	200-290, 259	95-140, 125	85-120, 108	50-55, 53	45-50, 49

LR	BV	SV
0.53-0.60, 0.58	3.33-3.49, 3.40	3.26-3.80, 3.41

Abdomen: Gonocoxite with 4-8 setae. Seminal capsule diameter 40-43. Notum length (from bifurcation forward) 62-70, 65.

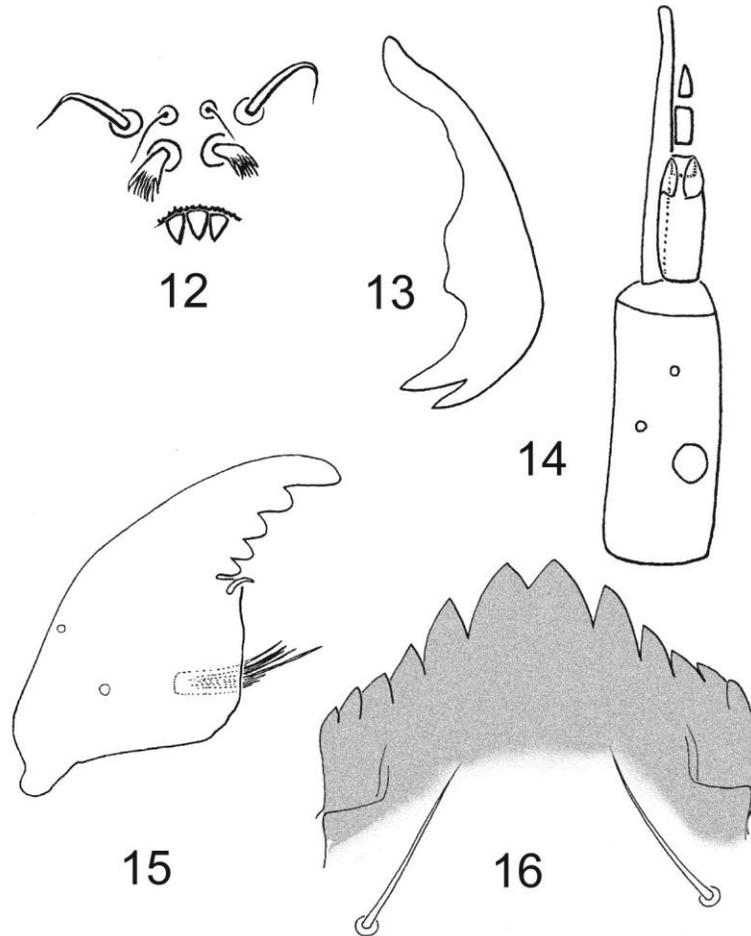
Pupa (n=2-4)

As in generic diagnosis.

Lengths: Total: 2.09-2.13 mm; cephalothorax 0.57-0.61 mm; abdomen 1.50-1.60 mm.

Cephalothorax. Frontal setae 60-68; anteprenotal setae 68 (1); precorneal setae 55-75; 48-88; 55-63 (2). Dc1 60-83 (1); Dc2 45-52; Dc3 55-73 (2); Dc4 45-50.

Abdomen. Longest lateral seta on T I: 68-75; longest lateral seta on T VIII 65-120. Anal macrosetae 133-173; 130-168.



Figures 12-16, larva. 12. labral setae and pecten epipharyngis; 13. premandible; 14. antenna; 15. mandible; 16. mentum

Fourth instar larva (n=6)

As in generic diagnosis. Total length 2.56-2.76 (3) mm.

Head. Postmentum length 113-127, 122. Mentum width 72-88, 80. Premandible length 45-57, 52. Mandible length 90-100, 98(5). Antennal segment lengths: 1: 27-33, 30; 2: 10-15, 12; 3: 3-4, 3 (5); 4: 5-7, 6(5); 5: 2-3, 3 (5). Blade length 30-33, 31(5). Distance from base of segment 1 to ring organ 7-9, 8 (4). AR 1.13-1.32, 1.25(5).

Body. Longest body seta ~85. Longest anal seta length 105-121, 114(4); longest supraanal seta length 80-98, 89(4).

Material examined (all slide mounted): Holotype female/Pex/Lex: **U.S.A.**: FL: Highlands Co., Riverwoods Field Laboratory nr Cornwall, from terrestrial bromeliad phytotelmata, 13-i-1999, leg. J.H. Epler. Paratypes (26): 2 females/Pex/Lex, 1 female pupa/Lex, same data as holotype; 14 larvae, same data as holotype except 1-i-1999; 1 female pupa/Lex, 1 larva: FL: Indian River Co, Donald MacDonald Park nr Roseland, ex *Tillandsia*, 21-viii-1980, leg. J.H. Epler. **BRAZIL**: São Paulo State, Parque Estadual Intervales: 1 female/Pex/Lex, 1 female/Pex, 1 female Pex, bromélia 02, 15-viii-2000; 1 pharate female pupa/Lex, same data except bromélia 01; 2 larvae, bromélia 1, 22-vi-2000; 1 larva, bromélia 2, 22-vi-2000; all leg. H. F. Mendes. Holotype to be placed in Chironomidae collection of Florida State Collection of Arthropods housed at Florida A & M University, Tallahassee, Florida, U.S.A.; paratypes in this collection, the author's collection and the Museu de Zoologia da Universidade de São Paulo (MZUSP), São Paulo, Brazil.

**Remarks.** One of the females examined had at least one wing without any squamal setae (other wing damaged); all other females had one seta on the squama. One pupa possesses sternal setae V3 that are longer (120 vs. 70) and thicker (2 vs. 1) than on other specimens. One larval specimen examined had a four toothed pecten epipharyngis.

Along with the first *Phytotelmatocladius* material I collected from *Tillandsia* phytotelmata I also found *Monopelopia tillandsia* Beck & Beck and some *Tanytarsus* larvae (recently described as *T. bromelicola* Cranston by Cranston (2007)). Also collected and reared from the Riverwoods phytotelmata were the naidid worm *Dero (Aulophorus) superterrenus* (Michaelsen) (Oligochaeta: Naididae), the mosquito *Wyeomia mitchellii* (Theobald) (Diptera: Culicidae) and a *Forcipomyia* (Diptera: Ceratopogonidae). An unidentified ostracod (probably Ostracoda: Cytheridae: *Metacypris maracaoensis* Tressler; see Frank & Fish, 2008) was the most numerous organism in the phytotelmata; these ostracods became problematic if left in the rearing vials with larvae or pupae because they quickly consumed any dead material or exuviae.

#### ACKNOWLEDGMENTS

I thank Dr. Carlos de la Rosa for his hospitality during his tenure as Director of Riverwoods Field Laboratory and for his friendship, knowledge and ability to put up with my antics. Mr. Humberto Fonseca Mendes kindly provided the Brazilian material. Judy and Barry Merrill (Merrill Consultants, Dallas, TX) provided support for computer and laboratory equipment, for which I am especially grateful.

## REFERENCES

- Coffman, W.P., P.S. Cranston, D.R. Oliver & O.A. Sæther. 1986. The pupae of Orthoclaadiinae (Diptera: Chironomidae) of the Holarctic region – Keys and diagnoses. pp. 147-296 in Wiederholm, T. (ed.). 1986. *Chironomidae of the Holarctic region. Keys and diagnoses. Part 2. Pupae*. Ent. scand. Suppl. 28: 482 pp.
- Cranston, P.S. 2007. A new species for a bromeliad phytotelm-dwelling *Tanytarsus* (Diptera: Chironomidae). Ann. Entomol. Soc. Am. 100: 617-622.
- Cranston, P.S. & R.L. Kitching. 1995. The Chironomidae of Austro-oriental phytotelmata (plant-held waters): *Richea pandanifolia* Hook. F. in Cranston, P.S. (ed.) *Chironomids: from Genes to Ecosystems*, CSIRO, Melbourne, pp. 225-32.
- Epler, J.H. 1988. Biosystematics of the genus *Dicrotendipes* Kieffer, 1913 (Diptera: Chironomidae: Chironominae) of the World. Mem. Am. Ent. Soc. 36:1-214.
- Epler, J.H. 1992. Identification Manual for the Larval Chironomidae (Diptera) of Florida. FL Dept. Environ. Reg., Orlando, FL. 302 pp.
- Epler, J.H. 1995. Identification Manual for the Larval Chironomidae (Diptera) of Florida. Revised edition. FL Dept. Environ. Protection, Tallahassee, FL. 317 pp.
- Epler, J.H. 2001. Identification Manual for the Larval Chironomidae (Diptera) of North and South Carolina. A guide to the taxonomy of the midges of the southeastern United States, including Florida. Special Publication SJ2001-SP13. North Carolina Department of Environment and Natural Resources, Raleigh, NC, and Saint Johns River Water Management District, Palatka, FL. 526 pp.
- Epler, J.H. & W.J. Janetzky. 1999. A new species of *Monopelopia* (Diptera: Chironomidae) from phytotelmata in Jamaica, with preliminary ecological notes. J. Kans. Ent. Soc. 71: 216-225.
- Frank, J.H. & D. Fish. 2008. Potential biodiversity loss in Florida bromeliad phytotelmata due to *Metamasius callizona* (Coleoptera: Dryophthoridae), an invasive species. Florida Entomol. 91: 1-8.
- Picado, C. 1913. Les Broméliacées épiphytes considérées comme milieu biologique. Bull. Sci. Fr. Belg. (Ser. 7) 47:215-360 + 24 plates.
- Sæther, O.A. 1980. A glossary of chironomid morphology terminology (Chironomidae: Diptera). Ent. scand. Suppl. 14: 1-51.
- Sæther, O.A. 1981. Orthoclaadiinae (Diptera: Chironomidae) from the British West Indies with descriptions of *Antillocladius* n. gen., *Lipurometriocnemus* n. gen., *Compterosmittia* n. gen. and *Diplosmittia* n. gen. Ent. scand. Suppl. 16: 1-46.
- Sæther, O.A. 1982. Orthoclaadiinae (Diptera: Chironomidae) from SE U.S.A., with descriptions of *Pludsonia*, *Unniella*, *Platysmittia* n. genera and *Atelopodella* n. subgen. Ent. scand. 13: 465-510.