

# **Identification Guide and Key to the Chironomid Pupal Exuviae of Tortuguero National Park, Costa Rica**



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## **INTRODUCTION**

### **Aquatic biological monitoring**

Biological communities provide information on overall water quality conditions. In particular, aquatic macroinvertebrates have been used in water quality assessment due to their sedentary nature, long life cycles, low dispersal capabilities, and the range of responses to environmental stresses by different species. Their population assemblage reflects the stream conditions present during their lifecycles. As a result, certain species are tolerant of pollution while others are intolerant and will be absent from water systems with poor water quality or habitat. Aquatic macroinvertebrate sampling can be used to infer the current conditions and recent water quality of specific water bodies (Barbour *et al.* 1999). However, traditional methods of collecting aquatic macroinvertebrates can be time consuming and expensive (Ferrington *et al.* 1991).

### **Family Chironomidae and pupal exuviae**

One efficient form of sampling involves collection of surface floating pupal exuviae (SFPE) of a group of aquatic flies of the family Chironomidae (Spies *et al.* 2009). Chironomidae are commonly known as non-biting midges. Collections of SFPE have been used across a range of aquatic systems, from small, freshwater streams to large rivers and lakes (Armitage *et al.* 1995; Hayford & Ferrington 2006). The wide distribution of the group in combination with the widely varying species-specific ranges of tolerance to water quality make Chironomidae a highly valuable tool for surveying and monitoring both pristine and disturbed habitats (Armitage *et al.* 1995). A large number of chironomid species are tolerant of a wide range of salinities and may be a major component of the fauna of brackish water (Rawson & Moore 1944). Chironomid

community composition has been used in many studies in monitoring organic pollution and eutrophication (Murphy & Edwards 1982; Armitage & Blackburn 1985; Wilson 1987; Rae 1989).

Chironomidae are widely distributed and frequently the most abundant macroinvertebrates in aquatic systems (Armitage *et al.* 1995). In many aquatic habitats the chironomid species present may account for more than 50% of the total number of macroinvertebrates recorded (Ferrington *et al.* 2008). It has been estimated that the worldwide total number of Chironomidae species may be as high as 15,000 (Armitage *et al.* 1995). In North America, about 1,100 named species are recognized (Oliver *et al.* 1990; Oliver & Dillon 1994), while in the Neotropical region the corresponding number is about 900 (Spies & Reiss 1996; Spies pers. comm., 2011). Some have proposed that total chironomid richness close to 1,000 species in Central America would not be surprising (Spies *et al.* 2009).

The chironomid life cycle is divided into four distinct life stages, i.e. egg, larva, pupa, and adult.

The immature stages of most species develop in aquatic habitats, and most types of aquatic

ecosystems have chironomid inhabitants. The

habitats range from flowing waters (trickles, torrents,

streams, rivers) and standing waters (puddles, pools,

lakes) to temporary rain-pools, plant-held waters, and

even thin films of water on high-altitude glaciers (Armitage *et al.* 1995). Upon

completion of the larval life stage, the larva attaches itself with silken secretions to the

surrounding substrate and pupation occurs. Once the developing adult has matured, the

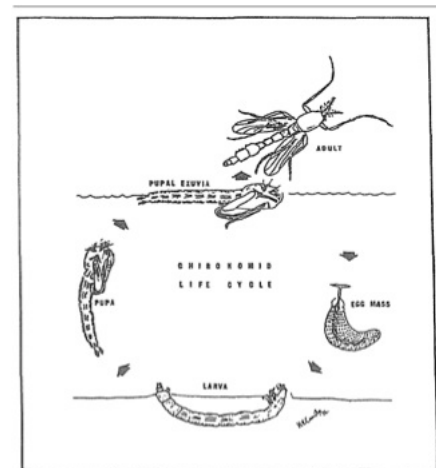


Figure 1. Life cycle of Chironomidae (adapted from Ferrington *et al.* 1991).

pupa frees itself from the silken chamber and swims to the surface of the water where the adult can emerge from the pupal skin (also called exuviae) (Fig. 1). The exuviae will float on the water surface and tend to accumulate in areas downstream of rocks or where riparian vegetation or fallen trees contact the water surface. These pupal exuviae can be collected while drifting on the water surface or from areas of natural accumulation to rapidly evaluate Chironomidae emergence patterns and species composition. Pupal exuviae collections take one-third the time to process compared to larval collections and can easily be identified to species or morphospecies with distinguishing morphological features (Ferrington *et al.* 1991).

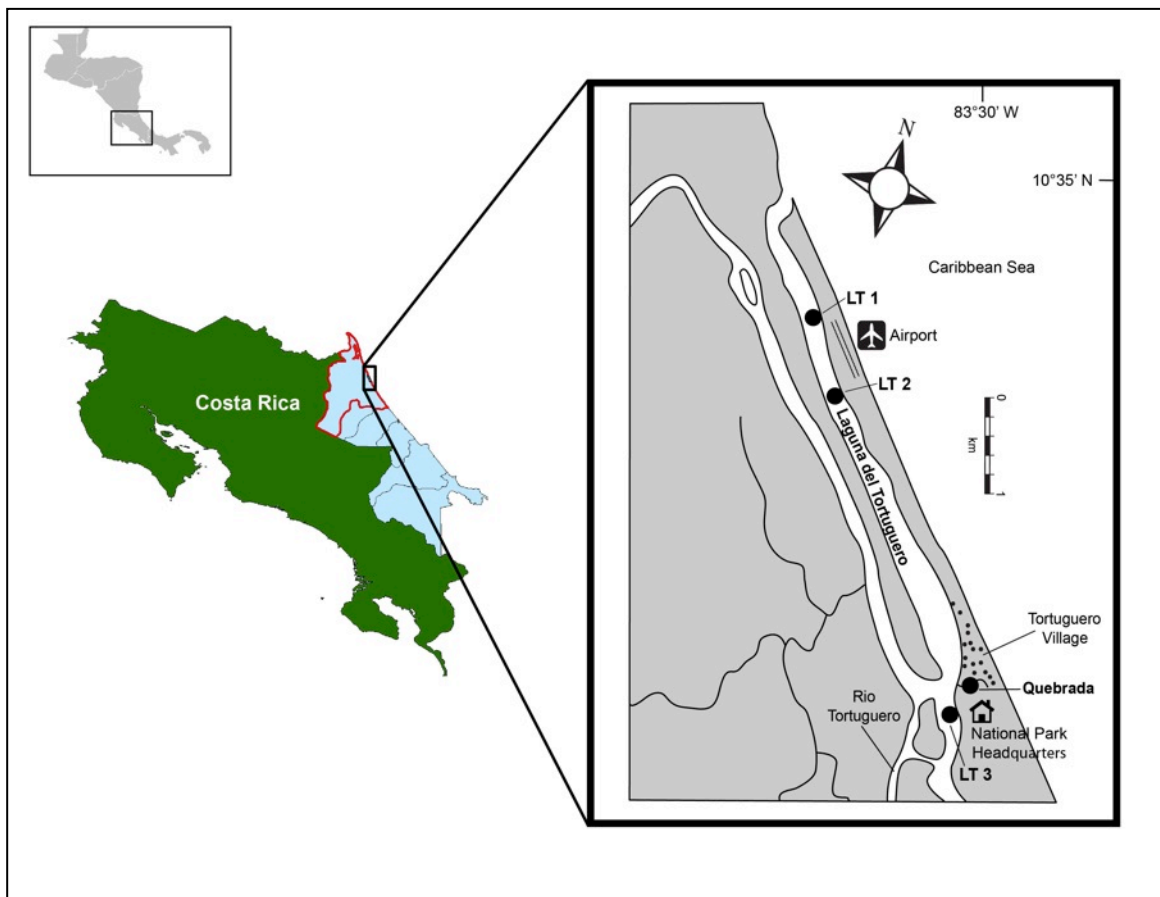


Figure 2. Sample area in Tortuguero National Park, Costa Rica (LT = Laguna del Tortuguero).

## Guide Scope

This guide is based on material collected from three sample sites in the brackish water estuary, Laguna del Tortuguero, and one sample site in the freshwater stream, Quebrada, in Tortuguero National Park, Costa Rica (Fig. 2). These areas were sampled for seven consecutive days each in June 2010 and January 2011. From these samples, 3 subfamilies, 111 species, and 44 genera were identified. Consequently, this identification guide is not meant to be a comprehensive key to pupal Chironomidae of all habitats in Tortuguero National Park or Costa Rica. This guide includes keys to subfamily, tribe, genus, and species. The subfamily, tribe, and genus keys were modified from Wiederholm (1986) and Ferrington *et al.* (2008). The species keys were modified from Borkent (1984), Hayford (1998), Maschwitz and Cook (2000), and Wiedenbrug and Ospina-Torres (2005). Illustrations and photographs are included to highlight distinguishing characteristics at these taxonomic categories. The guide should be most useful to identify chironomid pupal exuviae in fresh and brackish waters in Tortuguero National Park and the surrounding Atlantic lowlands of Costa Rica, Nicaragua, and Panama.

Most of the species and some of the genera represent taxa previously unknown in the pupal stage. As a result, many taxa are left as morphospecies (e.g., *Ablabesmyia* sp. 1) or unknown genera (e.g., Unknown Chironomini #1). These taxa are unknown at the pupal stage, thus may represent either taxa with described adults or genera and species new to science. As well, these designations identify the gaps in the current state of taxonomy for the pupal stage in Chironomidae. Future rearing programs to associate adults with their immature stages and new species descriptions will reveal the identity of these taxa. Due to the great diversity of Costa Rican Chironomidae, the number of

species recorded in this guide should be considered as a low estimate and future studies will certainly document many additional taxa from this area (Spies *et al.* 2009).

### **How to use this guide**

This guide consists of a series of dichotomous keys to subfamily, tribe, genus, and species. The subfamily sections are arranged phylogenetically, based on Ferrington *et al.* (2008). Within the subfamilies, the tribes are also arranged phylogenetically, while the genera and species are in alphabetical and numerical order. See Ferrington *et al.* (2008) for phylogenetic order of subfamilies and tribes. Unknown genera are at the end of each tribe section.

The guide starts with a dichotomous key to the three represented subfamilies. The key directs the user to tribe and/or genus keys for each subfamily. Once the tribe or genus is identified, keys are provided to species or morphospecies for known genera. If a specimen appears to be close to a described species, it is noted as being near that species (e.g., *Parachironomus* near *cayapo*). Additionally, if a specimen is close to a described species, but has morphological variations, then it is noted as being a variation of the species (e.g. *Nilothauma* near *reissi* variation 1). Notes on the unknown genera, species, and morphospecies specific to specimens collected in this collection are provided.

### **Morphology and terminology of chironomid pupae**

There are a number of morphological structures and characteristics that are commonly used to separate chironomid taxa. The morphology of the pupa is mostly external, which makes it easier to see the structures on the pupal exuviae. The pupal exuviae has three main body divisions: head, thorax, and abdomen. In many cases, the

head and thorax are referred to collectively as the cephalothorax (Fig. 3). Terminology in this guide follows Sæther (1980), Wiederholm (1986), and Ferrington *et al.* (2008). See those publications for a more detailed summary of morphology and terminology of Chironomidae pupae.

*Head:* The head region of the chironomid pupal exuviae consists of the frontal area, eyes, and antennal and mouthpart sheaths (Fig. 3). The frontal apotome is the area of integument covering the dorsal side of the pharate adult head. Some other important characters in this body region can include cephalic tubercles, frontal warts, and frontal setae (Figs. 3-4) (Ferrington *et al.* 2008).

*Thorax:* The thorax of the chironomid pupal exuviae includes the legs, wings, and halter sheaths. It bears structures of potential taxonomic significance such as several groups of setae and especially the thoracic horn, which can vary greatly among taxa in presence, size, and shape (Figs. 3-4) (Ferrington *et al.* 2008).

*Abdomen:* The abdomen of the chironomid pupa includes eight segments plus a terminal segment modified into anal lobes and genital sheaths. The dorsal tergites and ventral sternites often bear distinctive groups of spines, hookrows, shagreen, setae, and spurs (Figs. 3-4) (Ferrington *et al.* 2008).



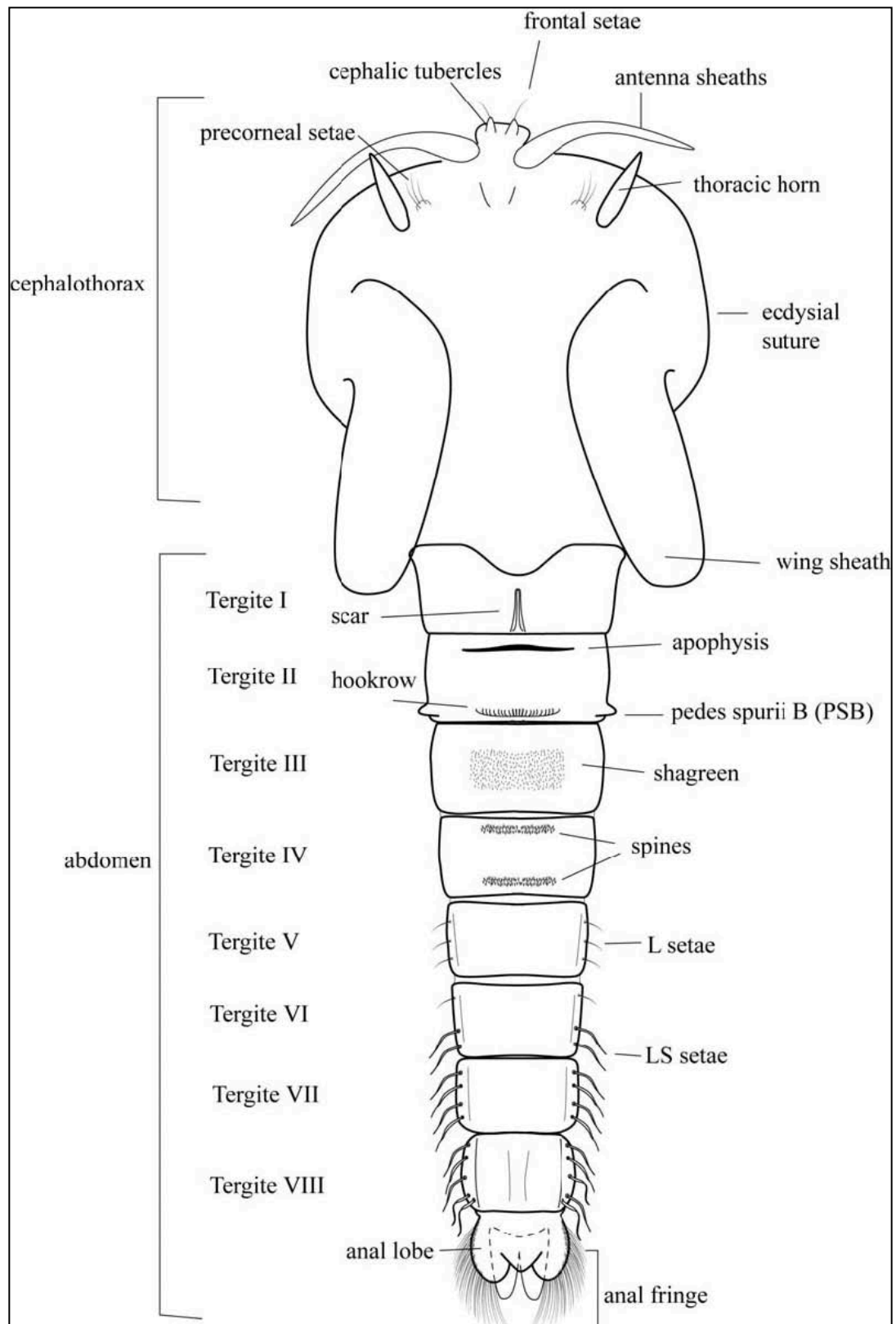


Figure 3. Morphology and terminology of Chironomidae pupal cephalothorax and abdomen (Illustrations by M. R. Rufer 2007)



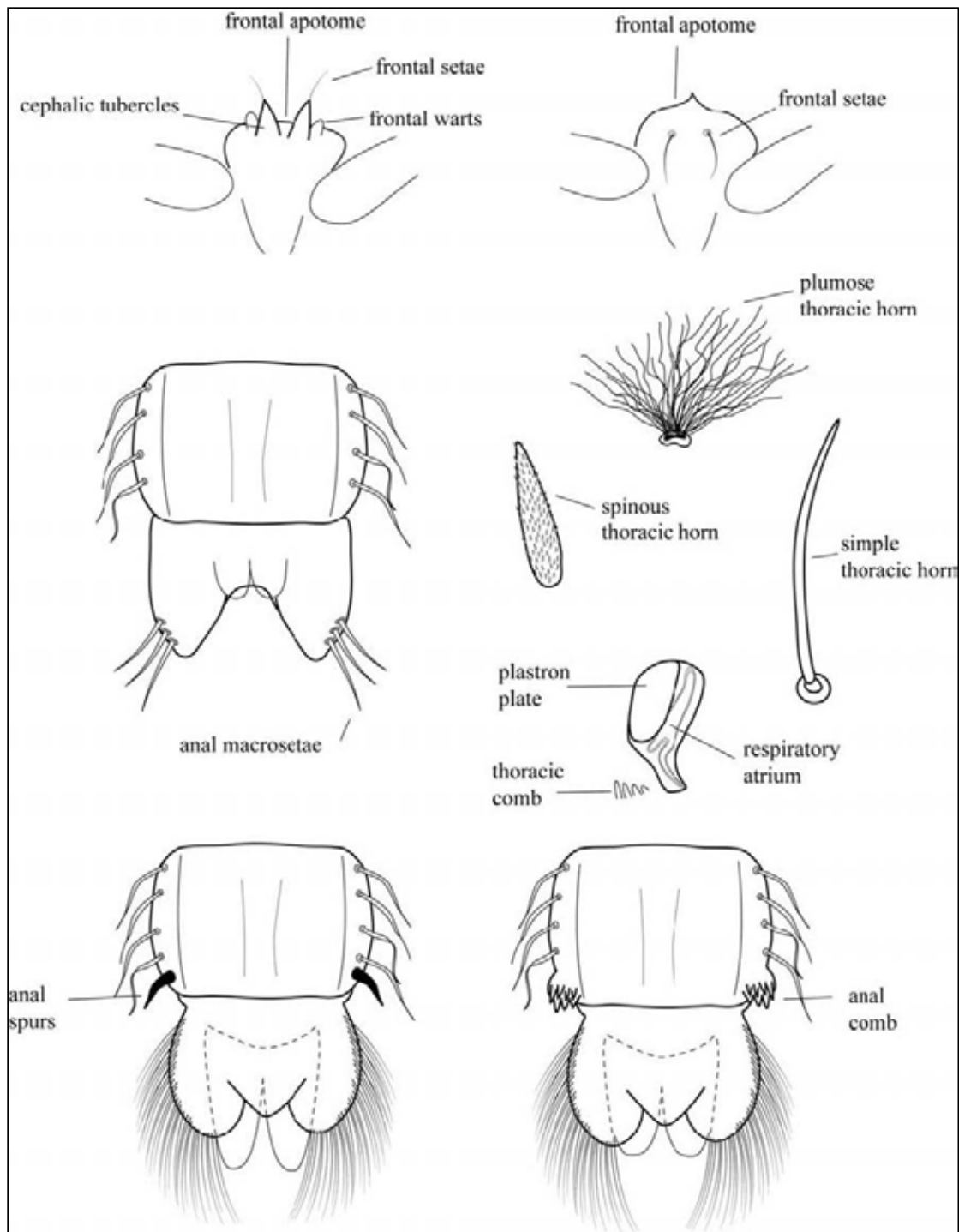


Figure 4. Morphology and terminology of Chironomidae pupal exuviae (Illustrations by M. R. Rufer 2007)

## KEY TO THE SUBFAMILIES OF CHIRONOMIDAE PUPAE

1. Thoracic horn with a distinct plastron plate (Figs. 5-6), or reticulate meshwork (Fig. 7); thoracic horn never branched; anal lobes with two lateral anal macrosetae (Fig. 8)..... **Tanypodinae**

plastron plate

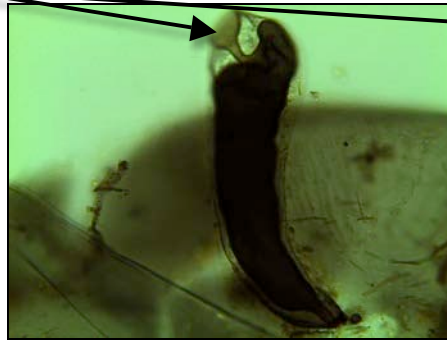


Figure 5. Thoracic horn of *Paramerina* sp. 1



Figure 6. Thoracic horn of *Coelotanypus* sp. 1

reticulate meshwork

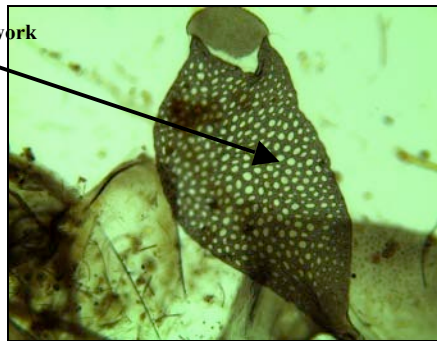


Figure 7. Thoracic horn of *Fittkauimyia crypta*



Figure 8. Anal lobes of *Altabesmyia* sp. 1

anal macrosetae

- 1'. Thoracic horn, if present, lacking a distinct plastron plate or large reticulate meshwork (Figs. 9-10); thoracic horn often branched; anal lobes never with two lateral anal macrosetae (Figs. 11-12) ..... 2

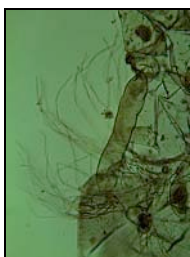


Figure 9. Thoracic horn of *Cladopelma* sp. 1



Figure 10. Thoracic horn of *Tanytarsus* sp. 1

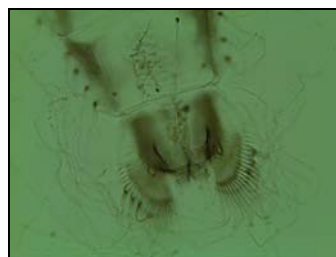


Figure 11. Anal lobes of *Thienemanniella* sp. 1

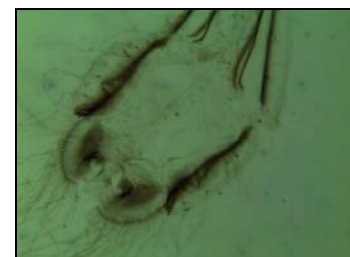


Figure 12. Anal lobes of *Tanytarsus* sp. 10

2(1'). Anal lobes often with three anal macrosetae and caudolateral margin of segment VIII rarely with an anal spur (Figs. 11, 13); thoracic horn never branched (Fig. 14) and frequently absent..... **Orthoclaadiinae**

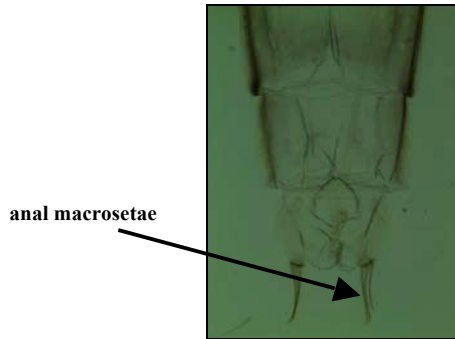


Figure 13. Anal lobes of *Cricotopous* sp. 2

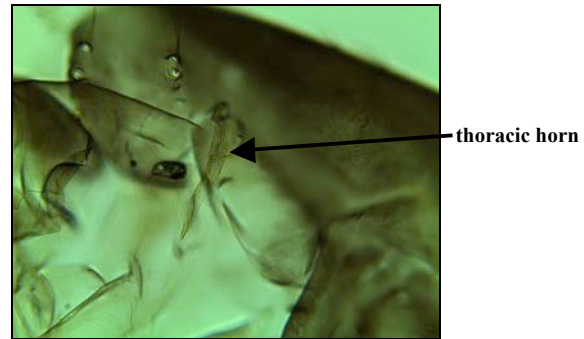


Figure 14. Thoracic horn of *Nanocladus* sp. 1

2'. Anal lobes almost always with a fringe of setae (Fig. 12) and caudolateral margin of segment VIII usually with an anal spur or comb (Figs. 15-16); thoracic horn with single (Figs. 10, 17) or multiple branches (Figs. 9, 18) ..... **Chironominae**



Figure 15. Anal spur of *Polypedilum* sp. 10



Figure 16. Anal claw of *Cladotanytarsus* sp. 1

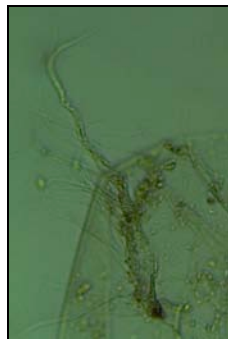


Figure 17. Thoracic horn of *Cladotanytarsus* sp. 1

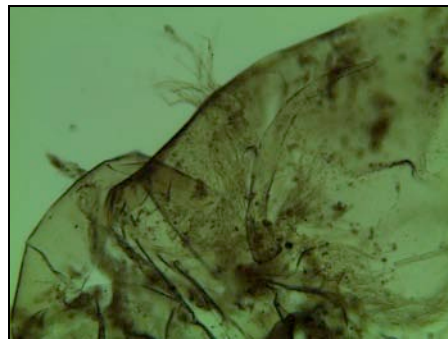


Figure 18. Thoracic horn of *Stenochironomus* sp. 1

## KEYS TO GENERA OF TANYPODINAE PUPAE

1. Thoracic horn with a distinct plastron plate (Figs. 5-6, 19), but it may be small (Fig. 20) ..... 2

1'. Thoracic horn without a distinct plastron plate (Fig. 21) ..... 8



Figure 19. Thoracic horn of *Larsia* sp. 1



Figure 20.  
Thoracic horn  
of Unknown  
Pentaneurini #3

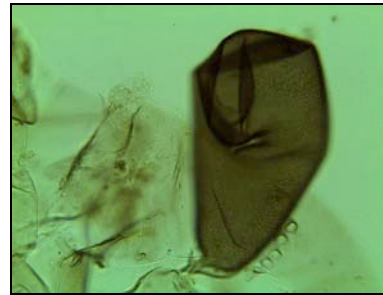


Figure 21. Thoracic horn of  
*Labrundinia* sp. 1

2(1). Anal lobes without a fringe of setae or setae-like spines (Fig. 22-23) ..... 3

2'. Anal lobes with a fringe of setae (Fig. 24) or setae-like spines (Fig. 25) ..... 6

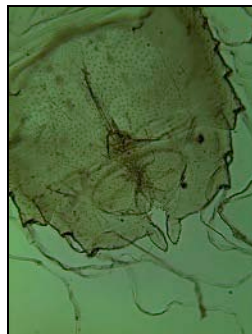


Figure 22. Anal lobes of  
*Djalmabatista* sp. 1



Figure 23. Anal lobes of *Larsia* sp. 1

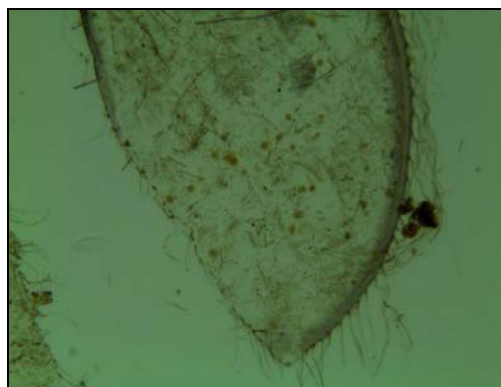


Figure 24. Anal lobe of *Fittkauimyia crypta*

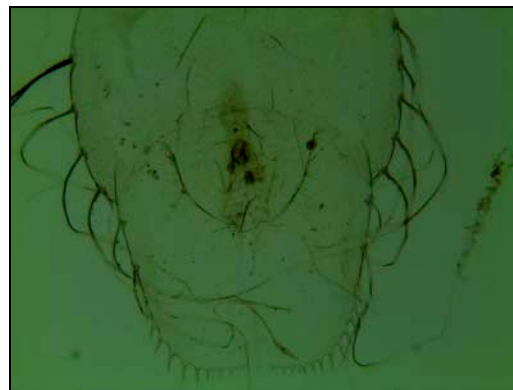


Figure 25. Anal lobes of *Procladius (Psilotanytus) bellus*



3(2). Anal lobes with terminal processes (Fig. 22); abdominal segments IV-VII with dense fringe of setae (Fig. 24) ..... ***Djalmabatista***

3'. Anal lobes without terminal processes, however lobes are long and pointed (Figs. 23, 25-26); abdominal segments with, at most, 5 lateral setae ..... 4

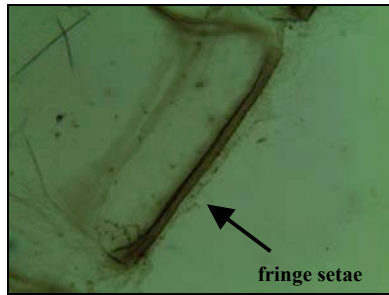


Figure 24. Tergite VII of *Djalmabatista* sp. 1



Figure 25. Anal lobes of Unknown Pentaneurini #3



Figure 26. Anal lobes of *Paramerina* sp. 1

4(3'). Thoracic horn tubular, distally flattened, 10x as long as wide (Fig. 20); thoracic comb and basal lobe absent; anal lobe about 2x as long as broad (Fig. 25) ..... **Unknown Pentaneurini #3**

4'. Thoracic horn elongate, curved slightly, 5x as long as wide (Figs. 5, 19); thoracic comb and basal lobe present; anal lobe about 3-4x as long as broad (Figs. 23, 26) ..... 5

5(4'). Thoracic horn with numerous convolutions of the horn sac (Figs. 19, 27), shagreen dense across entire tergite and composed of groups of 5-8 spinules (Fig. 28) ..... ***Larsia***

5'. Thoracic horn with tubular horn sac (Fig. 5), shagreen very sparse and restricted to pleural area of tergite (Fig. 29) ..... ***Paramerina***



Figure 27. Thoracic horn of *Larsia* sp. 1

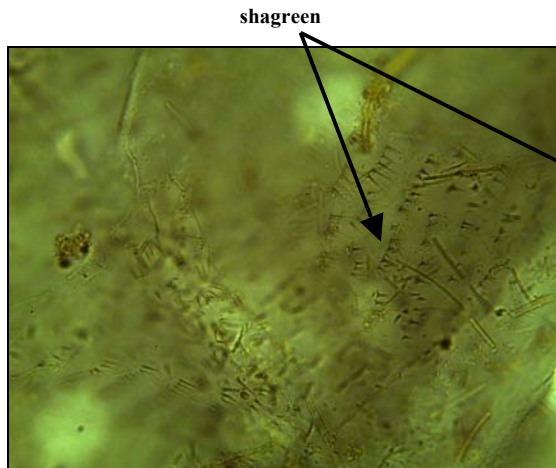


Figure 28. Tergite IV of *Larsia* sp. 1

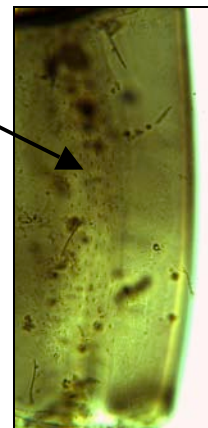


Figure 29. Tergite IV of *Paramerina* sp. 1

6(2'). Segment VII with at least 12 hairlike setae (Fig. 32); thoracic horn with reticulate meshwork (Figs. 5, 30) ..... ***Fittkauimyia***

6'. Segment VII with less than 12 hairlike setae (Figs. 33-34); thoracic horn without reticulate meshwork (Figs. 6, 31) ..... 7

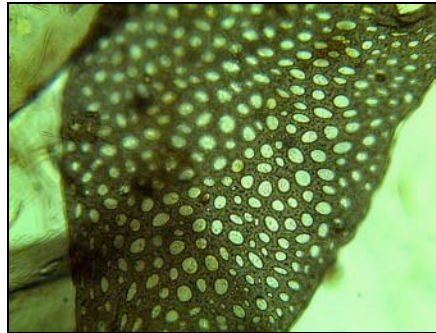


Figure 30. Reticulate meshwork on thoracic horn of *Fittkauimyia crypta*



Figure 31. Thoracic horn of *Procladius bellus*

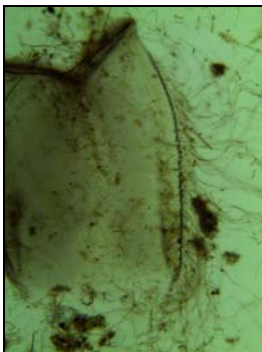


Figure 32. Tergite VII of *Fittkauimyia crypta*

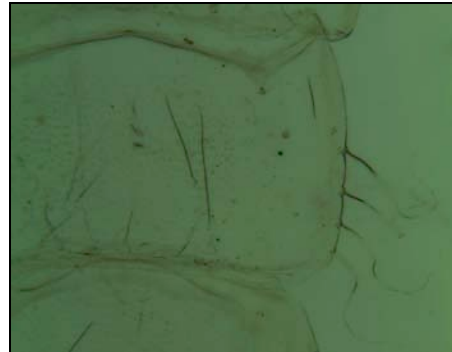


Figure 33. Tergite VII of *Procladius bellus*

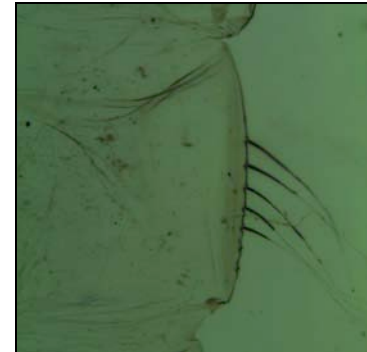


Figure 34. Setae on tergite VII of *Coelotanypus* sp. 1

7(6'). Anal lobes more or less quadrate with rounded inner border (Fig. 25), spines along the margin (Fig. 35); thoracic horn dark brown and plastron plate narrower than horn sac (Fig. 31) ..... ***Procladius***

7. Anal lobes rounded uniformly with straight inner border and filamentous lateral fringe (Fig. 36); thoracic horn light yellow and plastron plate slightly wider than horn sac (Figs. 6, 37) ..... ***Coelotanypus***



Figure 35. Anal lobe spines of *Procladius bellus*



Figure 36. Anal lobe lateral fringe of *Coelotanypus* sp. 1



Figure 37. Thoracic horn of *Coelotanypus* sp. 2

8(1'). Thoracic horns large and ovoid, usually dark and with a conspicuous reticulate meshwork (Figs. 21, 38-39); tergite IV without lateral fringe setae (Figs. 41-42) ..... 9

8'. Thoracic horn smaller and tubular, light and without meshwork (Fig. 40); tergite IV with lateral fringe setae (Fig. 43) ..... **Unknown Pentaneurini #2**

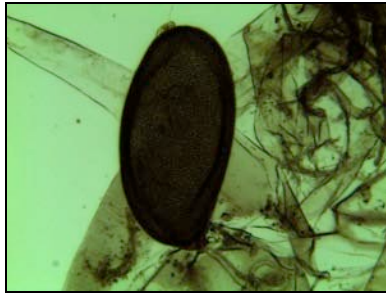


Figure 38. Thoracic horn of *Ablabesmyia* sp. 1

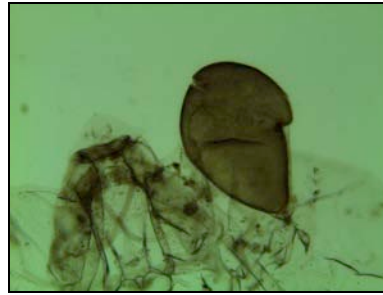


Figure 39. Thoracic horn of Unknown Pentaneurini #1



Figure 40. Thoracic horn of Unknown Pentaneurini #2

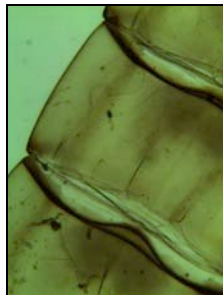


Figure 41. Tergite IV of *Ablabesmyia* sp. 1

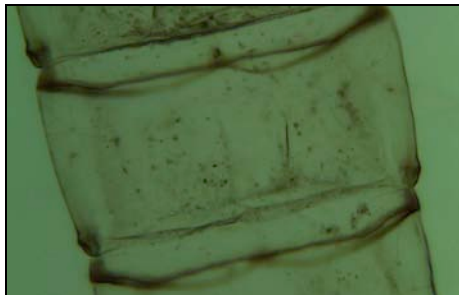


Figure 42. Tergite IV of Unknown Pentaneurini #1



Figure 43. Tergite IV of Unknown Pentaneurini #2

9(8). Meshwork of thoracic horn coarse (Figs. 38, 44); anal lobes short and broad (Figs. 8, 46) ..... ***Ablabesmyia***

9'. Meshwork of thoracic horn usually fine (Figs. 21, 39, 45); anal lobes long and narrow (Figs. 47-48) ..... 10

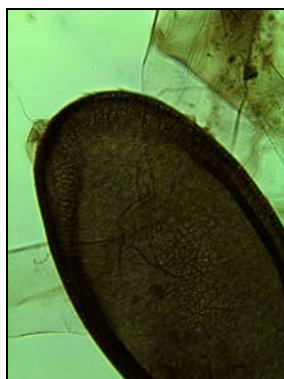


Figure 44. Thoracic horn of *Ablabesmyia* sp. 1



Figure 45. Thoracic horn of *Labrundinia* sp. 2





Figure 46. Anal lobes of  
*Ablabesmyia* sp. 2



Figure 47. Anal lobes of  
*Labrundinia* sp. 1

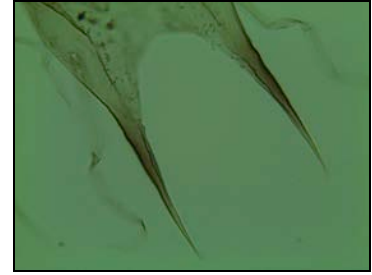


Figure 48. Anal lobes of  
Unknown Pentaneurini #1

10(9'). Outer border of anal lobes straight with prominent spines below the anal macrosetae (Figs. 47, 49) .....  
***Labrundinia***

10'. Outer border of anal lobes curved inward apically and without spines below the anal macrosetae (Figs. 48, 50) ..... **Unknown Pentaneurini #1**



Figure 49. Anal lobe of *Labrundinia* sp. 1

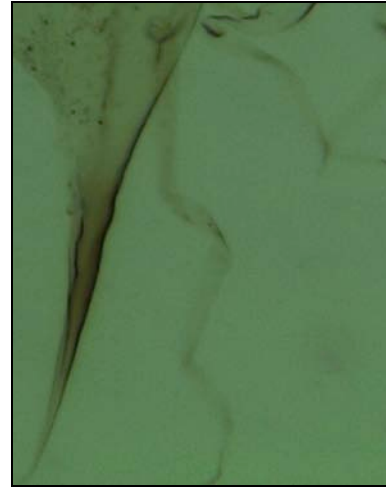


Figure 50. Anal lobe of  
Unknown Pentaneurini #1

## KEY TO *ABLABESMYIA* SPECIES

1. Anal lobe outer border slightly concave and spinose in the apical 1/3, inner border more or less convex, and anal lobe points slightly divergent (Fig. 51) ..... *Ablabesmyia* sp. 1
- 1'. Anal lobe outer border very concave in the apical 1/3, inner border very convex, and anal lobe points very divergent (Fig. 52) ..... *Ablabesmyia* sp. 2

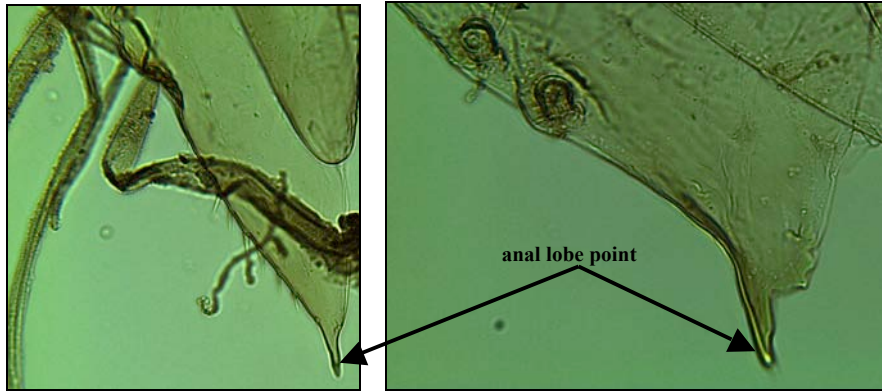


Figure 51. Anal lobe of *Ablabesmyia* sp. 1      Figure 52. Anal lobe of *Ablabesmyia* sp. 2

## NOTES ON *ABLABESMYIA* SPECIES

### *Ablabesmyia* sp. 1

**Locality:** Laguna del Tortuguero 1, 2 & 3

**Thorax:** Thoracic horn like Fig. 5.1 A (Wiederholm 1986), apical nipple of thoracic horn short (Figs. 38, 44); 9 tubercles on thoracic comb; wings pads with M absent, like *A. janata* var. I (Roback 1985)

**Abdomen:** Shagreen on tergites I-VIII made up of short simple spines (Fig. 5.1 F, Wiederholm 1986); anal lobes with outer border spines (Fig. 5.1 H Wiederholm 1986) (Figs. 8, 51); O & D setae on tergite VII and tergite VII don't match *A. janata* var. I (Roback 1985)

### *Ablabesmyia* sp. 2

**Locality:** Laguna del Tortuguero 2

**Thorax:** Both thoracic horns missing

**Abdomen:** Inner border of anal lobe swollen medially; anal lobe points very divergent; tergites VII, VIII, and anal lobes like *A. peleensis*, except this specimen doesn't have small spikes (Figs. 46, 52) (Roback 1985)

## ADDITIONAL REFERENCE

Roback, S.S., 1985. The immature chironomids of the eastern United States VI. Pentaneurini – Genus *Ablabesmyia*. Proceedings of the Academy of Natural Sciences of Philadelphia 137: 153-212.

## KEY TO *COELOTANYPUS* SPECIES

1. Thoracic horn about 5x as long as broad (Fig. 6); tergite VII with 8 LS setae (Figs. 34, 53) ..... *Coelotanypus* sp. 1
- 1'. Thoracic horn about 4x as long as broad (Fig. 37); tergite VII with 9 LS setae (Fig. 54) ..... *Coelotanypus* sp. 2



Figure 53. Tergite VII LS setae of *Coelotanypus* sp. 1

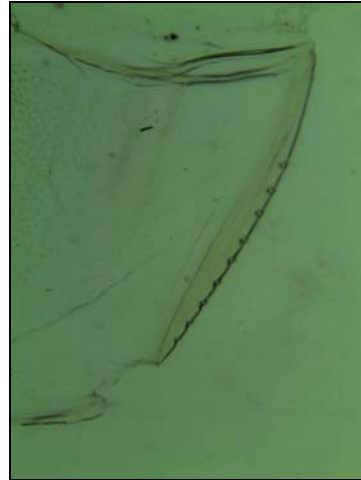


Figure 54. Tergite VII LS setae of *Coelotanypus* sp. 2

## NOTES ON *COELOTANYPUS* SPECIES

### *Coelotanypus* sp. 1

**Locality:** Laguna del Tortuguero 1, 2, & 3

**Thorax:** Thoracic horn pale (like Fig. 5.9 A, Wiederholm 1986)

**Comments:** Close to *C. tricolor*, around 5 mm long exuviae

### *Coelotanypus* sp. 2

**Locality:** Laguna del Tortuguero 3

**Thorax:** Thoracic horn larger than *Coelotanypus* sp. 1, smaller neck, and horn sac fills more of the lumen than *Coelotanypus* sp. 1

## ADDITIONAL REFERENCES

Roback, S.S. 1974. The immature stages of the genus *Coelotanypus* (Chironomidae; Tanypodinae: Coelotanypodini) in North America. Proceedings of the Academy of Natural Sciences of Philadelphia. 126: 9-19.

## NOTES ON *DJALMABATISTA* SPECIES



Figure 55. Thoracic horn of *Djalmabatista* sp. 1

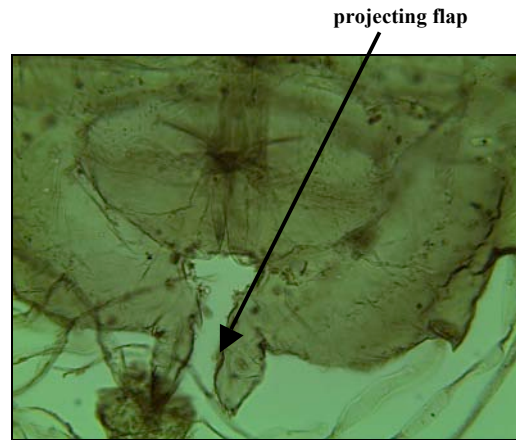


Figure 56. Anal lobes of *Djalmabatista* sp. 1

### *Djalmabatista* sp. 1

**Locality:** Laguna del Tortuguero 1 & 2

**Thorax:** Thoracic horn very pale brown and small plastron plate (Fig. 55)

**Abdomen:** Anal lobe different than *D. pulcher*, distal 1/3 concave with a short projecting flap; anal lobe point more bulbous (Figs. 22, 56) (Roback 1978)

## ADDITIONAL REFERENCES

Roback, S. S., & K. J. Tennessen. 1978. The immature stages of *Djalmabatista pulcher* [= *Procladius (Calotanypus) pulcher* (Joh.)]. *Proceedings of the Academy of Natural Sciences of Philadelphia* 130: 11-20.

## NOTES ON *FITTKAUIMYIA* SPECIES



Figure 57. Tergite V of *Fittkauimyia crypta*

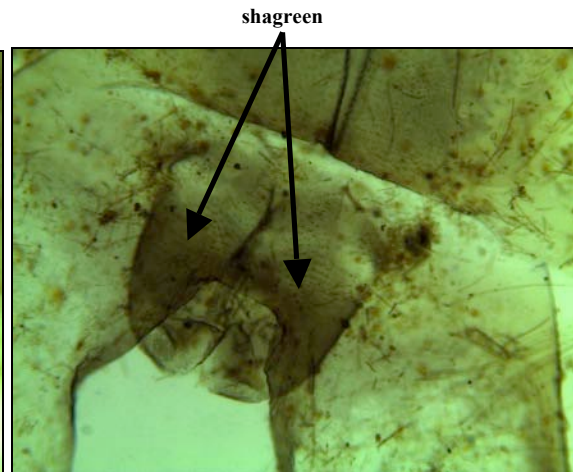


Figure 58. Male genitalia of *Fittkauimyia crypta*

### *Fittkauimyia crypta* Serrano & Nolte, 1996

**Locality:** Quebrada

**Thorax:** Missing right thoracic horn; left horn large, flattened with perforations, narrow at the base; oval plastron plate (Figs. 7, 30)

**Abdomen:** Segments II-VII with lateral fringe setae (Fig. 32); segment VIII half the size of segment VII; shagreen present but covered by debris; D1 setae on segments III-VII robust and arising from sclerotized tubercles (Fig. 58); around 16 LS setae on tergite VIII like *F. crypta*; shagreen present on tergites II-VII and genitalia of anal lobes, like *F. crypta* (Fig. 59) (Serrano & Nolte 1996a)

### ADDITIONAL REFERENCE

Serrano, M. A. S. and Nolte, U. 1996a. A sit-and-wait predatory chironomid from tropical Brazil - *Fittkauimyia crypta* sp. n. (Diptera: Chironomidae).- Entomologica Scandinavica 27: 251-258.



## KEY TO *LABRUNDINIA* SPECIES

1. Respiratory atrium of thoracic horn with elongate preapical groove (Fig. 60); anal lobes 4x as long as wide, unsclerotized anal lobe points with long outer border spines (Fig. 63) ..... *Labrundinia* sp. 2

1'. Respiratory atrium of thoracic horn ovoid (Fig. 59), or club shaped (Fig. 61); anal lobes 5x as long as wide; sclerotized anal lobe points with short outer border spines (Figs. 62, 64) ..... 2



Figure 59. Thoracic horn of *Labrundinia* sp. 1

Figure 60. Thoracic horn of *Labrundinia* sp. 2

Figure 61. Thoracic horn of *Labrundinia* sp. 3



Figure 62. Anal lobes of *Labrundinia* sp. 1

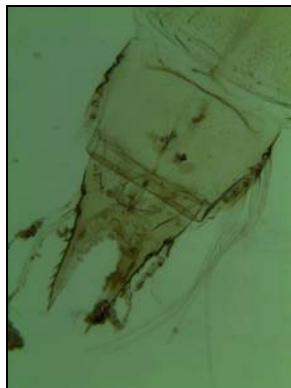


Figure 63. Anal lobes of *Labrundinia* sp. 2



Figure 64. Anal lobes of *Labrundinia* sp. 3

2(1'). Respiratory atrium of thoracic horn ovoid, without distinct neck or plastron plate (Fig. 59); exuviae light brown (Fig. 62) ..... *Labrundinia* sp. 1

2'. Respiratory atrium of thoracic horn club-shaped, distinct neck and plastron plate (Fig. 61); exuviae dark brown (Fig. 64) ..... *Labrundinia* sp. 3

## NOTES ON *LABRUNDINIA* SPECIES

### *Labrundinia* sp. 1

**Locality:** Laguna del Tortuguero 1 & 2

**Thorax:** Both thoracic horns present, dark outline and small plastron plate (5.20 A, Wiederholm 1986) and close to *L. sp. 10* (Fig. 66, Roback 1987); around 5 thoracic comb tubercles visible

**Abdomen:** Segment I missing, sparse shagreen on tergites II-VIII, spines on long anal lobe but not as conspicuous as (Figs. 5.20 H-I, Wiederholm 1986)

### *Labrundinia* sp. 2

**Locality:** Laguna del Tortuguero 2

**Thorax:** Only right thoracic horn present (Fig. 5.20 C, Wiederholm 1986); horn sac occupies less of the lumen (Fig. 62, Roback 1987)

**Abdomen:** Anal lobe overall lighter color than *Labrundinia* sp. 1 and sp. 3 with conspicuous external spines (Fig. 63)

**Comments:** Close to *L. sp. 3* near *virescens* (Roback 1987)

### *Labrundinia* sp. 3

**Locality:** Laguna del Tortuguero 2 & Quebrada

**Thorax:** thoracic horn very dark and spinose; horn sac filling most of lumen; conspicuous, small plastron plate (Fig. 61)

**Abdomen:** External conspicuous spines on outside of dark anal lobe (Fig. 64)

## ADDITIONAL REFERENCE

Roback, S.S., 1987. The immature chironomids of the eastern United States IX. Pentaneurini – genus *Labrundinia* with the Description of some Neotropical material. Proceedings of the Academy of Natural Sciences of Philadelphia 139: 159-209.

## NOTES ON *LARSIA* SPECIES



Figure 65. Thoracic horn of *Larsia* sp. 1



Figure 66. Anal lobes of *Larsia* sp. 1

### *Larsia* sp. 1

**Locality:** Quebrada

**Thorax:** Thoracic horn visible under tissues of head of adult, respiratory atrium without distinct central duct (Figs. 19, 65); thoracic horn most similar to *Larsia gelhausi* (Fig. 7, Oliveira & Silva 2011)

**Abdomen:** Scar on tergite I, segment VII with 4 LS setae, segment VIII with 5 LS setae, longer than broader anal lobe, adhesive sheath macrosetae (Fig. 23), medial border with spines on anal lobes (Fig. 66)

## ADDITIONAL REFERENCE

Oliveira, C.S.N. and F.L. Da Silva, 2011. Two new species of *Larsia* Fittkau, 1962 (Diptera Chironomidae: Tanypodinae) from Neotropical region, with a checklist of *Larsia* species of the world. *Zootaxa*, 2786: 27-41.

## NOTES TO *PARAMERINA* SPECIES



Figure 67. Thoracic horn of *Paramerina* sp. 1

### **Paramerina sp. 1**

**Locality:** Quebrada

**Thorax:** Long neck and small corona (Fig. 5.28 C, Wiederholm 1986) (Figs. 5, 67); thoracic comb with 12 spines

**Abdomen:** No inner border spines on anal lobes (Fig. 26)

### **ADDITIONAL REFERENCE**

Sublette, J.E. & Sasa, M. 1994. Chironomidae collected in Onchocerciasis endemic areas of Guatemala (Insecta, Diptera). Spixiana Supplement 20: 1-60.

## NOTES ON *PROCLADIUS* SPECIES

### *Procladius (Psilotanypus) bellus* Loew, 1866

**Locality:** Laguna del Tortuguero 1, 2, & 3

**Abdomen:** Light scar on tergite I, small triangular shaped shagreen present on tergites II-VIII (Fig. 5.33 F, Wiederholm 1986), 4 LS setae on tergite VII (Fig. 33), 5 LS on tergite VIII, 2 macrosetae on anal lobe and external spines like *Procladius bellus* (Figs. 25, 35)

**Comments:** *Psilotanypus* subgenus group, most similar to *Procladius bellus* var. 3 (Roback 1980)

## ADDITIONAL REFERENCE

Roback, S.S., 1980. The immature chironomids of the eastern United States IV. Tanypodinae – Procladiinae. Proceedings of the Academy of Natural Sciences of Philadelphia 132: 1-63.

## NOTES ON UNKNOWN PENTANEURINI GENERA

### Unknown Pentaneurini #1

**Locality:** Laguna del Tortuguero 2

**Thorax:** Horn sac filling the entire lumen, similar to *Ablabesmyia* (Fig. 39)

**Abdomen:** Tergite I with much darker scar than other *Labrundinia*; anal lobe 3x as long as broad, similar to *Labrundinia*; longer and curved inward and without external spines (Figs. 48, 50)

### Unknown Pentaneurini #2

**Locality:** Laguna del Tortuguero 3

**Thorax:** Thoracic horn pale and slender, like *Rheopelopia*, but wider than Fig. 5.36 A & B (Wiederholm 1986) (Fig. 40); plastron plate and thoracic comb absent; rounded spines along median suture

**Abdomen:** Tergite I without median scar; dense covering of tuberculate on shagreen I-IV (Fig. 43); many more L setae on tergite IV (unlike Fig. 5.36 E, Wiederholm 1986); apex of abdomen missing

**Comments:** Represented by 1 specimen

### Unknown Pentaneurini #3

**Locality:** Quebrada

**Thorax:** Thoracic horn dark brown and slender with apical setae similar to *Monopelopia* (Fig. 5.25 C, Wiederholm 1986) (Fig. 20); thoracic comb present

## KEY TO GENERA OF ORTHOCLADIINAE PUPAE

1. Anal lobes with full or partial fringe of setae (Figs. 11, 68-69) ..... 2

1'. Anal lobes without a fringe of setae (Figs. 13, 70) ..... 4

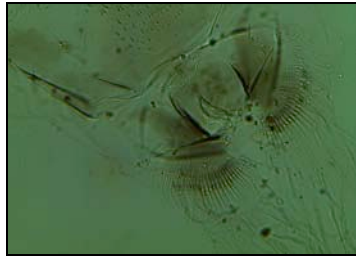


Figure 68. Anal lobes of *Corynoneura* sp. 1



Figure 69. Anal lobes of *Nanocladius minimus*



Figure 70. Anal lobes of Unknown Orthoclaadiinae #1

2(1). Thoracic horn present (Figs. 14, 71) ..... *Nanocladius*

2'. Thoracic horn absent ..... 3

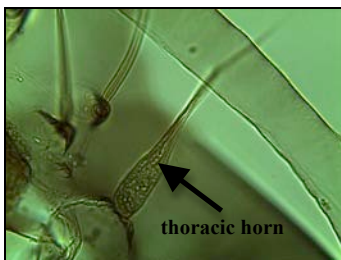


Figure 71. Thoracic horn of *Nanocladius minimus*

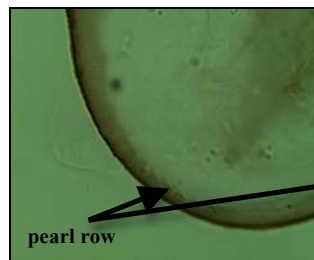


Figure 72. Wing sheath of *Corynoneura* sp. 1

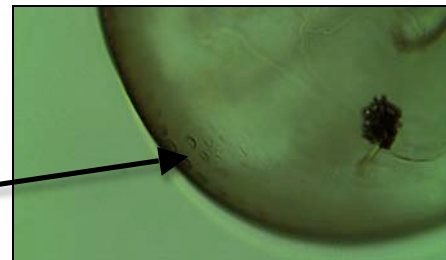


Figure 73. Wing sheath of *Corynoneura* sp. 2

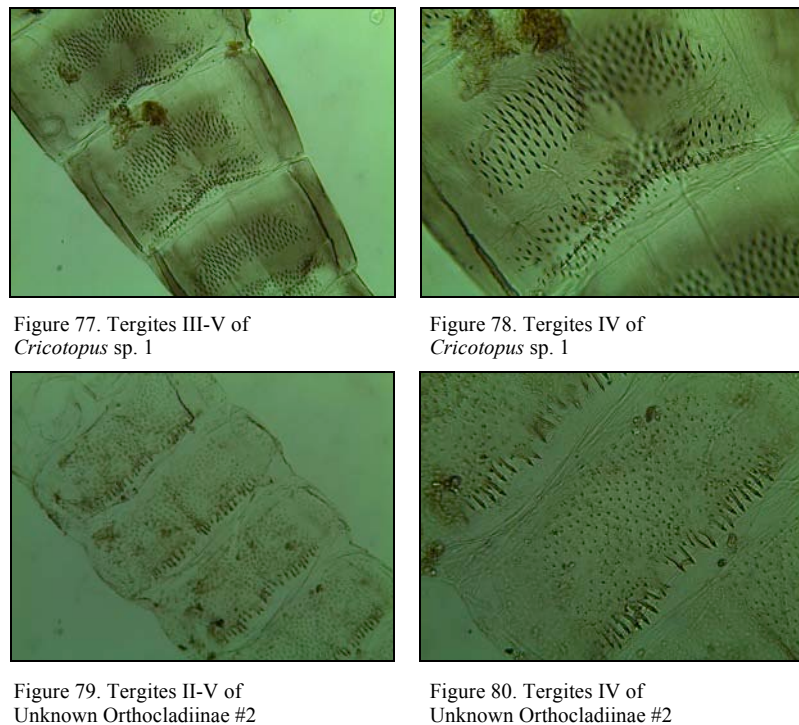
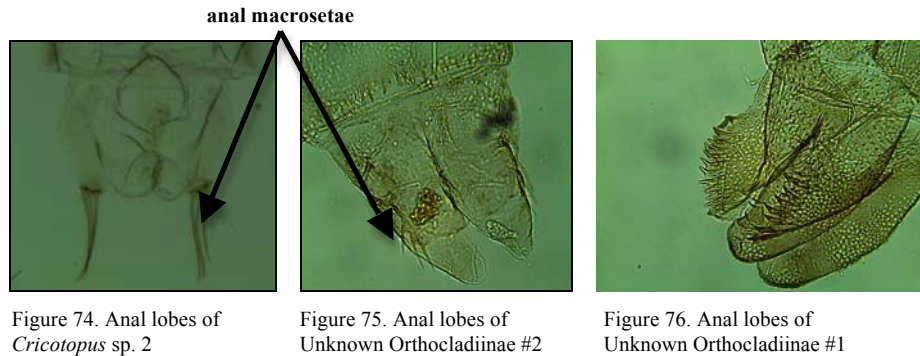
3(2'). Wing sheaths with pearl rows (Figs. 72-73) ..... *Corynoneura*

3'. Wing sheaths without pearl rows ..... *Thienemanniella*



4(1'). Anal lobes with 3 terminal or lateral anal macrosetae, either hair-like (Figs. 13, 74), or spine-like (Fig. 75) ..... 5

4'. Anal lobes without 3 terminal or lateral anal macrosetae, but rather conspicuous spines along lateral border of lobes (Fig. 76) ..... **Unknown Orthoclaadiinae #1**



5(4). Anal lobes with 3 terminal hair-like anal macrosetae (Fig. 74); tergites IV sometimes with light continuous shagreen and anterior and/or posterior bands of shagreen, but no posterior row of long spines (Figs. 77-78) ..... ***Cricotopus***

5'. Anal lobes with 3 lateral spine-like anal macrosetae (Fig. 75); tergites IV with continuous shagreen and posterior row of long spines (Figs. 79-80) ..... **Unknown Orthoclaadiinae #2**

## KEY TO *CORYNONEURA* SPECIES

1. Wing sheaths with dark pigmentation (Figs. 81-82); tergites III-VII with light (Fig. 85) or dark (Fig. 84) median shagreen ..... 2

1'. Wing sheaths with light pigmentation (Fig. 83); tergites III-VII with light median shagreen and dark posterior row of spines ..... *Corynoneura* sp. 3

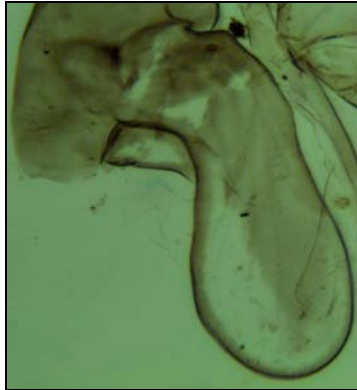


Figure 81. Wing sheaths of *Corynoneura* sp. 1



Figure 82. Wing sheaths of *Corynoneura* sp. 2

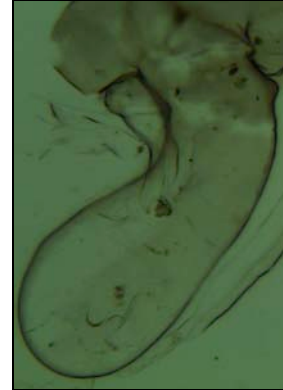


Figure 83. Wing sheaths of *Corynoneura* sp. 3

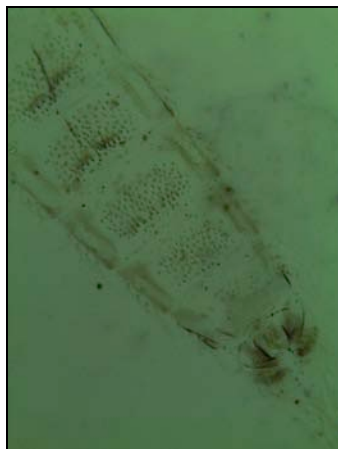


Figure 84. Lower tergites of *Corynoneura* sp. 1



Figure 85. Lower tergites of *Corynoneura* sp. 2

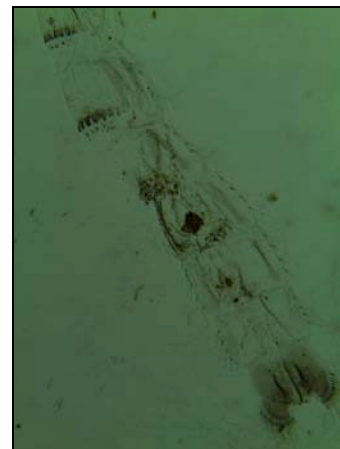


Figure 86. Lower tergites of *Corynoneura* sp. 3

2(1). Wing sheaths with 1 row of pearls (Fig. 72); tergites with light brown pleural pigmentation and dense shagreen covering entire segment on tergites III-VII (Fig. 84) ..... *Corynoneura* sp. 1

2'. Wing sheaths with 4 rows of pearls (Fig. 73); tergites with dark brown pleural pigmentation and light shagreen constricted to median 1/3 of segment on tergites III-VII (Fig. 85) ..... *Corynoneura* sp. 2

## NOTES ON *CORYNONEURA* SPECIES

### *Corynoneura* sp. 1

**Locality:** Laguna del Tortuguero 2 & 3

**Head:** Frontal setae present on frontal apotome

**Thorax:** One row of pearls on wing sheaths (Fig. 72)

**Abdomen:** Tergite I bare; tergite II with sparse median shagreen; tergites III-VII with dense median shagreen; tergite VIII with sparse median shagreen; anal lobe with sparse shagreen; anal fringe incomplete and only occupying the distal 1/2 to 2/3 of the anal lobe (Figs. 68, 84)

### *Corynoneura* sp. 2

**Locality:** Laguna del Tortuguero 2 & 3

**Head:** Frontal setae present on frontal apotome

**Thorax:** Four rows of pearls on wing sheaths (Fig. 73)

**Abdomen:** Darker plular area than sp.1; tergite I bare; tergite II with very sparse patch of shagreen on the posterior; tergites III-anal lobe shagreen constricted to median area (only covering 1/3 of segment); anal fringe incomplete and only occupying the distal 1/2 to 2/3 of the anal lobe (Fig. 85)

### *Corynoneura* sp. 3

**Locality:** Quebrada

**Head:** Frontal setae absent

**Thorax:** Two rows of pearls on wing sheaths

**Abdomen:** Lateral view of abdomen; tergite II-VII with darker posterior row of spines than sp. 1 and sp. 2; anal lobe fringe incomplete and only occupying the distal 1/2 to 2/3 of the anal lobe (Fig. 86)

**Comments:** Represented by one specimen

## ADDITIONAL REFERENCES

- Roback, S.S. & Coffman, W.P. 1983. Results of the Catherwood Bolivian-Peruvian Altiplano expedition Part II. Aquatic Diptera including montane Diamesinae and Orthocladiinae (Chironomidae) from Venezuela. *Proceedings of the Academy of Natural Sciences of Philadelphia* 135: 9–79.
- Sublette, J.E. & Sasa, M. 1994. Chironomidae collected in Onchocerciasis endemic areas of Guatemala (Insecta, Diptera). *Spixiana Supplement* 20: 1-60.
- Wiedenbrug, S & Trivinho-Strixino, S. 2011. New species of the genus *Corynoneura* Winnertz (Diptera, Chironomidae) from Brazil. *Zootaxa* 2822: 1-40.

## KEY TO *CRICOTOPUS* SPECIES

1. Frontal setae located on prefons (Figs. 88-89) ..... 2

1'. Frontal setae located on frontal apotome (Fig. 87) ..... *Cricotopus* sp. 1

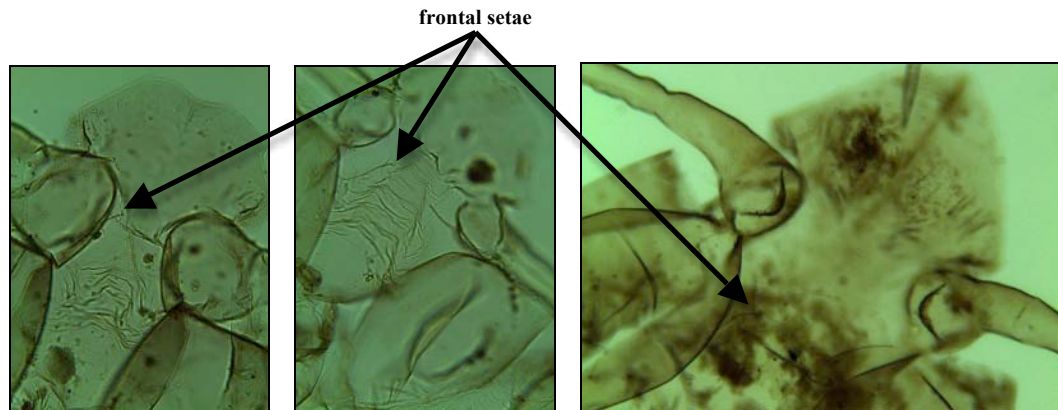


Figure 87. Frontal apotome of *Cricotopus* sp. 1

Figure 88. Frontal apotome of *Cricotopus* sp. 2

Figure 89. Frontal apotome of *Cricotopus* sp. 3

2(1). Anterior band of shagreen on tergites rectangular and anterior and posterior bands distinctly divided (Fig. 90); male antennal sheaths very short (Fig. 92) ... *Cricotopus* sp. 2

2'. Anterior band of shagreen on tergites crescent-shaped and anterior and posterior bands undivided (Fig. 91); male antennal sheaths regular size ..... *Cricotopus* sp. 3

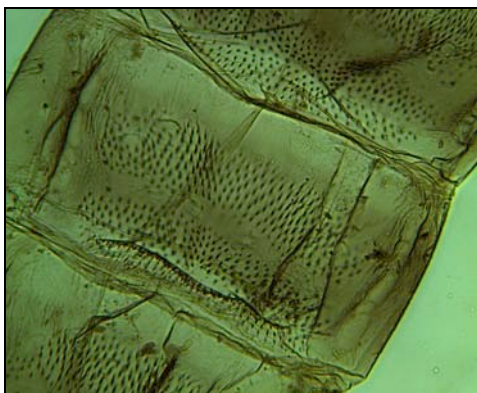


Figure 90. Tergite IV of *Cricotopus* sp. 2

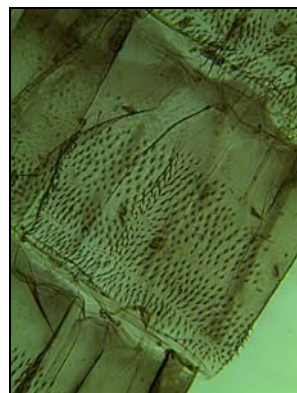


Figure 91. Tergite IV of *Cricotopus* sp. 3



Figure 92. Antennal sheaths of *Cricotopus* sp. 2

## NOTES ON *CRICOTOPUS* SPECIES

### *Cricotopus* sp. 1

**Locality:** Laguna del Tortuguero 1, 2, 3 & Quebrada

**Head:** Frontal setae on frontal apotome (like Fig. 9.13 B, Wiederholm 1986) (Fig. 87)

**Abdomen:** Abdomen looks like subgenus *Cricotopus*; tergite I with light shagreen; pedes spurii B present on tergites II and III; tergite II with median shagreen and dark; continuous hook row on projecting flap (1/2 width); tergites III-VI with thick anterior band and thinner posterior band of shagreen (not reaching lateral edge); tergite VII, VIII, and anal lobe with anterior median light shagreen (Figs. 77-78)

### *Cricotopus* sp. 2

**Locality:** Laguna del Tortuguero 2 & 3

**Head:** Frontal setae on prefons (like Fig. 9.13 A, Wiederholm 1986) (Fig. 88); male antennal sheath shorter than usual (Fig. 92)

**Abdomen:** Tergites II-VI with dense anterior and posterior shagreen (rectangular-shaped) and gap between patches; tergite II with dark hook row (1/2 width) (Fig. 90)

### *Cricotopus* sp. 3

**Locality:** Laguna del Tortuguero 1 & 2

**Head:** Frontal setae on prefons (like Fig. 9.13 A, Wiederholm 1986) (Fig. 89)

**Abdomen:** Tergite I with light shagreen; tergite II with continuous, dark hook row (3/4 width); tergite II-VI with anterior crescent shaped shagreen and posterior band of shagreen; tergite VII and VIII with anterior light patches of shagreen (Fig. 91)

## ADDITIONAL REFERENCES

- Roback, S.S. & Coffman, W.P. 1983. Results of the Catherwood Bolivian-Peruvian Altiplano expedition Part II. Aquatic Diptera including montane Diamesinae and Orthocladiinae (Chironomidae) from Venezuela. *Proceedings of the Academy of Natural Sciences of Philadelphia* 135: 9–79.
- Simpson, K.W., Bode, R.W. & Albu, P. 1983. Keys for the genus *Cricotopus* adapted from Revision der Gattung *Cricotopus* van der Wulp und ihrer Verwandten (Diptera, Chironomidae) by M. Hirvenoja. New York State Museum, The University of the State of New York, Albany, NY. Bulletin 450
- Sublette, J.E. & Sasa, M. 1994. Chironomidae collected in Onchocerciasis endemic areas of Guatemala (Insecta, Diptera). *Spixiana Supplement* 20: 1-60.



## KEY TO *NANOCLADIUS* SPECIES

1. Thoracic horn elongate and tapering to a point (Fig. 93); long frontal setae on pronounced cephalic tubercles (Fig. 95); tergites V-VI with anterior bands of long spines (Fig. 97) ..... *Nanocladius* (*Nanocladius*) *minimus*

1'. Thoracic horn broad and rounded (Fig. 94); long frontal setae on small, rounded cephalic tubercles (Fig. 96), tergites V-VI without anterior bands of long spines (Fig. 98) ..... *Nanocladius* sp. 1

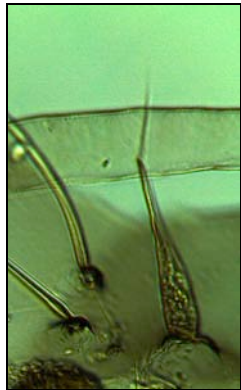


Figure 93. Thoracic horn of *Nanocladius minimus*



Figure 94. Thoracic horn of *Nanocladius* sp.1



Figure 95. Frontal apotome of *Nanocladius minimus*

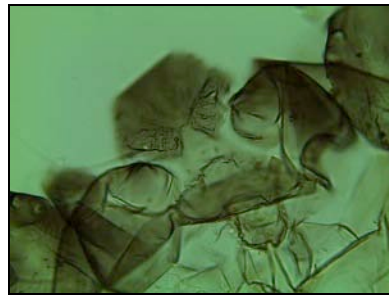


Figure 96. Frontal apotome of *Nanocladius* sp. 1



Figure 97. Lower tergites of *Nanocladius minimus*



Figure 98. Lower tergites of *Nanocladius* sp. 1

## NOTES ON *NANOCLADIUS* SPECIES

### *Nanocladius (Nanocladius) minimus*

**Locality:** Laguna del Tortuguero 1, 2 & 3

**Head:** Long frontal setae on prominent cephalic tubercle (like Fig. 9.37 A, Wiederholm 1986) (Fig. 95)

**Thorax:** Thoracic horn elongate and tapering to a point with spines (Fig. 9.37 B, Wiederholm 1986) (Fig. 93)

**Abdomen:** Tergite IV with weak median patch of shagreen; tergites V-VI with posterior band of long spines and strong median patch of shagreen; row of spinules on integument IV/V broadly interrupted; around 14 setae in anal fringe (Fig. 97)

### *Nanocladius* sp. 1

**Locality:** Quebrada

**Head:** Long frontal setae on small, rounded tubercle (Fig. 96)

**Thorax:** Thoracic horn broad and rounded (like Fig. 9.37 C, Wiederholm 1986) (Fig. 96)

**Abdomen:** Darker pigmentation of segments than *N. minimus*, no median patches of shagreen on tergites IV-V; anal lobe folded under segment VIII (Fig. 98)

## ADDITIONAL REFERENCE

Sæther, O.A., 1977. Taxonomic studies on Chironomidae: *Nanocladius*, *Pseudochironomus*, and the *Harnischia* complex. Bulletin of the Fisheries Research Board of Canada. Bulletin 196.

## KEY TO *THIENEMANNIELLA* SPECIES

1. Dark pigmentation on pleural area of segments and anal lobes; tergites II-VIII with dark median shagreen; anal lobes with  $\frac{1}{2}$  anal fringe (Fig. 99) .... ***Thienemanniella* sp. 1**

1'. Light pigmentation on pleural area of segments and anal lobes; tergites II-VIII with light median shagreen; anal lobes with  $\frac{3}{4}$  anal fringe (Fig. 100)  
..... ***Thienemanniella* sp. 2**

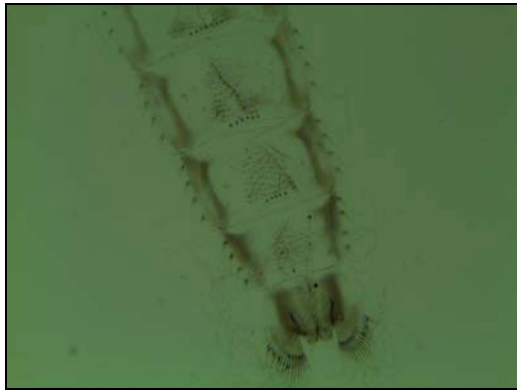


Figure 99. Lower tergites of *Thienemanniella* sp. 1

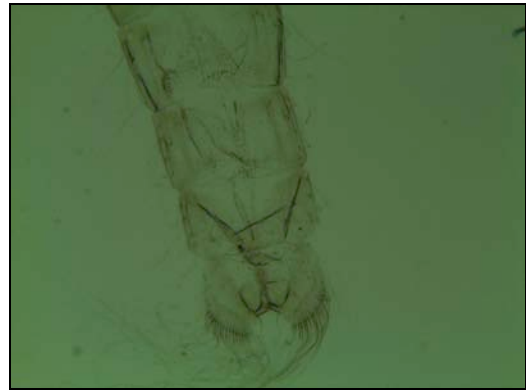


Figure 100. Lower tergites of *Thienemanniella* sp. 2

## NOTES ON *THIENEMANNIELLA* SPECIES

### *Thienemanniella* sp. 1

**Locality:** Laguna del Tortuguero 3

**Abdomen:** No shagreen on tergites I; very light shagreen on tergite II; shagreen on tergites III-VIII and anal lobe; fine spinules and small posterior hook row on tergite III; tergites IV-VIII with coarse shagreen; tergites IV-VII with posterior spines; segments III-VIII with 4 thick L setae; anal lobes with  $\frac{1}{2}$  anal fringe; dark pigmentation on pleural area of abdomen and anal lobe (Fig. 99)

**Comments:** Represented by one specimen; close to *T. sanctivincenta* (Saether 1981)

### *Thienemanniella* sp. 2

**Locality:** Laguna del Tortuguero 2 & 3

**Abdomen:** Damaged abdomen; no shagreen on tergite I; tergite II-VIII and anal lobe with light shagreen; tergites V-VIII with 4 LS setae; anal lobes with  $\frac{3}{4}$  anal fringe (Fig. 100)

## ADDITIONAL REFERENCE

Sæther, O.A. 1981. Orthocladiinae (Chironomidae: Diptera) from the British West Indies with descriptions of *Antillocladius* n. gen., *Lipurometriocnemus* n. gen., *Comptosmittia* n. gen. and *Diplosmittia* n. gen. Entomologica Scandinavica, Supplement 16: 1-46.

## NOTES TO UNKNOWN ORTHOCLADIINAE GENERA

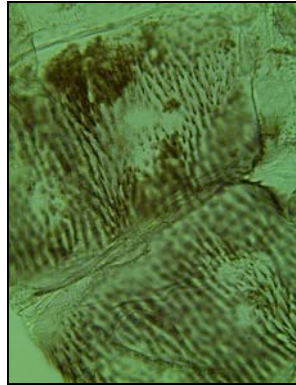


Figure 101. Tergites II-III of Unknown Orthoclatiinae #1

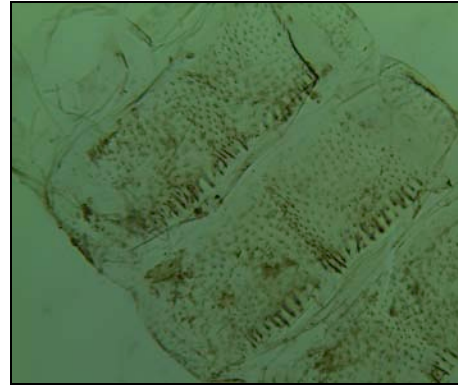


Figure 102. Tergites II-III of Unknown Orthoclatiinae #2

### Unknown Orthoclatiinae #1

**Locality:** Laguna del Tortuguero 1 & 2

**Abdomen:** Partial lateral slide mount; dense spines on tergites I-VIII (Fig. 101) and anal lobes; no anal fringe or macrosetae; no lateral setae; anal lobes with large spines on lateral side (increase from interior or posterior) (Fig. 76)

**Comments:** Close to *Gymnometriocnemus*

### Unknown Orthoclatiinae #2

**Locality:** Laguna del Tortuguero 2

**Abdomen:** 3 lateral spine-like anal macrosetae on anal lobes (Fig. 75); posterior spines on tergites II-VIII (Figs. 79-80, 102)

**Comments:** Represented by 1 specimen; somewhat resembling *Eukiefferiella* and *Pseudorthocladius*

## KEY TO TRIBES OF CHIRONOMINAE PUPAE

1. Thoracic horn unbranched (Figs. 10, 17, 103); wing sheaths almost always with nose (Fig. 106) ..... ***Tanytarsini***

1'. Thoracic horn with at least two branches (Figs. 9, 18, 104-105); wing sheaths almost always without nose ..... 2

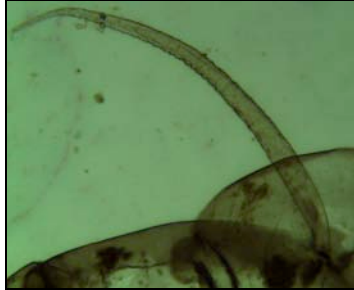


Figure 103. Thoracic horn of *Tanytarsus* sp. 1



Figure 104. Thoracic horn of *Pseudochironomus richardsoni*

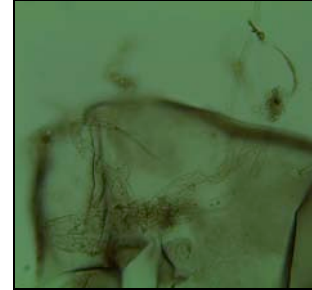


Figure 105. Thoracic horn of *Paratendipes* sp. 7

2(1'). Thoracic horn with two short, plump, apically rounded branches (Fig. 104) ..... ***Pseudochironomini***

2'. Thoracic horn with more than two slender, apically pointed branches (Figs. 9, 18, 105) ..... ***Chironomini***

## KEY TO GENERA OF CHIRONOMINI PUPAE

1. Hook row on posterior margin of segment 2 distinctly interrupted (Figs. 106-107) ... 2
- 1'. Hook row on posterior margin of segment 2, at most, very narrowly interrupted (Figs. 108-109) ..... 5

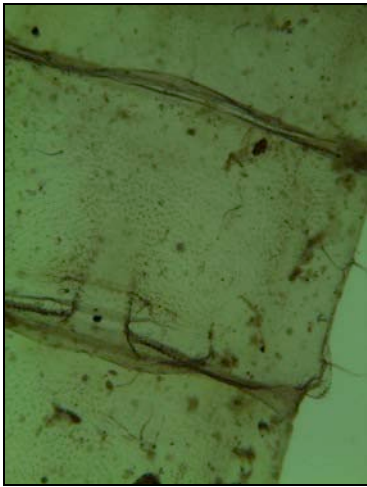


Figure 106. Tergite II of *Cryptochironomus* sp. 2

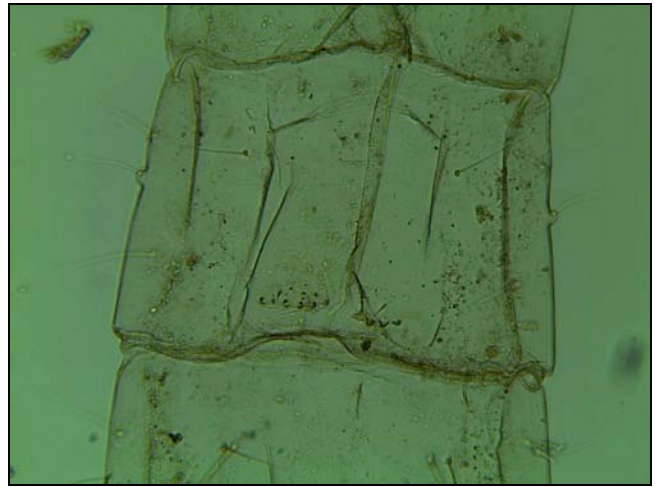


Figure 107. Tergite II of *Cryptotendipes* sp. 1

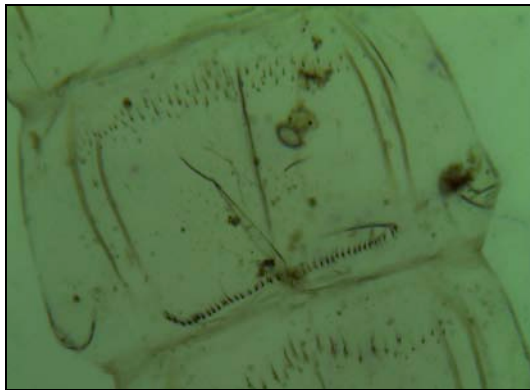


Figure 108. Tergite II of *Polypedilum* sp. 1

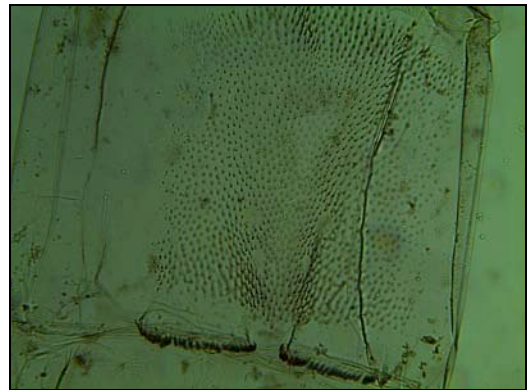


Figure 109. Tergite II of *Stenochironomus* sp. 5

- 2(1). Thoracic horn exceptionally long (Fig. 110) ..... ***Cryptotendipes***
- 2'. Thoracic horn not as long as above (Figs. 9, 111-112) ..... 3





Figure 110. Thoracic horn of *Cryptotendipes* sp. 1



Figure 111. Thoracic horn of *Cryptochironomus* sp. 2

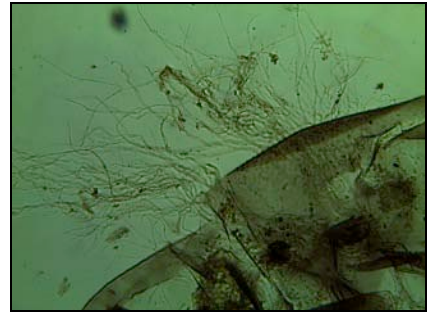


Figure 112. Thoracic horn of *Harnischia* sp. 1

3(2'). Tergite VI with posteromedian mound of spines (Figs. 113-114) ..... ***Cladopelma***

3'. Tergite VI without such a mound of spines ..... 4

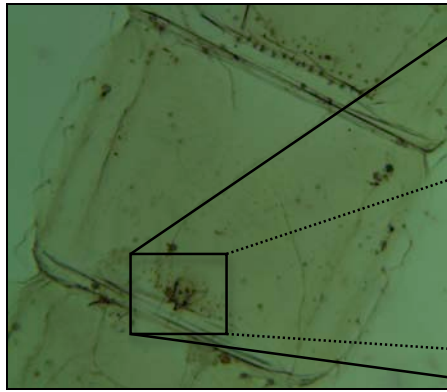


Figure 113. Tergite VI of *Cladopelma* sp. 1

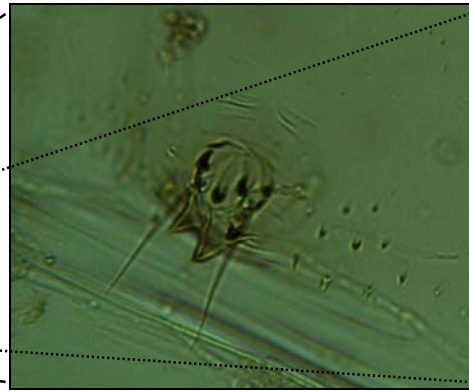


Figure 114. Tergite VI of *Cladopelma* sp. 1

4(3'). Anal segment with forked, posteromedian process (Fig. 115); frontal apotome often with ornate cephalic tubercles (Figs. 116-117); tergite IV with single row of short posterior spines (Fig. 118) ..... ***Cryptochironomus***

4'. Anal segment without forked, posteromedian process; cephalic tubercles, when present, never ornate; tergite IV with multiple rows of long posterior spines (Fig. 119) ..... ***Harnischia***



Figure 115 Anal segment of *Cryptochironomus* sp. 4



Figure 116. Cephalic tubercle of *Cryptochironomus* sp. 3

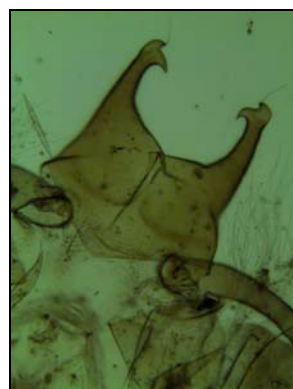


Figure 117. Cephalic tubercle of *Cryptochironomus* sp. 4

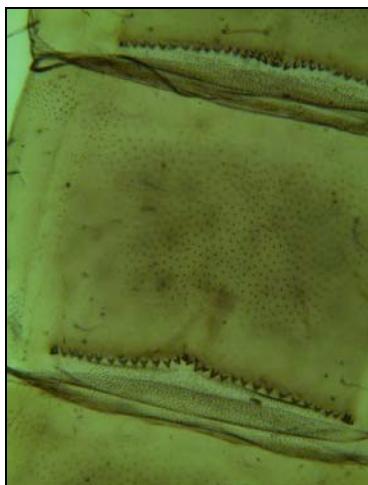


Figure 118. Tergite IV of *Cryptochironomus* sp. 4

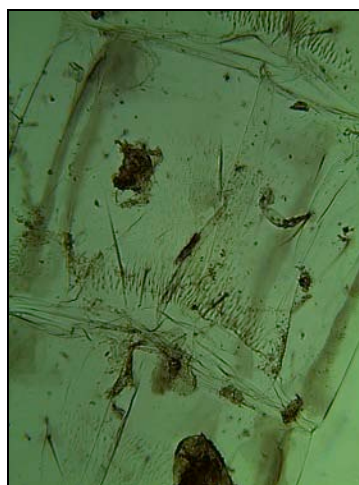


Figure 119. Tergite IV of *Harnischia* sp. 1

- 5(1'). Caudolateral margin of segment VIII sometimes without a spines or with a spine or group of spines (Figs. 120-121) ..... 7
- 5'. Caudolateral margin of segment VIII always without spines (Figs. 122-123) ..... 6



Figure 120. Tergite VIII of  
*Goeldichironomus* sp. 1

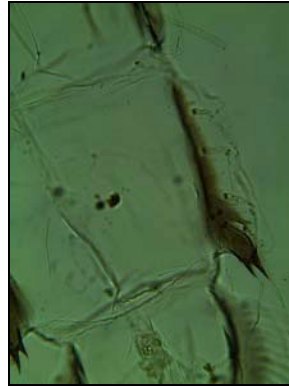


Figure 121. Tergite VIII of  
*Polypedilum* sp. 11



Figure 122. Tergite VIII of  
*Saetheria* nr *tylus*

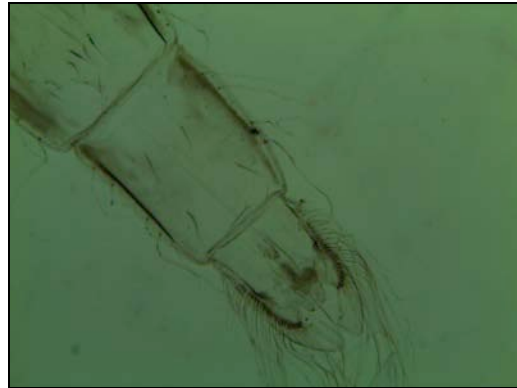


Figure 123. Tergite VIII of Unknown Chironomini #3

- 6(5'). Tergite II with continuous hook row on projecting flap; tergite III with posterior rows of triangular spines, with a yellow base with dark brown tips (Fig. 124)  
..... ***Saetheria***
- 6'. Tergite II with interrupted hook row and posterior row of triangular dark brown spines; tergite III also with posterior row of triangular dark brown spines (Fig. 125)  
..... **Unknown Chironomini #3**



Figure 124. Tergites II-III of *Saetheria* nr. *tylus*

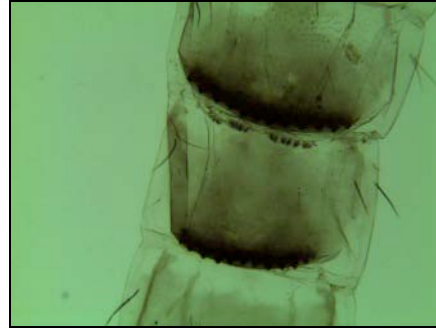


Figure 125. Tergites II-III of Unknown Chironomini #3

- 7(5). Cephalic tubercles absent (Figs. 126-127) ..... 8
- 7'. Cephalic tubercles present (Figs. 128-129) ..... 12



Figure 126. Frontal apotome of *Nilothauma* sp. 1



Figure 127. Frontal apotome of *Stenochironomus* sp. 5



Figure 128. Frontal apotome of *Paralauterborniella nigrohalteralis*



Figure 129. Frontal apotome of *Polypedilum* sp. 4

- 8(7). Thoracic horn with about 6 slender branches (Fig. 130); two anterolateral patches and one median patch of shagreen on tergite VIII (Fig. 131) ..... ***Nilothauma***
- 8'. Thoracic horn with more than 20 fine braches; no to continuous and dense shagreen on tergite VIII ..... 9

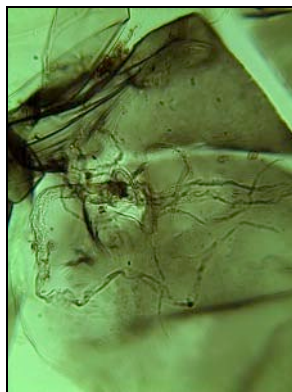


Figure 130. Thoracic horn of *Nilothauma* nr *reissi* var. 2



Figure 131. Tergite VIII of *Nilothauma* nr *reissi* var. 2



9(8'). Thoracic horn with several fine branches and one simple, spinose branch (Figs. 18, 132); frontal apotome with a pair of large swollen mounds (Fig. 127) ..... 10

9'. Thoracic horn with fine branches only; frontal apotome with a pair of small swollen mounds (Fig. 133) ..... 11

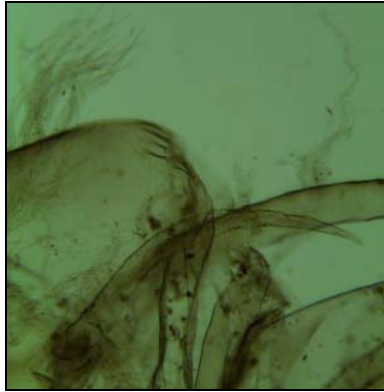


Figure 132. Thoracic horn of *Stenochironomus* sp. 1

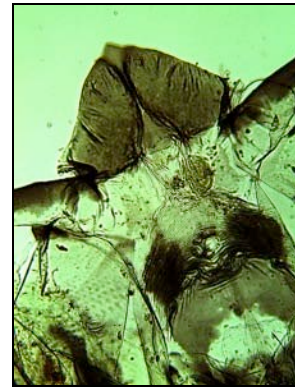


Figure 133. Frontal apotome of Unknown Chironomini #1

10(9). Shagreen absent on tergites VII and VIII or restricted to anterolateral regions (Fig. 134) ..... ***Stenochironomus***

10'. Shagreen present on tergites VII and VIII on posterior regions (Fig. 135)  
..... ***Xestochironomus***

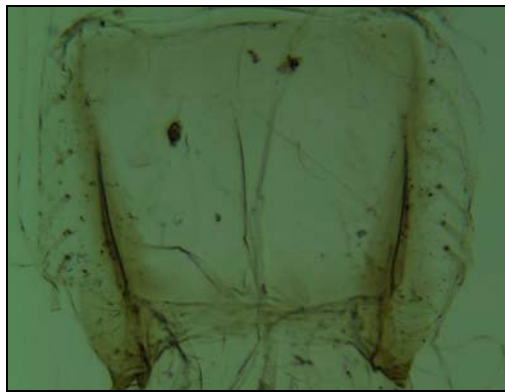


Figure 134. Tergite VIII of *Stenochironomus* sp. 1

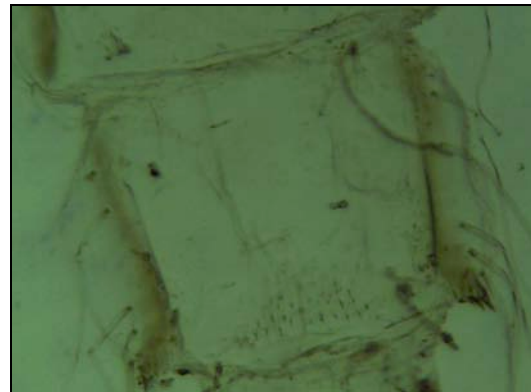


Figure 135. Tergite VIII of *Xestochironomus subletti*

11(9'). Dense, continuous shagreen on tergite VIII; dark brown recurved anal claw (Fig. 136) ..... **Unknown Chironomini #1**

11'. Light, anterolateral shagreen on tergite VIII; yellow recurved anal claw (Fig. 137)  
..... **Unknown Chironomini #2**

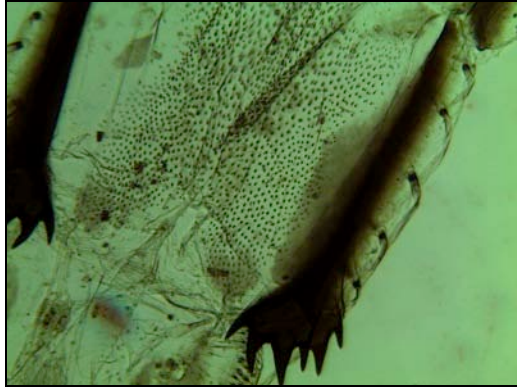


Figure 136. Tergite VIII of Unknown Chironomini #1



Figure 137. Tergite VIII of Unknown Chironomini #2

12(7'). Cephalic tubercles truncate and with a cluster of spinules (Fig. 138)  
 ..... ***Endotribelos***

12'. Cephalic tubercles not truncate and without spinules ..... 13

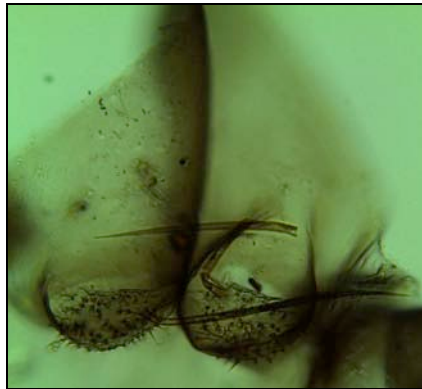


Figure 138. Cephalic tubercles of  
*Endotribelos* sp.1

13(12'). Tergites II-VI with paired groups of spines (Fig. 139); thoracic horn with 4 thick  
 branches (Fig. 140) ..... ***Zavreliella***

13'. Tergites II-VI without paired groups of spines; thoracic horn with more than 4  
 branches ..... 14

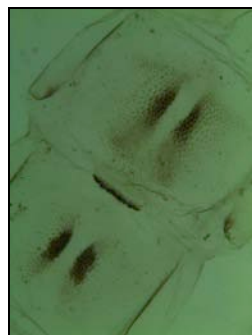


Figure 139. Tergites II-III  
 of *Zavreliella* sp.1

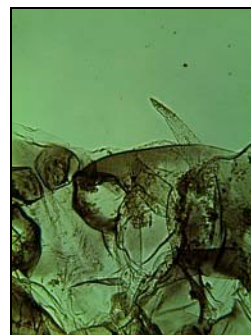


Figure 140. Thoracic horn  
 of *Zavreliella* sp.1

- 14(13'). Thoracic horn plumose with more than 20 fine branches (Fig. 141) ..... 15
- 14'. Thoracic horn with less than 20 coarse branches (Figs. 142) ..... 18

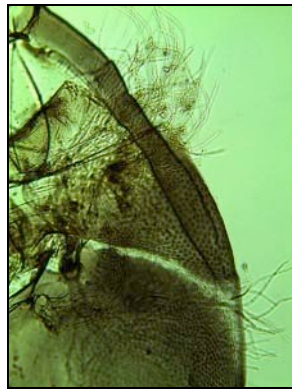


Figure 141. Thoracic horn of Unknown Chironomini #4



Figure 142. Thoracic horn of *Polypedilum* sp. 1

- 15(14). Segment VIII with a singular, large spine (Fig. 143); conjunctives III/IV and IV/V each with a short, slender L seta (Fig. 146) ..... ***Chironomus***
- 15'. Segment VIII without spines (Fig. 144) or at least 2 separate spines (Fig. 145); conjunctives III/IV and IV/V each without L seta (Fig. 147) ..... 16

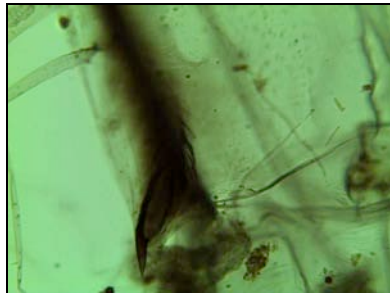


Figure 143. Anal spur of *Chironomus* sp. 1



Figure 144. Segment VIII of *Parachironomus* sp. 1

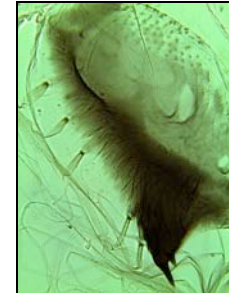


Figure 145. Anal comb of *Goeldichironomus* sp. 4



Figure 146. Conjunctive III/IV of *Chironomus* sp. 1

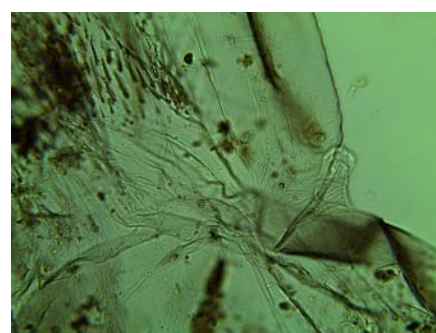


Figure 147. Conjunctive III/IV of *Goeldichironomus* sp. 5



- 16(15'). Tergite VI with posteromedian spinose swelling (Fig. 148) ..... ***Parachironomus***
- 16'. Tergite VI without posteromedian spinose swelling ..... 17



Figure 148. Tergite VI of *Parachironomus* nr. *cayapo*

- 17(16'). Tergite VIII with 4 LS setae; median pair of shagreen bands; dark brown pigmentation across entire segment (Fig. 149) ..... **Unknown Chironomini #4**
- 17'. Tergite VIII with 5 LS setae; anterolateral pair of shagreen bands; dark brown pigmentation on anterior or lateral portions of segment (Figs. 150-151) ..... ***Goeldichironomus***

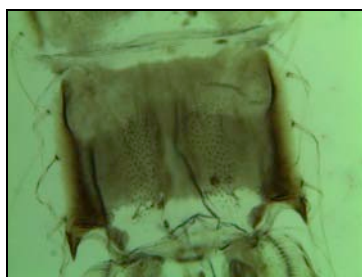


Figure 149. Tergite VII of Unknown Chironomini #4



Figure 150. Tergite VII of *Goeldichironomus* sp. 4

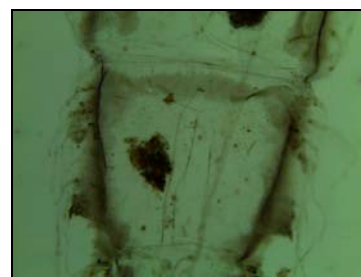


Figure 151. Tergite VII of *Goeldichironomus* sp. 5

- 18(14'). Cephalic tubercles long and slender with 2 apical spinules; frontal setae long and slender (Fig. 152); tergites IV-VIII with 4 LS setae ..... ***Paralauterborniella***
- 18'. Cephalic tubercles variable from absent to long and slender; frontal setae absent to long (Figs. 153-154); tergite IV with 0-3 LS setae and tergites V-VIII with 3-5 LS setae ..... 19

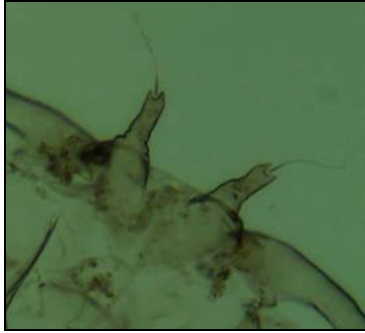


Figure 152. Cephalic tubercles of *Paralauterborniella nigrohalteralis*

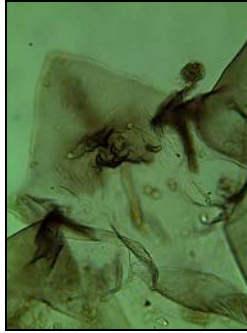


Figure 153. Cephalic tubercles of *Polypedilum* sp. 5

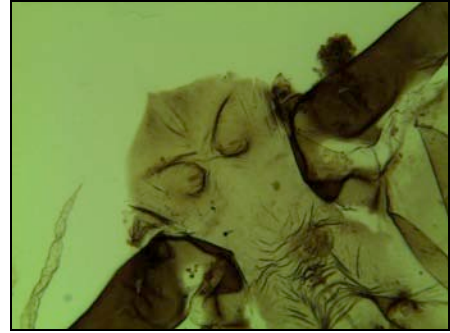


Figure 154. Cephalic tubercles of *Paratendipes* sp. 1

19(18'). Tergites II-VI with continuous shagreen in square or hourglass shape (Figs. 155-156); tergite V-VI with 4 LS setae ..... 20

19'. Tergites II-VI with anterior band of shagreen mostly separate from remaining shagreen (Fig. 157); tergites V-VI with 3 LS setae ..... ***Polypedilum***

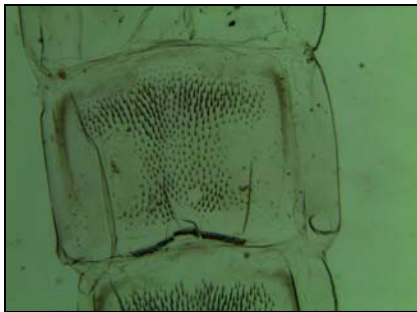


Figure 155. Tergite II of *Paratendipes* sp. 3

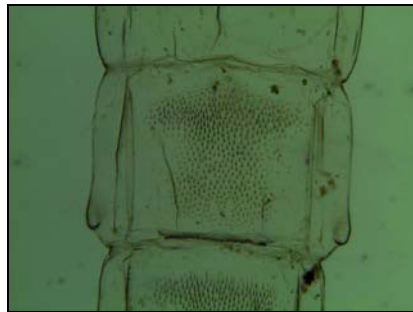


Figure 156. Tergite II of *Beardius* sp. 1

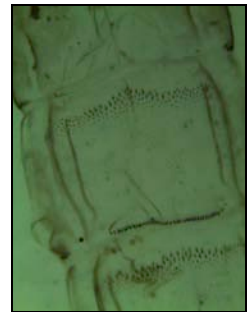


Figure 157. Tergite II of *Polypedilum* sp. 5

20(19). Tergite VIII with 4-7 dark spines along the lateral edge and one small dark anal spur on posterolateral corner (Figs. 158-159) ..... ***Beardius***

20'. Tergites VIII without dark spines along lateral edge and variable anal spur or comb (Figs. 160-161) ..... ***Paratendipes***

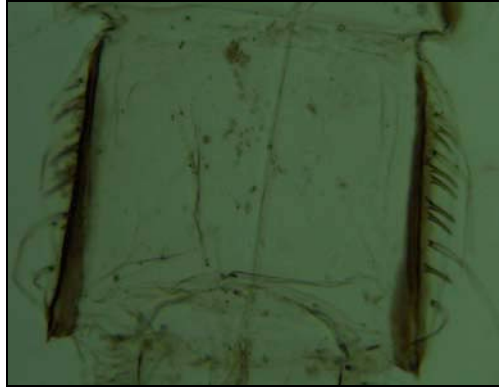


Figure 158. Tergite VIII of *Beardius* sp. 1



Figure 159. Tergite VIII of *Beardius* sp. 1

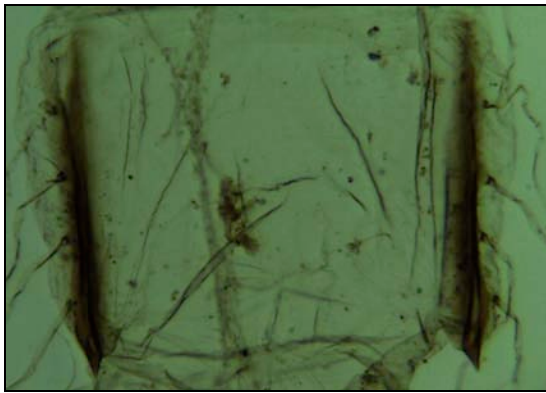


Figure 160. Tergite VIII of *Paratendipes* sp. 3

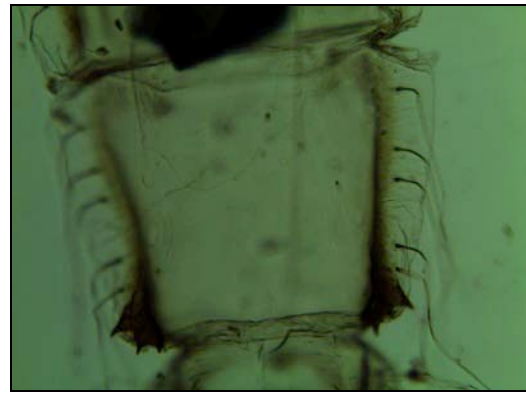


Figure 161. Tergite VIII of *Paratendipes* sp. 1

## NOTES ON *BEARDIUS* SPECIES

### *Beardius* sp. 1

**Locality:** Laguna del Tortuguero 1, 2, 3 & Quebrada

**Head:** Cephalic tubercles small and apically pointed; frontal setae present

**Thorax:** Basal ring with 1 tracheal branch

**Abdomen:** Lateral view of abdomen; tergite I bare; tergite II with dense median shagreen with continuous hook row (1/2 width) (Fig. 156); pedes spurii A and B present; tergites III-VI with median shagreen; tergite VII with anterior circular shagreen; tergite VII and VIII bare; 4 LS setae on tergites VI-VII; around 6 small, dark spines along pluera and one dark anal spur; at least 4 LS setae on tergite VIII (every other pattern of spine and LS setae) (Figs. 158-159), anal lobe fringe 3/4 complete

**Comments:** Originally described as an unknown Chironomini; appears close to *Beardius cristhinae* (Trivinho-Strixino & Siqueira 2007).

## ADDITIONAL REFERENCES:

Reiss, F. and J.E. Sublette. 1985. *Beardius* new genus with notes on additional Pan-American taxa (Diptera, Chironomidae). Spixiana Supplement 11: 179-193.

Trivinho-Strixino, S. and T. Siqueira. 2007. New species of *Beardius* Reiss et Sublette, 1985 (Diptera: Chironomidae) from southeastern Brazil. In: T. Andersen (ed.). Contributions to the Systematics and Ecology of Aquatic Diptera- A tribute to Ole A. Saether. The Caddis Press. p 281-286.

## KEY TO *CHIRONOMUS* SPECIES

1. Anal spur slightly longer and dark brown; anal lobe fringe dark brown (Fig. 162);  
cephalic tubercles with bulbous base and arched apex (Fig. 164) ..... *Chironomus* sp. 1

1'. Anal spur slightly shorter and light brown; anal lobe fringe light brown (Fig. 163);  
cephalic tubercles bulbous base and tubular apex (Fig. 165) ..... *Chironomus* sp. 2

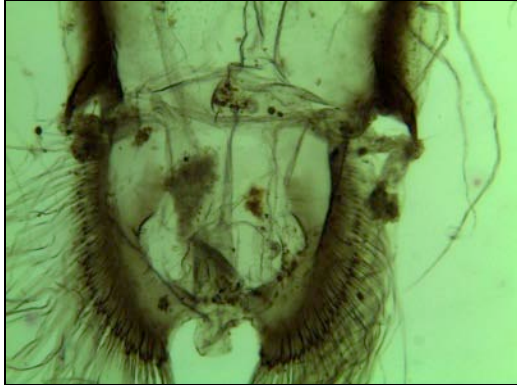


Figure 162. Tergite VIII and anal lobes of *Chironomus* sp. 1



Figure 163. Tergite VIII and anal lobes of *Chironomus* sp. 2



Figure 164. Cephalic tubercles of *Chironomus* sp. 1

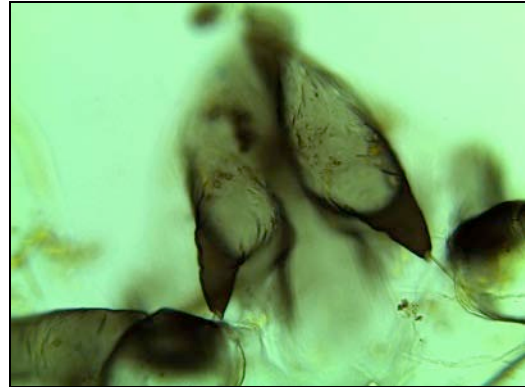


Figure 165. Cephalic tubercles of *Chironomus* sp. 2

## NOTES ON *CHIRONOMUS* SPECIES

### *Chironomus* sp. 1

**Locality:** Laguna del Tortuguero 1 & Quebrada

**Head:** Cephalic tubercles with bulbous base and arched apex (Fig. 164)

**Abdomen:** Tergite I bare; tergite II with median shagreen and continuous hook row (1/2 width); tergite III-V with median shagreen with a slightly darker posterior; conjunctives III/IV and IV/V with short, slender L setae (Fig. 146); tergite VI with heavier anterior and posterior patches of shagreen; tergite VII with light anterior patches of shagreen; tergite VII with light lateral patches of shagreen; dark anal spur; around 40 anal lobe filaments (Figs. 143, 162)

### *Chironomus* sp. 2

**Locality:** Laguna del Tortuguero 1, 2 & Quebrada

**Head:** Cephalic tubercles with bulbous base and tubular apex (Fig. 165)

**Abdomen:** Anal spur much longer and darker than *Chironomus* sp. 1, appears close to *Chironomus gigas* (Reiss 1974:); around 45 anal lobe filaments (Fig. 163)

## ADDITIONAL REFERENCES

Fittkau, E. J. 1968. *Chironomus streinzkei* n. sp. (Chironomidae, Dipt.), ein neues Laboratoriumstier. Zeitschrift für Morphologie der Tiere 63: 239–250.

Reiss, F. 1974. Vier neue *Chironomus*-Arten (Chironomidae, Diptera) und ihre ökologische Bedeutung für die Benthosfauna zentralamazonischer Seen und Überschwemmungswälder. Amazoniana 5: 3–23.

## NOTES ON *CLADOPELMA* SPECIES

### *Cladopelma* sp. 1

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercles rounded with terminal point (like Fig. 10.8 B, Wiederholm 1986); thoracic horn plumose

**Thorax:** Medially restricted basal ring; granulose thorax

**Abdomen:** Tergite I with medial row of spines; tergite II anterior row of spines (wider than tergite I) and medially interrupted hook row; pedes spurii B absent on tergite II; tergites III-VI with posterior, triangular patch of spines; tergite VI with more rounded patch of spines (Figs. 113-114); shagreen on tergites I-VIII; tergite VIII with pale, single thorn-like spur in posterior 1/3; complete anal fringe; doesn't match abdomen of *C. laccophila* (Fig. 10.8, Wiederholm 1986)



## KEY TO *CRYPTOCHIRONOMUS* SPECIES

1. Cephalic tubercles unfused at the base (Fig. 166) ..... *Cryptochironomus* sp. 2

1'. Cephalic tubercles fused at the base (Figs. 167-169) ..... 2

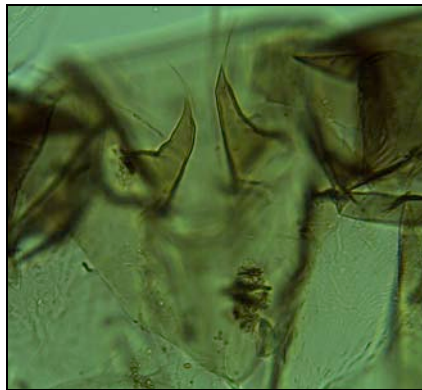


Figure 166. Cephalic tubercles of *Cryptochironomus* sp. 2

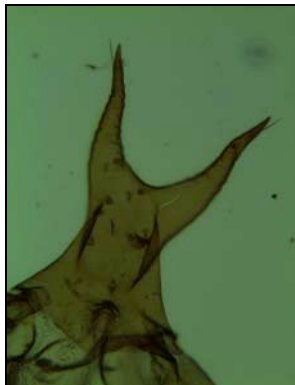


Figure 167. Cephalic tubercles of *Cryptochironomus* sp. 1



Figure 168. Cephalic tubercles of *Cryptochironomus* sp. 3

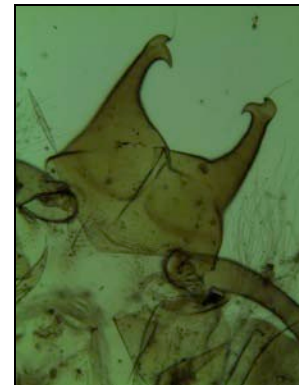


Figure 169. Cephalic tubercles of *Cryptochironomus* sp. 4

2(1'). Undivided arms of cephalic tubercles (Fig. 167), tergites III-VI with double row of posterior spines (Fig. 170) ..... *Cryptochironomus* sp. 1

2'. Divided arms of cephalic tubercles (Figs. 168-169); tergites III-VI with single row of posterior spines (Fig. 171) ..... 3



Figure 170. Tergite IV of *Cryptochironomus* sp. 1

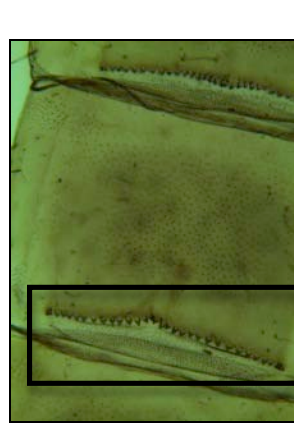
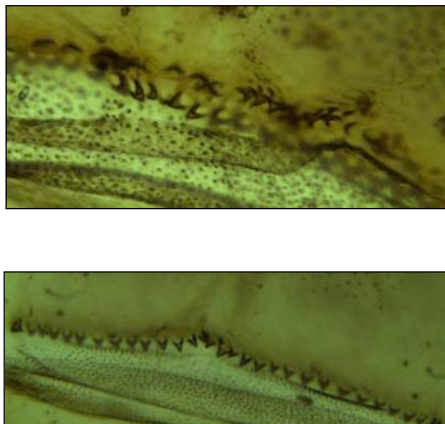


Figure 171. Tergite IV of *Cryptochironomus* sp. 4

3(2'). Divided arms of cephalic tubercles relatively straight, outside arm 2x as long as inside arm (Fig. 168); tergite VI single spine row consisting of a set of 2-3 small spines, a large gap, and another set of 2 small spines (Fig. 173); tergite VII without a small row of spines (Fig. 175) ..... ***Cryptochironomus* sp. 3**

3'. Divided arms of cephalic tubercles curved, outside arm 1/2x as long as inside arm, frontal setae on outside arm (Fig. 169); tergite VI with single row consisting of about 25 small spines (Fig. 174); tergite VII with a small row of spines (Fig. 176) ..... ***Cryptochironomus* sp. 4**

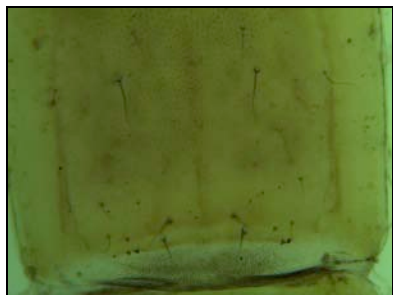


Figure 173. Tergite VI of *Cryptochironomus* sp. 3

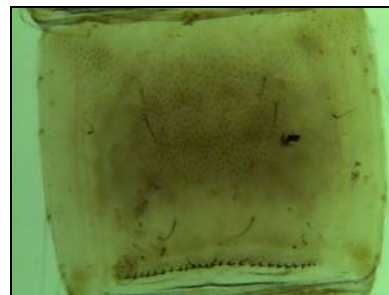


Figure 174. Tergite VI of *Cryptochironomus* sp. 4

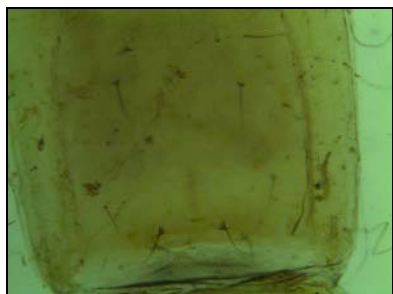


Figure 175. Tergite VII of *Cryptochironomus* sp. 3

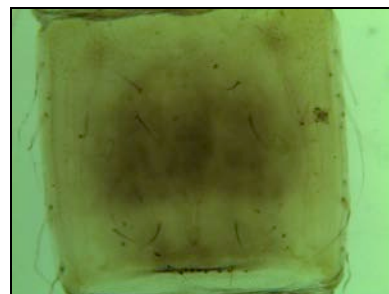


Figure 176. Tergite VII of *Cryptochironomus* sp. 4

## NOTES ON *CRYPTOCHIRONOMUS* SPECIES

### *Cryptochironomus* sp. 1

**Locality:** Laguna del Tortuguero 1, 2 & 3

**Head:** Large cephalic tubercles fused at the base; arms of cephalic tubercle relatively straight and equal in length; frontal setae present (Fig. 167)

**Abdomen:** Tergites without reticulations (doesn't match species in Vallenduuk 2004); spinose pedes spurii B on segment II; tergite II with large gap in hook row (Fig. 107); tergites III-VII with two posterior rows of spines (Fig. 170)

**Comments:** Around 6.5 mm long exuviae

### *Cryptochironomus* sp. 2

**Locality:** Laguna del Tortuguero 2 & 3

**Head:** Moderate conical cephalic tubercles that are not fused at the base; frontal setae present (Fig. 166)

**Thorax:** Thoracic horn plumose (Fig. 111)

**Abdomen:** Very fine reticulation on tergites; sternite I with 2 spinose anterolateral tubercles; spinose pedes spurii B on segment II; tergite II with gap in hook row (Fig. 106); anal lobe missing

**Comments:** Light yellow pigmentation; around 4 mm long exuviae, appears to be closest to *C. denticulatus* (Goetghebuer, 1921) (Vallenduuk & Morozova 2004)

### *Cryptochironomus* sp. 3

**Locality:** Laguna del Tortuguero 1

**Head:** Large cephalic tubercles fused at base, subdivided arms relatively straight, outside arm 2x as long as the inside arm; frontal setae appears absent (Figs. 116, 168)

**Abdomen:** Tergites III-VI with single row of posterior spines; tergite VI single spine row consisting of a set of 2-3 small spines, a large gap, and another set of 2 small spines (Fig. 173); tergite VII without a small row of spines (Fig. 175); missing anal lobe

***Cryptochironomus* sp. 4**

**Locality:** Laguna del Tortuguero 2

**Head:** Large cephalic tubercles fused at base, subdivided arms curved inward (Fig. 117); frontal setae present on outside arm (Fig. 169)

**Abdomen:** Tergites III-VI with single row of posterior spines (Figs. 118, 171); tergite VI with single row consisting of about 25 small spines (Fig. 174); tergite VII with a small row of spines (Fig. 176); anal projection longer than *Cryptochironomus* sp. 1 (Fig. 115)

**ADDITIONAL REFERENCES**

- Curry, L.L., 1958. Larvae and pupae of the species *Cryptochironomus* (Diptera) in Michigan. *Limnology and Oceanography* 3:427-442.
- Mason, P.G., 1986. Four new species of the *Cryptochironomus fulvus* (Johannsen) species complex (Diptera: Chironomidae). *Entomologica scandanavica* 16: 399-413.
- Vallenduuk H.J. & E. E. Morozova. 2005. *Cryptochironomus*: An identification key to the larvae and pupal exuviae in Europe. *Lautrebornia* 55: 1-22.

## KEY TO *CRYPTOTENDIPES* SPECIES

1. Segment VIII with singular long, curved, slender spines about 2/3 of the way down lateral margins (Fig. 177) ..... *Cryptotendipes* sp. 1

1'. Segment VIII with singular long, curved, slender spine about 2/3 of the way down right lateral margin and bifurcated spine on left margin (Fig. 178)  
..... *Cryptotendipes* sp. 2

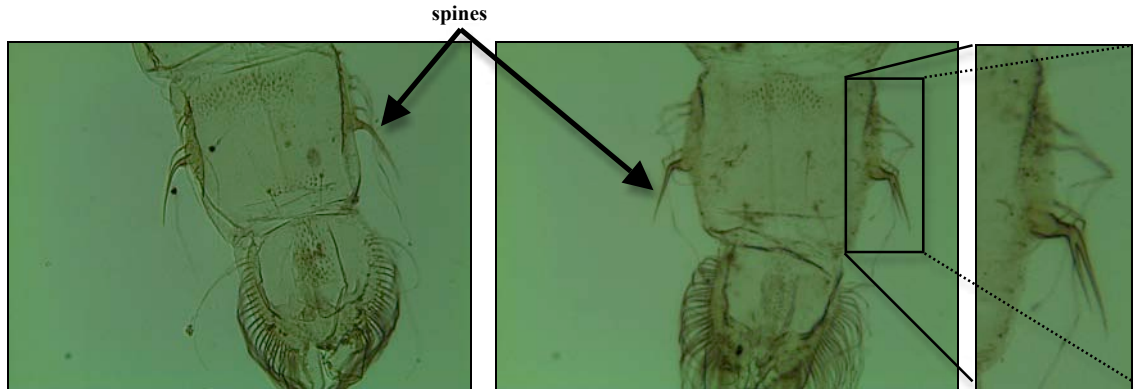


Figure 177. Tergite VIII of *Cryptotendipes* sp. 1

Figure 178. Tergite VIII of *Cryptotendipes* sp. 2

## NOTES ON *CRYPTOTENDIPES* SPECIES

### *Cryptotendipes* sp. 1

**Locality:** Laguna del Tortuguero 1, 2 & 3

**Head:** Cephalic tubercle similar to 10.13 A (Wiederholm 1986)

**Thorax:** Thoracic horn similar to 10.13 D (Wiederholm 1986) (Fig. 110)

**Abdomen:** Tergites V-VIII with shagreen; tergite V-VI with median shagreen patch; tergite VII-VIII anterior band of shagreen; segment VIII with singular long, curved, slender spines about 2/3 of the way down lateral margins (Fig. 177); anal lobe with median shagreen,

### *Cryptotendipes* sp. 2

**Locality:** Laguna del Tortuguero 1 & 2

**Head:** Same as *Cryptotendipes* sp. 1

**Thorax:** Same as *Cryptotendipes* sp. 1

**Abdomen:** Segment VIII with singular long, curved, slender spine about 2/3 of the way down right lateral margin and bifurcated spine on left margin (Fig. 178)

## NOTES ON *ENDOTRIBELOS* SPECIES

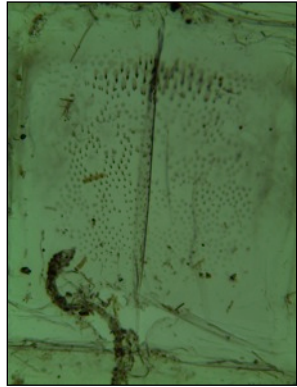


Figure 179. Tergites VI of *Endotribelos* sp. 1



Figure 180. Tergites VIII of *Endotribelos* sp. 1

### *Endotribelos* sp. 1

**Locality:** Laguna del Tortuguero 1, 2, 3 & Quebrada

**Head:** Cephalic tubercles truncate with apical patches of spines; frontal setae long with width at least two times diameter of tubercle (like Fig. 93, Grodhaus 1987) (Fig. 138)

**Thorax:** Thoracic horn with few branches (Fig. 95, Grodhaus 1987)

**Abdomen:** Conjunctives I/II – IV/V with laterally darkened; tergite II-VI with continuous, median shagreen (Fig. 179); pupal anal lobes (like Fig. 127, Grodhaus 1987); tergite V with 3 LS setae, tergite VI with 3 LS setae, tergite VII with 4 LS setae; tergite VIII with 4 LS setae; brown anal comb with 1 main tooth and 2-3 accessory teeth (Fig. 241) (Fig. 120, Grodhaus 1987)

**Comments:** Originally described as *Phaenopsectra*

## ADDITIONAL REFERENCES

Grodhaus, G., 1987. *Endochironomus* Kieffer, *Tribelos* Townes, *Synendotendipes*, n. gen., and *Endotribelos*, n. gen. (Diptera: Chironomidae) of the Nearctic Region. *Journal of the Kansas Entomological Society* 60: 167-247.

Roque, F. O. & Trivinho-Strixino, S. 2008. Four new species of *Endotribelos* Grodhaus, a common fallen fruit-dwelling chironomid genus in Brazilian streams (Diptera: Chironomidae: Chironominae). *Studies on Neotropical Fauna and Environment* 43: 191-207.



## KEY TO *GOELDICHIRONOMUS* SPECIES

1. Segment VIII with yellow singular anal spur (Figs. 181-182) ..... 2

1'. Segment VIII with dark brown anal comb with multiple spines (Figs. 183-185) ..... 3

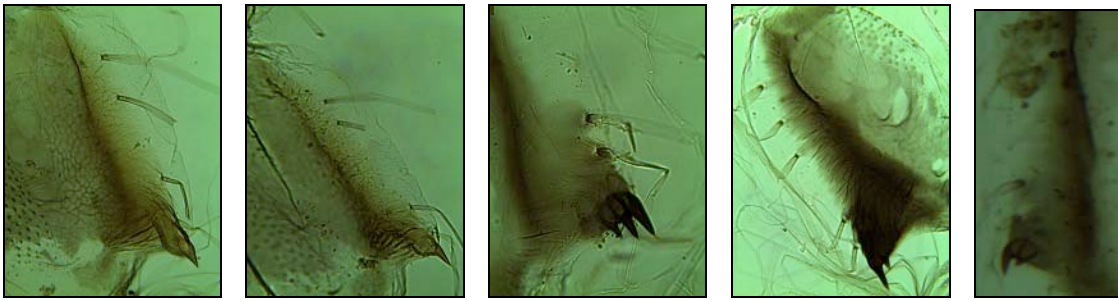


Figure 181. Tergite VIII of *Goeldichironomus* sp. 1    Figure 182. Tergite VIII of *Goeldichironomus* sp. 2    Figure 183. Tergite VIII of *Goeldichironomus* sp. 3    Figure 184. Tergite VIII of *Goeldichironomus* sp. 4    Figure 185. Tergite VIII of *Goeldichironomus* sp. 5

2(1). Segment VIII with 4 LS setae and singular yellow anal spur with minor accessory spine (Fig. 186) ..... ***Goeldichironomus* sp. 1**

2'. Segment VIII with 5 LS setae and singular yellow anal spur without accessory spine (Fig. 187) ..... ***Goeldichironomus* sp. 2**

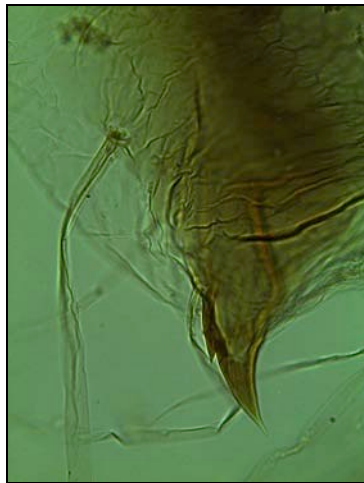


Figure 186. Anal spur of *Goeldichironomus* sp. 1

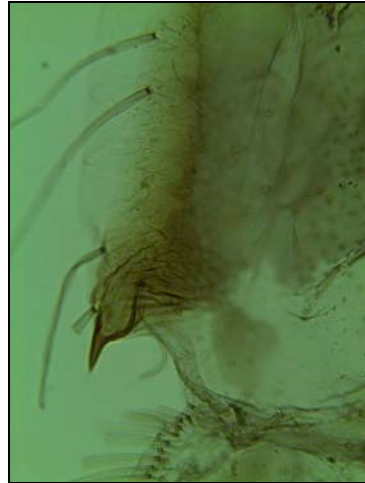


Figure 187. Anal spur of *Goeldichironomus* sp. 2

3(1'). Cephalic tubercles small, light brown (Fig. 188); tergites II-VI with continuous shagreen with dark, long spinules and slightly darker, longer spinules on posterior patches of shagreen (Fig. 191); tergite VIII with dark anterior and lateral pigmentation (Fig. 194) ..... ***Goeldichironomus* sp. 4**

3'. Cephalic tubercles large, dark brown (Figs. 189-190); tergites II-VI with continuous shagreen with light, short spinules and distinct darker, longer spinules on posterior patches of shagreen (Figs. 192-193); tergite VIII with only dark anterior pigmentation (Fig. 196) ..... **4**

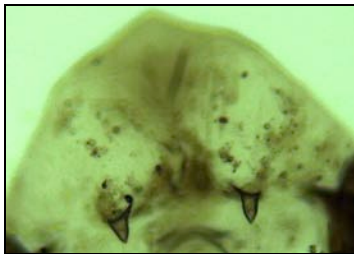


Figure 188. Cephalic tubercles of *Goeldichironomus* sp. 4



Figure 189. Cephalic tubercles of *Goeldichironomus* sp. 3

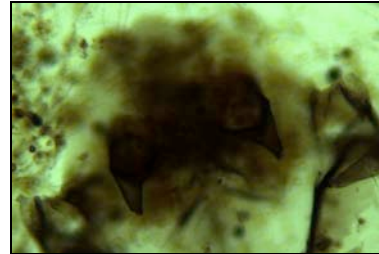


Figure 190. Cephalic tubercles of *Goeldichironomus* sp. 5

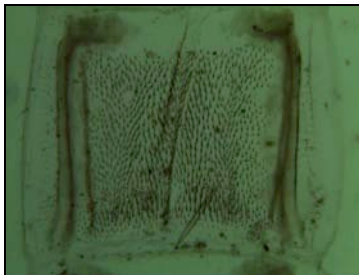


Figure 191. Tergite IV of *Goeldichironomus* sp. 4

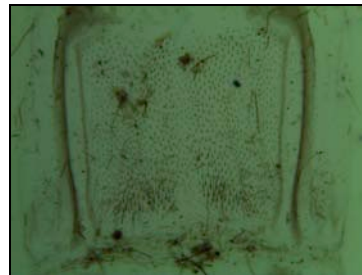


Figure 192. Tergite IV of *Goeldichironomus* sp. 3

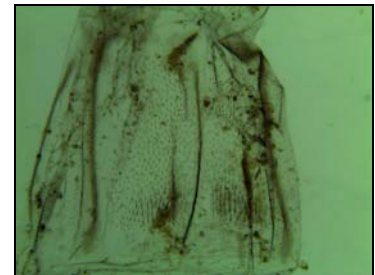


Figure 193. Tergite IV of *Goeldichironomus* sp. 5



Figure 194. Tergite VIII of *Goeldichironomus* sp. 4

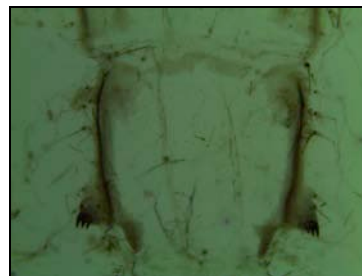


Figure 195. Tergite VIII of *Goeldichironomus* sp. 3

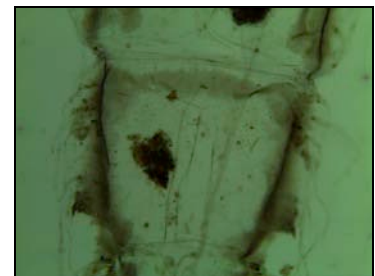


Figure 196. Tergite VIII of *Goeldichironomus* sp. 5

4(3'). Segment VIII with dark, 3-point anal claw (Figs. 183, 195); cephalic tubercles as long as wide (Fig. 189) ..... ***Goeldichironomus* sp. 3**

4'. Segment VIII with dark, 2-point anal claw (Figs. 185, 196); cephalic tubercles 2x as long as wide (Fig. 190) ..... ***Goeldichironomus* sp. 5**

## NOTES ON *GOELDICHIRONOMUS* SPECIES

### *Goeldichironomus* sp. 1

**Locality:** Laguna del Tortuguero 2 & Quebrada

**Head:** Cephalic tubercle small and pointed with frontal setae

**Thorax:** Basal ring with 2 semi-circles (medially restricted); upper portion of thorax granulose; 4 dorsocentral setae spaced out between one another

**Abdomen:** Tergite I bare; tergite II with anterior band of shagreen and medial shagreen and continuous hook row (3/4 width); tergites III-V with dense hourglass shaped shagreen; tergite VI with anterior triangular patch of shagreen; tergite VII with two small patches of anterior shagreen; tergite VIII with two medial bands of shagreen; yellow spur with two minor spines (Figs. 181, 186); complete single row of anal fringe; pedes spurii A & B present; 4 LS setae on tergites V-VII and 4 LS setae on tergite VIII (two setae around anal spur) (Figs. 120, 181, 186); two lateral tubercles on tergite VIII

**Comments:** Abdomen shagreen and anal spur doesn't match any of the described species

### *Goeldichironomus* sp. 2

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercle small and pointed with frontal setae; very similar to *Goeldichironomus* sp. 1

**Abdomen:** Can clearly see the 5 LS setae on tergite VIII; LS setae position varies from *Goeldichironomus* sp. 1, single spur with no minor spines (Figs. 182, 187)

**Comments:** Very different from *G. holoprasinus*, closest to *Goeldichironomus* sp. 1

### ***Goeldichironomus* sp. 3**

**Locality:** Quebrada

**Head:** Cephalic tubercles small, dark and pointed; short frontal setae (Fig. 189)

**Thorax:** Two medially constricted basal rings (like 10.29 B, Wiederholm 1986)

**Abdomen:** Brown pigmentation of pleural area; tergite I bare; pedes spurii A & B present; tergite II-VI with continuous shagreen (more anteriorally than posteriorally) but longer spines on posterior (Fig. 192); tergite VII-VIII with two circular anterior patches of shagreen (abdomen very similar to *G. holoprasinus*); tergites V-VII with 4 LS setae; tergite VIII with 5 LS setae (gap between first 2 and last 3 setae); dark brown, globular 3-point anal claw with some minor spines (Figs. 183, 195)

**Comments:** Around 6 mm long exuviae, closest to *G. xiborena* (Reiss 1974b, but varies from setal position on tergite VIII)

### ***Goeldichironomus* sp. 4**

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercles small, light brown

**Thorax:** Kidney shaped basal ring with two tracheal branches

**Abdomen:** Tergite I bare; tergite II-VI with dense continuous shagreen (Fig. 191); tergite II with continuous hook row (3/4 width) and pedes spurii B; tergite IV with pedes spurii A; tergites VII and VIII with anterolateral patches of shagreen; no shagreen on anal lobe; 4 LS setae on tergites V-VII; 5 LS on tergite VIII; 2 large dark brown anal spurs (varies from *G. holoprasinus*) (Figs. 145, 150, 184, 194)

**Comments:** Close to *G. holoprasinus* group, *Chironomus*, and *Einfeldia* species group C

***Goeldichironomus* sp. 5**

**Locality:** Quebrada

**Head:** Cephalic tubercles large, dark brown with frontal setae (Fig. 190)

**Thorax:** Basal ring with 2 tracheal branches, thorax slightly granulose

**Abdomen:** Tergite I bar; tergite II with dense central shagreen and interrupted hook row on projecting flap (1/2 width); pedes spurii A & B present; tergites III-V with light central shagreen and two posterior dark patches of shagreen (Fig. 193); conjuncties between III/IV and IV/V without L setae (Fig. 147); tergite VI with anterior triangular light shagreen and darker posterior patches; tergites VII and VIII with anterolateral light patches of shagreen; 5 LS setae on tergite VIII; dark two-point spine (Figs. 151, 185, 196)

**Comments:** Close to *Chironomus* and *Einfeldia* species group C

**ADDITIONAL REFERENCE**

Reiss, F. 1974. Die in stehenden Gewässern der Neotropis verbreitete Chironomidengattung *Goeldichironomus* Fittkau (Diptera, Insecta). Studies on Neotropical Fauna 9: 85–122.

## NOTES ON *HARNISCHIA* SPECIES

### *Harnischia* sp. 1

**Locality:** Laguna del Tortuguero 1 & 2

**Head:** Cephalic tubercles bulbous with distal point and frontal setae absent

**Thorax:** Thoracic horn plumose (Fig. 112); bumps near median suture

**Abdomen:** Tergite I bare with 4 D setae; tergite II hook row interrupted (but appears connected since it is smashed together on the slide) and median shagreen; tergites III-VI with median shagreen and posterior row of long spines (Fig. 119); tergites III-VI with at least 10 D setae and 3 L setae; tergite IV with pedes spurii A; 4 LS setae on tergite V-VI; 5 LS setae on tergite VII, tergite VIII without anal spur; anal lobes with shagreen

**Comments:** Represented by two specimens; close to *Harnischia curtilamellata* (Malloch)

## KEY TO *NILOTHAUMA* SPECIES

1. Tergite VII with anterior shagreen only (Fig. 197-200) ..... 2
- 1'. Tergite VII with anterior and posterior hourglass-shaped shagreen (Fig. 202, 204, 206)  
..... 3



Figure 197. Tergites VII-VIII of *Nilothauma* nr *reissi* var. 1

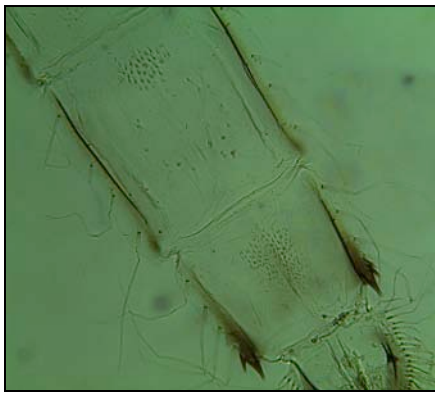


Figure 198. Tergites VII-VIII of *Nilothauma* nr *reissi* var. 2



Figure 199. Tergites VII-VIII of *Nilothauma* nr *reissi* var. 3

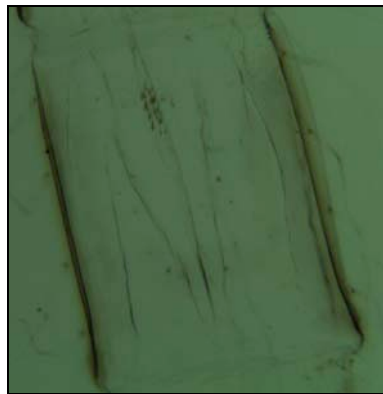


Figure 200. Tergites VII of *Nilothauma* sp. 4

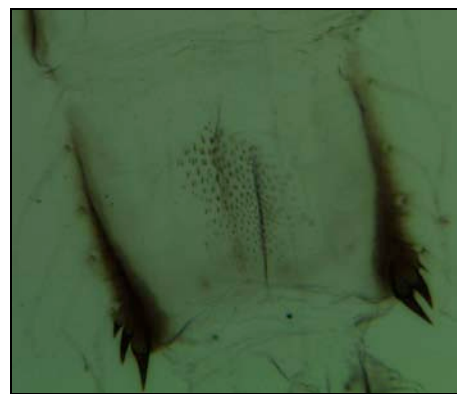


Figure 201. Tergites VIII of *Nilothauma* sp. 4



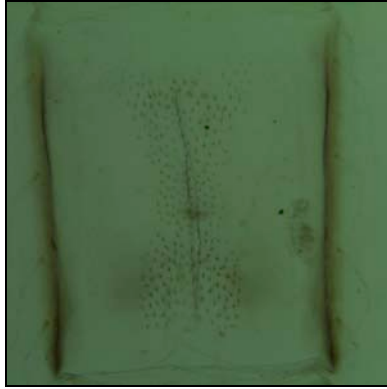


Figure 202. Tergites VII of  
*Nilothauma* sp. 1

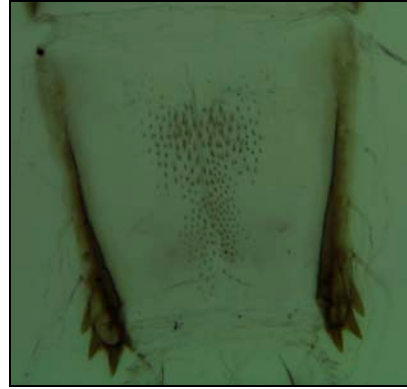


Figure 203. Tergites VIII of  
*Nilothauma* sp. 1

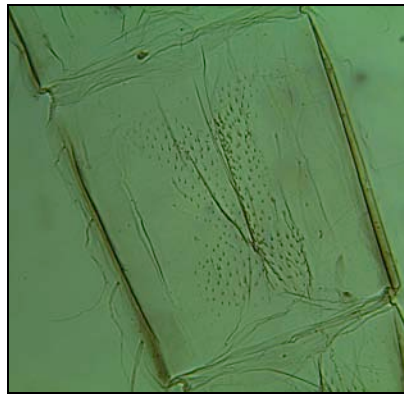


Figure 204. Tergites VII of  
*Nilothauma* sp. 2



Figure 205. Tergites VIII of  
*Nilothauma* sp. 2

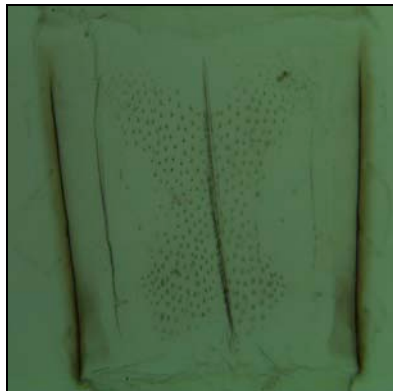


Figure 206. Tergites VII of  
*Nilothauma* sp. 3



Figure 207. Tergites VIII of  
*Nilothauma* sp. 3

2(1). Dark brown, 2-3 point anal comb (Fig. 208); dark brown pigmentation of pleural area of tergites (Fig. 212) ..... *Nilothauma* sp. 4

2'. Yellow to light brown, 2-3 point anal comb (Figs. 209-211); light brown pigmentation of pleural area of tergites (Fig. 213) ..... *Nilothauma* near *reissi* var. 1, 2, 3



Figure 208. Anal comb of *Nilothauma* sp. 4



Figure 209. Anal comb of *Nilothauma* nr. *reissi* var. 1



Figure 210. Anal comb of *Nilothauma* nr. *reissi* var. 2



Figure 211. Anal comb of *Nilothauma* nr. *reissi* var. 3

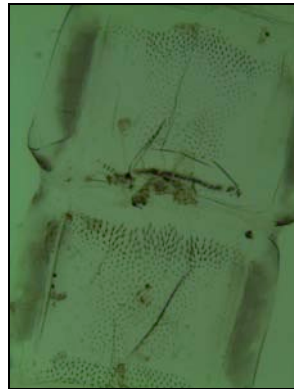


Figure 212. Tergites II-III of *Nilothauma* sp. 4

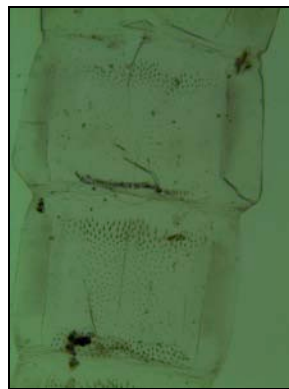


Figure 213. Tergites II-III of *Nilothauma* nr. *reissi* var. 3

- 3(1'). Tergite VIII with anterior patch of shagreen only (Figs. 205, 207) ..... 4
- 3'. Tergite VIII with anterior and posterior hourglass-shaped patch of shagreen (Fig. 203)  
..... ***Nilothauma* sp. 1**
- 4(3). Posterior area of tergite VIII with yellow pigmentation; yellow to light brown, 6-point anal claw (Fig. 205) ..... ***Nilothauma* sp. 2**
- 4'. Posterior area of tergite VIII with dark brown pigmentation; dark brown, 5-point anal claw (Fig. 207) ..... ***Nilothauma* sp. 3**

## NOTES ON *NILOTHAUMA* SPECIES

### *Nilothauma* near *reissi* variation 1 Soponis, 1987

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercle absent, frontal setae present

**Thorax:** Singular, round basal ring; distinct banded wing sheaths

**Abdomen:** Tergite I without shagreen; tergites II-VI with hourglass-shaped shagreen; tergite II with continuous hook row (1/2 width); tergite VII with anterior circular patch of shagreen; tergite VIII with anterior patch of shagreen (Fig. 197); yellow, 2-point anal claw (Fig. 209)

### *Nilothauma* near *reissi* variation 2 Soponis, 1987

**Locality:** Laguna del Tortuguero 1

**Thorax:** Thoracic horn with six slender branches (Fig. 130)

**Abdomen:** Tergites similar to *Nilothauma* nr. *reissi* var. 1; tergite VIII with two anterolateral patches and one median patch of shagreen (Fig. 131); yellow anal claw made up of one major spur and 2-3 minor spines in a linear position (Fig. 210)

### *Nilothauma* near *reissi* variation 3 Soponis, 1987

**Locality:** Laguna del Tortuguero 1

**Abdomen:** Tergites similar to *Nilothauma* nr. *reissi* var. 1; yellow to light brown 2-3 point anal claw (Fig. 211)

### ***Nilothauma* sp. 1**

**Locality:** Laguna del Tortuguero 1 & 2

**Head:** Cephalic tubercle absent, frontal setae present (Fig. 126)

**Thorax:** Median suture slightly granulose; distinct banded antennal sheath

**Abdomen:** Tergite I bare; tergite II-V with continuous dark shagreen; tergite II with hook row, continuous occupying 1/2 width; tergite VI and VII with hourglass shaped shagreen; tergite VII with anterior and posterior shagreen patches or only posterior shagreen patch (Fig. 202); tergite VIII with anterior and posterior shagreen patches (Fig. 203); overall abdomen close to *Nilothauma* sp. 1 in Mendes & Anderson 2009 (see Figs 75–79), but variation in shagreen pattern and anal comb, yellow to brown, 4-point anal comb (Fig. 203); 4 LS setae on segments V-VIII; complete anal fringe; around 22 taeniae on each anal lobe

### ***Nilothauma* sp. 2**

**Locality:** Laguna del Tortuguero 1

**Head:** Cephalic tubercle absent, frontal setae present

**Thorax:** 4 dorsocentral setae; 2 precorneal setae; rugulose thorax near median suture; slight protuberance on wing sheath

**Abdomen:** Pedes spurii B present; tergite II with continuous hook row (1/2 width); tergites II-VI with continuous hourglass-shaped shagreen; tergite VII with anteromedian hourglass-shaped shagreen (Fig. 204); tergite VIII with anteromedian circular-shaped shagreen (Fig. 205); posterior patch of shagreen on tergite VII (unlike *N. reissi*) and only anterior patch of shagreen on tergite VIII (unlike *Nilothauma* sp.1); 4 LS setae on tergites V-VIII; anal comb with 8-10 points (Fig. 205)

### ***Nilothauma* sp. 3**

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercle absent, frontal setae present

**Thorax:** 4 dorsocentrals; 2 precorneals; rugulose thorax near median suture; slight protuberance on wing sheath; small singular basal ring

**Abdomen:** Tergite I without shagreen; tergites II-VII with continuous hourglass-shaped shagreen (Fig. 206); continuous hook row on tergite II (1/2 width); tergite VIII with median circular shagreen (Fig. 207); around 5-pointed dark anal claw; tergite VIII and anal claw different than *Nilothauma* sp. 2

### ***Nilothauma* sp. 4**

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercle absent, frontal setae present

**Thorax:** 4 dorsocentrals; 2 precorneals; semi-circular basal ring; distinct banded antennal sheaths

**Abdomen:** Dark pigmentation of pleural area of tergites; tergite I without shagreen; tergites II-V with hourglass-shaped shagreen (darker anterior and posterior patches); tergite II with continuous hook row (1/2 width); tergite VI one anterior patch and two posterior patches of shagreen; tergite VII one anteromedian patch and two anterolateral patches (Fig. 200); tergite VIII with anteromedian circular patch of shagreen; very dark brown, 3-point anal claw (Fig. 201); complete anal fringe

### **ADDITIONAL REFERENCES**

- Adam, J.I. and O.A. Sæther. 1999. Revision of the genus *Nilothauma* Kieffer, 1921 (Diptera: Chironomidae). Entomologica Scandinavica Supplement 56: 1–107.
- Mendes, H.F. and T. Andersen. 2009. Neotropical *Nilothauma* Kieffer, 1921, with the description of thirteen new species (Diptera: Chironomidae). Zootaxa 2063: 1–45.

## KEY TO *PARACHIRONOMUS* SPECIES

1. Tergite VIII with 5 LS setae (Figs. 214-215) ..... 2

1'. Tergite VIII with 4 LS setae (Fig. 216) ..... *Parachironomus* sp. 2

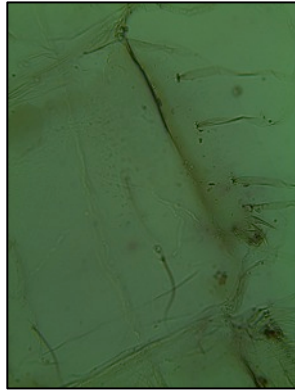


Figure 214. Tergite VIII of  
*Parachironomus* nr. *cayapo*

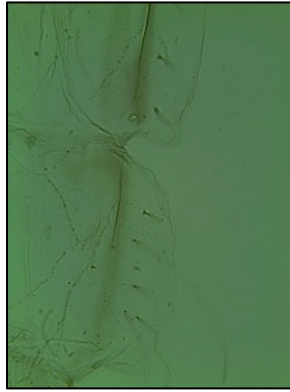


Figure 215. Tergite VIII of  
*Parachironomus* sp. 1



Figure 216. Tergite VIII of  
*Parachironomus* sp. 2

2(1). Segment VIII with 1 or more small anal spines (Figs. 214, 217-218) ..... 3

2'. Segment VIII without spines (Fig. 215) ..... *Parachironomus* sp. 1

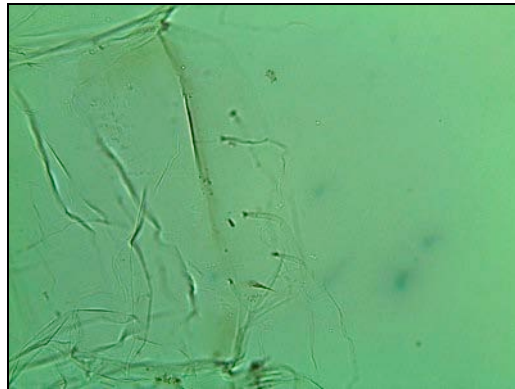


Figure 217. Tergite VIII of  
*Parachironomus* sp. 3

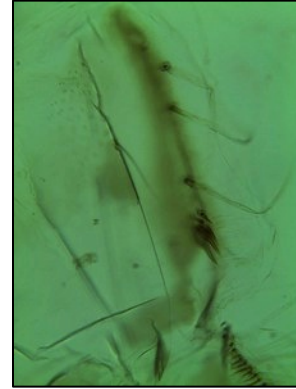


Figure 218. Tergite VIII of  
*Parachironomus* sp. 4

3(2). Tergite VI with posterior group of small spines on projecting flap (Figs. 219-220) ..... 4

3'. Tergite VI with posterior group of distinct, large spines on projecting flap (Fig. 221) ..... ***Parachironomus* sp. 4**

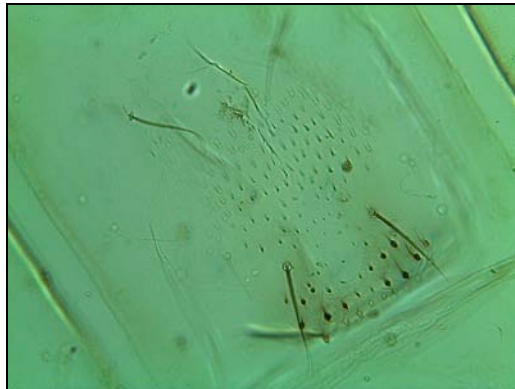


Figure 219. Tergite VI of *Parachironomus* nr. *cayapo*

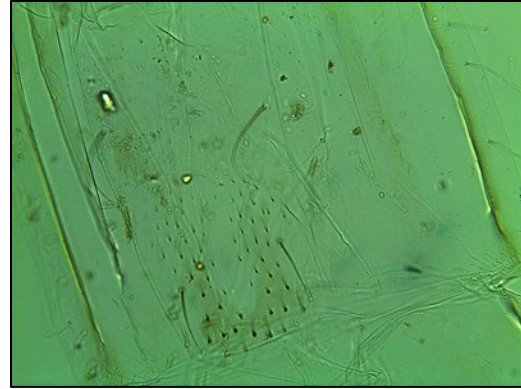


Figure 220. Tergite VI of *Parachironomus* sp. 3

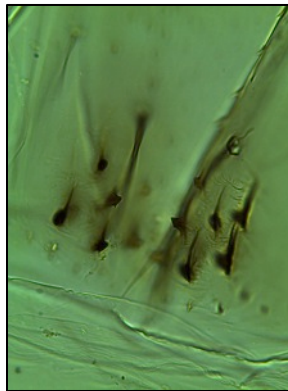


Figure 221. Tergite VI of *Parachironomus* sp. 4



4(3). Tergite II with light median shagreen and no pigmentation (Fig. 222)  
..... *Parachironomus* nr. *cayapo*

4'. Tergite II with anterior band of small spines and dark brown pigmentation (Fig. 223)  
..... *Parachironomus* sp. 3

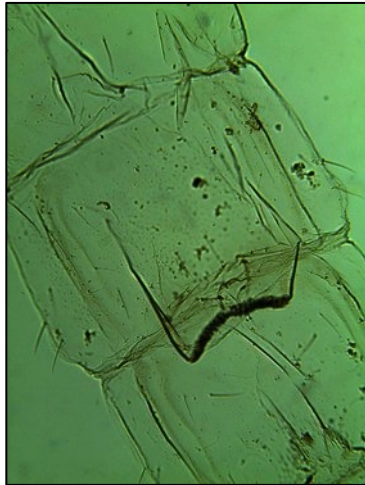


Figure 222. Tergite II of  
*Parachironomus* nr. *cayapo*

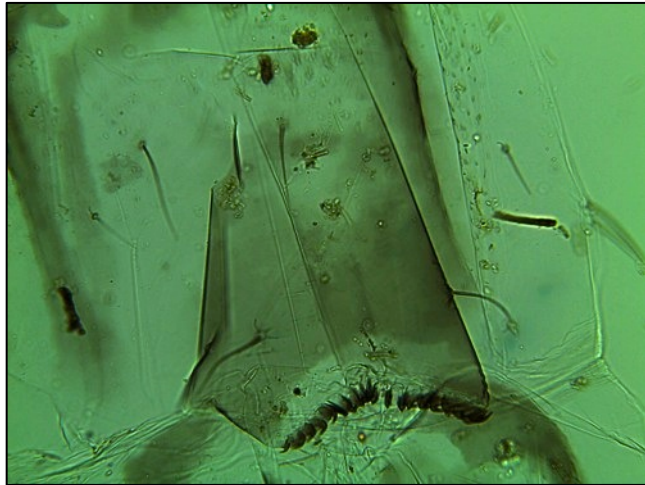


Figure 223. Tergite II of *Parachironomus* sp. 3

## NOTES ON *PARACHIRONOMUS* SPECIES

### *Parachironomus* near *cayapo* Spies, Fittkau & Reiss, 1994

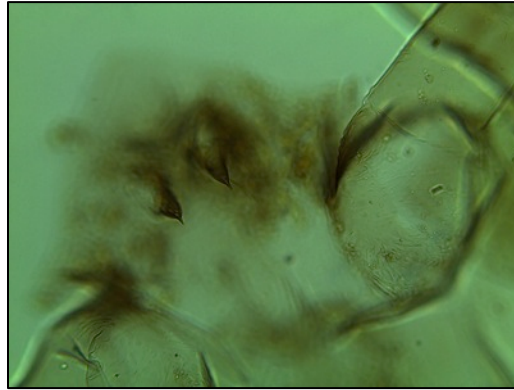


Figure 224. Cephalic tubercles of *Parachironomus* near *cayapo*

**Locality:** Laguna del Tortuguero 2 & 3

**Head:** Cephalic tubercles dark colored and conical with apical point and frontal setae (Fig. 224)

**Thorax:** Dorsocentral setae 1 and 4 much longer and more robust than dorsalcentral setae 2 and 3

**Abdomen:** Light median shagreen on tergites I-II (unlike *Parachironomus cayapo*); tergite II with continuous hook row (1/3 width) (Fig. 222); tergite VI with posterior group of points on distinct projecting flap (Figs. 148, 219); 5 LS setae and 2-4 point anal comb on tergite VIII (Fig. 214)

**Comments:** Close to *vitiosus* group (Wiederholm 1986); see page 7 of Trivinho-Strixino *et al.* 2010 for species description

***Parachironomus* sp. 1**

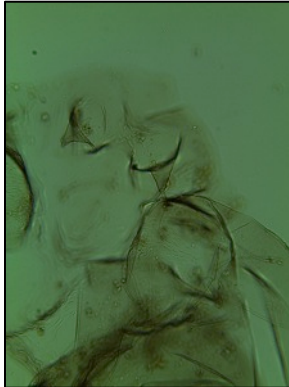


Figure 225. Cephalic tubercles of *Parachironomus* sp. 1

**Locality:** Laguna del Tortuguero 1

**Head:** Cephalic tubercles light colored and conical with apical point and frontal setae (Fig. 225)

**Thorax:** Very well developed prealar tubercles; 4 distanced dorsocentral setae

**Abdomen:** Tergite I with light median shagreen; tergite II with light median shagreen, posterior continuous hook row (1/2 width) and conspicuous pedes spurii B; tergites III-VI with light median shagreen and dark posterior shagreen; tergite VI with posterior shagreen on projecting flap; tergites VII-VIII with two light patches of anterolateral shagreen; tergite VII without anal claw or spines and 5 LS setae (Figs. 144, 215)

**Comments:** Close to varus group (Wiederholm 1986)

***Parachironomus* sp. 2**

**Locality:** Laguna del Tortuguero 1 & 2

**Head:** Cephalic tubercles light colored, long, and conical with slender frontal setae

**Thorax:** Rugulose median suture and median thorax; prealar tubercle weakly developed; 4 long spaced out dorsocentral setae

**Abdomen:** Tergite I appears bare (half missing); tergite II with light median shagreen and light hook row on distinct posterior flap (1/2 width and could be medially interrupted); tergites III-VI with anterior fine and posterior coarse shagreen; pedes spurii B inconspicuous and A well developed; tergite VI with very well developed patch of posterior spines on projecting flap (like Fig. 10.51 D, Wiederholm 1986), tergites V-VI with small spines on the lateral conjunctives; tergites V-VI with lateral spines; tergites VII-VIII with two light anterior patches of shagreen; anal claw made up of many minute, pale spines; 4 LS setae on tergites V-VIII (Fig. 216); single row of complete anal fringe

**Comments:** Close to species group C Carey Lake, Pa., coll. W.P. Coffman (Wiederholm 1986)

***Parachironomus* sp. 3**

**Locality:** Quebrada

**Head:** Cephalic tubercles bulbous and conical with apical point and frontal setae

**Abdomen:** Tergites I-IV with dark brown pigmentation of pleural area (Fig. 223); sternite II with anterior band of light spines; tergites V-VII with 4 LS setae; tergite VI with small swelling and stronger shagreen in middle near posterior margin but not on distinct projecting flap (Fig. 220); tergite VIII with 5 LS setae and 1 spine on the left side (Fig. 217)

**Comments:** Close to arcuatus group, but this specimen doesn't have posterior band of colorless spines (Wiederholm 1986)

***Parachironomus* sp. 4**

**Locality:** Laguna del Tortuguero 1

**Head:** Cephalic tubercles dark coloration and conical with frontal setae

**Thorax:** Very well developed prealar tubercle; very granulose median suture area of thorax

**Abdomen:** No anterior/posterior bands of spines on sternite II; spines on posterior shagreen on tergite VI very dark and thick on projecting flap (Fig. 221); tergite VIII with 5 LS setae and 3-4 pointed (Fig. 218), yellow anal claw with some minor spines

**Comments:** Represented by 1 specimen; close to vitiosus group, but tergite VI spines don't appear to be on a distinct projecting flap (Wiederholm 1986)

**ADDITIONAL REFERENCES**

Spies, M., E.J. Fittkau, and F. Reiss. 1994. The adult males of *Parachironomus* Lenz, 1921, from the Neotropical faunal region (Insecta, Diptera, Chironomidae). Spixiana Supplement 20: 61-98.

Trivinho-Strixino, S., F.L. Da Silva, and F.O Roque. 2010. A new species of *Parachironomus* Lenz, 1921 (Diptera: Chironomidae: Chironominae), and description of immature stages of two other species from the Neotropical Region. Zootaxa 2689: 1-14

## NOTES ON *PARALAUTERBORNIELLA* SPECIES

### *Paralauterborniella nigrohalteralis* Malloch, 1915

**Locality:** Laguna del Tortuguero 3

**Head:** Cephalic tubercles like Fig. 10.53 A (Wiederholm 1986) (Figs. 128, 152)

**Thorax:** Distinct nace on wing sheathes (most like Fig. 10.53 E); 1 long anteprenotal; 2 precorneals and at least 2 dorsocentral setae present; missing paired patches on tergites VII & VIII (Fig. 10.53 G, Wiederholm 1986)

**Abdomen:** Abdomen like Fig. 10.53 D (Wiederholm 1986); 4 thick & bulbous LS setae on tergites V-VIII; anal comb most like *P. nigrohalteralis* (see Fig. 10.53 I, Wiederholm 1986)

**Comments:** Previously found in Costa Rica

## KEY TO *PARATENDIPES* SPECIES

1. Tergite VIII with 5 LS setae (Fig. 226) ..... 2
- 1'. Tergite VIII with 4 LS setae (Fig. 227) ..... 3

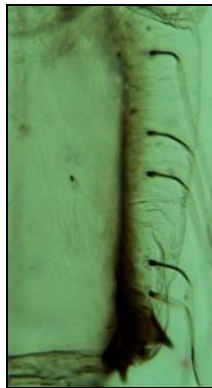


Figure 226. Tergites VIII of *Paratendipes* sp. 5



Figure 227. Tergites VIII of *Paratendipes* sp. 2

2(1). Frontal apotome with no to small cephalic tubercles and frontal setae absent (Fig. 228); tergite II with continuous hook row occupying  $\frac{1}{4}$  width of segment (Fig. 230); segment VIII with dark brown, 3-point anal claw (Fig. 232) ..... ***Paratendipes* sp. 1**

2'. Frontal apotome with cephalic tubercles and frontal setae absent (Fig. 229); tergite II with continuous hook row occupying  $\frac{3}{4}$  width of segment (Fig. 231); segment VIII with dark brown, multi-spined anal claw (Fig. 233) ..... ***Paratendipes* sp. 5**

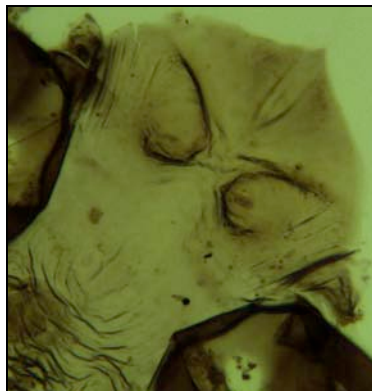


Figure 228. Frontal apotome of *Paratendipes* sp. 1



Figure 229. Frontal apotome of *Paratendipes* sp. 5



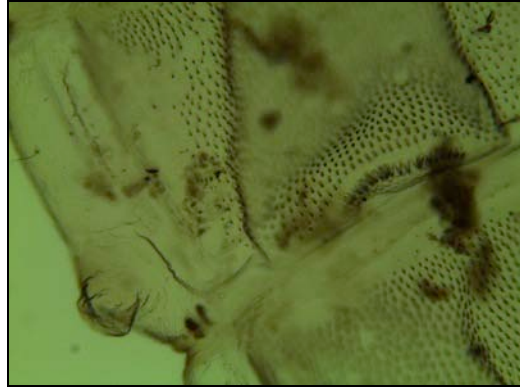


Figure 230. Tergite II of *Paratendipes* sp. 1

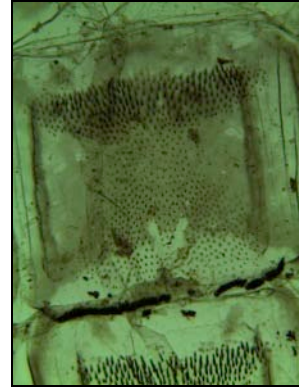


Figure 231. Tergite II of *Paratendipes* sp. 5

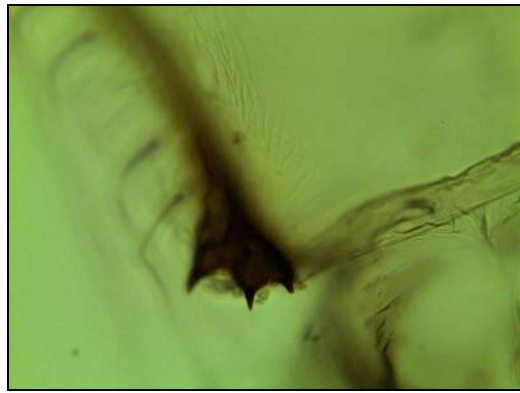


Figure 232. Anal claw of *Paratendipes* sp. 1

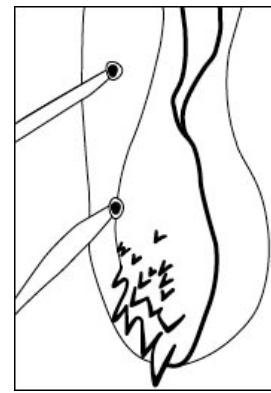


Figure 233. Anal claw of *Paratendipes* sp. 5

- 3(1'). Tergite V with 3 LS setae (Fig. 234); cephalic tubercles small, dark, and pointed (Fig. 236); dark, singular anal spur (Fig. 237) ..... ***Paratendipes* sp. 3**
- 3'. Tergite V with 4 LS setae (Fig. 235); cephalic tubercles absent; anal claw with multiple spines (Figs. 237-239) ..... 4

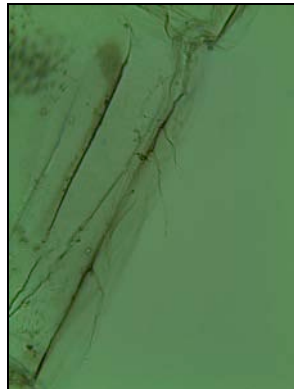


Figure 234. Tergite V of *Paratendipes* sp. 3

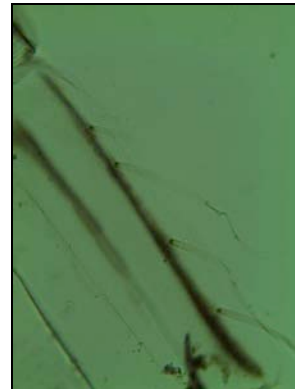


Figure 235. Tergite V of *Paratendipes* sp. 2



Figure 236. Frontal apotome of *Paratendipes* sp. 3



Figure 237. Anal spur of *Paratendipes* sp. 3

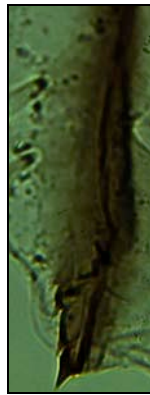


Figure 238. Anal claw of *Paratendipes* sp. 2

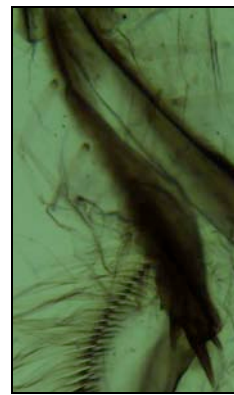


Figure 239. Anal claw of *Paratendipes* sp. 4

4(3'). Conjunctives between tergites III and IV without band of spines, but conjunctive between tergites IV and V with band of spines (Fig. 240); light brown, single anal spur with accessory spines (Fig. 238) ..... ***Paratendipes* sp. 2**

4'. Conjunctive between tergites III and IV with band of spines (Fig. 241); dark brown, multi-spine anal claw (Fig. 239) ..... ***Paratendipes* sp. 4**

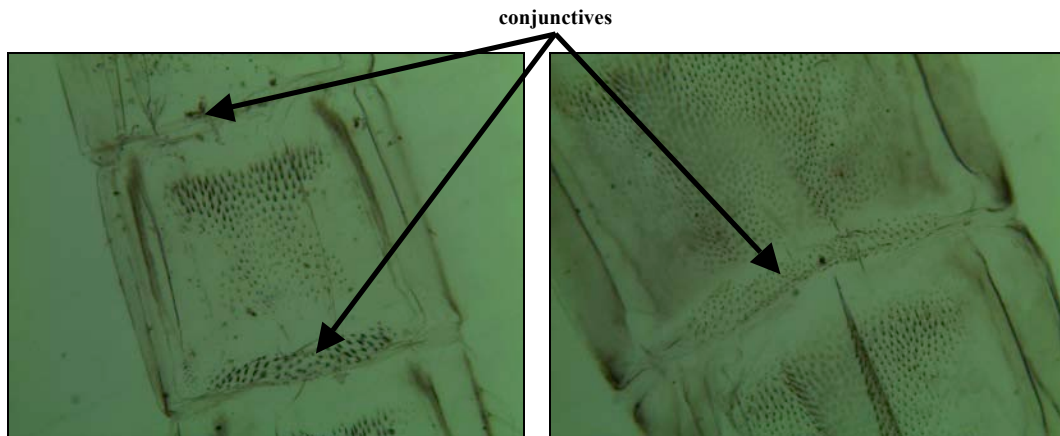


Figure 240. Tergites IV of *Paratendipes* sp. 2

Figure 241. Tergites III and IV of *Paratendipes* sp. 4

## NOTES ON *PARATENDIPES* SPECIES

### *Paratendipes* sp. 1

**Locality:** Laguna del Tortuguero 3

**Head:** Cephalic tubercles small and bulbous; frontal setae present (Figs. 154, 228)

**Thorax:** Thoracic horn with eight long, smooth branches; dark oval basal ring; median suture granulose; four dorsocentral setae; two precorneals

**Abdomen:** Short row of spines on tergite I with around 8-10 spinules; tergites II-VI with dense shagreen (like Fig. 10.58 E, Wiederholm 1986) (Fig. 232); tergite VII with median patch of shagreen; hook row continuous and occupying 1/4 width; pedes spurii A & B present, B very long and prominent; almost complete anal fringe; 4 LS setae on tergite V-VII; 5 LS setae on tergite VIII; brown, 3-point anal claw (Figs. 161, 232)

**Comments:** Represented by one specimen

### *Paratendipes* sp. 2

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercles absent; frontal setae present

**Thorax:** Thoracic horn with several branches; 2 precorneal setae; 4 dorsocentral setae

**Abdomen:** Tergite II with continuous hook row covering 3/4 width; tergites II-VI with hourglass-shaped shagreen (like Fig. 10.57 E, Wiederholm 1986); only band of spines on conjuncture between tergites IV and V (Fig. 240); segments V-VIII with dark abdominal outline; small pedes spurii B; pedes spurii A present; 4 LS setae on segments V-VIII (Figs. 227, 235); dark brown anal spur with one major spine and around 4 minor spines (Fig. 238)

**Comments:** Represented by two specimens; appears close to *Beardius* sp. B from Jacobsen and Perry (2000)

***Paratendipes* sp. 3**

**Locality:** Laguna del Tortuguero 1, 2 & 3

**Head:** Cephalic tubercles dark brown, small, and pointed (Fig. 236)

**Thorax:** Thoracic horn with several branches; semi-circular basal ring (like Fig. 10.57 D, Wiederholm 1986); 4 conspicuous dorsocentral setae; dark pigmented cephalothorax

**Abdomen:** Tergite 1 without shagreen; tergites II-VI with hourglass-shaped shagreen; pedes spurii A & B present; 3 LS setae on tergite V (Fig. 234); 4 LS setae on tergites VI-VIII; 1-point dark anal spur (Figs. 160, 237); 3/4 complete anal fringe

**Comments:** Most common *Paratendipes* species; appears close to *Beardius* sp. B from Jacobsen and Perry (2000)

***Paratendipes* sp. 4**

**Locality:** Laguna del Tortuguero 2

**Head:** Cephalic tubercles absent; frontal setae present

**Thorax:** Small basal ring with one tracheal branch

**Abdomen:** Tergite II-V with median dense shagreen; tergite II with continuous hook row (3/4 width); Conjunctive between tergites III and IV with band of spines (Fig. 241); conjunctive between tergites IV and V with band of spines; tergite VI with anterior and posterior patch of shagreen; tergite VII and VIII with sparse anterior shagreen; 4 LS setae on tergite V-VIII; 3 dark major points and several minor points in anal claw (Fig. 239); complete anal fringe

**Comments:** Represented by one specimen

***Paratendipes* sp. 5**

**Locality:** Laguna del Tortuguero 1

**Head:** Cephalic tubercles absent, frontal setae present (Fig. 229)

**Abdomen:** Tergite II with dark hourglass-shaped shagreen (darker anterior band) and continuous hook row (3/4 width, appears to be damaged and partially missing) (Fig. 231); only single band of spines on conjunctives between tergites IV and V; tergites V-VII with 4 LS setae; tergite VIII with 5 LS setae (Fig. 226); 1 dark anal spur and many small accessory spines (Fig. 233)

**Comments:** Represented by one specimen

**ADDITIONAL REFERENCES**

Hayford, B.L. 1998. A systematic revision of *Paratendipes* (Diptera: Chironomidae) with special emphasis on the evolution of thermophily. Unpublished PhD thesis.

Jacobsen, R. E. & Perry, S. A. 2000. A review of *Beardius* Reiss & Sublette, with description of a new species from Everglades National Park (Insecta, Diptera, Chironomidae). *Spixiana* 23: 129-144.