



The Photographic Checklist of the Orthoclaadiinae of the Niger Delta, Nigeria

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Authors' contributions

This work was carried out in collaboration between both authors. Both authors read and approved the final manuscript

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ABSTRACT

Aims: Compilation of the photographic checklist of the Chironomids under the subfamily Orthoclaadiinae from the Niger Delta of Nigeria. The compilation used records of specimens collected over a period of thirty years from many field trips.

Study Design and Methodology: The photographic keys were described to show the cephalothorax with mentum, mandibles, premandibles and ventromental plates. Orthoclaadiinae larvae collected from different substrates with different sizes of pond nets were preserved in 75% alcohol. Slide mounted samples were identified to genus and species. Optimal photography was obtained using a Brunel digital microscope (DN-117M) equipped with a Camera system and a ScopelImage 9.0 software, allowing automated retention of focused parts and a sequence of exposures at different focal depths.

Results: A total of thirty six illustrations, consisting of six genera and ten species, were documented. These were *Cricotopus sylvestris*, *Cricotopus sp.*, *Cricotopus fuscus*, *Cricotopus triannulatus*, *Diamesa sp.*, *Diamesa heterodentata*, *Eukiefferiella sp.*, *Heterotanytarsus sp.*, *Trissocladius grimshawi*, *Limnophyes pusillus* and *Trissocladius sp.* *Cricotopus sylvestris*,

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Cricotopus sp., *Cricotopus fuscus*, *Cricotopus triannulatus*, *Diamesa* sp., *Diamesa heterodentata*, and *Eukiefferiella* sp. occur in lotic waters. Those that occurred only in lentic waters were *Heterotanytarsus* sp., *Trissocladius grimshawi*, *Limnophyes pusillus* and *Trissocladius* sp. Three of the genera recorded in the literature of studies in the Niger Delta, namely *Cricotopus*, *Eukiefferiella* and *Limnophyes*, are in the current description while new genera to the literature of the Niger Delta were *Heterotanytarsus*, *Trissocladius* and *Limnophyes*.

Conclusion: This photographic checklist provides additional contribution to the taxonomic metadata of the Chironomids of the Niger Delta. This can be used to provide new insights in water quality management.

Keywords: Chironomids; Orthoclaadiinae; Niger Delta; lentic; lotic; ecology.

1. INTRODUCTION

Macro invertebrate organisms are fundamental parts of an aquatic system and are of ecological and economic importance because they maintain interaction between communities and the environment at various levels [1,2]. Several authors [3-7] have advocated the use of macro invertebrates as bio- indicators of water quality and as a tool in predicting recent events through the knowledge of their structure [8,2]. Being one of such invertebrates, the Chironomids are strategic in the benthic community of an aquatic ecosystem as they meet the need of higher organisms through food production and purification of river systems through absorption and accumulation. During the last three decades, studies in the Niger Delta have focused on the macro-invertebrates of many rivers in both estuarine and freshwater habitats [9-13]. The generated macro-invertebrate data has provided new insights in water quality management decisions with Chironomids playing a key role in the assessment and qualification of a few of these freshwater habitats. In order to develop sufficient metadata for Chironomid-based monitoring and assessment, an additional subfamily of the Chironomid fauna is presented from earlier descriptions of Onwuteaka & Uwagbae [7].

2. MATERIALS AND METHODS

Orthoclaadiinae larvae were collected from with different sizes of pond nets in relation to the substrate. Samples were preserved in 75% alcohol. The samples were mounted on slides and identified up to species and/or genus level, using key materials published by [14-20]. Optimal photographic results were obtained using a Brunel digital microscope (DN-117M) equipped with a Camera system. Photographs were taken with ScopelImage 9.0 software, allowing automated retention of focused parts and

a sequence of exposures at different focal depths.

3. RESULTS

The illustrated taxa consist of nine species belonging to the subfamily Orthoclaadiinae. The nine species were *Cricotopus sylvestris*, *Cricotopus* sp., *Cricotopus fuscus*, *Cricotopus triannulatus*, *Eukiefferiella* sp., *Heterotanytarsus* sp, *Trissocladius grimshawi*, *Limnophyes pusillus* and *Trissocladius* sp. All the genera have vestigial ventromental plates. The Mentum is either wide domelike or with bifid or trifid median tooth. The first lateral tooth is subequal or lower than median tooth and second lateral tooth. The apical tooth of the mandible is short or long and pointed or rounded. The illustrated taxa were found in either lotic or lentic systems. The *Cricotopus*, *Diamesa* and *Eukiefferiella* genera were mainly found in lotic systems while the genera *Heterotanytarsus*, *Limnophyes* and *Trissocladius* were found in lentic systems.

3.1 Species Descriptions

Cricotopus sylvestris (6°20'5.675"E, 5°47'48.929"N)

The species (Plates 1) has three inner teeth and one long dorsal tooth on the mandible. The Mentum has a median tooth which is protruded and six lateral teeth. The ventromental plates are vestigial without striations. Larvae were found in a lotic system.

Cricotopus sp. (6°29'24.441"E, 5°47'50.99"N)

The species (Plates 2 - 3) has three inner teeth and one dorsal tooth on the mandible. The premandible is simple and has a bifid. The mentum has six lateral teeth on each side. The ventromental plates are poorly developed and without striations. Larvae were discovered in a lotic system.

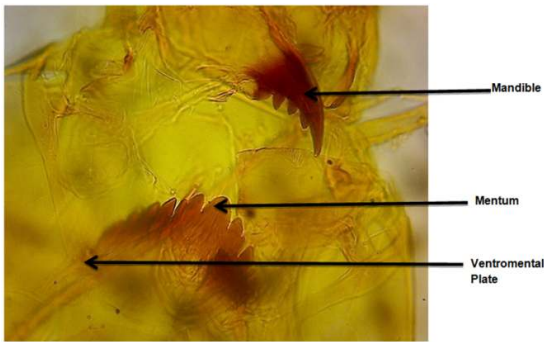


Plate 1. *Cricotopus sylvestris*

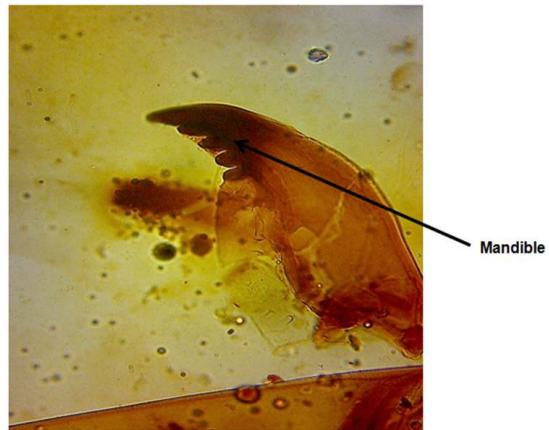


Plate 4. Mandible of *Cricotopus fusicola*

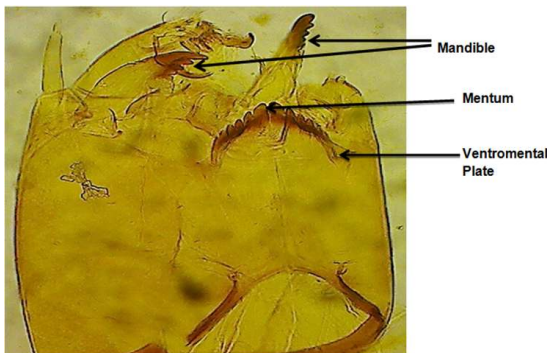


Plate 2. Mandible, Mentum and Ventromental Plate of *Cricotopus* sp.

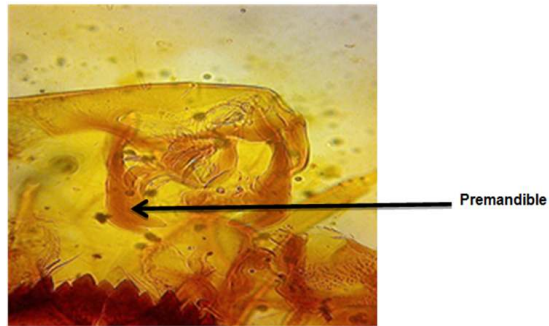


Plate 5. Premandible of *Cricotopus fusicola*

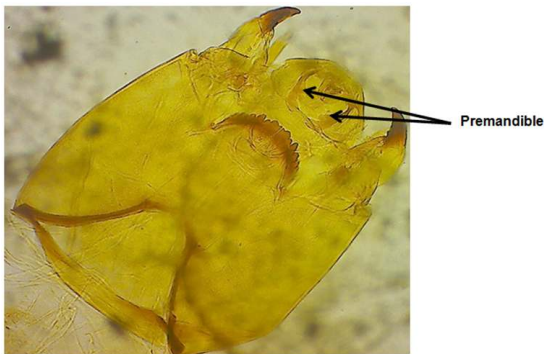


Plate 3. Premandible of *Cricotopus* sp.

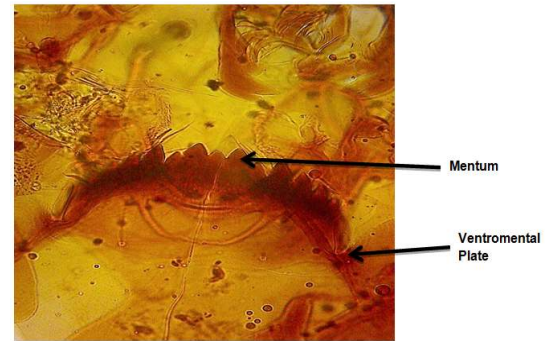


Plate 6. Mentum of *Cricotopus fusicola*

Cricotopus fusicola. (6°24'22.36"E, 5°53'12.789"N)

Cricotopus triannulatus. (6°8'37.055"E, 5°51'42.927"N)

The species (Plates 4 - 5) possess four inner teeth and one dorsal tooth on the mandible. The premandibles contain a bifid tooth. The mentum has an odd number of teeth- seven teeth on one side and six teeth on the other side. The ventromental plates are poorly developed and without striations. Larvae were observed in a lotic system.

The species (Plates 7) has three inner teeth and one dorsal tooth on the mandible. The premandibles contain a bifid tooth. The mentum is conical with a total of fourteen teeth- seven teeth on each side of the Mentum. The ventromental is weak and poorly developed. Larvae were collected from a lotic system.

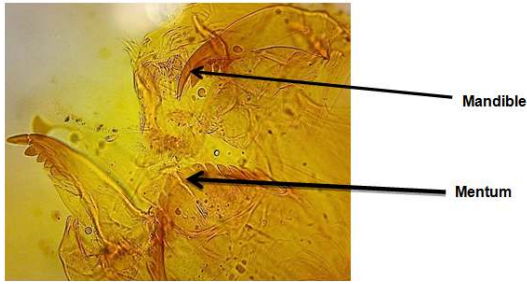


Plate 7. Mandible and Mentum of *Cricotopus triannulatus*

Eukiefferiella sp. (6°46'29.569"E, 5°42'34.758"N)

The species (Plates 8 and 9) has a well-developed mandible which contains three inner teeth and one dorsal tooth. There are premandibles with bifid. The mentum is toothed with a total of eight teeth. The ventromental plate is poorly developed and never with striations. Larvae were found in a lotic water system.

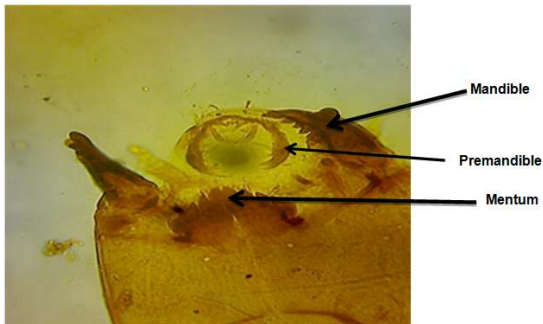


Plate 8. *Eukiefferiella* sp

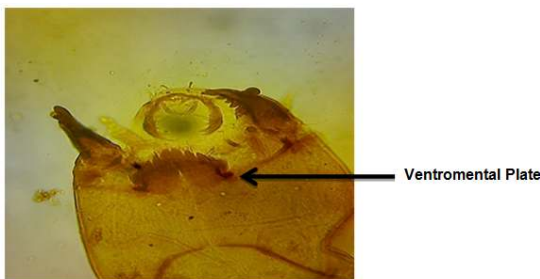


Plate 9. Ventromental Plate of *Eukiefferiella* sp

Heterotanytarsus sp. (6°43'42.372"E, 5°37'55.311"N)

The species (Plates 10. and 11) has mandible made of three inner teeth and one dorsal tooth. It has premandibles that are sharp and without bifid. The mentum contains 12 teeth (six on each half) in total and the ventromental plate is not

well-developed and does not have striations. Larvae were often found in a poor lentic system.

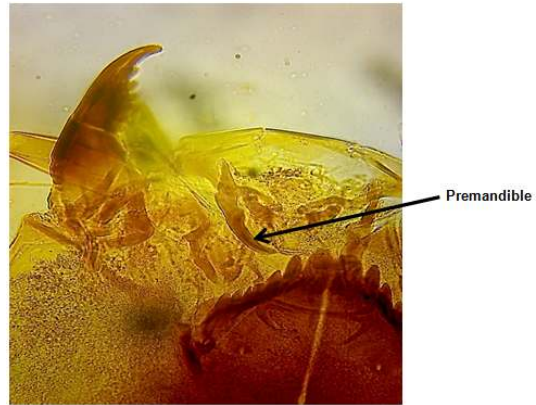


Plate 10. Premandible of *Heterotanytarsus* sp

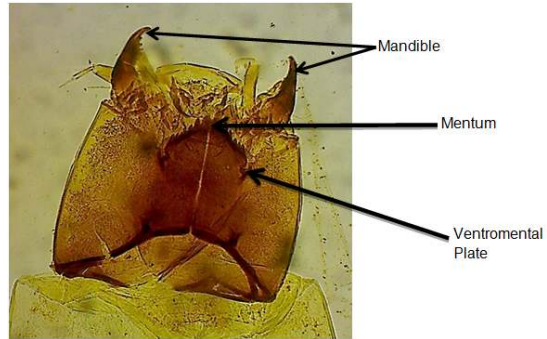


Plate 11. Mandible, Mentum, and Ventromental plates of *Heterotanytarsus* sp

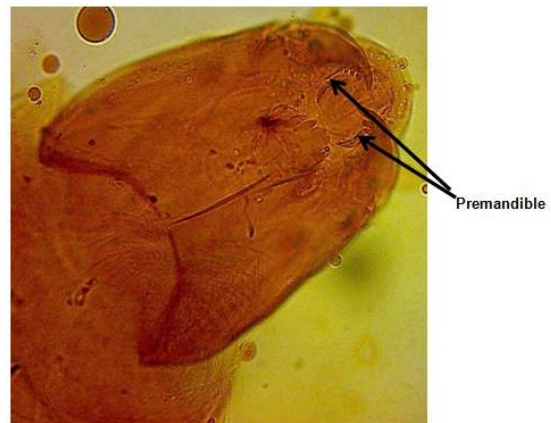


Plate 12. Premandible of *Limnophyes pusillus*

Limnophyes pusillus (6°31'20.184"E, 5°17'3.339"N)

The species (Plates 12-13) has mandible which is composed of four inner teeth and one dorsal tooth. It has sharp premandibles which are

without bifid. The mentum contains 8 teeth in total and the ventromental plates are poorly established on both sides of the Mentum and with no striations. Larvae were found in a lentic water body.

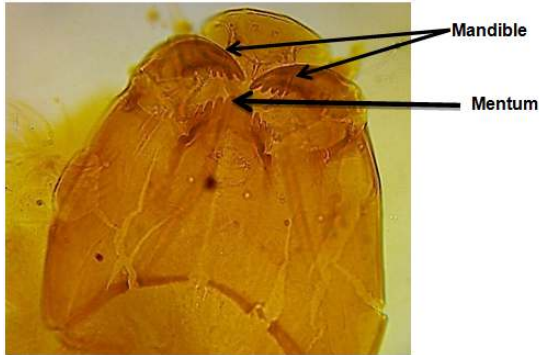


Plate 13. Mandible and Mentum of *Limnophyes pusillus*

tooth. It has premandibles which are with bifid. The mentum contains 12 teeth in total with a central line dividing the tooth into two equal half. The ventromental plates are poorly established on both sides and with no striations. Larvae were found in a lentic water body.

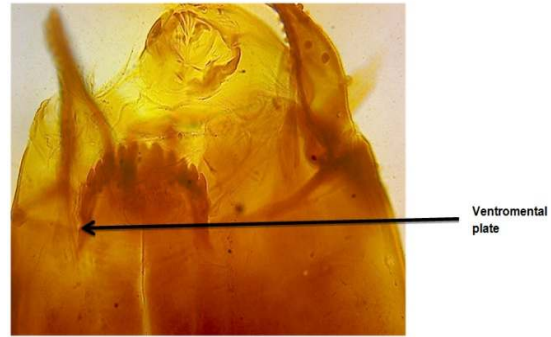


Plate 16. Ventromental plate of *Trissocladius grymshawi*

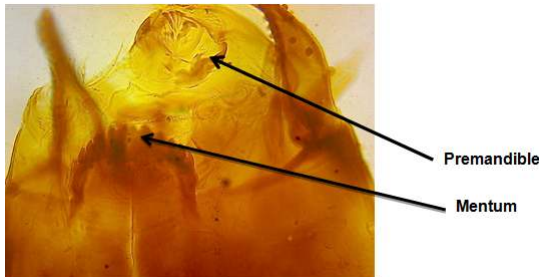


Plate 14. Premandible and Mentum of *Trissocladius grymshawi*

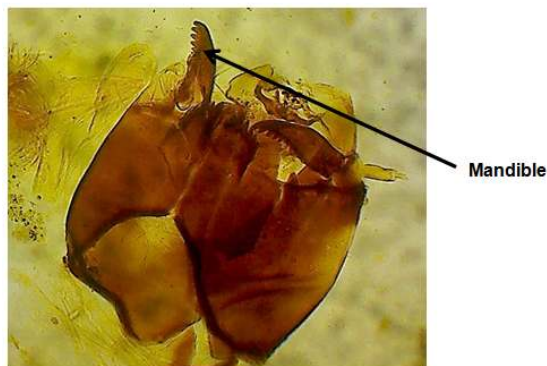


Plate 15. Mandible of *Trissocladius grymshawi*

Trissocladius grymshawi. (6°23'16.619"E, 5°8'25.111"N)

The species (Plate 14, 15 and 16) has mandible which consists of four inner teeth and one dorsal

4. DISTRIBUTION AND ECOLOGY

Fig. 1. shows the locations where the specimens were collected. The ecology of the lotic and lentic systems is described in Table 1.

5. DISCUSSION

The study presents the taxonomic status of the subfamily Orthoclaadiinae in the Niger Delta. Illustrated keys are presented as well as descriptions of ten species in the area. A review of literature shows that members of the Orthoclaadiinae subfamily reported in ecological studies from the Niger Delta consist of two genera and five species. The documented species were *Corynonuera* sp1, sp2, sp3, *Cricotopus scotae* and *Cricotopus* sp. [21]. One genera listed above is in the current description, while new genera to the literature of the Niger Delta are *Eukiefferiella*, *Heterotanytarsus*, *Limnophyes* and *Trissocladius*. The current species description were not present among the 41 taxa observed by Dejoux [22] for the Chironomids of Guinea republic; two genera [*Cricotopus*, *Limnophyes*] were similar to those observed in Ghana [23]; and three genera [*Cricotopus*, *Eukiefferiella*, *Limnophyes*] were similar to those observed in the aquatic systems of South Africa [24]. From other West African (Cameroon, Gabon and Chad) countries, a review by Hilde *et al.* [25] also documented Chironomini taxa comprising fourteen (14) Orthoclaadiinae with two genera [*Cricotopus* and

Lymnophus] which are similar to those described in this paper. In general compared with documented Orthoclaadiinae from Niger Delta and other African regions three genera (*Heterotanytarsus*, *Trissocladius* and

Limnophyes) are new from this study to the Niger Delta of Nigeria. These were distributed in both lentic and lotic habitats making them good indicator organisms for pollution biology of freshwater systems.

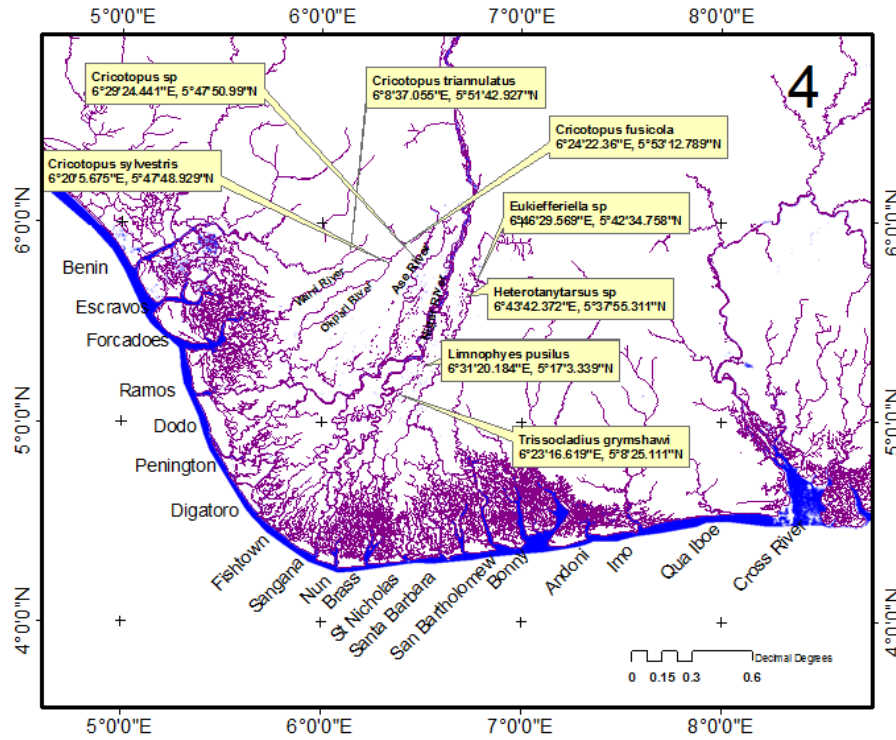


Fig. 1. Geographic locations of Orthoclaadiinae collections

Table 1. Location and ecology of Orthoclaadiinae specimens

Species	Coordinates	Aquatic habitat	Ecology
<i>Cricotopus sylvestris</i>	6°20'5.675"E, 5°47'48.929"N	Lotic	Collected from the forested black waters that drain into the lower portion of Okparsi river. pH can range from 4.5 to 6.5
<i>Cricotopus sp</i>	6°29'24.441"E, 5°47'50.99"N	Lotic	Collected from the forested black waters that drain into the Ase River but independent of the white water influence of the River Niger. pH can range from 3.5 to 6.4
<i>Cricotopus fusicola</i>	6°24'22.36"E, 5°53'12.789"N	Lotic	Collected from the forested black waters that drain into the Okparsi River but independent of the white water influence of the River Niger. pH can range from 3.5 to 6.4.
<i>Cricotopus triannulatus</i>	6°8'37.055"E, 5°51'42.927"N	Lotic:	Found on a tributary of Benin river with pH ranging from 4.2 in the dry season to 6.8 during the wet season
<i>Eukiefferiella sp</i>	6°46'29.569"E, 5°42'34.758"N	Lotic	Collected from backwaters that are creeklets discharging into the Orashi River whose pH ranges from 5.2 in the wet season to 6.9 in the dry season
<i>Heterotanytarsus sp</i>	6°43'42.372"E, 5°37'55.311"N	Lentic	Collected from a forested lake between the River Niger and Orashi River drainage system.

Species	Coordinates	Aquatic habitat	Ecology
<i>Limnophyes pusillus</i>	6°31'20.184"E, 5°17'3.339"N	Lentic	Vegetation surrounding the lake is composed of wetland forests and aquatic macrophytes floating, rooted and submerged forming large stands. Average pH is approximately 4.5 Collected from forested a lake between the River Niger and Orashi River drainage system.
<i>Trissocladius grymshawi</i>	6°23'16.619"E, 5°8'25.111"N	Lentic	Vegetation surrounding the lake is composed of wetland forests and aquatic macrophytes floating, rooted and submerged forming large stands. Average pH is approximately 4.5 Collected from a forested lake between the River Niger and Orashi River drainage system.

6. CONCLUSION

The photographic taxonomy of the species belonging to the Orthocladiinae subfamily increases the present state of the knowledge of the family Chironomidae within the Niger Delta. These recent findings support the likely high diversity of the many subfamilies of the Chironomidae in the vast lotic and lentic habitats that have not been surveyed. Future directions of research can help discover genera and species unknown at the present state of knowledge.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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