

First report of Simuliidae and Chironomidae (Diptera) living on nymphs of *Lachlania* Hagen (Ephemeroptera: Oligoneuriidae) in South America

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Abstract: We report cases of Simuliidae and Chironomidae living on *Lachlania* nymphs (Ephemeroptera). This is the first record of these associations in South America. *Simulium exiguum* (pupae and larvae), *Simulium cuasiexiguum* (larvae), *Cricotopus* sp. (larva) and *Rheotanytarsus* sp. (larva) were found associated with *Lachlania* nymphs. We believe that all of these associations can be classified as opportunistic (or casual) attachment.

Keywords: *aquatic insects, neotropical region, association, black fly, mayfly.*

PEPINELLI, M., SIQUEIRA, T., SALLES, F.F. & SHIMBORI, E.M. **Primeiro registro de Simuliidae e Chironomidae (Diptera) vivendo sobre ninfas de *Lachlania* Hagen (Ephemeroptera: Oligoneuriidae) na América do Sul.** *Biota Neotrop.* 9(1): <http://www.biotaneotropica.org.br/v9n1/pt/abstract?short-communication+bn00509012009>.

Resumo: Este é o primeiro registro de associações entre imaturos de Simuliidae e Chironomidae vivendo sobre ninfas do gênero *Lachlania* (Ephemeroptera) na América do Sul. *Simulium exiguum* (pupas e larvas), *Simulium cuasiexiguum* (larvas), *Cricotopus* sp. (larva) and *Rheotanytarsus* sp. (larva) foram coletadas vivendo sobre/aderidas a ninfas de *Lachlania*. Apesar de existirem algumas espécies que vivem, obrigatoriamente, sobre ninfas e larvas de outros insetos aquáticos, no presente estudo estas associações podem ser classificadas como casuais.

Palavras-chave: *insetos aquáticos, região neotropical, associação, borrachudo, foresia.*

Introduction

Associations of aquatic insects, especially Simuliidae and Chironomidae, with nymphs of mayflies (Ephemeroptera) have been documented by several authors (e.g. Corbet 1960, Crosskey 1965, 1990, Disney 1971a, 1971b, 1973, De Moor 1999, Callisto & Goulart 2000, Caldwell & Wiersma 2002, Roque et al. 2004). Regarding Simuliidae, two types of association are reported: obligate phoresy and opportunistic (or casual) attachment. Obligate phoresy has been reported in 28 species of Simuliidae living on Ephemeroptera nymphs or decapod crustaceans. The larvae of phoretic species exhibit adaptive modifications to live on the bodies of those arthropods (Crosskey 1990). In contrast, opportunistic attachment occurs as the product of chance encounters (Crosskey 1990). Despite the few records of larvae and pupae of non-phoretic black flies living on bodies of other animals, in most cases the association between black fly species and mayfly nymphs is described as obligate phoresy. Moreover, all of these records are restricted to Africa and Asia (Crosskey 1990).

Recently, Roque et al. (2004) published a review on interactions between Chironomidae and other aquatic animals in Brazil. They present an updated list of records of chironomids living on aquatic organisms in Brazil and discuss the difficulties of studying chironomid-host interactions. Despite this recent effort in investigating these interactions, there are only two records of chironomid larvae living on nymphs of mayflies in Brazil, both of the family Leptophlebiidae (Callisto & Goulart 2000, Roque et al. 2004). To our knowledge, there are no records from Brazil or even South America on interactions or associations between Simuliidae and Ephemeroptera.

Material and Methods

The nymphs of *Lachlania* were collected at the Pardo and Aguapeí Rivers, both in the State of São Paulo (Southeastern Brazil) during a field survey in April and August of 2004. The material was deposited in the Museu de Zoologia, Universidade de São Paulo.

Aquatic insects were hand collected directly from the substrate (stems, roots and leaves).

Results and Discussion

In this paper, we report the occurrence of larvae and pupae of Simuliidae and larvae of Chironomidae living on mayfly nymphs of the genus *Lachlania* Hagen (Oligoneuriidae) in Brazil.

Four larvae and two pupae of Simuliidae and two larvae of Chironomidae living on *Lachlania* nymphs were collected (Table 1). All cases of association between black flies and nymphs of *Lachlania* were observed in the field, and specimens were preserved in separate vials. Since black fly larvae dislodge easily from the body of the nymphs when fixed and transported, we present a photographic record (Figures 1 and 2) of *Lachlania* nymphs that were carrying pupae of *Simulium exiguum* Roubaud and two Chironomidae larvae. The larva and pupa of *Simulium exiguum* and *Simulium cuasiexiguum* Shelley, Luna Dias, Maia Herzog & Lowry usually live on submerged deciduous leaves and roots, and on leaves of the streamside vegetation (Pepinelli et al. 2006).

Although specimens in this study were not collected quantitatively, there is evidence to suggest that the association between mayflies and simuliids occurs at relatively low frequencies. We collected 27 *Lachlania* nymphs in the Pardo River and only one had a pair of *Simulium exiguum* pupae attached (Figures 1, 2). In contrast, more than 100 larvae and pupae of the same species of black fly were found attached to submerged stems, roots and leaves at the same site. Similarly, we collected 19 *Lachlania* nymphs in the Aguapeí River and only two of them contained larvae of black flies attached to their bodies. Once again, large numbers (>200) of simuliid larvae and pupae were found attached to submerged stems and roots at the same site.

Phoretic associations of black fly species recorded in the literature indicate that there are adaptive modifications of morphological structures which differ conspicuously from those found in typical non-phoretic species that live on vegetal or mineral substrata (Crosskey 1990). Without morphological characteristics indicative of a phoretic habit, it is very difficult to explain these types of associations or interactions (Roque et al. 2004). We believe that the two species of Simuliidae and the two species of Chironomidae that we collected living on *Lachlania* nymphs constitute a typical case of opportunistic (or casual) attachment. These dipteran larvae and pupae use the Oligoneuriidae nymphs as a substrate, since they all live in running water and attach themselves to stems and roots for long period remaining stationary.

Table 1. Records of Simuliidae and Chironomidae living on nymphs of Ephemeroptera in Brazilian streams.

Tabela 1. Registros de Simuliidae e Chironomidae vivendo sobre ninfas de Ephemeroptera em córregos do Brasil.

Simuliidae/Chironomidae	Host	Aquatic system, location (geographical coordinates)	Reference
<i>Simulium exiguum</i> pupae (Figures 1, 2)	<i>Lachlania</i>	Pardo River, São Paulo (22° 57' 05" S and 49° 51' 11" W)	Present study
<i>Simulium exiguum</i> larvae	<i>Lachlania</i>	Aguapeí River, São Paulo (21° 27' 31" S and 50° 55' 09" W)	Present study
<i>Simulium cuasiexiguum</i> larvae	<i>Lachlania</i>	Aguapeí River, Lucélia, São Paulo (21° 27' 31" S and 50° 55' 09" W)	Present study
<i>Corynoneura</i> sp.	<i>Farrodes</i>	Boracéia Stream, São Paulo (23° 32' S and 45° 51' W)	Roque et al. (2004)
<i>Cricotopus</i> sp. (Figure 1)	<i>Lachlania</i>	Pardo River, São Paulo (22° 57' 05" S and 49° 51' 11" W)	Present study
<i>Nanocladius</i> sp.	<i>Thraulodes</i>	Stream, Serra do Cipó, Minas Gerais (19°-20° S, and 43°-44° W)	Calisto & Goulart (2000)
<i>Rheotanytarsus</i> sp. (Figure 2)	<i>Lachlania</i>	Pardo River, São Paulo (22° 57' 05" S and 49° 51' 11" W)	Present study

Simuliidae and Chironomidae living on nymphs of Ephemeroptera

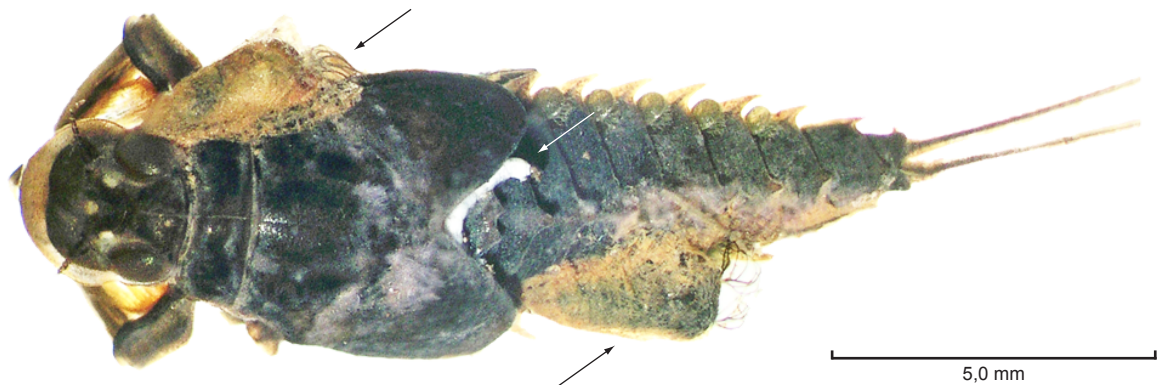


Figure 1. *Lachlania* sp. nymph with two pupae of *Simulium exiguum* (indicated by the black arrows), one larvae of *Cricotopus* sp. (indicated by the white arrow) and one larvae of *Rheotanytarsus* sp., dorsal view.

Figura 1. Ninfa de *Lachlania* sp. com duas pupas de *Simulium exiguum* (indicadas pelas setas escuras), uma larva de *Cricotopus* sp. (indicada pela seta clara) e uma larva de *Rheotanytarsus* sp., vista dorsal.

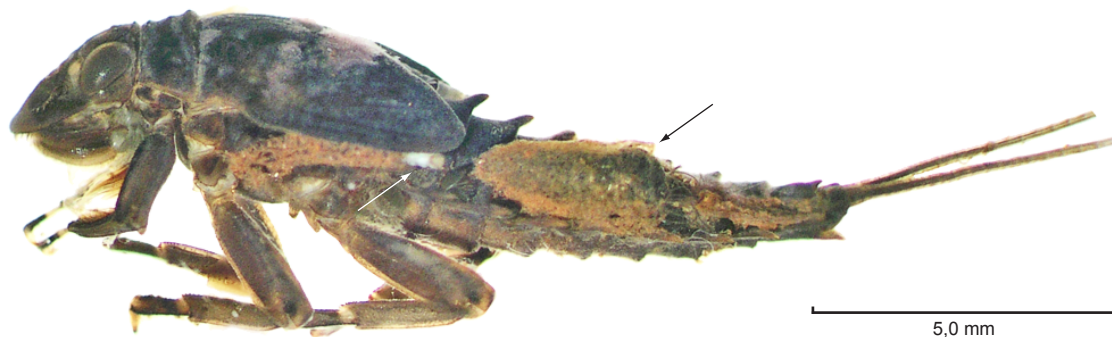


Figure 2. *Lachlania* nymph with two pupa (we can see only one in this view) of *Simulium exiguum* (indicated by the black arrow), one larva of *Cricotopus* sp. and one larvae of *Rheotanytarsus* (indicated by the white arrow), lateral view.

Figura 2. Ninfa de *Lachlania* sp. com duas pupas (nesta vista é possível ver apenas uma) de *Simulium exiguum* (indicada pela seta escura), uma larva de *Cricotopus* sp. e uma larva de *Rheotanytarsus* sp. (indicada pela seta clara), vista lateral.

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References

- CALDWELL, B.A. & WIERSEMA, N.A. 2002. New record and observation for parasitic chironomid midges (Diptera: Chironomidae) and their mayflies (Ephemeroptera) hosts. *Entomol. News*. 113(1):11-14.
- CALLISTO, M. & GOULART, M.D. 2000. Phoretic association between *Nanocladius* (*Plecopteraocoluthus*) sp. (Chironomidae: Diptera) and *Thraulodes* sp. (Leptophlebiidae: Ephemeroptera). *An. Soc. Entomol. Bras.* 29(3):605-608.
- CORBET, P.S. 1960. A new species of *Afronurus* (Ephemeroptera) and its association with *Simulium* in Uganda. *Proc. R. Entomol. Soc. B.* 29(5- 6):68-72.
- CROSSKEY, R.W. 1965. The identification of African Simuliidae (Diptera) living in phoresis with nymphal Ephemeroptera, with special references to *Simulium bernei* Freeman. *Proc. R. Entomol. Soc. A.* 40(7- 9):118- 124.
- CROSSKEY, R.W. 1990. The natural history of blackflies. John Wiley & Sons, Chichester, 711p.
- De MOOR, F.C. 1999. Phoretic associations of blackflies (Diptera: Simuliidae) with heptageniid mayflies (Ephemeroptera: Heptageniidae) in South Africa. *Afri. Entomol.* 7(1):154-156.
- DISNEY, R.H.L. 1971a. Two phoretic black-flies (Diptera: Simuliidae) and their associated mayfly host (Ephemeroptera: Heptageniidae) in Cameroon. *J. Entomol. A.* 46(1):53-61.
- DISNEY, R.H.L. 1971b. Notes on *Simulium ovazzae* Grenier and Mouchet (Diptera: Simuliidae) and river crabs (Malacostraca: Potamidae) and their association. *J. Nat. Hist.* 5(6):677-689.
- DISNEY, R.H.L. 1973. Further observations on some blackflies (Diptera: Simuliidae) associated with mayflies (Ephemeroptera: Baetidae and Heptageniidae) in Cameroon. *J. Entomol. A.* 47(2):169-180.
- PEPINELLI, M., HAMADA, N. & TRIVINHO-STRIXINO, S. 2006. Larval description of *Simulium* (*Notolepria*) *cuasiexiguum* and *Simulium* (*Chirostilbia*) *obesum* and New Records of Black Fly Species (Diptera: Simuliidae) in the States of São Paulo and Minas Gerais, Brazil. *Neotropical Entomol.* 35(5):698-704.
- ROQUE, F.O., TRIVINHO-STRIXINO, S., JANCOSO, M. & FRAGOSO, E.N. 2004. Records of Chironomidae larvae living on other aquatic animals in Brazil. *Biota Neotrop.* 4(2): <http://www.biotaneotropica.org.br/v4n2/pt/fullpaper?bn03404022004+en> (último acesso em 14/05/2008).

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