OCCURRENCE OF CHIRONOMID LARVAE LIVING INSIDE FALLEN-FRUITS IN ATLANTIC FOREST STREAMS, BRAZIL

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Resumo

Ocorrências de larvas de Chironomidae (Diptera) em frutos caídos em córregos da Mata Atlântica, Brasil - Larvas de Chironomidae exploram uma grande variedade de habitats e tipos de alimentos. Neste estudo, nós documentamos a ocorrência de larvas vivendo dentro de frutos caídos em córregos de baixa ordem na Mata Atlântica, Brasil. Nós encontramos larvas minando o tecido de frutos de 12 espécies de árvores. Sete morfoespécies de *Endotribelos* foram identificadas, incluindo as espécies *E. albatum* and *E. grodhaus,* encontradas pela primeira vez no Brasil. Os resultados indicam que larvas de *Endotribelos* constituem o grupo de insetos mais comum em frutos caídos em córregos da Mata Atlântica.

Palavras-chave: Comportamento alimentar, *Endotribelos*, Diptera, Região Neotropical

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Abstract

Occurrence of chironomid larvae living inside fallen-fruits in Atlantic Forest streams, Brazil - The Chironomidae larvae explore a wide variety of habitats and kinds of food. In this study we reported the use of fallen-fruits by chironomid larvae in low order streams in the Brazilian Atlantic Forest. We found chironomid larvae mining fruit tissue of 12 tree species. Seven morphospecies of *Endotribelos* were identified, including the species *E. albatum* and *E. grodhaus* found for the first time in Brazil. Our results suggest that larvae of *Endotribelos* are the commonest insect group living inside fallen-fruits in streams.

Key words: Feeding behavior, *Endotribelos*, Diptera, Neotropical region

Introduction

The Chironomidae larvae explore a wide variety of habitats and have a great diversity of kinds of food and feeding behaviors. They have been reported using a variety of plant-derived food resources, including parts of higher plants that fall in aquatic systems, such as wood and leaves (Pinder, 1986; Berg, 1995). This subject has been studied in different regions of the world. In the Neotropical region, particularly in the Brazilian Atlantic Forest, although some studies have been carried out about the distribution of Chironomidae larvae in different stream habitats (Sanseverino & Nessimian, 1998; Sanseverino & Nessimian, 2001; Henrique-Oliveira, 2003; Roque *et al*. 2003), none about Chironomidae in specific fallen-parts of plants in streams had been published.

The input of material from forest has been suggested as an important ecological driving force to the low order stream dynamic (Vannote *et al*., 1980). In the Atlantic Forest, the forest floor may receive up to 400 kg/ha/yr of fallen-fruits (Morellato, 1992) and the streams also receive a great amount (Henry *et al*., 1994). Although the fallen-fruits have been recognized as having important implications for aquatic and terrestrial ecology and dynamics, little information is available about their influence on stream invertebrate community.

Given the huge amount of fallen-fruits, the high diversity and density of Chironomidae larvae in streams of Atlantic Forest, and the quality of the fallen-material strongly affects Chironomidae population dynamics (Toscano &

McLachlan, 1980; Walentowics & McLachlan, 1980), we decided to assess the use of fallen-fruits by Chironomidae larvae in low order Atlantic Forest streams.

Material and Methods

The study area

According to Morellato & Haddad (2000) the Atlantic Forest is composed of two major vegetation types: the coastal forest or Atlantic Rain Forest and the tropical seasonal forest or Atlantic semi-deciduous forest. The Atlantic Rain forest covers mostly the low to medium elevation (< 1000 m a.s.l.) of the eastern slopes of mountain chain that runs along the coastline from southern to northeastern Brazil; the Atlantic-deciduous Forest extends across the plateau (usually > 600 m a.s.l.) in the center and southeastern interior of the country. The Atlantic Rain Forest experiences warm and wet climate without dry season; a seasonal climate with a relatively severe dry season (generally from April to September) predominates over the distribution of the Atlantic Semi-deciduous Forest.

This study was carried out in streams of 5 areas in Atlantic Forest in the State of São Paulo, three streams situated in Atlantic Rain Forest and two in Atlantic semi-deciduous forest. The general characteristics of the streams, where the fruits were collected, are given in Table I.

Sampling

After collecting the fallen-fruits in the streams, we transported them to the laboratory. When possible, the fruits were kept in an oxygenated aquarium in order to rear the chironomid larvae and obtain the adults. In this study only the specimens collected inside the fruits were considered. Because of the low resolution of taxonomic knowledge for Chironomidae in Brazil (Spies & Reiss, 1996), it was difficult to identify specimens to the species level. Hence, individuals were identified up to the most specific taxonomic level possible, using available literature and they were separated as morphospecies. The specimens are deposited in the collection of the Laboratório de Entomologia Aquática do Departamento da Hidrobiologia da Universidade Federal de São Carlos, São Paulo, Brazil.

Table I
General characteristics of the streams where the fruits were collected

General Characteristics	Sites				
	Parque Estadual do Jaraguá	Serra do Mar, Cananéia	Serra do Mar, Cubatão	Itirapina, "Lagoa que canta"	São Carlos, Fazzari Stream
Predominant vegetation	Atlantic Rain Forest	Atlantic Rain Forest	Atlantic Rain Forest	Riparian-forested formation	Riparian-forested formation
Geographic Coordenates	23°24' S 45°44' W	24°54' S 47°58' W	23°54' S 46°28' W	–	21°57' S 47°50' W
Stream Order	1 and 2	1 and 2	1 and 2	1	1 and 2
pH	6.68	7.02	7.09	4.67	4.75
OD(mg/l)	6.98	10.9	8.7	5.83	6.95
Conductivity (µS cm-1)	30	30	20	23	10

Results and Discussion

Fleshy fruits belonging to 12 tree species were collected (Tab. II). Most of them have been reported as important food recourse for terrestrial insects (Pizo & Oliveira, 2000). We found Chironomidae larvae mining fruit tissue of all tree species. Seven morphospecies of *Endotribelos* were identified (Tab. II). The species *E. albatum* Sublette & Sasa, 1994 and *E. grodhausi* Sublette & Sasa, 1994 have already been reported to the Neotropical region by Sublette & Sasa (1994), but our study amplifies the South limit distribution of these species.

The occurrence of different *Endotribelo*s morphospecies in fruits of different sites suggests a non-homogenous distribution of them in the Atlantic Forest (State of São Paulo), while the presence of the same

Table II
Chironomidae (Diptera) collected in different fallen-fruits in low order streams of different sites of Atlantic Forest (São Paulo, Brazil)

	Taxa						
Sites/ Fruits	*Endotribelos grodhausi*	*E. albatum*	*E.* sp. 1	*E.* sp. 2	*E.* sp. 3	*E.* sp. 4	*E.* sp. 5
P. E. Jaraguá							
Euterpes edullis	X						
Magnoliacea sp.1	X						
Myrtacea sp. 1	X						
Ficus sp. 1	X						
Fruit sp. 1	X						
Cubatão							
Annonacea sp.1					X		
Ficus sp. 2					X		
Myrtacea sp. 2					X		
Rubiacea sp. 1					X		
Cananéia							
Ficus sp. 2		X					
São Carlos							
Callophylum brasiliensis						X	X
Talauma ovata		X					
Itirapina							
Callophylum brasiliensis			X	X			
Talauma ovata			X	X			

morphospecies living in different fruits suggests low specific relationship between morphospecies and fruits. However, new studies are required to support this hypothesis.

Food quality affects chironomid population densities (Berg, 1995) and life history patterns (Ward & Cummins, 1979), but is extremely difficult to define it, because some larvae may ingest a wide variety of foods (Pinder, 1986). The high amount of carbohydrates, proteins and lipids in some fruits suggest that they represent a rich food resource for the Chironomidae larvae (see Galetti *et. al*., 2000 and Pizo & Oliveira, 2000 for some fruit nutritional information). Furthermore, microbial colonization probably make the fruits in decomposition more palatable and with a high nutritional value, as some studies about woody debris and macrophytes have demonstrated (Pinder, 1986; Berg, 1995). On the other hand, the anaerobic condition inside fallen-fruits in decomposition and the presence of allelopathic substances in many

Neotropical plants (Pizzamiglio, 1991) may difficult their colonization by Chironomidae larvae, except by *Endotribelos*.

According to Oliver (1971) few Chironomidae appear to be restricted rigidly to a single type of habitat and food, except some xylophagous groups, such as *Stenochironomus, Xestochironomu*s (Borkent, 1984) and *Xylotopus* (Oliver, 1982). In the case of *Endotribelos* larvae, a strong tendency to penetrate leaves and stems of macrophytes was observed (Grodhaus, 1987). Sanseverino & Nessimian (1998) found plant tissue, fungi and pollen in the stomach contents of *Endotribelos* larvae. Furthermore, *Endotribelos* (identified as *Tribelos*) have been reported in woods (Trivinho-Strixino & Strixino, 1998), in macrophytes (Trivinho-Strixino & Strixino, 1993; Trivinho-Strixino *et al.*, 2000), and we have found them in the freshwater sponges *Radiospongilla amazonensi* and *Metania spinata* (unpublished data). These results suggest that although the larvae of *Endotribelos* may be the commonest insect group living inside fallen-fruits in aquatic systems, they are not restricted to them.

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