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## ***CULICOIDES PARAENSIS* (DIPTERA: CERATOPOGONIDAE) INFESTATIONS IN CITIES OF THE ITAPOCÚ RIVER VALLEY, SOUTHERN BRAZIL<sup>1</sup>**

Maria Luiza Felipe-Bauer<sup>2</sup> and Ulises Sebastian Sternheim<sup>3</sup>

**ABSTRACT:** *Culicoides paraensis* (Goeldi), a vector of the human viral disease Oropouche, is reported as a pest from five cities in the Itapocú River Valley, southern Brazil. Adults likely emerge from rotting banana plants and are common enough to cause skin problems and allergies.

**KEY WORDS:** Diptera, Ceratopogonidae, *Culicoides paraensis*, infestations, pest, southern Brazil

*Culicoides paraensis* (Goeldi, 1905) is the most important species of Ceratopogonidae with medical importance in the Neotropical Region. It is a vector to humans of the nematode *Manzonella ozzardi*, in Argentina (Shelley and Coscarón, 2002) and Oropouche (ORO) virus infections in Panama, Peru and Brazil (Tesh, 1994). Over a half million persons have been infected with ORO virus. This makes this viral disease a serious public health threat in tropical and subtropical areas of Central and South America (Pinheiro et al., 2004).

In Brazil, ORO epidemics have been reported from 1960 to 1980 in the northern state of Para where the most important epidemics occurred in Belem. During the last two decades, ORO virus has spread to neighboring states of Amazonas, Amapá, Acre, Rondônia, Maranhão and Tocantins (Nunes et al., 2005).

*Culicoides paraensis* is the most widespread species in the New World. It occurs in the southeastern United States as far north as Pennsylvania and Wisconsin, and south through Central and South America to Uruguay (Salto) (Felipe-Bauer et al., 2003). Despite its widespread distribution in the states of the north, northeast and south of Brazil, this species is poorly collected and infestations were mainly reported in the northern states where it is associated with ORO in endemic sites. Only Sherlock (1963) previously mentioned *C. paraensis* as a pest in Salvador, Bahia, causing allergic dermatitis in the local residents.

### **METHODS**

Between February and September 2002, representatives of the cities' governments of Jaragua do Sul, Corupa, Schroeder, Guaramirim and Massaranduba in the Itapocu River Valley (1723 km<sup>2</sup>) in northeast Santa Catarina (Fig.1), sent us samples of *Culicoides*, collected from schools, day-care centers, and residences where females were biting exposed parts of the body (legs, arms, face) of local residents. Some people developed eczema, mainly on the legs, due to allergic reactions caused by the bite of these insects. The collections were made in different day's hours due to the availability of the local agents at 91 rural, periurban, and urban

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sites described in Table 1. Infested sites were signaled in Jaragua do Sul (533 km<sup>2</sup>) and Corupa (405 km<sup>2</sup>), the two cities with the biggest claims (Fig. 2). The species were identified based in the Atlas of *Culicoides* (Wirth et al., 1988) and in the key and diagnostic characters of *Culicoides* of the *paraensis* species group that can be found in Felipe-Bauer et al. (2003).



Figure 1. Map of the Itapocu River Valley, Santa Catarina State, Brazil, with indication of the cities infested by *Culicoides paraensis* (Goeldi, 1905).

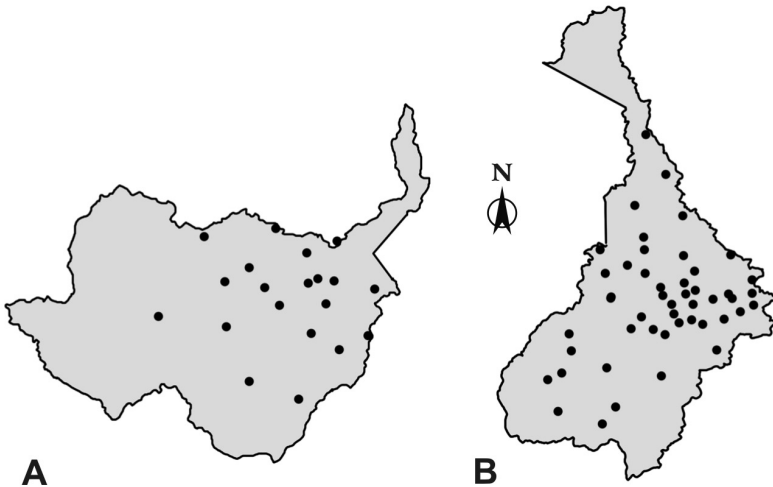


Figure 2. Map of Corupá (A) and Jaraguá do Sul (B) with indication of infested sites by *Culicoides paraensis* (Goeldi, 1905). Scale 1: 534,000 for Corupá and 1: 657,000 for Jaraguá do Sul.

Table 1. Collection sites of *Culicoides paraensis* in the cities of Jaragua do Sul, Corupa, Guaramirim, Schroeder and Massaranduba, Santa Catarina State, Brazil, February-September 2002.

City	Date	Site (Quarter)	Description
	18/03/2002	Nereu Ramos	Urban, banana and irrigated rice plantation, secondary forest distant
	26/04/2002	Rio Molha	Urban, surrounded by secondary forest
<b>J</b>	03/05/2002	Vila Lenzi	Urban, surrounded by secondary forest
<b>A</b>	30/04/2002	Três Rios do Norte	Periurban, banana and irrigated rice plantation, secondary forest distant
<b>R</b>	03/05/2002	Ilha da Figueira	Periurban, irrigated rice plantation and secondary forest distant
<b>A</b>	09/05/2002	Vila Lalau	Urban center near residences
<b>G</b>	26/04/2002	Vieiras	Periurban, neighbor to banana plantation
<b>U</b>	17/05/2002	Barra do Rio Cerro	Urban center
<b>A</b>	03/05/2002	Vila Rau	Urban center
	12/04/2002	Czerniewicz	Urban center
<b>D</b>	22/05/2002	Ilha da Figueira	Periurban, close secondary forest
<b>O</b>	03/04/2002	Água Verde	Urban center
	21/03/2002	Jaragua 99	Periurban, near banana plantation and secondary forest
<b>S</b>	18/04/2002	Alto Garibaldi	Rural, adjacent to banana plantation and secondary forest
<b>U</b>	17/04/2002	Jaraguá Esquerdo	Urban center
<b>L</b>	28/03/2002	Nereu Ramos	Rural, neighbor to banana and irrigated rice plantation, surrounded by secondary forest
	22/05/2002	Ilha da Figueira	Periurban, close secondary forest
	01/04/2002	Chico de Paulo	Rural, close secondary forest
	14/03/2002	Garibaldi	Rural, near banana plantation, chicken creation and surrounded by secondary forest
	21/05/2002	Barra do Rio Cerro	Periurban, surrounded by secondary forest
	13/03/2002	Jaragua 84	Periurban, neighbor to banana plantation and secondary forest

17/04/2002	Tifa Martins	Perturban, surrounded by secondary forest
12/04/2002	Amizade	Perturban, surrounded by secondary forest
21/03/2002	João Pessoa	Perturban, near banana plantation
03/05/2002	Estrada Nova	Urban center, surrounded by secondary forest
30/04/2002	Tifa Martins	Urban center, surrounded by secondary forest
02/04/2002	Três Rios do Norte	Rural, near secondary forest
21/05/2002	Rio da Luz	Rural, banana plantation, chicken creation, secondary forest distant
03/04/2002	Tifa Monos	Perturban, secondary forest distant
30/04/2002	São Luis	Urban center
30/04/2002	Nereu Ramos	Rural, close to banana and irrigated rice plantation, secondary forest
03/04/2002	Rio Molha	Rural, near secondary forest
19/04/2002	Rio Cerro I	Rural, irrigated rice plantation distant
17/05/2002	Rio da Luz	Rural, adjacent to cattle and chicken creation
21/05/2002	Rio da Luz	Rural, adjacent to cattle and chicken creation
22/05/2002	Vila Lalau	Urban center
13/03/2002	Garibaldi	Perturban, neighbor to banana plantation
25/03/2002	Vila Chartes	Rural, near irrigated rice plantation
30/04/2002	Três Rios do Norte	Perturban with variated cultivation
25/03/2002	Vieiras	Perturban, next banana plantation
16/04/2002	Centro	Urban center
25/03/2002	Santa Luzia	Perturban, irrigated rice plantation and secondary forest distant
18/04/2002	Jaraguazinho	Rural, near banana plantation
18/04/2002	Ribeirão Grande do Norte	Rural, near banana plantation
28/05/2002	Grota Funda	Rural, adjacent to secondary forest
06/06/2002	Ribeirão das Pedras	Rural, neighbor to banana plantation
16/08/2002	São Pedro	Rural, near banana plantation and cattle creation

**J A R A G U A D O S U L**

	Ano Bom	Periurban, adjacent to river and secondary forest
	Center	Urban, next to residences, river and secondary forest
	Bomplandt	Rural, neighbor to river, secondary forest, cattle creation and banana plantation
	Caminho do Morro	Rural, near river, secondary forest, cattle creation and banana plantation
	Isabel Alto	Rural, next to cattle creation and river, surrounded by secondary forest
	Escola Felipe Schmidt	Rural, near river, cattle creation and banana plantation, secondary forest,
	Center	Urban, neighbor to river, surrounded by secondary forest
	Guarajuva	Rural, near pig creation, banana plantation and secondary forest
	Itapocu	Rural, near pig creation, banana plantation and secondary forest
	Isabel Alto	Rural, close to river, secondary forest, cattle creation and banana plantation
	Center	Urban, adjacent to river, factory, surrounded by secondary forest
	Oswaldo Amaral	Rural, next to river and banana plantation
	Faxinal	Rural, near cattle creation, banana plantation and secondary forest
	Pedra de Amolar	Rural, close to river, surrounded by banana plantation and secondary forest
	Poço D'Anta	Rural, near river, cattle and chicken creation and banana and irrigated rice plantation
	Rio Correias	Rural, neighbor to river, secondary forest and banana plantation
	Rio Novo Alto	Rural, next to river, cattle creation, banana plantation and secondary forest,
	Rio Paulo	Rural, adjacent to river, cattle creation, banana plantation and secondary forest
	Tifa dos Milhões	Rural, near river, cattle creation, banana plantation and secondary forest
	Center	Urban, close to residences
	Brüderthal	Rural, irrigated rice plantation distant
	Brüderthal	Rural, near banana plantation, irrigated rice plantation and secondary forest
	Brüderthal	Rural, next to banana plantation and secondary forest
	Brüderthal	Rural, close to banana plantation and secondary forest
	Brüderthal	Rural, near banana plantation and secondary forest
	Bylaardt	Rural, neighbor to banana plantation
	Bylaardt	Rural, neighbor to banana plantation
	Ilha da Figueira	Urban, near irrigated rice plantation and secondary forest
	Jacu-Açú	Rural, adjacent to irrigated rice plantation and secondary forest
	Jacu-Açú	Rural, irrigated rice plantation and secondary forest distant

**C O R U P A****G U A R A M I R I M**

## S C H R O E D E R

03/2002	Centro	Urban, closet to by banana plantation
03/2002	Centro	Periurban, near banana plantation
03/2002	Duas Mamas	Rural, adjacent to banana plantation and secondary forest
03/2002	Duas Mamas	Rural, near banana plantation and cattle creation
03/2002	Duas Mamas	Rural, next to banana plantation
03/2002	Rio Hern	Periurban, neighbor to banana plantation
03/2002	Rio Hern	Periurban, near banana plantation
03/2002	Bracinho	Periurban, adjacent to banana plantation
03/2002	Bracinho	Rural, closet to banana plantation and fish creation

## M A S S A R A N D U B A

11/06/2002	Guarani Mirim	Periurban, closet to banana plantation, irrigated rice, pasture
20/7/2002	Guarani Mirim	Periurban, near banana and irrigated rice plantation, pasture
13/7/2002	Ribeirão Gustavo	Periurban, adjacent to irrigated rice plantation, pasture, palms and secondary forest
25/6/2002	Ribeirão Wilde	Periurban, next to banana and irrigated rice plantation, pasture and secondary forest
28/8/2002	Alto Guarani Açú	Periurban, near banana plantation, chicken creation, palms and secondary forest

## RESULTS

A total of 3,640 specimens of *Culicoides* were captured during this study: 1,254 from Jaragua do Sul, 1,344 from Corupa, 611 from Guaramirim, 363 from Schroeder and 68 from Massaranduba. Of these, 3,516 specimens were *C. paraensis* and 124 *C. insignis* Lutz. The latter species was found only in one collection made in a rural site from the city of Guaramirim near an irrigated rice plantation, whereas in all other sites only *C. paraensis* was captured. *Culicoides* adult populations in the cities of the Itapocu River Valley are therefore due nearly entirely to the high incidence of *C. paraensis*.

## DISCUSSION

The economies of the cities of the Itapocu River Valley are based mainly on the intensive culture of banana (Musaceae) (Table 1). As observed in other areas with the same cultural practices, after felling of banana trees, the stems, stumps and other banana plant residues are left in the environment for decomposition. Several authors (e.g. Winder and Silva, 1972; Winder, 1977; Hoch et al., 1987; Mercer et al., 2003) have shown that *C. paraensis* emerge from decaying vegetation. The change of the forest environment to agricultural sites, like banana plantations, provides an increase in the incidence of this species due to the greater availability of breeding substrates.

In order to identify the preferred larval development sites of *C. paraensis* in areas of banana monoculture, studies have been started in Jaragua do Sul. This information may provide knowledge toward development of an alternative management regime of banana plantations. Changes to the cultivation methods of this important crop will likely contribute to future *Culicoides* control programs in the cities of the Itapocu River Valley.

In Brazil, the ORO virus was restricted to the areas with occurrence of ORO fever, especially those in the Amazon Basin. Recently, Nunes et al. (2005) isolated the genotype III of ORO virus from monkeys (*Callithrix*) in the Arinos region of the state of Minas Gerais, a genotype reported previously only in Panama.

The record of the ORO virus outside the states of the Amazon Basin, in sylvatic areas of southeastern Brazil and the report of established populations of *C. paraensis* in urban areas of Santa Catarina demands special attention. Unlike that in the Amazon region of Brazil, banana culture in southern Brazilian states is extensively cultivated in populous urban areas. The potential of transportation of this arbovirus from natural habitats to urban areas and the risk of spreading ORO fever to susceptible populated regions of southeastern and southern Brazil must be addressed by government health agencies. Clearly, additional studies regarding the bioecological aspects of the vector, as well as the spatial distribution of the ORO virus and its vectors are needed to better understand the potential risk of spreading this epidemic arboviral disease in Brazil.



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