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Inventory of breeding-sites and species of *Anopheles* mosquitoes in the Juruá valley

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ABSTRACT

In Brazil the numbers of malaria are cause for concern, especially in the “Legal Amazon” region, where climatic conditions favor the development of the mosquito transmitter. One of the regions with a high infection rate is the Juruá valley. The breeding of the vectors are not well characterized, as well as species of mosquitoes present in each one. In the present work, five types of breeding-sites: excavations, fish-farm tanks, reservoirs, lagoons and creeks were identified and a total of 10 species of *Anopheles* collected. The highest abundance was of *An. peryassui* (31%), *An. triannulatus* (28.3%) and *An. darlingi* (22.5%).

Keywords: breeding-sites, mosquitoes, malaria, Juruá valley, *Anopheles*

1. Introduction

Malaria is an infectious disease caused by parasitic protozoa of the genus *Plasmodium*, transmitted by the bite of the mosquito *Anopheles*. This disease affects more than 500 million people every year, leading to the death of 3 million people, of whom 1 million are children under the age of five. It is the main tropical parasitic disease and one of the most frequent causes of death in children in these countries. According to the WHO, malaria kills one African child every 30 seconds, and many children who survive severe cases have serious brain damage and learning difficulties [1].

In Brazil the numbers of malaria are cause for concern, especially in the “Legal Amazon” region, where climatic conditions favor the development of the mosquito transmitter. The State Health Department for the state of Acre, concerned with the local situation, has started a large program to control the disease, which includes preventive and educational measures, treatment for the sick and vector control. However, the breeding of the vectors are not well characterized, as well as species of mosquitoes present in each one. Thus, the objective of the current work was to carry out an inventory of breeding-sites and of the species of *Anopheles* present in the three main towns of the Juruá Valley (Cruzeiro do Sul, Mâncio Lima and Rodrigues Alves).

2. Materials and methods

All the potential breeding-sites in the urban part of Mâncio Lima, Rodrigues Alves and Cruzeiro do Sul, situated in the valley of the Juruá River, were surveyed, identified and characterized by their dimensions, type of vegetation along the banks and infestation by *anophelines*. Teams from Embrapa, the State Health Department/Municipal Coordination for Endemic Diseases and Bthek Biotechnology carried out the survey, visiting all parts of the towns. The work was carried out in March 2007.

In each possible breeding ground, sample points were chosen where samples of water were collected using a dipper [2,3]. At each point six to ten “dips” were made depending on the size of the breeding-site. The points were recorded as positive or negative for the presence of larvae from *Anopheles* spp. in the “dips”. The percentage of positive breeding-sites were thus determined. The larvae were taken to the laboratory at the State Health Department/Municipal Coordination for Endemic Diseases of Cruzeiro do Sul, where they were raised until adult phase, being then identified and separated by species [2].

3. Results & Discussion

The survey of the breeding-sites revealed four types, viz., excavations, fish-farm tanks, reservoirs, lagoons and creeks (Figure 1).

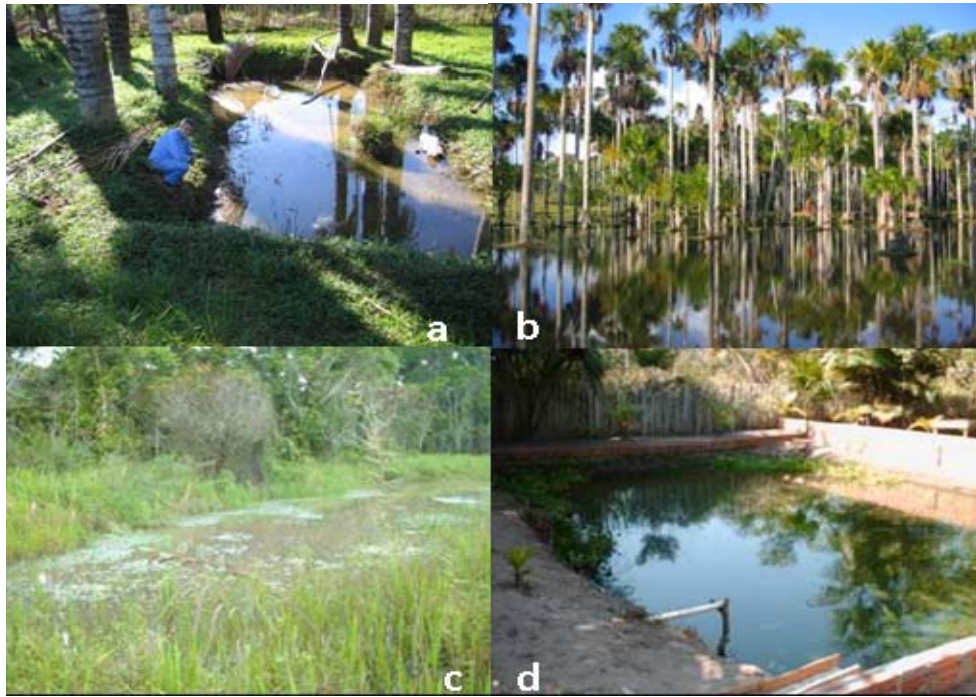


Fig 1: Types of Breeding-sites for *Anopheles* spp. found in the Juruá Valley. (a) excavation, (b) natural lagoon and creek, (c) reservoir, (d) fish-farm tanks

Table 1: Type and number of breeding-sites in each site in March 2007 and percentage of Breeding-sites infested with *Anopheles* spp.

Towns	Type of breeding-sites (number and percentage of breeding-sites infested with <i>Anopheles</i> spp.)									
	Reservoirs		Excavations		Fish-farm tanks		Lagoons and creeks		Total	
	number	% positives	number	% positives	number	% positives	number	% positives	number	% positives
Cruzeiro do Sul	65	79	248	95	345	67			658	80
Mancio Lima	42	84	182	76	133	76	17	100	374	78
Rodrigues Alves	35	67	165	84	34	86			234	79
Total	142	77	595	85	512	76	17	100	1266	79

Table 2: Species of *Anopheles* collected at the start of the project (quantity of larvae and abundance of each species)

Species	Quantity	Abundance %
<i>Anopheles braziliensis</i>	33	1,1
<i>Anopheles peryassui</i>	956	31
<i>Anopheles rangeli</i>	185	6
<i>Anopheles albitarsis</i>	236	7,7
<i>Anopheles argyritarsis</i>	10	0,3
<i>Anopheles darlingi</i>	690	22,5
<i>Anopheles evansae</i>	11	0,4
<i>Anopheles mediopunctatus</i>	23	0,8
<i>Anopheles oswaldoi</i>	58	1,9
<i>Anopheles triannulatus</i>	865	28,3
Total	3067	100

In the three towns, 1266 breeding-sites were found (Table 1). Of the 1266 breeding-sites, 595 were excavations, 512 fish-farm tanks, 142 reservoirs, 17 lagoons and creeks. The fish-farm tanks were the most numerous breeding-sites, because the population of these towns had received financial incentives from the local government to open these tanks and were given to raise fish. Many tanks had been opened and then abandoned. To differentiate these from the active tanks, the abandoned ones were called excavations. The reservoirs are creeks that have been dammed and often used to raise fish. The lagoons are natural bodies of water and the swamps are permanently flooded areas surrounded by hydromorphic soil. There are also temporary breeding-sites, which are formed when the rivers are at high water.

Data analysis from the collections showed that mosquito infestation was very high, with infestation percentages in breeding-sites recorded as varying from 67 to 100%. In addition, it was observed that the infestation was very similar in the three towns, which presented a mean of 79% of breeding-sites considered positive.

According to studies by Deane ^[4], Oliveira-Ferreira *et al.* ^[5], Tadei *et al.* ^[6] and Tadei and Thatcher ^[7], among others, *An. darlingi* was the main malaria-transmitter species in the region. In addition, these authors comment that *An. triannulatus*, *An. braziliensis* and *An. nuneztovari* have already been found infected with *Plasmodium falciparum* and/or *P. vivax*, and are also involved, albeit on a smaller scale, in the transmission of malaria.

The correct identification of *Anopheles* larvae and adults is an action of extreme importance in that certain species present a much greater vectorial capacity than others from the same genus. Therefore, all larvae collected by field agents were sent to the laboratories at the endemic disease centers for confirmation of the species.

A total of 10 species of *Anopheles* were collected, and the highest abundance was of *An. peryassui* (31%), *An. triannulatus* (28.3%) and *An. darlingi* (22.5%) (Table 2). The total percentage of the other species were below 10%. It is important to highlight that this is the first report of a high infestation of *An. peryassui*. Previous studies have reported the presence of this species, but in much lower numbers ^[8,9].

4. Conclusions

The present work enabled the identification of the number and types of breeding-sites of *Anopheles* spp. in Juruá Valley region. It also enabled the collection and identification of 10 species of *Anopheles*. Based on these data, further work to control *Anopheles* spp. and consequently to control malaria could be developed.

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