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# First official record of *Aedes (Stegomyia) albopictus* (Diptera: Culicidae) in the Acre State, Northern Brazil

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## ABSTRACT

*Aedes (Stegomyia) albopictus* (Skuse, 1854) was reported in Brazil for the first time in 1986 and has shown marked expansion throughout the Brazilian territory. During a routine activity to control dengue fever conducted by the Division of Entomology of the Municipal Health Department in Rio Branco city, adults and immatures of Culicidae were collected in a peri-urban area. The identified Culicidae forms indicated that they belonged to the species *Ae. albopictus*. This is the first official record of the presence of *Ae. albopictus* in the Acre State, confirming its current presence in all Brazilian states.

**KEYWORDS:** Mosquitoes. *Aedes albopictus.* Vectors. Peri-urban. Arboviruses.

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Aedes (Stegomyia) albopictus (Skuse, 1894) has also been referred to as the Asian tiger mosquito, native to East Asia and the islands of the Western Pacific and Indian oceans[1]. Currently, the species is found on all continents with the exception of Antarctica[1]. In Brazil, *Ae. albopictus* was first detected in 1986, in the Rio de Janeiro State, in a batch of larvae collected from abandoned tires on the Federal Rural University of Rio de Janeiro campus, in Seropedica city[2]. In 1986, *Ae. albopictus* was recorded for the first time in the Minas Gerais and Sao Paulo states. In the following year, this species established itself in all the regions of the Southeastern Brazil states[3].

In 2003, Brazil's national information data on *Ae. albopictus* distribution was updated, and seven states – namely, Acre, Amapa, Tocantins and Roraima (Northern Brazil) and Ceara, Piaui and Sergipe (Northeastern Brazil) – had not yet officially recorded the existence of this species[3]. Nearly twelve years later, some of these Brazilian states recorded the presence of *Ae. albopictus*, and the absence was noted only in the Acre, Amapa and Sergipe states[4]. Towards the end of 2014, then again in 2019, the presence of this mosquito vector was reported in the Sergipe and Amapa states, respectively. Acre was the only state that did not have an official record of the existence of this species[5].

In this work, we analyze the first officially reported presence of adults and immature forms (larvae and pupae) of *Ae. albopictus* in the Acre State.

During routine activities performed to control dengue fever conducted by the Division of Entomology of the Municipal Health Department in Rio Branco city, on March 31, 2022, *Ae. albopictus* pupae were collected from a peri-urban area of Rio Branco city. This non-residential area is classified as high-risk for the

proliferation of vectors (Strategic Point-SP; 10° 00' 22.8" S; 67° 50' 57.7" W). After confirming the identification of the *Ae. albopictus* pupae, the Division of Entomology team conducted new entomological research from April 8 to 13, 2022, covering a radius of approximately 8km from the initial point of the primary collection of the *Ae. albopictus* pupae (Figure 1). This peri-urban area presented a reduced number of residences and relatively high vegetation cover, which favor the proliferation of this species.

In the second entomological survey, four female adults were collected, using a Pulsar-type net. The larvae were collected with the help of a plastic pipette and stored in plastic tubes. The immature forms were gathered from different artificial breeding sites, such as tires and domestic waste, in addition to their natural breeding sites, such as tree holes.

The collected specimens were sent to the School of Public Health of the University of Sao Paulo, which confirmed that the species was *Ae. albopictus,* through morphological identification of the larvae, pupae and adult females. Photographs were taken using a Zeiss 2000-C Stereomicroscope and Zeiss AXIO Lab.A1 Microscope (Figures 2 and 3).

Figure 2 represents the four females examined, highlighting the longitudinal band of silvery scales in the mesonotum; on the head, the torus showed a tuft of silvery scales, internally, and the clypeus was without scales; on the anterior leg, the V tarsus has smooth nails.

In the larva (Figure 3), short and hyaline lateral spines are prominent on the thorax; on the head, bifurcated bristle 6 and multiple bristles 7 are visible; in the VIII abdominal segment pecten is in a single row, presented as a long spine with a small serrated base or fringes on the lateral bases; in the siphon, the pecten is regularly spaced, and the 1S bristle is composed of two to four branches. In the pupa, the swimming reed possesses long hairs along its edge; in the abdomen, arrow 1 shows dichotomous ramifications; bristle 9 is simple, with tiny side hairs. All these identification features of the morphology of *Ae. albopictus* adhered to the classification of the Ministry of Health[6] and of Consoli and Lourenço-de-Oliveira[7].

The specimens of one larva and one pupa per slide, prepared on two separate slides, plus the four adult females were deposited in the Entomological Reference Collection of the Department of Epidemiology, School of Public Health, University of Sao Paulo (Nº E-16223, E-16224, E-16225, E-16226, for females and E-16227 and E-16228 for larva and pupa).

The presence of *Ae. albopictus* in Acre reinforces the rapid expansion of this species in Brazil. In the Americas, including Brazil, *Ae. albopictus* is considered a potential

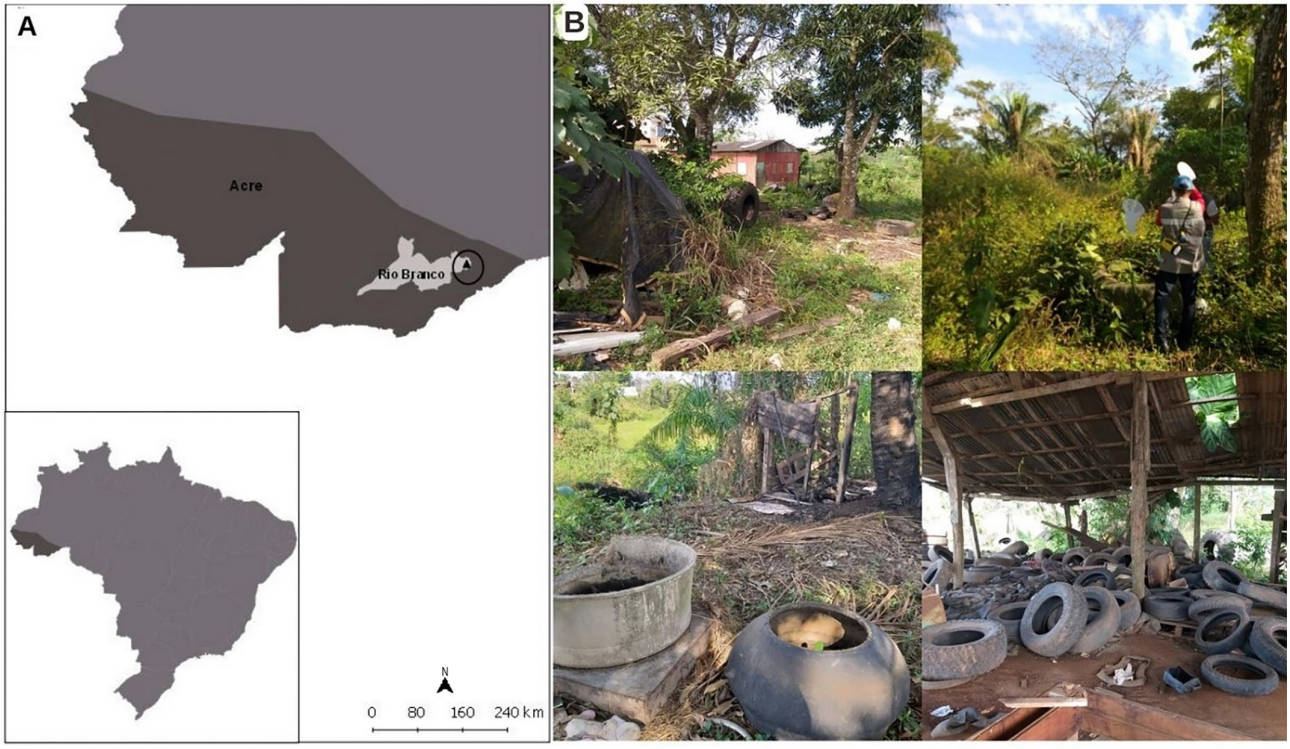


**Figure 1** - Collection area for immatures and adults of *Ae. albopictus*: A) Map of Brazil in the lower left corner highlighting the Acre state. In the right corner, Acre state with the Rio Branco city highlighted and the collection area indicated by a circled triangle; B) Peridomiciliary area with high vegetation cover, but with the presence of garbage and discarded tires, demonstrating the presence of artificial breeding sites for the species.

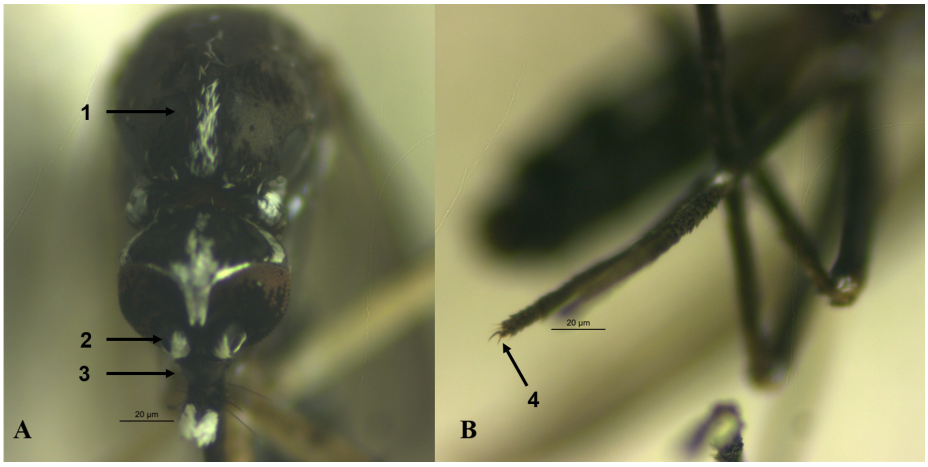


**Figure 2** - Female of *Ae. albopictus*: A) head and mesonotum: 1- longitudinal stripe of silvery scales; 2- silvery scales torus; 3- clypeus without scales; B) V tarsus of the anterior leg: 4- smooth shank nail.

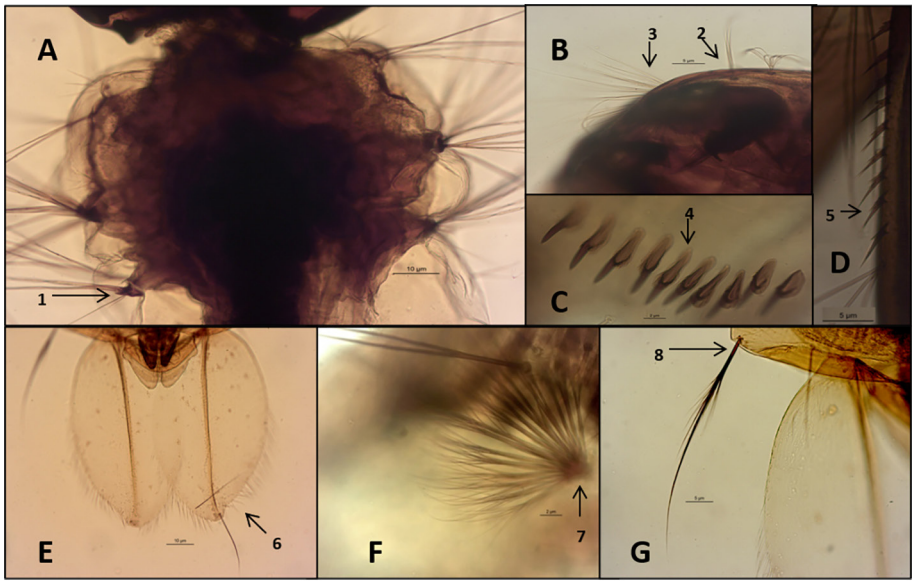


**Figure 3** - Larvae and pupae of *Ae. albopictus*: A) Larvae thorax: 1- short lateral spines; B) Larvae head: 2- forked bristle 6; 3- bristle 7 multiple; C) VIII abdominal segment: 4- pecten in a single row, in the shape of a long spine and serrated base; D) 5- pecten siphon regularly spaced; E) Pupa: 6- swimming reed with long hairs on the edge; F and G) pupal abdomen: 7- bristle 1 with dichotomous bristles; 8- bristle 9 simple with small side hairs.

vector of the dengue virus (DENV), Zika virus (ZIKV), chikungunya virus (CHIKV) and yellow fever virus (YFV)[8]. Besides, the presence of vertical transmission of these arboviruses among the *Ae. albopictus* females have already been reported under natural conditions worldwide[5,8-10]. Vertical transmission appears to be an essential mechanism for maintaining the circulation of the arboviruses during the less favorable periods of transmission. The occurrence of this phenomenon among the *Ae. albopictus* populations in countries where it is not regarded as a primary vector of arboviruses, such as Brazil, raise concerns regarding the possible role that this species may play in the epidemiological scenario of the transmission of these pathogens[5,9,10].

In Brazil, *Ae. albopictus* is present more abundantly in the sylvatic and rural areas. However, its presence has already been recorded in the peri-urban and urban areas, with immature forms occurring both in the natural and artificial breeding sites[5,11,12]. In parallel, *Ae. albopictus* presents eclecticism in relation to the choice of which vertebrate host to blood-feed upon, feeding on both human beings, as well as other vertebrate animals[5,8]. Such behavior may favor this species as a bridge vector for the arboviruses that circulate in the sylvatic areas, such as YFV[2].

A recent study using secondary data from entomological surveillance in Brazil showed the rapid expansion of *Ae. albopictus* and indicated the presence of this species in the Acre State in 2020[13]. Nevertheless, it is important to

highlight that the first record of *Ae. albopictus* can only be officially confirmed after collection and identification of the species certified by a reference institution[14-16]. Moreover, the methods used for the surveillance of *Aedes* with medical importance, especially *Aedes aegypti* and *Ae. albopictus*, are highly dependent on human operation and skills to identify the mosquito species, both in the field and laboratory[17].

This paper shows for the first time that *Ae. albopictus* is present in all the Brazilian states, including Acre. With the record of *Ae. albopictus* in Rio Branco city, it would be interesting to investigate the presence of this species in the other municipalities within Acre. As a result of the presence of this species, new studies on the expansion and bioecology of this vector in the state are encouraged.

In the current context, it is important to include the identification of the species *Ae. albopictus* in the routine activities performed by the endemic agents. The maintenance of continuous entomological and virological surveillance of the *Ae. albopictus*, now recorded in all the Brazilian states, is essential to detect any possible change in the role of this species in the dynamics of the transmission of DENV, ZIKV, CHIKV and YFV, in Brazil.

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## AUTHORS' CONTRIBUTIONS

RCR: paper writing and critical review; ASC, JLS and MFS: field work and identification; ESP, MSMS, CLM and MFMM: acquisition, field work and project administration; DUOM: field work and its critical review; MBP: identification, taxonomy description, photographs, and paper writing; AFB: paper writing and critical review; TNLC: paper writing and critical review.

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