

SCIENTIFIC NOTE

Aedes aegypti INVADES TRINDADE ISLAND, 1,140 KM FROM THE BRAZILIAN COAST, IN THE SOUTH ATLANTIC

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ABSTRACT. Herein we report the first recorded arrival of *Aedes aegypti* on Trindade Island, approximately 1,140 km from the Brazilian coast, posing potential health risks to the human inhabitants thereof. The collection of mosquitoes was done from August to October 2019 via an active search for adults, eggs, and larvae by surveying objects with accumulated water and implantation of 23 ovitraps in different regions of the island. As a result, we collected 33 adults of *Ae. aegypti* via active search inside buildings. A total of 433 eggs of *Ae. aegypti* were also obtained from the ovitraps, all of which subsequently reached the adult stage. No other species of Culicidae was found.

KEY WORDS *Aedes aegypti*, geographic distribution, island, ovitraps

Aedes aegypti (Linnaeus) is a mosquito posing a major impact on public health in Brazil. In this country, *Ae. aegypti* has been the unique proven vector of Dengue virus for more than 30 years and of the recently introduced emerging arboviruses in the New World, namely, Zika virus and Chikungunya virus. All the respective diseases (Dengue, Zika, and Chikungunya fevers) have become a global health concern (Patterson et al. 2016, Carvalho and Moreira 2017, Donalisio et al. 2017). It is believed that *Ae. aegypti* was introduced to the New World more than 4 centuries ago from its ancestral habitat in West Africa, within ships via the European slave trade (Powell et al. 2018). Whether *Ae. aegypti* should really be considered “the most dangerous animal in the world” (Powell 2016) is debatable, but it certainly has been a cause of immense human suffering over the centuries (Powell 2018).

Aedes aegypti is distributed in several regions of the world including the South American continent (e.g., Kotsakiosi et al. 2017, Powell et al. 2018). Recently, several island invasions by *Ae. aegypti* have been reported worldwide, with the associated risk of transmission of arboviruses, or in some cases, unfortunately, triggering outbreaks of diseases transmitted by this mosquito (e.g., Mavian et al. 2018,

Ryan et al. 2019, Salgueiro et al. 2019, Seixas et al. 2019).

Trindade is an oceanic island in the South Atlantic Ocean, lying approximately 1,140 and 4,270 km from the Brazilian and African coasts, respectively, between the geographical coordinates 20°29' to 20°31.7'S and 29°17.7' to 29°20.7'W (Alves et al. 2011, SECIRM 2017) (Fig. 1). The island has an oceanographic station manned by military staff of the Brazilian Navy, and a recently built research station designed to accommodate up to eight scientists. Navy ships transfer personnel and supplies to the island at roughly 60-day intervals. The trips from Rio de Janeiro to the island used to take a minimum of 4 days depending on the vessel, but with a partial renewal of the fleet with new vessels, it is possible to reach the island from the continent in only 3 days.

Despite the island's 5 centuries long and complex occupation history, apart from a single unconfirmed occurrence of an undetermined culicid mosquito species, annotated by the late Prof. Johann Becker (Alves 1998:137), there had never been reports of its human occupants being bitten by mosquitoes. However, in November 2018, the presence of mosquitoes and their blood-sucking activities on people were noticed by the military personnel, which alerted them to seek the identification of species. This was also called for because of the endemic nature of arboviruses, which are currently occurring in several states of Brazil (Donalisio et al. 2017).

After the third author (RJVA) contacted the second author (HRG-S), an intensive effort of mosquito collection on Trindade Island was performed from August 12, 2019, to October 11, 2019. The collection methods included 1) active search for adults in and around places of constant human presence; 2) egg and larval survey in objects with accumulated water, such as abandoned tires and other kinds of neglected receptacles; and 3) monitoring performed using oviposition traps. Each trap consist-

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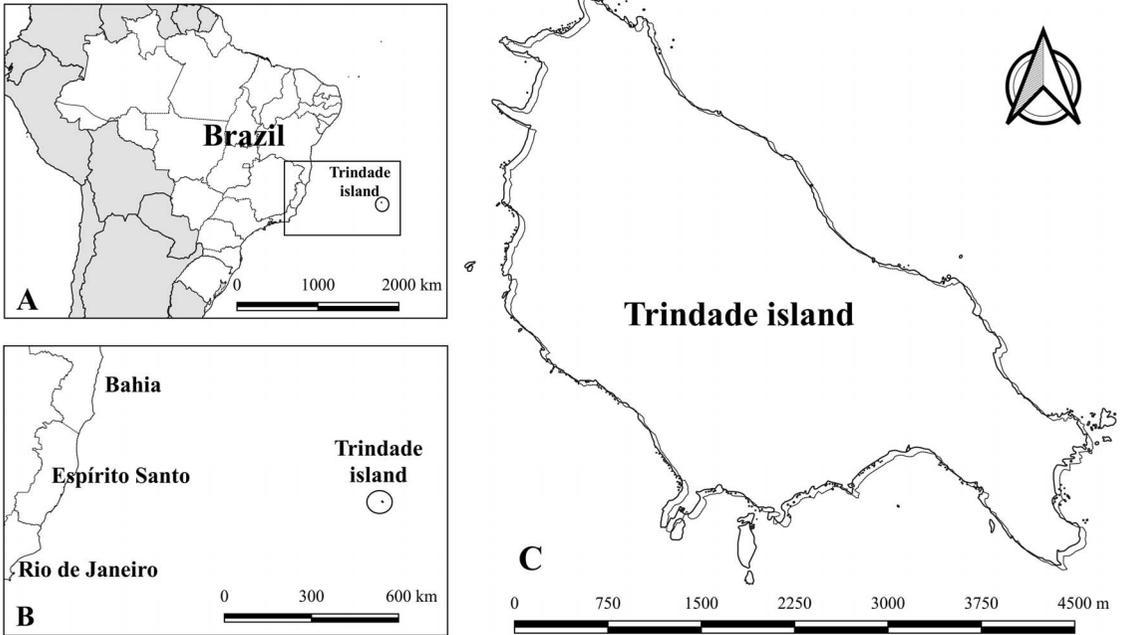


Fig. 1. Trindade Island. (A) Position of Trindade Island in relation to Brazil indicated by a circle in the South Atlantic Ocean; (B) Closer view of the area in the rectangle from panel A shows the neighboring coasts of the Brazilian states of Bahia, Espírito Santo, and Rio de Janeiro; (C) Trindade Island outline.

ed of a 400-ml-capacity black pot without a lid and 4 plywood pallets (Eucatex® plates, Eucatex S/A, São Paulo, Brazil), measuring 2.5×14 cm, fixed vertically inside the trap with paper clips (Alencar et al. 2016). Natural water and water with hay infusion were added to the trap to generate an ecosystem similar to the natural one. Twenty-three ovitraps were installed in different places on the island. The ovitraps were examined and changed every 4 days from August 17 to October 4, 2019 (48 days).

As a result, 33 adults of *Ae. aegypti* were collected via active search inside buildings. A total of 433 eggs were obtained in the ovitraps, and the relative

number in relation to each respective 4-day period is represented in Fig. 2. The eggs were reared, and all of them resulted in adult *Ae. aegypti*. No other species of Culicidae was found. Species determination was performed with direct observation of morphological characters using a stereomicroscope (Zeiss Stemi SV6, Carl Zeiss Microscopy GmbH, Munich, Germany) and consulting the pertinent literature, e.g., Forattini (2002). All identified specimens were incorporated into the Entomological Collection of the Oswaldo Cruz Institute (Fiocruz).

Although it may seem a low number of specimens, 2 factors may influence the results obtained. First, before the study performed by our team in the island, the military personnel had already begun some measures to combat the mosquitoes and, second, this study was conducted in the cooler months of the year, a period when the species is naturally less abundant. Yet the proven presence of *Ae. aegypti* on Trindade Island poses a great danger to the military personnel, taking into account the role of this species as a vector of potentially dangerous arboviruses, currently endemic on the South American continent.

Therefore, as a conclusion of the work, a list of suggestive measures for the eradication and prevention of future infestations by *Ae. aegypti* in the station was presented to the military personnel. On the one hand, as far as we can tell, *Ae. aegypti* must have reached the island carried via military ships, similar to how this species is believed to have reached the New World centuries ago (Powell et al. 2018). On the

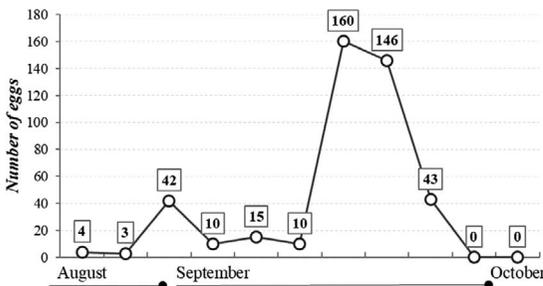


Fig. 2. The number of eggs (in squares) collected by month from August 17 to October 4, 2019. The 4-day period between which the ovitraps were examined and changed corresponds to the interval between each trace on the horizontal line.

other hand, it is noteworthy that with a partial renewal of the fleet, the ships currently arrive in about 3 days from the continent, which may have made it easier for the mosquito to survive the voyage and colonize the island.

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