

**ON THE PRESENCE OF *Aedes (Stegomyia) aegypti*  
LINNAEUS, 1762 (INSECTA, DIPTERA, CULICIDAE)  
IN THE ISLAND OF MADEIRA (PORTUGAL)**

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With 5 figures

*ABSTRACT.* Since October 2005 the population of the yellow fever mosquito *Aedes (Stegomyia) aegypti* Linnaeus, 1762 has expanded in the city of Funchal. In 2008, the mosquito was found in the neighbouring municipalities of Câmara de Lobos and Santa Cruz. A monitoring scheme with ovitraps has been set up and the first results are given in the present paper. During 2009, the ovitraps network will be rearranged in Funchal and expanded to the neighbouring eastern and western municipalities, thereby covering all of the south coast of Madeira. Two sentinel ovitraps will be deployed in the north coast of the island.

KEY WORDS: Diptera, Culicidae, *Aedes aegypti*, Madeira.

*RESUMO.* Desde Outubro de 2005 que a população do mosquito da febre-amarela *Aedes (Stegomyia) aegypti* Linnaeus, 1762 tem vindo a expandir-se no concelho do Funchal. Em 2008, o mosquito foi detectado nos concelhos de Câmara de Lobos e de Santa Cruz. Foi instalado um esquema de monitorização com armadilhas de oviposição e os primeiros dados sobre esta expansão são apresentados no presente trabalho. Durante o ano de 2009, a actual rede de armadilhas de oviposição será reorganizada no concelho do Funchal e será expandida para os concelhos vizinhos a oeste e a leste abrangendo assim toda a costa sul da Ilha da Madeira. Serão ainda colocadas duas armadilhas-sentinela na costa norte da ilha.

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## INTRODUCTION

The mosquito *Aedes (Stegomyia) aegypti* Linnaeus, 1762 is found throughout most of the tropical and subtropical regions of the World within the latitudes 35° N and 35° S, although in summertime this species can migrate to higher latitudes (up to 45° N) (ANONYMOUS, 1997). It was detected in Santa Luzia, Funchal, the capital city of the Island of Madeira, in October 2005 (MARGARITA *et al.*, 2006).

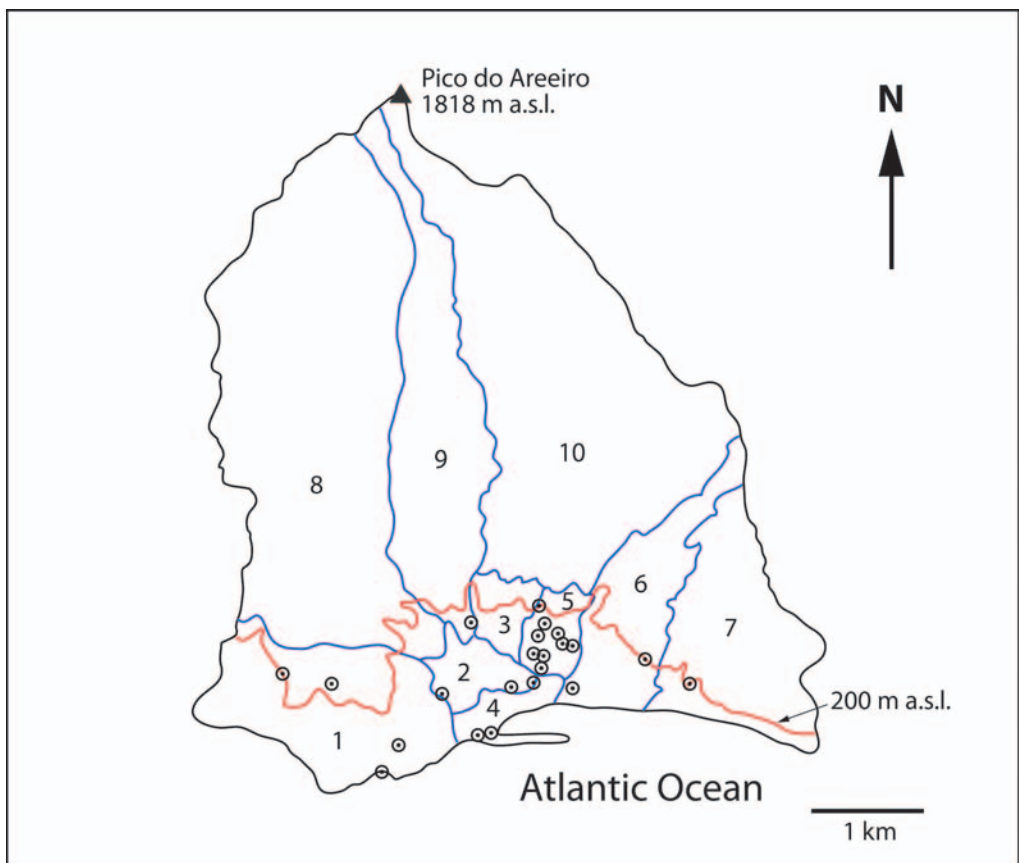


Fig. 1 - Map of the Municipality of Funchal showing the location where ovitraps were set up in the period between 2006 and 2008:

1 - São Martinho; 2 - São Pedro; 3 - Imaculado Coração de Maria; 4 - Sé; 5 - Santa Luzia; 6 - Santa Maria Maior; 7 - São Gonçalo; 8 - Santo António; 9 - São Roque; 10 - Monte.

This Atlantic island is situated between 32° 38' N and 32° 52' N and 16° 39' W and 17° 16' W, about 900 Km southwest of Lisbon. The climate is temperate to subtropical and deeply influenced by the northeast trade winds. Weather conditions vary markedly with altitude and from the south to the north coasts. Along the low areas on the south, temperature ranges are narrow, rarely below 15° C in winter and above 24° C in summer. Humidity is generally above 70%. These climatic conditions, associated with a large in-and-out movement of people and goods, mean the island is very vulnerable to new introductions of tropical and subtropical species. *A. aegypti* is no exception and since its introduction it has not stopped spreading throughout the island, as shown by a monitoring scheme, the results of which are presented herein.

## METHODS

Following the detection of *A. aegypti* in Funchal, the Municipality of Funchal, through the entomology section of the Museu Municipal do Funchal (Natural History) has implemented a surveillance program in order to determine the distribution and expansion of the population of *Aedes aegypti* in the city. Twenty-four ovitraps were set up on March 2006 from sea level to about 200 m altitude (Fig. 1) and stayed in place until December 2008.

Ovitraps used were a modification of the one described by OLIVEIRA *et al.*, (2007), and consisted of a 10 litre black plastic bucket, with a red velvet-paper band fixed on a plastic ruler (Fig. 2), filled with 1.5 litres of tap water and placed in a fully or partially shaded place. Traps were inspected weekly and the red velvet-paper band changed. Egg deposition was recorded (negative / positive) and when applicable, the number of eggs counted using a binocular microscope. On every inspection buckets were cleaned and water changed.



Fig. 2 - Ovitrap.

During 2007, six ovitraps were placed as sentinels outside the city (Fig. 3). These were checked every two weeks, following the same procedure as above.

Air temperature data were obtained from the local meteorological observatory.



Fig. 3 - Map of the Island of Madeira showing the location where ovitraps were set up, outside the city of Funchal, in 2007 (●) and those to be implemented in 2009 (☆).

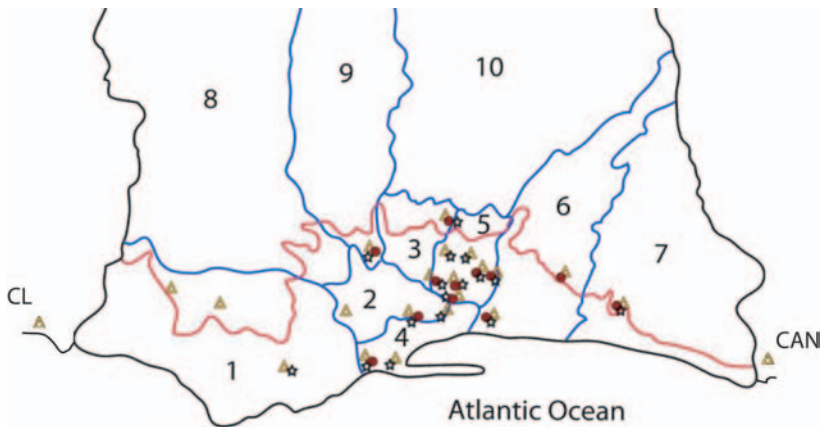


Fig. 4 - Map of the Municipality of Funchal showing the positive traps in the period between 2006 and 2008: ● 2006; ☆ 2007; ▲ 2008.

1 - São Martinho; 2 - São Pedro; 3 - Imaculado Coração de Maria; 4 - Sé; 5 - Santa Luzia; 6 - Santa Maria Maior; 7 - São Gonçalo; 8 - Santo António; 9 - São Roque; 10 - Monte; CL - Câmara de Lobos; CAN - Caniço.

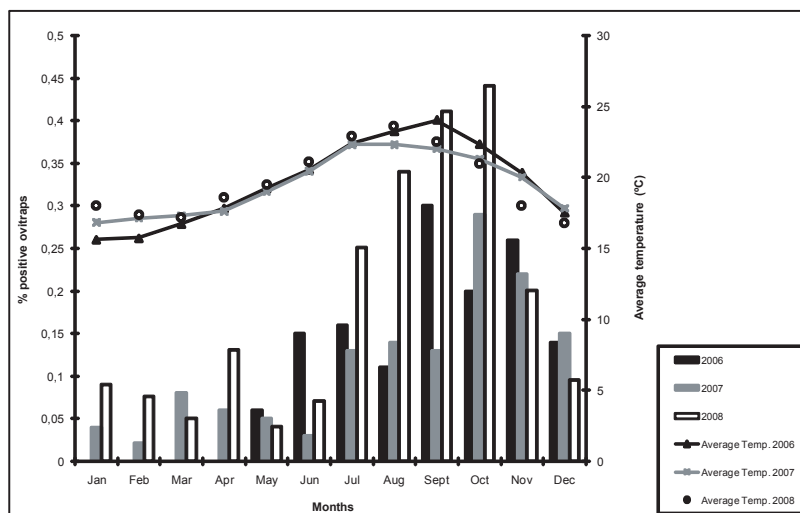


Fig. 5 - Average temperature and percentage of positive traps between 2006 and 2008.

## RESULTS

During the three years studied, the population of *Aedes aegypti* expanded throughout the city of Funchal and in 2008, it was recorded in two neighbouring municipalities: Câmara de Lobos (to the west) and Caniço (to the east) (Fig. 4).

The mosquito was active throughout the year. This activity, measured by the number of positive traps, not only increased over time (2006-2008), but also showed a consistent peak in summer (August and September) and early autumn (October) in the three years studied (Fig. 5).

The maximum number of eggs recorded in one trap was 500 on 13 October 2006.

## DISCUSSION AND CONCLUSIONS

The results obtained show a clear increase, not only in the geographical expansion of the species, but also in the monthly activity over the three-year period. The activity of the species, measured by the number of positive traps, follows the temperature variation during the year (Fig. 5). Average temperatures above 20° C correspond to 25% or more positive traps and the peak of positivity coincides with the summer peak of temperature. The highest number of positive traps occurred in October 2008, slightly after the temperature peak. One explanation for this may be the increase in the mosquito population, associated with an abnormally high rainfall for that month (29 l/m<sup>2</sup>).

Government authorities have launched an awareness campaign to inform people about how to control the presence of this species. In addition some insecticide sprayings have been done in designated areas of the city. The results of this monitoring experience show that those actions have not been enough to control the population of *A. aegypti* in Madeira. The local tradition of having many pot plants at home, most of them with plates to prevent water spilling, greatly favour the multiplication of *A. aegypti*, which is well known as a peri-urban species (GADELHA & TODA, 1985). Strict measures to change this behaviour must be implemented if the expansion of this species is to be controlled.

In view of the present results a new monitoring scheme will be implemented in 2009 (Fig. 3). Twenty-seven ovitraps will be set up in the urban area of the city of Funchal. A series of 16 ovitraps will also be placed in some villages along the south coast of Madeira and two on the north coast.

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