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Daily oviposition activity of *Aedes aegypti* in Orán, Argentina

ABSTRACT

The study aimed to determinate the maximum daily peak of *Aedes aegypti* oviposition in the city of Oran, northwestern Argentina. Biweekly samplings were taken between November 2006 and February 2007 (spring-summer). The city was divided into three areas (north, center, and south) and households were randomly selected. Two ovitraps were placed outdoors in the selected houses. Ovitraps were replaced every four hours, from morning (8 a.m.) to late afternoon (8 p.m.). The largest number of eggs was recorded between 4 p.m. and 8 p.m. (81%). These findings enhance our understanding of the vector and thus its control such as spraying during the hours of peak oviposition activity.

DESCRIPTORS: *Aedes*, growth & development. Oviposition. Insect Vectors. Dengue, prevention & control.

INTRODUCTION

More than 2.5 billion people in tropical and subtropical regions of the world are at risk of dengue. Factors associated with the dissemination of dengue include geographic expansion and spread of dengue virus and its vector *Aedes aegypti* and rapid increase in vector populations resulting in a greater number of susceptible people, especially in areas favorable for breeding, among others.[a] In the province of Salta, northwest Argentina, dengue cases are reported every year, especially in the northern towns of the province, where it is located the city of San Ramón de la Nueva Orán, near the border with Bolivia,[b] where this study was conducted.

It is crucial to understand vector biology, and thus daily oviposition activity of a vector. The present study aimed to determine peak hours of daily *Ae. aegypti* oviposition activity in the city of San Ramon de la Nueva Orán, Argentina.

METHODS

San Ramon de la Nueva Orán (23° 08' S, 64° 20' W) is the farthest city of the department of San Ramon de la Nueva Orán and lies 270 km from the capital city of Salta. This is a subtropical area, although there are one or two frosts in July (winter season). Temperatures range from 11.5ºC to 44.5ºC in the summer and –3.6ºC to 38.9°C in the winter. The accumulated annual rainfall is greater than 1,000 mm and average annual relative humidity is 78%.[b]

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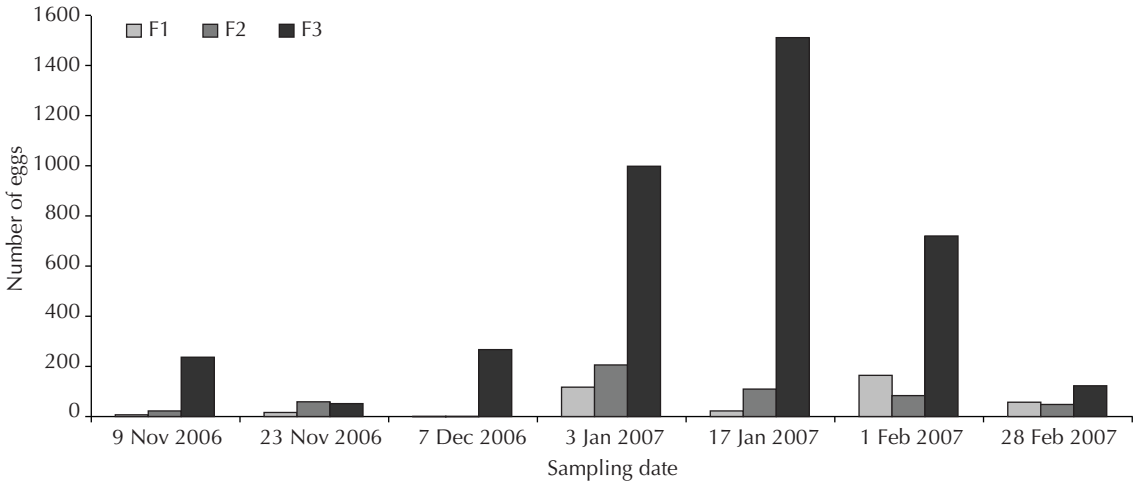
[b] Ministerio de Defensa. Secretaria de Planeamiento. Servicio Meteorológico Nacional. Buenos Aires; 2000[cited 2009 Oct 26]. Available from: http://www.smn.gov.ar/



Note: T1: 8 am to 12 pm; T2: 12 pm to 4 pm; T3: 4 pm to 8 pm.

Figure. Number of *Aedes aegypti* eggs sampled according to timeslots. Orán, Salta, Argentina

For determining peak hours of daily *Ae. aegypti* oviposition activity samples were collected fortnightly between November 2006 and February 2007 (spring-summer). For operational procedures the city of Orán was divided into three areas (north, central and south) and 10 households were selected in each area with the use of a random number table. Two ovitraps were placed in the selected houses. Ovitraps were active for a day and replaced every four hours. Three timeslots were studied: T1, 8 am to 12 pm; T2, 12 pm to 4 pm; T3, 4 pm to 8 pm) (GMT time zone –3) covering from morning to sunset.

Ovitraps consisted of 350-mL plastic bottles (8 cm wide x 9 cm high) with a cylinder of brown filter paper inside. They were placed outdoors in the houses, in the shadow on the ground or at a maximum height of 50 cm. Both ovitraps in each house were placed close together (maximum distance of 50 cm between them). Each contained 250 mL of an infusion made from dried grass mashed together in a water vial for a week. This infusion is recommended by the World Health Organization (WHO) as it provides an olfactory stimulus that attracts gravid females to oviposit.[c] Each ovitrap was labeled with date, number and timeslot it was active.

We compared the number of eggs recorded in different timeslots using ANOVA. To assess the assumptions of normality and homogeneity of variance, the number of eggs "N" was converted to Ln (N+1).

RESULTS

Ovipositions were recorded in all sampling dates, although at different intensities depending on the timeslot. On December 7, 2006, there were eggs only in T3 (Figure), but eggs were collected in all three timeslots in the remaining dates. A total of 385 eggs were collected in T1, 524 eggs in T2, and 3,902 eggs in T3 (81% of all eggs collected). There were thus detected significant differences between timeslots ($F = 5.65$; $gl = 2:18$; $p<0.05$).

DISCUSSION

According to Nelson (1986),[d] both blood meal and oviposition by female mosquitoes occur mainly during daylight hours. Most activity occurs in the first hours after sunrise, mid-morning and sunset hours. However, Rodhain & Rosen[3] (1997) reported that the biology of these mosquitoes can vary depending on specific local characteristics. In the present study In Orán, daily oviposition activity of *Ae. aegypti* showed a major peak between 4 pm and 8 pm. In a study[1] conducted in Belo Horizonte, southeastern Brazil, during March 2002, oviposition activity was recorded every two hours from sunrise (5:15 am) to sunset and during the night. An increased activity was recorded during photophase (1:15 pm to 5:15 pm), while during scotophase an increased activity was observed during the first two hours of sunset (5:15 pm to 7:15 pm). Although sampling started at 5:15 am, oviposition activity was

[c] Reiter P, Nathan MB. Guías para la evaluación de la eficacia del rociado especial de insecticidas para el control del vector del dengue *Ae. aegypti*. Geneva: World Health Organization; 2001[cited 2005 May 03]. Available from: http://whqlibdoc.who.int/hq/2003/WHO_CDS_CPE_PVC_2001.1_spa.pdf

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only observed at 7:15 am (2 hours after sunrise), and was minimal throughout the morning until 11:15 pm.[1] These data are consistent with those reported in our study in Orán, where most activity was recorded in T3 that ended at 8 pm, i.e., half an hour after sunset (7:30 pm). Moreover, during the study in Orán, when sunrise was at 6:45 am, there was also minimal oviposition activity in the morning (8 am to 12 pm), similar to that reported in Belo Horizonte.

Studies on the hematophagous activity of *Ae. aegypti* conducted in Uganda, east Africa, found activity in the evening (one or two hours before sunset). They also reported a smaller peak, two or three hours after sunrise.[2] Similarly, a study in Bangkok, Thailand,[4] showed a first peak of hematophagous activity after 8 am, although sampling began at 6 am at sunrise in the city. The hematophagous activity in Bangkok is increased during the rainy season, with peaks in the morning, noon and sunset and few mosquitoes are caught after dark while during dry seasons (cold and warm) there are only two peaks of activity (morning and sunset hours).

Local characteristics and seasons can certainly affect both hematophagous and oviposition activities. Therefore, knowing the oviposition activity of *Ae. aegypti* is important from both a biological and an epidemiological perspective. Better understanding the biology of *Ae. aegypti* and the time of the day when peak hematophagous and oviposition activity occurs may help vector control (spraying at specific times) in cities like Orán where dengue is endemic.

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