OVIPOSITION AND BITING PATTERNS OF *AEDES TRISERIATUS* IN THE FLOOD PLAINS OF FORT BEND COUNTY, TEXAS

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ABSTRACT. *Aedes triseriatus* deposited eggs at all tree heights between ground level and 3.7 meters, from June through early August, 1985, in a flood plain area of Fort Bend County, TX. Percentage of eggs decreased with increasing oviposition heights and greater preferences were found for ground level and 1.2 meters. More eggs were deposited at all heights in June than in July and August. Weekly biting activity of the mosquito was recorded for a 24-hour period throughout the study. Biting occurred during the day with early morning and late afternoon peaks and continued into the crepuscular period.

INTRODUCTION

Aedes triseriatus (Say), commonly incriminated as the vector of LaCrosse encephalitis virus in the midwest (Thompson et al. 1972, Watts et al. 1972) is widely distributed in the wooded areas of central and south Texas (Darsie and Ward 1981). Traditionally organized mosquito surveillance has been directed towards *Ae. aegypti* (Linn). Surveillance of *Aedes triseriatus* in the Texas Gulf Coast has not been routinely performed by mosquito control and public health agencies. Recent laboratory demonstration by Freier and Grimstad (1983) that strains of *Ae. triseriatus* and *Ae. hendersoni* Cockerell were susceptible to dengue type 1 virus, reflects the importance of studying these species both in the urban and sylvan situations.

Vertical oviposition stratification (Sinsko and Grimstad 1977, Loor and DeFoliart 1970, Clark and Craig 1985) and biting cycles (Loor and DeFoliart 1970, Sinsko and Grimstad 1977, Scholl and DeFoliart 1977, Scholl et al. 1979, Clark et al. 1985) for this species has been demonstrated in the midwest. This research effort was conducted in the flood plains of the Brazos River in Fort Bend County, TX, with a view to determine the ovipositional stratification and temporal biting cycle of *Ae. triseriatus*. The results of this preliminary study could direct research aimed at facilitating future control programs for the area.

MATERIALS AND METHODS

The study was conducted June through early August 1985 in the flood plains of the Brazos River, approximately 12.4 km south of Houston, TX. The area was an isolated wooded section surrounded on two sides by a 500 m wide drainage channel and open pastures on the other two sides. The wooded section consisted primarily of cedar elm (*Ulmus crassifolia*), hackberry (*Celtis laevigata*), white ash (*Fraxinus americana*), and slippery elm (*Ulmus rubra*). Less abundant trees consisted of soapberry (*Sapindus saponaria*), bumelia (*Bumelia lanuginosa*), osage orange (*Maclura pomifera*) and live oak (*Quercus virginiana*). The total density of trees in the area was 800 trees/ha, with tree heights of approximately 11–14 meters. The undergrowth vegetation was very scanty and the area was subject to flooding during late winter and early spring.

Thirty trees were selected at random and ovitraps were suspended at ground level (0 m) and at heights of 0.6, 1.2, 1.8, 2.7 and 3.7 m. The ovitraps consisted of 400 ml plastic tumblers lined with paper towels. Fluid for the ovitraps consisted of a 300 ml mixture of tree hole fluid and rainwater. The tree hole fluid was siphoned out by hand pump from the natural tree holes in the area and detritus filtered through layers of muslin fabric. The filtered fluid was mixed with rain water to increase the volume. Wooden tongue depressors covered with paper toweling were used as egg substrate and were changed weekly throughout the study. Tongue depressors and toweling around tumblers were dried and eggs counted under a microscope.

Identification was made using the key to aedine mosquito eggs (Horsfall and Craig 1956), and further confirmed by rearing larvae and adults to separate this species from its sympatric species *Ae. hendersoni*, based on the criteria of Grimstad et al. (1974). Distribution of eggs deposited at different heights was analyzed using a split plot analysis with trees (blocks) heights (treatment) as main plot and month (time) as subplot. A protected LSD mean separation test was used to separate means (Steel and Torrie 1980).

Biting captures were made at ground level with one person sitting motionless with sleeves rolled up and another person collecting. Nighttime collections were made with a flashlight. Clear vials were used to collect the mosquitoes soon after they started to probe. Vials were labeled by time and area, all mosquitoes were killed by freezing and identified in the field laboratory. This procedure was followed over a 24-hour period weekly throughout the study. Hourly collections were made for 3 hours and

while these collectors rested, another pair collected for 3 more hours.

Species determination was made using Darsie and Ward (1981). No *Ae. hendersoni* were encountered. In addition to adult captures, eggs and larvae were collected and reared out to the adult stage throughout the study. When *Ae. albopictus* (Skuse) was reported from neighboring Harris County in 1986, Jack Hayes returned to this study area and collected larvae from the original tree holes and reared the material through to the adult stage, and again only *Ae. triseriatus* was present. Representative material was re-examined using the keys in Zavortink (1972), and no *Ae. hendersoni* were encountered. If this species was in the area, its numbers were low. We feel this data reflects a relatively isolated population of *Ae. triseriatus.*

RESULTS AND DISCUSSION

A total of 49,622 eggs were collected at the 6 tree heights over the period of study. All trees and heights between ground level and 1.2 m were positive for eggs. At heights ranging between 1.8 and 3.7 m, the majority of eggs were deposited in trees located in the inner (dense) part of the woods. Trees along the edge and sparser sections exhibited negative egg deposition at the upper heights. Approximately 55% of the eggs collected at all heights hatched and were reared to adult stage. Eggs for hatching were separated according to height and week of the month; however, no data on the rate of hatching is given here.

Mean percentage of eggs deposited decreased with increasing ovipositional heights (Fig. 1). Oviposition preference was strongest for heights less than 1.8 m. Heights between ground level and 1.2 m cumulatively yielded more than 50%

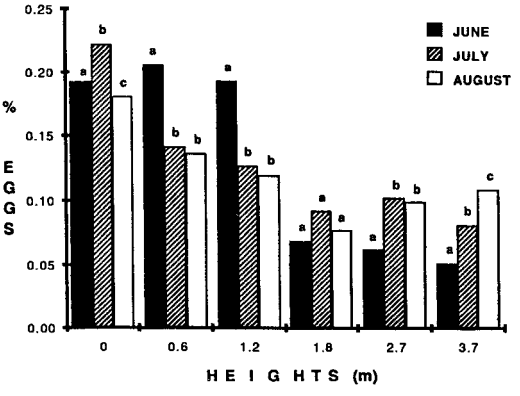

Fig. 1. Vertical distribution of eggs of *Aedes triseriatus*, June–August, 1985, Fort Bend Co., Texas. Means within a height followed by the same letter are not significantly different (Protected LSD) ($P > 0.05$).

of the eggs. This ground level preference agrees with the works of Sinsko and Grimstad (1977), Scholl and DeFoliart (1977) and Loor and DeFoliart (1970) for the same species.

No difference was found in the mean percentage of eggs for June, July, and August; however, the vertical stratification of eggs varied during this time. Fewer eggs were deposited during June than during July and August at heights exceeding 1.8 meters. In contrast, more eggs were recorded between ground level and 1.2 m during June and July than during August. In the Texas Gulf Coast, rainfall and warming temperatures induce hatching of eggs in early spring. Thus, peak oviposition probably occurred earlier than June. High temperature and continued drought caused the majority of the natural tree holes and ovitraps to dry up toward the end of July. However, fluid level was maintained at approximately 300 ml for each ovitrap throughout the study.

Aedes triseriatus was active throughout the daytime hours and biting reached its greatest peak at dusk (Fig. 2) which is in contrast to Loor and DeFoliart (1970) who rarely recorded biting after 2000 hr. Figure 2 presents the average bites per man hour over the study period. The maximum numbers encountered were in July—25 per man hour at 0700–0800 hr, [which corresponds with Loor and DeFoliart (1970)], and rises to 30 per man hour at 1800–1900 and peaks at 0500 hr with 45 per man hour. There was no biting activity between 0300 and 0500 hr and a drop in daytime activity occurred between 1500–1800 hr. Our impression is that the overall man biting density of this species was low, which we attribute to alternate host preferences and distribution of mosquitoes within the wooded area. The reader should remember this area is feral and the nearest human habitation is over 2 km away. Thus previous man-mosquito contact is considered minimal.

The high probability of future residential development for this area prompted the study of this important vector species. Observations over 2 years (1984–86) have revealed that late summer dry weather dries up nearly all the natural tree holes and those ground level tree holes near the margin of the pastures are often "filled in" by fire ants (*Solenopsis* sp.). *Toxorhynchites* larvae were collected in nearly 80% of all tree holes sampled when we first selected the study area; however, in the tumblers (ovipositional sites) there were very few *Toxorhynchites* larvae or eggs encountered. Thus no data were collected on this species. Our impression was that in the natural tree holes initially surveyed that the numbers of *Ae. triseriatus* were higher in the sites where *Toxorhynchites* were not encountered. Large numbers of deer and cattle possibly

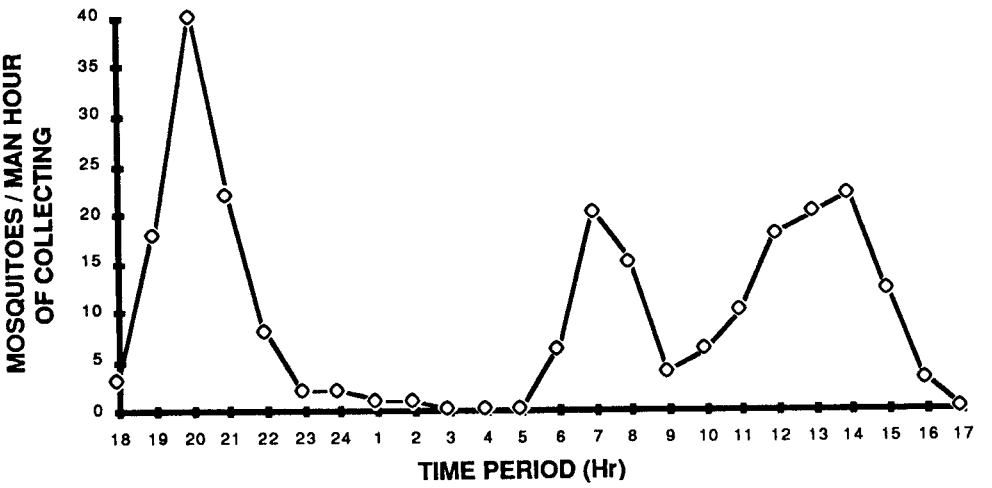

Fig. 2. Temporal occurrence of biting *Aedes triseriatus*, June–August, 1985, Fort Bend Co., Texas.

account for the low numbers coming to feed on man. The capacity of *Ae. triseriatus* to survive adverse conditions and flourish after spring rains emphasizes the importance of monitoring the species as this area becomes urbanized. Source reduction (elimination of artificial containers) will be critical as the ruminant population declines and homes are built in these wooded areas.

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