ple feeding by *L. longipalpis* in this study would appear to be oviposition mortality. We attribute our success in lowering mortality of this species to keeping all adult flies in an essentially quiescent state whenever possible. During the course of rearing procedures it was observed that under the standard lighting conditions used at the time, adult agitation and general activity were marked. By placing all adult colony and holding cages under sheets of semitranslucent polyethylene black plastic, the general level of activity in the cages was noticeably reduced and daily mortality decreased. When left unhandled or undisturbed in this manner for several hours, adult flies would appear moribund with considerable agitation being necessary to induce a taxis.

As noted in the introduction, significant differences appear to exist in the multiple feeding aptitude of different sand fly species. Guilvard et al. (1980) reported that *Phlebotomus ariasi* Tonnoir undergoes at least 3 anautogenous gonotrophic cycles in nature, and Ward (1977) has demonstrated that individuals of *L. flaviscutellata* may refeed and oviposit up to 4 times. Conversely, Johnson and Hertig (1961) showed that the majority of *L. sanguinaria* examined in their study died at the first oviposition or refused a second feed while Chaniotis (1967) reported similar findings with *Phlebotomus vexator occidentis* Fairchild and Hertig. The results of our study suggest *L. longipalpis* may refeed and complete up to 2 gonotrophic cycles in the laboratory and indicate the feasibility of using this species for cyclical disease transmission studies (Killick-Kendrick et al. 1977a).

Although the ability to survive oviposition and refeed represent an important aspect of sand fly vector potential, the role of interrupted partial feeding or probing may also be noteworthy. Dhanda and Gill (1982) noted mixed bloodmeals of human, bovine and rodent origin due to partial feeding in *Phlebotomus papatasi* Scopoli and *P. argentipes*. Killick-Kendrick et al. (1977b) reported that leishmania-infected *L. longipalpis* tend to probe more frequently than uninfected flies. Our own observations with *L. longipalpis* indicate this species will bite and probe repeatedly even after totally replete with blood. These facts might indicate that interrupted feeding or probing constitute as likely a manner of disease transmission for some species as complete gonotrophic cycles.

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THE PRODUCTION OF *AEDES AEGYPTI* BY A WEEKLY OVITRAP SURVEY

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The presence of dengue in the Caribbean nations has necessitated surveillance of local *Aedes aegypti* (Linn.) populations in the southern

United States. Surveillance methods involve sampling the egg (Anonymous 1979, Fay and Eliason 1966, Jakob and Bevier 1969), larval (Anonymous 1973, Sheppard et al. 1969) and adult populations (Fay and Prince 1970, Van Peenen et al. 1972).

Oviposition traps have been especially popular due to their effectiveness and convenience. Fay and Eliason (1966) found that an inspector could cover 3 to 5 times more area conducting ovitrap vs. larval surveillance at up to 25% of the cost. The standard *Ae. aegypti* ovitrap consists of a black-painted quart jar into which a wooden or hardboard paddle is placed. The jar is partially filled with water: Frank and Lynn (1982) suggest infusion water. Female *Ae. aegypti* oviposit on the paddle immediately above the water line. Traps are generally serviced (paddles and water replaced, cup wiped clean) every 7 days (Anonymous 1979, Jakob and Bevier 1969). Longer trapping periods increase the risk of egg loss through predation and hatching which could lead to the production of adults (Frank and Lynn 1982).

Shorter trapping periods have also been used. Fay and Eliason (1966) used 1, 3 and 4-day trapping periods. Nayar (1981) used a 1-day trapping period to pinpoint temporal oviposition patterns in a mark-release-recapture experiment. Frank and Lynn (1982) used 1 and 2-day regimes. Long trapping periods which produced adult mosquitoes would bias the survey (Frank and Lynn 1982). Therefore, Frank and Lynn (1982) recommend that ovitraps be serviced no less frequently than every 5 days in hot weather.

The oviposition trap, adapted from Anonymous (1979), consisted of a 511 ml (18 oz) red plastic cup (12 cm height; 10 cm diam) painted inside with flat-black spray paint. A 0.25 cm dribble hole was drilled 3 cm from the top to prevent inundation which would cover the oviposition paddle. A wooden paint paddle (13 × 3 cm), serving as the oviposition substrate, was attached inside the cup with a paper clip. Traps were filled with ca. 4 cm of well water then placed into black-painted cement half-blocks which provided protection from tipping. Fifteen ovitraps were set in areas of western Collier County, FL known to sustain populations of *Ae. aegypti* (Ritchie 1982). Traps were serviced weekly for 21 weeks (June 22–November 11, 1982). The eggs on the paddle and larvae, pupae and pupal exuviae in the trap water were tallied. Adult production was determined by the number of pupal exuviae. Meteorological data were provided by Jungle Larry's African Safari, Naples, FL, which is centrally located with regard to trap placement.

The paddle counts of eggs totaled 2112, an average of 140.8/trap (SD = 241.3, range 0 – 990). An average weekly frequency of 0.30 traps (SD = 0.26, range 0 – 0.95) contained 1+ eggs on the paddle. Larval production was lower. A total of 281 larvae were tallied, an average of 18.7/trap (SD = 33.8, range 0 – 136). Average weekly frequency of traps with 1+ larvae was 0.16 (SD = 0.18, range 0 – 0.70). Pupal production was much lower. Only 15 pupae were counted, an average of 1.0/trap (SD = 1.6, range 0 – 5). An average weekly frequency of 0.03 traps (SD = 0.04, range 0 – 0.10) contained pupae. Adult production was similarly low. Ovitraps produced 14 adults; an average of 0.9/trap (SD = 1.5, range 0 – 5). Average weekly frequency of traps producing 1 or more adults was 0.03 (SD = 0.05, range 0 – 0.15).

However, a simple count does not represent the true number of larvae and pupae produced by an ovitrap. An absolute count would incorporate the previous stage(s) (e.g., adult tallied as adult, pupae and larvae). Thus a trap containing 5 larvae, 3 pupae and 2 pupal exuviae has in fact produced 10 larvae, 5 pupae and 2 adults. This procedure was used to examine the fate of hatches in ovitraps. Of 54 hatching episodes (which produced 310 larvae), 15 subsequently produced 29 pupae and 10 subsequently produced 14 adults. Considering that 15 traps were exposed for 20 weeks (a total of 300 trap exposures), the frequency of trap exposures producing hatching was 0.18. The frequency of trap exposures producing pupae and adults was 0.05 and 0.03 respectively. (This frequency was based on the number of hatching episodes divided by 300 trappings.)

Meteorological data for the trapping period indicated a consistent hot, wet period. Average temperature for the months of June, July, August, September and October was 26.8, 27.4, 27.6, 27.1 and 24.7°C respectively. Rainfall for these months was 35.79, 19.91, 19.13, 21.13 and 8.03 cm, respectively.

The ovitrap used in the study, while nonstandard, does not detract from the value of the data. Clearly the trap was an ovipositional attractant for *Ae. aegytpi* and may have been comparable to standard traps. Kloter et al. (1983) found no significant differences in egg deposition between ovitraps made from black plastic vs. glass jars and traps baited with fiberboard vs. velour paper paddles. Therefore, while the nonstandard trap prohibits direct comparison of data generated from studies utilizing standard traps, the data do verify the threat of mosquito production in ovitrap surveys.

A weekly trapping period appears to be the maximum length that *Ae. aegypti* ovitraps can be set in warm weather without significant production of adults. Trapping periods shorter than a week would probably not produce adults. The minimal embryonation time for *Ae. aegypti* is 20 hr and the mean time to pupation is 6 days at 28°C (Christophers 1960). Usually the pupal stage lasts 2 to 3 days (Anonymous 1979). Thus, considering the crowded, food-limiting conditions of a weekly serviced ovitrap, production of adults would seem unlikely. However, longer trapping periods would produce adults which would defeat the purpose of the survey. The hot, wet weather during the study suggests that a weekly trapping regime would produce a minimal number of additional adults in even tropical climates.

The weekly trapping period has several advantages over shorter periods when used in general *Ae. aegypti* surveys. A longer trapping period is more sensitive. Frank and Lynn (1982) found the percentage of positive ovitraps increased with the time of exposure. Thus, longer trapping periods would be more likely to detect low level populations than shorter regimes. Additionally, the longer regime would increase the number of eggs/trap, thus increasing the statistical reliability of the data.

A weekly trapping period provides for continuous trapping. Continuous trapping (trap constantly in operation) reduces bias due to bad weather (i.e., conditions unfavorable for oviposition) and brood effects (i.e., local synchronous emergence followed by a 4–5 day lag in oviposition (Fay and Eliason 1966)). A noncontinuous trapping period increases the likelihood of such biases.

A weekly trapping period is more economical and efficient. Considering a 2-day trapping period where the inspector must service traps twice/week, a weekly regime would halve the costs and time.

Short trapping periods are advantageous in certain situations as they pinpoint temporal changes in oviposition more effectively than longer regimes. Fay and Craig (1969) used a 1-day trapping period to analyze the integration of released, genetically marked *Ae. aegypti* into natural populations at Meridian, Mississippi. Nayar (1981) also used a 1-day regime to determine the ovipositional history of released adults.

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ATTRACTION OF SIMULIIDAE TO DIFFERENT COLORS ON HUMANS—FIELD TRIAL

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Simuliid flies mostly depend on host stream and visual stimuli to orient themselves for a blood meal. For selection of the host, color plays an important role (Service 1977). In Canada, Davies (1972) compared the attraction of simuliids to a variety of colored garments and found that yellow, green and orange colors were less attractive than white and much less than maroon, purple or gray. Bradbury and Bennett (1974) compared the numbers of simuliids landing on two dimensional, white, yellow, red, blue and black colored silhouettes. Carbon dioxide was released near the targets to provide a general upwind attractant. It was