Arboreal Breeding Sites of Phlebotomine Sandflies in Panama[1, 2]

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ABSTRACT

Arboreal phlebotomine sandfly larvae are reported for the first time. From 70 quart-sized samples processed from 26 trees in Panama, 12 larvae were recovered from 4 sites at 20, 29, 36, and 40 feet above the ground. Eight of the larvae were reared to the adult stage and identified. The adults were: 1 ♂ and 1 ♀ of *Lutzomyia micropyga* (Mangabeira), and 2 ♂ and 4 ♀ of *L. dysponeta* (Fairchild & Hertig). It is suggested that when sandfly control is attempted, arboreal breeding sites should be considered since some man-biting species may develop there.

Larvae of phlebotomine sandflies have been found in various parts of the world. An extensive review of the literature on sandfly breeding places is given by Hanson (1961). According to him, only about 60 specimens of immature sandflies had been found in the New World prior to his study. Hanson's investigation in Panama turned up 2258 larvae and pupae of which 600 were reared to the adult stage and identified. The bulk of these specimens was obtained from the top 1 or 2 in. of soil between the buttresses of trees. It has been assumed that sandfly larvae live on, under, or near the surface of the soil. Occasionally, larvae will climb a short distance up a vertical surface to pupate, in laboratory breeding vessels. Pifano (1941) found about a dozen larvae in a hole in the wall of a house in Venezuela, and Deane and Deane (1957) found a few larvae in scrapings from the trunks of trees in Brazil. As far as I can determine, no larval sandflies have been reported previously from truly arboreal situations.

Field observations had shown that some species (especially *Lutzomyia trapidoi* (Fairchild & Hertig)) are often more abundant in the forest canopy than at ground level. Also, members of our staff have sometimes seen sandflies resting on tree trunks or in tree holes high above the ground. Because of these observations, I thought it possible that some species might oviposit and pass through their larval stages in the trees as well. For these reasons this study was initiated.

MATERIALS AND METHODS

Samples of dead leaves and detritus were collected by hand from likely looking tree sites. Sometimes it was necessary for field men to use tree-climbing spurs to scale the trees. Each sample consisted of a filled quart-sized jar which was capped in the tree, labeled on the ground, and then returned to the laboratory for examination.

At the laboratory, samples were washed and

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FIG. 1.—Collecting site no. 4 (in large hollow tree) from which *Lutzomyia dysponeta* was collected.
FIG. 2.—Collecting site no. 1 (in small tree hole) from which *L. micropyga* was collected.

screened, and the material on the fine 40- and 60-mesh screens was placed in a concentrated sugar solution to float the animal life (after the method described by Hanson 1961). The washed leaves and larger particles on the coarse 20-mesh screen were placed in a water-filled Baermann funnel and left standing for at least 3 hr. At half-hourly intervals, samples from the bottom of the funnel were removed and examined under a dissecting microscope. Several larvae that had not been dislodged from the leaves in the 1st washing were recovered by the funnel technique.

Living sandfly larvae recovered by this method were reared to the adult stage by methods described by Hertig and Johnson (1961). The adults thus obtained were cleared in phenol solution and identified to species.

ARBOREAL COLLECTING SITES

In the Panamanian forest there are many places in the trees where fallen leaves, dead insects, animal feces, and other material accumulate. On the upper surfaces of large limbs, around the roots of arboreal plants, between simple and multiple tree forks, within vertical or horizontal tree holes and hollows, may often be seen accumulations of litter not unlike those seen on the forest floor. Therefore, it is not surprising that various species of sandflies may oviposit in these sites. In the present study, I could not reach and sample all the kinds of potential sites, but samples were taken from 26 different trees that represented many different habitats. Sandfly larvae were recovered from 4 sites which are here described in detail. Tentative botanical determinations were obtained with the aid of Allen's (1956) publication.

Site no. 1.—The 1st arboreal site from which a sandfly larva was recovered was a medium-sized tree of undetermined species. This tree was growing about 10 ft from a large vine-covered "espave," *Anacardium excelsum*, and was well shaded. The specimen tree measured about 2 ft in diam above the small buttresses and 14 in. thick at a height of 20 ft from the ground where a series of large limbs branched out. One of the larger limbs had a triple fork 29 ft from the ground. In the center of the fork was a hole (Fig. 2) 7 inches in diam leading to a hollow 10 in. deep. This tree hole contained water during the rainy season and falling leaves that lodged in the entrance were thus kept moist. The sandfly larva was obtained from rotting leaves above the water level in the hole.

Site no. 2.—The 2nd positive site consisted of a rubber tree, *Castilla panamensis*, about 2 ft in diam. At 20 ft above the ground 4 large limbs branched out in different directions. The small enclosed area at the bases of the limbs served to catch and hold falling leaves and served as a breeding place for sandflies.

Site no. 3.—This site was in a large (46-in. diam above the buttresses) tree called locally "amarillo," *Terminalia* sp. The trunk of the tree was hollow as were some of the major branches. At the base of 1 of the large lateral limbs a basinlike hollow 2 ft in diam and 10 in. deep had formed. This hollow opened upward and caught falling debris. The rotten wood in the basin tended to hold moisture and keep the

Table 1.—Larvae of *Lutzomyia* from arboreal sites in Panama.

Date of collection	Site no.	Height above ground (ft)	Results
21 June 66	1	29	1 ♂ *micropyga*
5 July 66	2	20	2 dead larvae
7 July 66	2	20	1 dead larva
8 July 66	3	40	1 ♀ *micropyga*
12 July 66	3	40	1 ♂, 3 ♀ *dysponeta*
12 July 66	2	20	1 ♀ *dysponeta*
9 July 67	4	36	1 ♂ *dysponeta*
19 July 67	4	36	1 dead larva

debris damp. This site measured 40 ft from the forest floor.

Site no. 4.—This site was in a large (6-ft diam above the buttresses) "espave" tree. At a level 36 ft above the ground the tree had a hollow 4 ft in diam by 11 ft high (Fig. 1). Part of the hollow was open above, and a small strangler fig, *Ficus* sp., grew from the rim of the hollow. Sandfly larvae were found in the dead leaves at the bottom of the hollow.

RESULTS

Table 1 shows results of processing 70 samples from 26 trees. The adult specimens reared consisted of 1 ♂ and 1 ♀ of *L. micropyga* (Mangabeira), and 2 ♂ and 4 ♀ of *L. dysponeta* (Fairchild & Hertig). Since it is not yet possible to identify immature stages of sandflies, it is not known if the dead larvae were of the same or of different species.

All my larvae were found in the rainy season, June or July. During the dry-season months of December, February, March, and May, 28 samples were processed with negative results. Since Panamanian sandflies require a moist habitat, it would appear that the dry season reduces the number of possible arboreal breeding places. However, it should not be assumed that no sandfly larvae exist in the trees during the dry season, as there may well be deep hollows or other sites that retain enough moisture for breeding activity. Even on the forest floor, sandfly breeding is reduced, but not eliminated, during dry weather.

It is not known at present if some species oviposit exclusively in arboreal sites, or whether species breed both in the trees and on the ground. Hanson (1961) found 23 larvae of *L. dysponeta* in the soil between the buttresses of trees and an additional larva of the same species in soil under tree roots. However, he did not report any specimens of *L. micropyga*.

Even though no man-biting species were recovered during my study, some of these species may oviposit in trees. In the event that local control of these insects is attempted, possible arboreal breeding sites should be considered.

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