

larvae and pupae along Poso Creek into January, after they could no longer be found on the valley floor, may indicate that milder temperatures in the foothill belt favored their survival.

Field observations at Poso Creek were extended to determine whether this persisting population of older larvae and pupae was culminating in successful emergence of adults. Three metal cylinders (12 inches in diameter) were set perpendicularly in the creek in about a foot of water and adapted to serve as emergence cages. Pupae were collected and placed in the cylinders and inspected each day from January 12 to 23 for adult emergence. The entire procedure was repeated from January 25 to February 5. A total of 74 adult *C. tarsalis* (37 males, 37 females) emerged during the two periods. Adults of other species that emerged were: *Culiseta inornata* (Williston) (155 males, 82 females), *Culex wyethorax* Dyar (2 males, 1 female), and *Anopheles franciscanus* McCracken (1 female).

Bellamy and Reeves (1963) believed that overwintering of *C. tarsalis* in Kern County depended upon an autumn generation of adults and that the mated females persisted through early winter, took blood in January and February, and subsequently deposited eggs in the early spring. The present observations are consistent with these interpretations; however, they also indicate that occasionally an overlapping of autumn and spring brood populations of the aquatic stages may occur under favorable conditions.

#### Literature Cited

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#### OBSERVATIONS ON THE LIFE CYCLE OF *Culex quinquefasciatus*

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With many species of mosquitoes showing resistance to insecticides, there is a growing emphasis on screening of insecticides using both adult and immature mosquitoes. To give information of this type, the life cycle of the Isla Verde strain of *Culex quinquefasciatus* was studied. Larvae were collected from a cistern near the International Airport, Isla Verde, Puerto Rico, and brought to

the School of Medicine, University of Puerto Rico, San Juan, Puerto Rico for rearing. The adults were allowed to feed three nights a week on month-old chicks which were restrained and placed in the cage with the mosquitoes. Sugar water was available to the mosquitoes at all times. Glass finger bowls filled with distilled water were put into the cage as oviposition sites. The egg rafts were placed in individual containers and the numbers of eggs per raft were counted. The larvae were fed on guinea pig food. After the first three days of growth, the food and water were changed daily until pupation ceased. The pupae were placed in pint fruit jars with screen covers, where the adults were allowed to emerge. The rearing area was in a well ventilated room, in which the temperature and humidity fluctuated with the outdoor environment.

Over a period of a month, 50 egg rafts were selected at random from the finger bowls. Larvae appeared during the first day after collection, pupae appeared from the 6th to 20th day, and adults appeared from the 7th to the 20th day. The average time needed to reach the adult stage was 10 days. Ten percent of the egg rafts did not produce larvae. The egg rafts contained from 55 to 236 eggs with an average of 129. Forty-seven percent of the mosquitoes reached the adult stage from the egg, 66.2 percent reached adulthood from the 4th stage larvae and 88.9 percent of the pupae became adults.

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#### LABORATORY NOTES ON SNIPE FLY LARVAE (RHAGIONIDAE: *Symphoromyia*)

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FEEDING. To determine the nature of the feeding habits of *Symphoromyia* larvae some medium-sized to almost mature larvae of species A and/or B, and species C of Sommerman (1962) were kept in soil in small shell vials, each accompanied by another soil-inhabiting larva. All of the *Symphoromyia* larvae that fed pierced the integument of the prey with their mouth parts. They pushed their heads in far enough to leave a gaping hole in the integument, and then apparently predigested the soft internal tissues. Examination of the remains of the prey indicated that generally one feeding hole sufficed for draining the prey, but if the carcass were sharply bent there were two feeding holes, one on either side of the bend; otherwise the tissues beyond the bend were still intact.

Larvae of *Symphoromyia*, species C, ate other dipterous larvae, (some of which were themselves predacious) and new pupae, coleopterous larvae, larvae of *Symphoromyia* sp. A-B, and smaller larvae of sp. C. Hence species C is cannibalistic.

Larvae of *Symphoromyia* sp. A-B ate other diptera larvae and new pupae. They did not eat *Symphoromyia* larvae, and on two occasions other predacious diptera larvae killed and drained the sp. A-B larvae. It is interesting to note that even though these *Symphoromyia* larvae are slower and more sluggish than the other predacious diptera larvae, the snipe flies usually killed their opponents.

**RECOVERING EXUVIAE.** When rearing *Symphoromyia* larvae to adults for identification, the larval exuviae can usually be found near the tail of the pupa, but occasionally the pupa squirms about and then much time is spent searching through the soil (only about a tablespoon) for the exuviae. After the pupa has been removed the exuviae can be quickly recovered simply by dumping the dirt into a petri dish, rinsing the shell vial with water, and dumping it into the petri dish, and stirring the muddy water until there are no lumps. The exuviae float to the top where they can often be seen with the naked eye.

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#### FEEDING OF MANSONIA TITILLANS (WALKER) ON OTHER MOSQUITOES

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An unusual phenomenon of *Mansonia titillans* (Walker) sucking up the stomach contents of other mosquitoes was observed repeatedly in caged specimens. This species is a minor vector of filariasis due to *Wuchereria bancrofti* in British Guiana.

Numerous bush collections were made in Mocha Village, 2 miles east of the East Bank road along the Demerara River, about 5 miles south of Georgetown in British Guiana. The species caged together were females of *Mansonia* (*Mansonia*) *titillans* (Walker), *Aedes* (*Ochlerotatus*) *serratus* (Theobald), *Aedes* (*Ochlerotatus*) *angustivittatus* Dyar and Knab, and *Psorophora* (*Janthinosoma*) *ferox* (Humboldt).

As often happens, females of *P. ferox*, *A. serratus*, and *A. angustivittatus* fell to the bottom of the mosquito-netting cage and lay there, apparently dying. Some of them had had a recent human or animal blood meal, and others had probably fed on juices of plant origin.

No sooner were the weakened or dying mosquitoes lying on their side or back, when they were immediately attacked by one or more *M. titillans* females. As many as four of the latter were seen attacking a downed mosquito. In a

few cases, when a female *M. titillans* also lay dying, it was attacked also; this did not occur often because of the hardness of this species.

The attacker inserted or forced its proboscis into either the anterodorsal aspect (Figure 1) or the

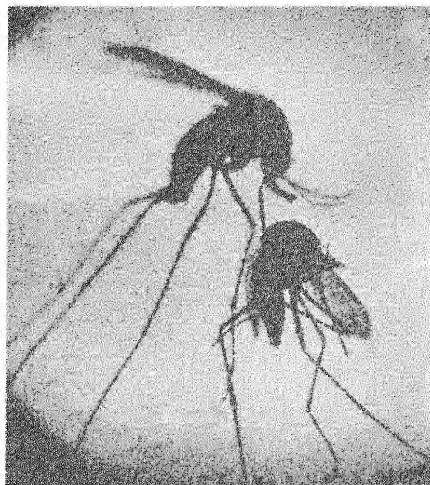


FIG. 1.—*M. titillans* attacking dying *Aedes serratus*.

lateral aspect of the victim, and sucked up the blood or other liquid contents of its stomach. Victims which had had a recent blood meal readily attracted more than one attacker. The attacking mosquitoes did not seem to get in each other's way. Penetration of the exoskeleton was effected more readily through the intersegmental membranes or the membranous pleural region. The victim's abdominal turgidity made insertion of the proboscis easier.

In no case was a female *P. ferox*, *A. serratus*, or *A. angustivittatus* seen to attack any of the dying mosquitoes. Also, no *M. titillans* was seen to attack any active, healthy mosquitoes; only weakened or dying mosquitoes were victimized.

**SUMMARY.** In British Guiana bush-caught *Mansonia titillans* females attacked and sucked up stomach contents of weakened or dying *Psorophora ferox*, *Aedes angustivittatus*, and *Aedes serratus* when all four were confined in the same cage. The proboscis was forced into the abdomen of the victim, generally through intersegmental membranes or the membranous pleural region. Dying mosquitoes which had had a recent blood meal were especially attacked, thus transferring blood with or without parasites to the attacking *M. titillans*. A photomicrograph shows a *M. titillans* female attacking a dying *A. serratus* female.

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