STUDIES ON THE VIABILITY OF SALT-MARSH MOSQUITO EGGS[1]

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During 1953–54 studies were conducted in the Savannah, Georgia, area to study the viability of overwintering eggs of the salt-marsh mosquitoes, *Aedes taeniorhynchus* (Wied) and *Aedes sollicitans* (Walk).

In the first test series, soil samples of 0.5 square foot each were taken at monthly intervals from five breeding areas (A—E; see table 1) to observe the influence of natural conditions on egg viability. The samples were obtained at random except in Area E, where they were taken in a regular series running from low to high elevations. None of the breeding areas studied had received a thorough flooding since the spring tides of October and November, the winter rains having caused only local and partial inundation.

All samples were held in the laboratory at 80° F. for 1 week to break the dormant condition of the eggs. Previous observations had indicated that eggs flooded immediately after the samples were removed in the field during the winter period produced relatively few larvae. However, adequate hatching could be obtained by conditioning the eggs for 1 week at 80° F. The conditioned samples were flooded with tap water, and the number of larvae counted 24 hours later.

In the second test series, approximately

[1] From the Communicable Disease Center, Public Health Service, U. S. Department of Health, Education, and Welfare, Savannah, Georgia.

TABLE 1.—Proportions of *A. taeniorhynchus* and *A. sollicitans* dipped from breeding areas from October 1953 to April 1954 near Savannah, Ga.

Date	Area	No. of Larvae Identified	Percent *A. taen.*	Percent *A. soll.*	Percent Other
11/27	E	23	0	100	0
12/24	A	98	1	82	17
1/21	A	148	0	76	24
3/3	A	103	16	81	3
4/6	C	67	78	22	0
4/13	E	71	87	13	0

75 square feet of soil samples were collected in late January, 1954, from a salt-marsh area known to contain mosquito eggs. The eggs in this area probably were laid during September and October, 1953, and had not been flooded prior to their collection. The samples were stored in trays in an unheated shed where they were kept in a moistened condition by periodic subirrigation. At weekly intervals, samples aggregating several square feet of sod were processed for flooding as in the first test series. After May 1 the rise in ambient temperatures permitted the samples to be flooded without preconditioning them.

In the third series of tests beginning in January, 1954, 30 soil samples of approximately 0.5 square foot each were collected at monthly intervals from selected sites in Area E. Each sample was then divided in half. One half was stored in an unheated shed and became extremely dry, while the other half was conditioned for one week and then flooded. At monthly intervals following the original collection date, five of the stored samples would be removed, conditioned for 1 week, and flooded. The mean number of larvae produced was then compared with the average number of larvae produced by the duplicate halves of the samples at the time of collection.

Prior to January 1, identification of the mosquitoes was made by rearing a portion of the newly hatched larvae to the fourth instar or to the adult stage. During January and February, the first instar larvae were also identified, and these determinations were found to give essentially the same proportions of species as was obtained by the rearing procedures. Consequently, all subsequent identifications were limited to first instar larvae.

Results from test series I indicated that on the basis of similar rates of larval densities per square foot for the winter and spring periods, eggs deposited the preceding fall or earlier apparently survived the winter with only slight losses in viability. Eggs from Area D showed the greatest drop in the number of larvae produced, the December and January samples averaging 270 and 310 larvae, respectively, as compared to the 96 and 83 larvae recorded for February and April. In the remaining areas the larval densities in March and April, except where spring tides flooded the marsh in early April, approximated those for November and December. In Area E larval densities for February and March were 3 to 10 times those present in the early winter. The recovery of eggs from the same area does not preclude such variation in numbers since the female mosquitoes frequently oviposit more heavily in one site or zone than in another.

With the exception of Area D, *A. taeniorhynchus* was predominant over *A. sollicitans* in the majority of the soil samples. Other species of mosquitoes also were produced from the various samples in the following order by numerical rank: (Area A) *Aedes vexans, Psorophora confinnis,* and *Culiseta inornata;* (Area B) *Aedes vexans, Aedes infirmatus, Psorophora* spp.; (Area C) *Aedes vexans* (1 specimen); and (Area D) *Aedes* sp., *Psorophora* sp., and *Aedes vexans.*

Table 1 shows the numbers of larvae

collected from breeding Areas A, C, and E as a result of natural flooding. It may be seen that midwinter hatches are composed almost entirely of *Aedes sollicitans*. However, observations indicated that all of the eggs of *A. sollicitans* present in an area do not hatch when flooded. For example, sod samples taken from beneath water containing large numbers of *A. sollicitans* larvae in January were shown to produce additional *A. sollicitans* larvae when the samples were held in the laboratory for 1 week and then flooded. The same samples also yielded *A. taeniorhynchus* larvae, the relative proportion of the two species being 67 percent (*A. taeniorhynchus*) and 33 percent (*A. sollicitans*). Sod samples removed from an unflooded portion of the same breeding area produced larvae of these two species in approximately the same proportions. Presumably, *A. sollicitans*, being better adapted to cooler climates, is able to develop small broods during the warm portions of the winter season.

TABLE 2.—Number of larvae found per square foot on soil samples collected in January, 1954, and flooded at various intervals between February 3 and June 29, 1954, Savannah, Georgia

Date Flooded	Square Feet Sample Flooded	Larvae per Sq. Ft.	Percent	
			Aedes taeniorhynchus	*Aedes sollicitans*
2/3	5	1,293	84	16
2/10	5	1,742	81	19
2/17	4.5	1,044	79	21
2/25	4.5	1,294	—	—
3/3	4.5	874	78	12
3/10	4.5	951	—	—
3/17	4.5	1,707	79	21
4/2	4.5	1,445	—	—
4/8	4.5	1,051	91	9
4/15	4.5	336	69	31
4/22	4.5	640	—	—
4/29	4.5	1,012	—	—
5/6	4.5	427	—	—
5/13	4.5	1,030	—	—
5/20	4.5	475	65	35
5/27	4.5	1,009	—	—
6/4	3	1,982	81	19
6/18	3	339	—	—
6/24	2	71	—	—
6/29	4.5	2	—	—
		Ave.	80	20

In addition to the above two species of salt-marsh mosquitoes, specimens of *Culiseta inornata, Culex salinarius, Aedes vexans,* and *Anopheles bradleyi* were found in Area A.

In the test series 2 (table 2), and 3, the eggs of both species survived the winter with little loss in viability. Not until June and early July did a marked decrease in viability occur. Where duplicate half samples of sod were flooded at monthly intervals after the date of collection, the numbers of larvae were similar until the July

flooding. The duplicate half of samples which produced 584 and 708 larvae when flooded initially in January and February yielded 625 and 404 larvae, respectively, when flooded in June. In comparison, samples collected in January and February and flooded in July produced 32 and 4 larvae, respectively, even though the duplicate half samples yielded 332 and 884 larvae when flooded in January and February. None of the samples held until August produced larvae despite collection of sod as late as April.

SUMMARY. Laboratory evaluation of winter-collected soil samples from salt marshes near Savannah, Georgia, indicated that eggs of *Aedes taeniorhynchus* and *Aedes sollicitans* show little loss in viability over the period December 1 through June 1. Subsequent to early June, the percentage of viable eggs decreased markedly.