

INSEMINATION RATES AND EGG DEVELOPMENT OF FEMALE
CULEX TRITAENIORHYNCHUS IN NATURE¹T. E. BLAKESLEE,⁵ H. D. NEWSON,² M. SAKAI,³ AND S. TOSHIOKA⁴

Attempts to establish a laboratory colony of *Culex tritaeniorhynchus* at the 406th Medical General Laboratory, Tokyo, have not yet succeeded. Suitable techniques have been developed to rear and maintain this species, but attempts to obtain consistent mating and egg production in the laboratory have not been successful (1, 2, 3). Adults reared from field-collected larvae and eggs have been subjected to a wide variety of combinations of humidity, temperature and light intensities, in an effort to provide conditions which were suitable for mating. The insemination rate in females varied according to the conditions to which they had been subjected, but never exceeded 5 percent and, usually, was much less. Few egg rafts were produced in the laboratory and only 7 percent of over 2,000 laboratory reared females examined showed any egg development. To obtain data with which these laboratory observations could be compared, a field study was made in 1955 to determine the insemination rate and egg development of *C. tritaeniorhynchus* females in nature.

MATERIALS AND METHODS. The study was started on August 12 and continued through September 27 when specimens no longer could be found in the study area. Collections were made six times each week through September 5 and daily thereafter. Adult females were collected with a light trap and from a cow barn located in a

rural area approximately 25 miles northwest of Tokyo, Japan. The barn was located in the center of a small village. The light trap was operated approximately four feet above the ground near a group of nightsoil tanks at the edge of the village, approximately 100 yards from the barn. During the study, these tanks were a principal breeding site for the *Culex tritaeniorhynchus* in this area.

RESULTS. A total of 1842 female *C. tritaeniorhynchus* were collected and examined for insemination and egg development. The average insemination rates, by week, for the light trap and cow barn collections are shown in Fig. 1. Total collections from the light trap had approximately the same proportion of inseminated females as those from the cow barn. Except for the decrease during the week of September 2 to 8, the average rate of insemination for all specimens steadily increased from 93 percent during the first week of the study to 100 percent during the week of September 9 to 15. Only one specimen collected after September 9 was not inseminated. The decrease during the week of September 2 to 8 was caused by decreased rates in the cow barn collections of September 3 and 5 and in the light trap collection made on the night of September 5-6. Insemination rates in the cow barn collections on September 3 and 5 were 44 and 61 percent respectively, and 86 percent in the light trap collection on the night of September 5-6. Heavy rains on September 1 and 2 perhaps were contributing factors to these decreased rates. Except for these three collections, 99 percent of the females collected that week were inseminated.

For the purpose of this study the ovulation cycle of *C. tritaeniorhynchus* was arbitrarily divided into four stages: 1. No egg development; 2. Enlargement of fol-

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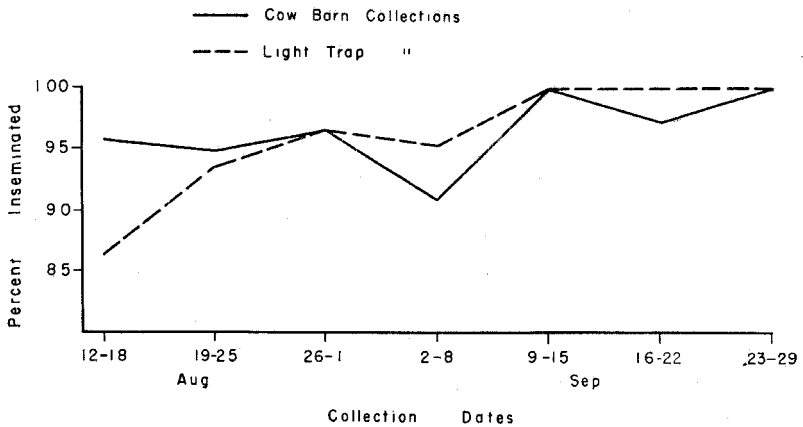
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Fig. 1 Insemination rate of female
C. tritaeniorhynchus in nature



lice, yolk not present; 3. Follicle further enlarged, yolk present; 4. Mature eggs. The percentage of the collections, by week, in each of these stages is shown in Table 1. The proportion of females in each stage of egg development varied erratically from week to week throughout the study.

Slightly over one-third of the collections from both the light trap and cow barn were in stage 1 of the ovulation cycle. Light trap and cow barn collections differed markedly, however, in the proportion of females in the other three stages. Over one-half of those collected in the cow

TABLE 1.—Egg development of *Culex tritaeniorhynchus* females in nature

Collection Period	Percent in each Stage of Development							
	Stage 1		Stage 2		Stage 3		Stage 4	
	No Egg Development		Follicle Slightly Enlarged, No Yolk Present		Follicle Further Enlarged, Yolk Developed		Mature Egg	
	Cow Barn	Light Trap	Cow Barn	Light Trap	Cow Barn	Light Trap	Cow Barn	Light Trap
Aug. 12-18	69	62	28	3	2	13	1	22
Aug. 19-25	14	55	83	10	3	33	<1	2
Aug. 26-Sept. 1	32	18	59	4	9	59	<1	19
Sept. 2-8	41	9	58	6	0	77	1	8
Sept. 9-15	32	37	68	0	0	63	<1	0
Sept. 16-22	51	25	49	0	0	75	0	0
Sept. 23-29	50	14	25	14	25	29	0	43
Percent for total period	37	39	59	5	4	44	<1	12
Total number Examined	500	193	786	27	54	217	6	59

barn were in stage 2 and less than 5 percent were in stages 3 and 4. Only slightly more than 5 percent of the females from the light trap collections were in stage 2 while 56 percent were in stages 3 and 4. Sixty-two percent of the 1842 females collected in this study had some egg development.

Of 65 females which contained fully developed eggs when collected, three did not have sperm in their spermathecae. In each of these three the eggs were normal in size and appearance.

SUMMARY. A field study was made to compare the insemination rate and egg development of *Culex tritaeniorhynchus* females in nature with those maintained in the laboratory. The insemination rate in laboratory females varied from 0 to 5 percent depending upon the conditions to which they had been subjected. Ninety-seven percent of the females collected in nature during a study period of seven weeks had been inseminated. There was

a gradual rise in the rate from 93 percent in those collected during the first week to 100 percent in those collected in the fifth week. Only one female collected after the fourth week had not been inseminated. Seven percent of the laboratory reared females had some egg development as compared with 62 percent of those collected in the field. Approximately one-third of the light trap and cow barn collections had no egg development. Egg development, when present, was usually more advanced in females collected in the light trap than those collected in the cow barn.

Literature Cited

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CONTROL OF MOSQUITOES FOUND IN LOG PONDS IN WESTERN OREGON

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Several species of pest mosquitoes are known to breed in the log ponds of western Oregon. Since the lumber industry has undergone considerable expansion in recent years, the number of log ponds and the acreage involved have also increased. In 1940, 442 mills were in operation in the 19 western counties while in 1947 there were 1295. This change has obviously increased the mosquito potential of the region.

The predominating species in the log

ponds are *Culex tarsalis* Coq., *C. stigmatosoma* Dyar, and *Culiseta incidens* (Thompson). *Culex pipiens* (L.), *C. territans* (Walk.), and *Anopheles punctipennis* (Say) are found in lesser numbers. Normally, the ponds support larvae from May through September. A seasonal species trend apparently exists, at least in the Corvallis area, in which *tarsalis* and *incidens* predominate in the spring and early summer but *stigmatosoma* is more prevalent in the late summer and fall.

Several experiments on the control of mosquitoes breeding in log ponds have

¹ Retired November 1952.