SEASONAL ABUNDANCE OF MOSQUITO LARVAL COUNTS AND ADULT LIGHT TRAP CATCHES IN OKINAWA [1]

JOHN L. MCDONALD, LT. MSC USN

Medical Ecology Department, U. S. Naval Medical Research Unit No. 2

AND

L. B. SAVAGE, Major

Chief, Entomology Division, U. S. Army Medical Service Group (RYIS)

The success or failure of any mosquito control program is dependent on surveillance; if the surveys are conducted thoroughly and often enough excellent mosquito control can usually be realized. Two tools of a mosquito survey are larval dips at the breeding sites and mosquito light traps. Normally these two tools can be fairly effective indicators in determining whether mosquito populations are likely to get out of hand.

The U. S. Army's intensive mosquito surveillance program conducted over the past several years on Okinawa has provided a significant amount of data for a 7-year period, 1965–1971. These data were collected and summarized on a monthly basis. Permanent larval dipping stations provided a constant source of information about the aquatic stages of the local mosquitoes. Twenty-five New Jersey type light traps in operation 7 days a week were used to collect the adult mosquitoes.

The voluminous data from this 7-year mosquito surveillance project were analyzed by the computer at U. S. Naval Medical Research Unit No. 2 (NAMRU-2). Monthly counts of larvae and adults of various mosquito species were expressed graphically in percent of the total count during the full period for which data were available, usually 7 years. Figures 1 through 10

---

[1] This study was supported through funds provided by the Bureau of Medicine and Surgery, Navy Department, for Work Unit MRO 41.09.01–0083B OGI.

The opinions and assertions contained herein are those of the authors and are not to be construed as official or as reflecting the views of the Navy Department or the Naval Service at large.

Reprint requests to Publications Office, NAMRU-2, Box 14, APO San Francisco 96263.

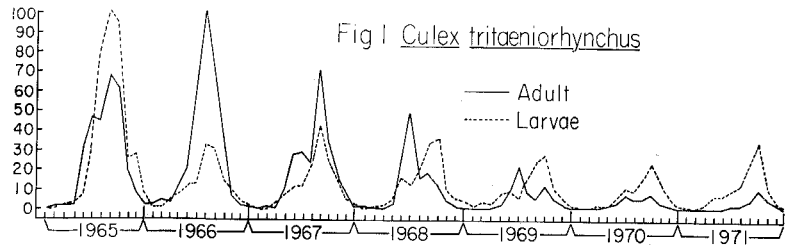
Fig 1 Culex tritaeniorhynchus
Adult
Larvae
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

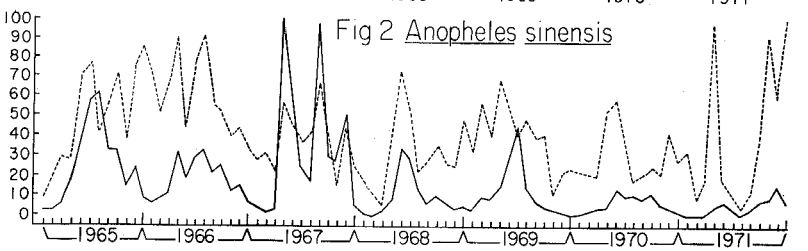
Fig 2 Anopheles sinensis
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

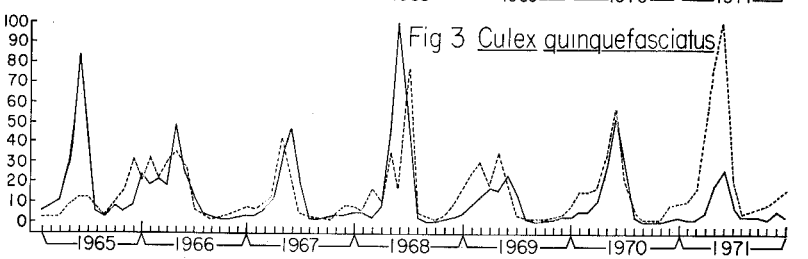
Fig 3 Culex quinquefasciatus
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

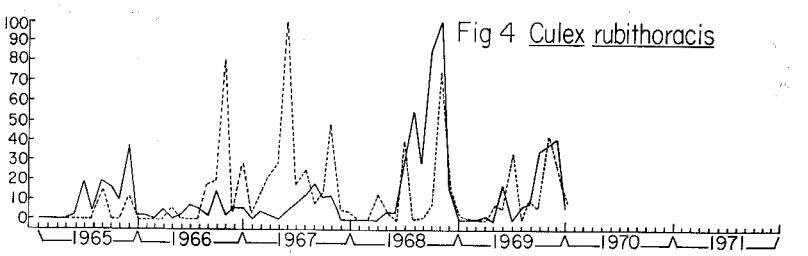
Fig 4 Culex rubithoracis
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

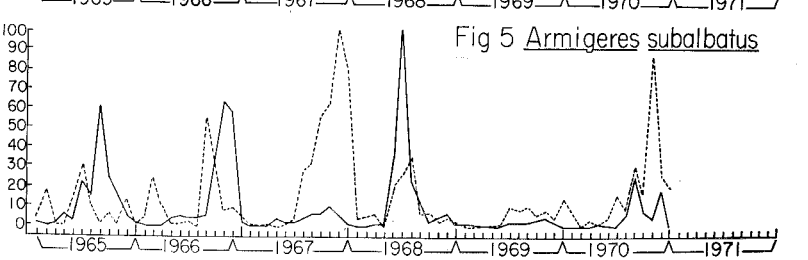
Fig 5 Armigeres subalbatus
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

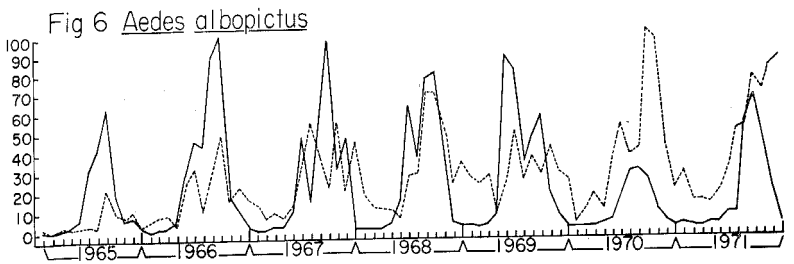
Fig 6 Aedes albopictus
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

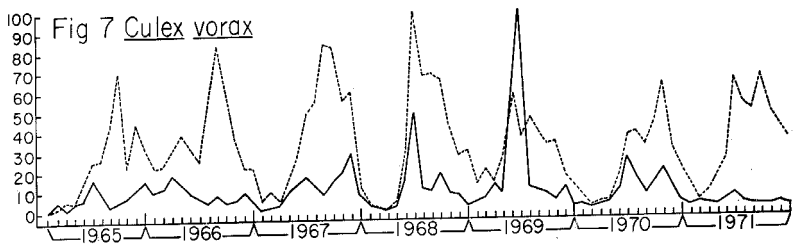
Fig 7 Culex vorax
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

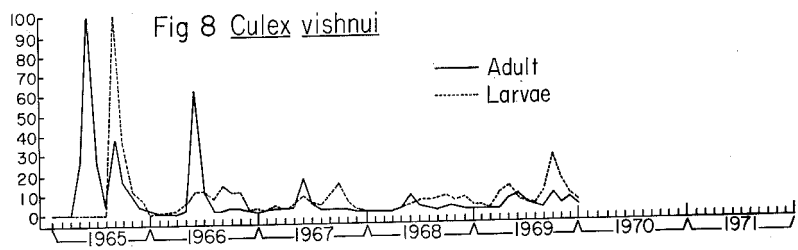
Fig 8 Culex vishnui
Adult
Larvae
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

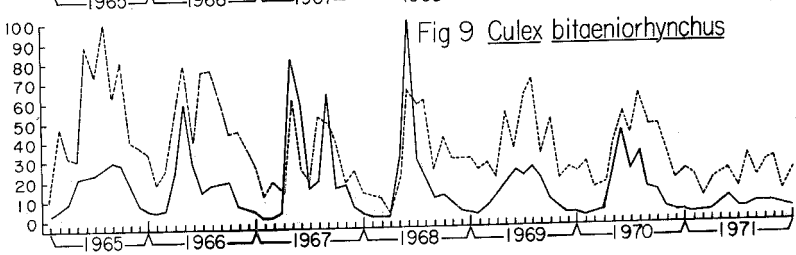
Fig 9 Culex bitaeniorhynchus
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

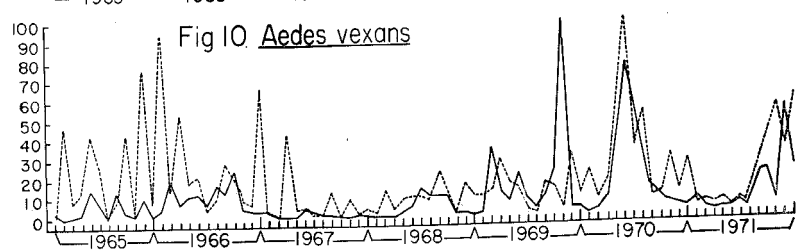
Fig 10 Aedes vexans
100
90
80
70
60
50
40
30
20
10
0
1965
1966
1967
1968
1969
1970
1971

show the occurrence of both the larvae and adults of several species of mosquitoes taken during the 7-year period.

These data clearly show that for the most part the overall mosquito populations on Okinawa follow normal northern hemispheric patterns of seasonal abundance. Warm or hot weather species, such as *Culex tritaeniorhynchus, Anopheles sinensis* and *Aedes albopictus,* were in greatest abundance during the months of July, August and September whereas *Culex rubithoracis* demonstrated a distinct propensity for relative increase from August through November. *Aedes vexans* demonstrated another abundance pattern showing little, if any, consistency.

Since all data are on a basis of relative abundance, it is obvious that standing water in rice paddies in the summer months encourages production of *Culex tritaeniorhynchus* and *Anopheles sinensis* whereas flood water mosquitoes, such as *Aedes vexans,* increase most dramatically, in both summer and other months, when this species tends to be more productive, in the rain-flooded urban and rural areas.

ACKNOWLEDGMENT. The authors wish to express their gratitude to the NAMRU-2 Data Processing Department for its assistance in processing the data presented in this study.

MOSQUITO BREEDING IN LEAF AXILS OF THE TEASEL (*DIPSACUS LACINIATUS* LINN.) IN NEW YORK [1]

R. MEANS

N.Y. State Museum & Science Service

Mosquitoes are known to breed in a variety of plant-associated containers such as tree holes, pitcher plants, leaf axils, and others, particularly in tropical regions, but I have found only one reference to mosquito breeding in the leaf axils of the teasel. Borobév (1968) reported finding larvae and pupae of *Anopheles maculipennis* Mg. as well as larvae of *Culicoides obsoletus* and *Dasyhelea* sp. (Ceratopogonidae) in leaf axils of *Dipsacus laciniatus* Linn. in Russia.

The cup-like receptacles formed by the leaf axils of the teasel (*Dipsacus* spp.) usually contain water throughout the summer (Fig. 1), providing a suitable breeding place for mosquitoes which breed in small containers. *Dipsacus laciniatus* Linn. grows to a height of 6–9 feet and has an average of 6–8 water-holding receptacles, one at the base of each pair of opposite leaves. The bottom three pairs of leaves are usually dried up and contain no water, but the reservoir at the axil of the fourth pair measures 100–150 mm across and 60–90 mm deep and holds 80–130 ml of water. This species frequently occupies 4–5 acres or more in an open field, with individual plants being about 1–2 feet apart.

Dipsacus silvestris Hud. and *D. fullonum* Linn. are usually 3–6 feet high and occupy 1 acre or less in a field. These species usually have 3–5 water-holding receptacles, the bottom 1–3 leaf axils being dried up, as with *D. laciniatus.* The fourth reservoir usually contains 40–60 ml of water and the higher reservoirs much less, usually 15–30 ml.

During the summer of 1972 teasels at several locations in New York State were examined for mosquito breeding. On July 25 two fourth instar *Aedes triseriatus* larvae and two fourth instar *Anopheles punctipennis* larvae were collected from *D. laciniatus* plants in a field of teasels several acres in extent in the vicinity of Amsterdam, N.Y. On August 22 two fourth instar *A. punctipennis* larvae were collected from one plant and one fourth instar *Aedes triseriatus* larva from another at the same location in Amsterdam. In each instance the larvae were collected from the fourth leaf axil, which was the first and largest which would hold water. No larvae were found in 150–200 additional plants examined each time.

FIG. 1.—Water-holding leaf axil receptacle of *Dipsacus laciniatus* Linn.

[1] Published by permission of the Director of the New York State Museum and Science Service, Journal Series No. 143.