

MOSQUITOES OF YAMAGUCHI PREFECTURE

I. THE RESULTS OF THE SURVEY IN ONODA AND OZUKI

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The knowledge of the mosquitoes has hitherto constituted a blank page in the entomological research in Yamaguchi Prefecture. Inasmuch as no materials have been available, not even the most fragmentary, presumption from the investigation of adjacent districts by means of analogy is all that is open to our access. In the present study an attempt was made, as the first step of the entomological exploration in this prefecture, to elucidate the species and the seasonal vicissitudes of mosquitoes in Onoda City and at Ozuki-chô, Shimonoseki City.

METHODS

1. Collection in Onoda. Mosquitoes were usually caught at eight to ten o'clock every night, from June 3 to September 12, 1952 by fourteen students of the Onoda High School with mosquito-aspirators. The students who were in charge of collecting were evenly distributed throughout the city. For the identification of species reference was made to Mizukawa (1948) and Yamaguti-La Casse (1950).

2. Collection at Ozuki. Eleven members of the author's family collected the mosquitoes at the author's dwelling as well as at a stable in neighbourhood at nine to eleven every night, from June 9 to September 17. The procedure employed was the same as that in Onoda. The collection comprises, in addition, a small number of mosquitoes delivered from the persons interested in our study.

3. The total incidence of Japanese B encephalitis, during the period of 1949 to 1952, were investigated with reference to the areas by the record of the report preserved in the municipal office, and those were compared with the relevant numbers of *Culex tritaeniorhynchus*, the mosquito now universally accepted as a potent transmitter of encephalitis, in the hopes that the correlation might be verified. At Ozuki no encephalitis has been encountered for these ten years.

RESULTS

Fourteen species were caught and the eleven, with exception of *Culex sinensis*, *Culex whitmorei* and *Aedes dorsalis*, were common in Onoda and at Ozuki. They are listed as follows:—

Tribe Culicini

Genus *Culex*,

* Under the direction of Prof. Susumu Shibata

- Culex (Culex) tritaeniorhynchus* Giles, 1901
Culex (Culex) pipiens var. *pallens* Conquillet, 1898
Culex (Culex) bitaeniorhynchus Giles, 1901
Culex (Culex) whitmorei Giles
Culex (Culex) sinensis Theobald, 1903
Culex (Lutzia) vorax Edwards, 1921
- Genus *Mansonia*,
Mansonia (Mansonioides) uniformis (Theobald, 1901)
- Genus *Armigeres*,
Armigeres (Armigeres) subalbatus (Conquillet, 1898)
 "Syn. *Armigeres (Armigeres) obturbans* Walker"
- Genus *Aedes*
Aedes (stegomyia) albopictus (Skuse, 1895)
Aedes (Finlaya) japonicus (Theobald, 1901)
Aedes (Finlaya) togoi (Theobald, 1907)
Aedes (Aedimorphus) vexans var. *nipponii* (Theobald, 1907)
Aedes (Ochlerotatus) dorsalis (Meigen, 1830)
- Tribe Anophelini
 Genus *Anopheles*,
Anopheles (Anopheles) hyrcanus var. *sinensis* Wiedemann, 1828
Culex pipiens var. *pallens*, *Culex tritaeniorhynchus* and *Anopheles hyrcanus*

TABLE I
 Weekly record of mosquito collection in Onoda

SPECIES	WEEK													
	JUNE					JULY					AUGUST			
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
<i>Culex pipiens</i> var. <i>pallens</i>	1	7	1	52	35	136	126	76	76	29	21	7	23	4
		6	4	69	24	35	37	42	45	42	6	3	6	1
<i>Culex tritaeniorhynchus</i>	1		24	78	224	463	835	944	450	360	58	50	1	
			1	6	19	28	17	11	3	3	1			
<i>Anopheles hyrcanus</i> var.		1	1	10	46	127	190	160	38	62	6	8	3	
<i>sinensis</i>			1		7	30	62	46	28		11			
<i>Culex bitaeniorhynchus</i> var.						2	1	68						
<i>karatsuensis</i>								1	35					
<i>Culex (Lutzia) vorax</i>			2						1	1	1			
<i>Armigeres obturbans</i>				2	4	6	3		4	35	36	55	2	
<i>Mansonia uniformis</i>						1					2			
<i>Aedes japonicus</i>									1					
<i>Aedes albopictus</i>						1				3	3	4		
<i>Aedes togoi</i>					1		1			1	1			
							2							

Culex whitmorei: Only one female was found.

The heavy black numbers represent females; the light numbers represent males.

var. sinensis were the most prevalent species, *Armigeres obturbans* follows them constituting the next most prevalent, whereas the other mosquitoes were far less in number. (Tables I and II, Figs. 1 and 3)

TABLE II
Weekly record of mosquito collection at Ozuki

SPECIES	WEEK	JUNE				JULY				AUGUST				SEPTEMBER			
		2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	
<i>Culex pipiens var. pallens</i>		50	106	408	394	321	381	259	313	178	63	33	42	22	13		
		4	55	176	166	76	98	48	42	25	14	7	13	6	3		
<i>Culex tritaeniorhynchus</i>		2	20	167	310	241	462	634	378	373	234	205	473	119	98	2	
			8	31	78	43	68	71	78	21	21	15	15	1	5		
<i>Anopheles hyrcanus var. sinensis</i>		1	9	40	130	73	326	682	275	102	34	30	53	5	24		
			4	37	100	37	90	376	180	82	23	13	14	1	3		
<i>Culex bitaeniorhynchus var. karatsuensis</i>						3	6	6	11	3	2			3			
						1			2								
<i>Culex (Lutzia) vorax</i>						2							2				
<i>Armigeres obturbans</i>				4	3	1	5	6	10	31	18	118	7	3	13		
							1		4	9	13	3	5				
<i>Mansonia uniformis</i>		1	2		1												
<i>Aedes japonicus</i>					1	2	1		1	1							
<i>Aedes albopictus</i>							2		1	1	1	1	1				
<i>Aedes togoi</i>				2													
<i>Aedes dorsalis</i>				1													
<i>Aedes vexans var. nipponi</i>			3	6			1	1									
			3	2													

Culex sinensis: Only one female was caught.

The heavy black numbers represent females; the light numbers represent males.

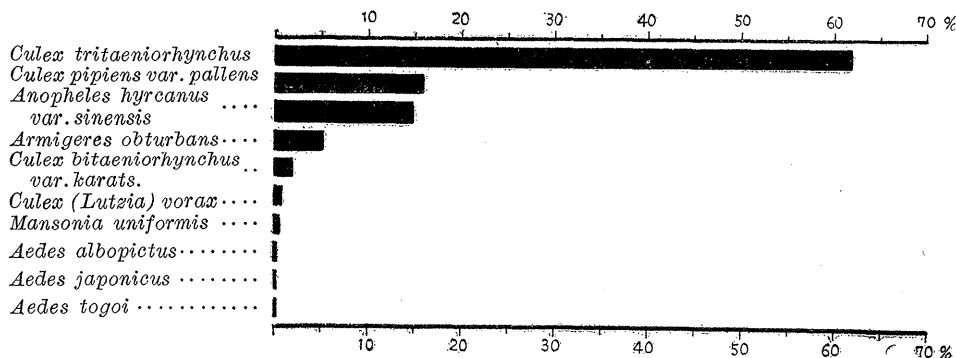


Fig.1 Collated graphical presentation of the number of mosquitoes caught in Onoda through the survey.

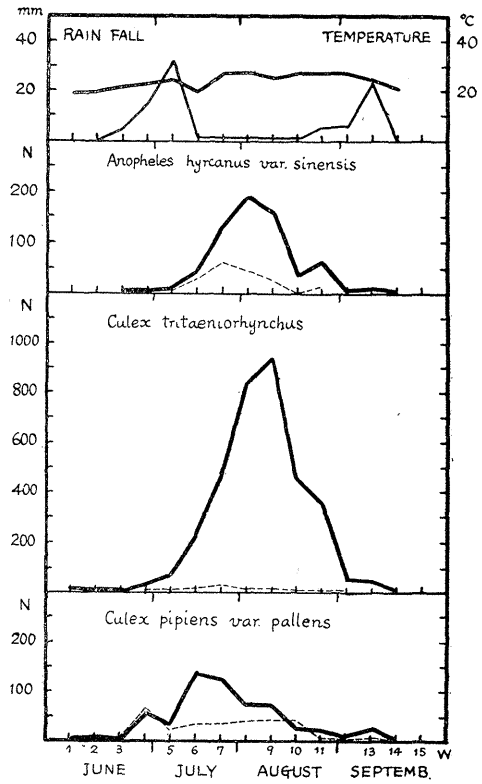


Fig.2 The seasonal vicissitude of the three prevalent mosquitoes in Onoda (Solid line: females, broken line: males. Rain fall is indicated by the thin line, while the temperature is shown by the thick line.)

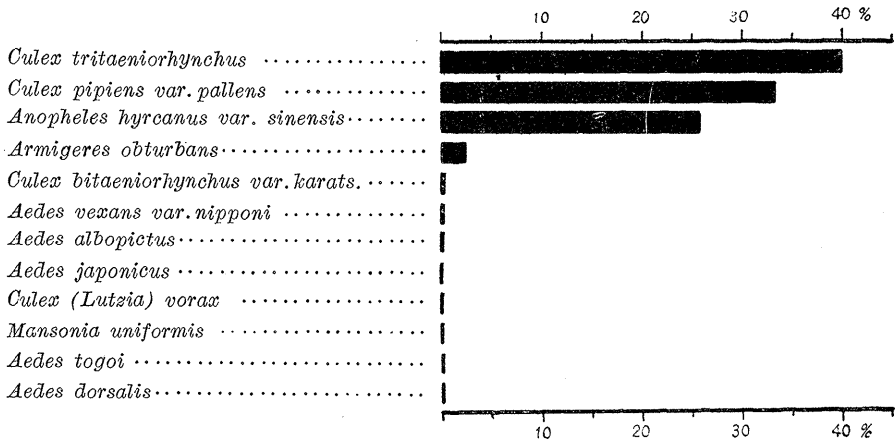


Fig.3 Collated graphical presentation of the number of mosquitoes caught at Ozuki throughout the survey.

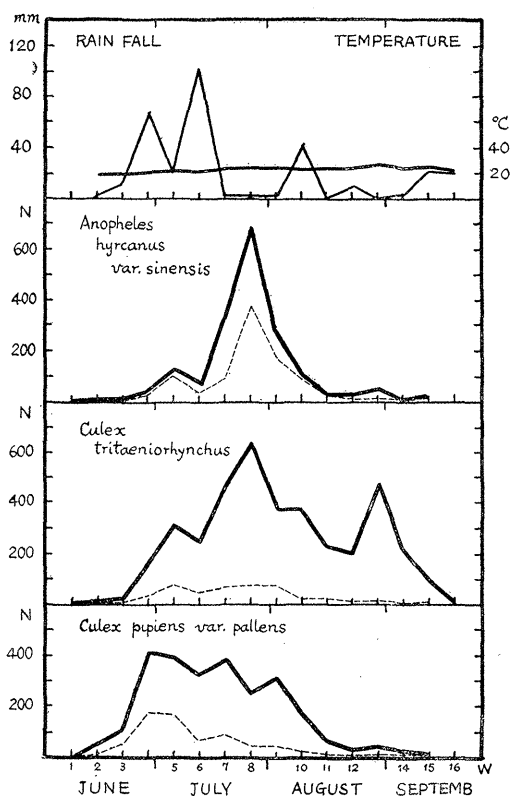


Fig.4 The seasonal vicissitude of the three prevalent mosquitoes at Ozuki (Solid line: females, broken line: males. Rain fall is indicated by the thin line, while the temperature is shown by the thick line.)

Culex tritaeniorhynchus like *Anopheles hyrcanus var. sinensis* proliferates most prosperously in July and August, the season scanty of rain fall, in contrast to *Culex pipiens var. pallens* which shows greatest procreation in the latter half of June to July, namely shortly after and in the midst of excessive rain fall. And the seasonal vicissitude appears to be somewhat more delayed in Onoda than at Ozuki (Fig. 2 and 4).

Conclusive evidence for the correlation between the incidence of encephalitis and the number of *Culex tritaeniorhynchus* is not obtained from the data of the present survey, because, as demonstrated in Figure 5, the relationship appears equivocal.

DISCUSSION

When the afore-mentioned results are compared with the data reported from the adjacent prefectures, it is readily noticed that the mosquito fauna of Onoda and

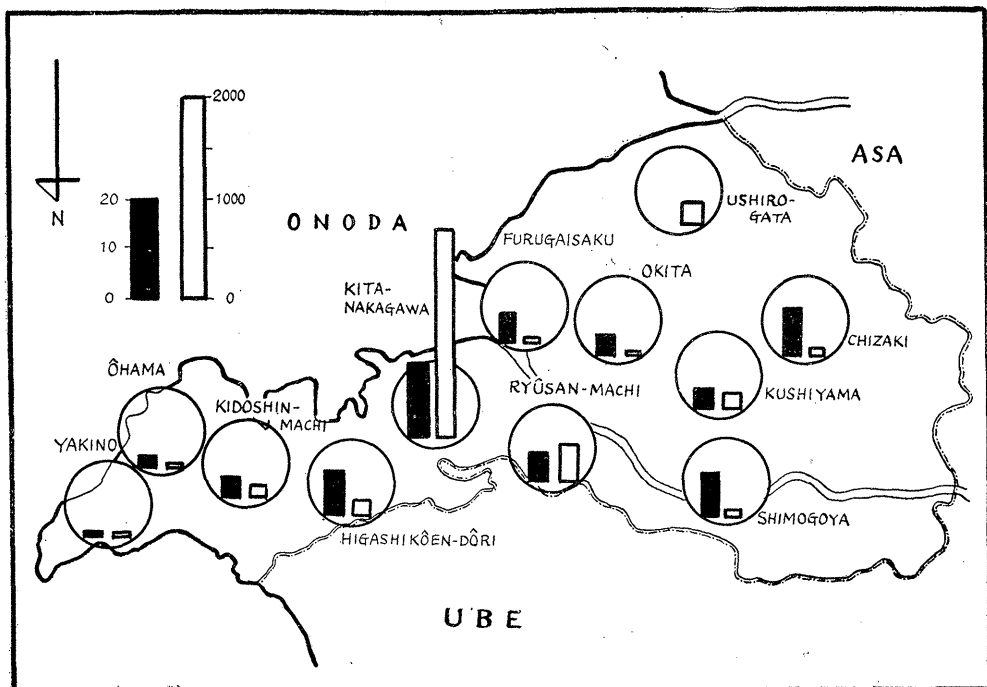


Fig.5 Collated presentation of the number of *Culex tritaeniorhynchus* and the incidence of encephalitis in Onoda
(Black column: encephalitis, white column: *Culex tritaeniorhynchus*.)

Ozuki bears close resemblance to that of Kurashiki and its surroundings, Okayama Prefecture, (Mizukawa 1949) in the following respects: (1) *Culex pipiens var. pallens*, *Culex tritaeniorhynchus* and *Anopheles hyrcanus var. sinensis* predominate over the other species, (2) *Culex pipiens var. pallens* is prevalent in June and July, while both *Culex tritaeniorhynchus* and *Anopheles hyrcanus var. sinensis* flourish in July and August, and (3) all the mosquitoes collected are common except for three species, *Culex hayashi*, *Culex annulus* and *Culex orientalis*, which are not found in the author's list despite their presence in Kurashiki. The positive relationship of *Culex tritaeniorhynchus* to Japanese B encephalitis has already been supported through the analysis of the data accumulated in Kurashiki. The disease was however so scarce in Onoda (only three cases were encountered) and at Ozuki (there were none) during the period of the author's observation, last year, the collated study with respect to the annual data was regrettably abandoned for the comparison of the four-yearly (1949-1952) incidence of encephalitis with the number of *Culex tritaeniorhynchus* collected last year, and hence resulted in the failure of conclusive decision.

A list has been published about the mosquitoes of Nagasaki Prefecture, Kyushu, but its description is too brief to be commented on (Oshima 1951).

Fukui Prefecture, Hokuriku, a district at considerable distance from Onoda and Ozuki (Kimizu 1952) differs in (1) relative abundance of *Armigeres obturbans* and *Culex vishnui*, despite the fact that the most predominant are likewise *Culex pipiens* var. *pallens*, *Culex tritaeniorhynchus* and *Anopheles hyrcanus* var. *sinensis*, and in (2) the advent of maximum abundance, in June and July, earlier by a month as compared with that in Onoda and at Ozuki.

SUMMARY

Mosquitoes were collected by use of aspirater in Onoda City and at Ozukichô, Shimonoseki City, during the period of June to September, 1952, and fourteen species have been confirmed to be existent. *Culex pipiens* var. *pallens*, *Culex tritaeniorhynchus* and *Anopheles hyrcanus* var. *sinensis* predominate over the other species, flourishing at their maximum in June to July, July to August, and July to August, respectively. The fauna bears a striking resemblance to that of Kurashiki, Okayama Prefecture, but differs to some extent from that in Fukui Prefecture, Hokuriku district. The author's investigation in Onoda has failed to derive the final conclusion upon the correlation between *Culex tritaeniorhynchus* and Japanese B encephalitis on account of the meager incidence of this disease in 1952.

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