

## Epidemiology and Control of Bancroftian Filariasis in Some Villages of Nagasaki Prefecture

### 2. Nocturnal feeding activities of mosquitoes in a filaria endemic section, Kamisikama of Nanatugama village \*

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#### Introduction

Mosquito survey was made in a section, Kamisikama which was the highest and 18.0% in the incidence of microfilarial infection among the sections of the Nanatugama village as shown in the previous report. The object of the survey was to examine the nocturnal changes in feeding activity, the host preference, the habit of staying houses, and the seasonal distribution of mosquitoes, especially of those having close relation to the bancroftian filariasis.

This study was performed under the direction of Prof. N. Omori to whom the author wishes to express his sincere appreciation.

#### The place and method of examination

The section, Kamisikama, where the study was made was in foot-hill and apart about 200 meters from the sea shore. At about the central part of the section including about thirty scattered farm houses, there was a group of houses standing rather closely with each other. Among the houses standing in a scope of about 30 meters in diameter, three farm houses,

a young men's club-house, a cow-shed, and a human-baited-trap set up at regular intervals were chosen as places of mosquito collection. The members of the families of the farm houses and the club-house were 3, 4, 5, and 10 persons including 1, 1, 1, and 3 microfilarial carriers respectively. The club-house was used by unmarried young men of this section to spend only the night. They gathered after dark and returned to respective home at dawn, spending together only the night scarcely using mosquito net. On the vacant ground near the houses and the club a human-baited-trap was set up. The blood positive rates of the male, female, and all persons examined in this section were 33.3%, 9.8%, and 18.5% respectively.

The detailed plan of the collecting place, time, and method is as given in Table 1. On the night of the first day of our arrival at the section, night catch in the young men's club-house was made. In the early morning of the second and third day, morning catches were made in the same club-house and also within three farm houses. From the sun-set of the second day through the sun-rise of the

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Table 1 The plan of the mosquito collections which were made twice a month from May through October, 1955 in a filaria endemic village

Houses or H.B.T. in which mosquitoes were collected	Collecting time	Collecting method	Results are shown in
Cow-shed (Bait : a cow)	Hourly night catches during from sun-set through sun-rise	For 15 minutes, by a collector	Tables 2, 3, 4, & 8 Figs. 1 & 3
Human-baited-trap (Baits : two men)		For 15-20 minutes, by a collector	Tables 5, 6, 7, & 9 Figs. 2 & 4
Young men's club-house (10 men spend the night)	9.00'—9.30' p.m.	For 30 minutes, by two collectors	Table 10
The same club-house (the same as above)	Early in the morning, 6.00'—8.00' a. m., on successive two days	For 20-40 minutes, for each house, by two collectors	Table 11, B
Three farm houses (3,4, and 5 persons in each)			Table 11, A

Remark : These houses, cow-shed, and place of the H. B. T. being set up, were situated near with each other.

third day, all-night catches were made in the cow-shed and the human-baited-trap. All these mosquito catches were made twice a month from May through October, 1955

### Result of the survey

(1) Hourly prevalence in nocturnal feeding activity of mosquito.

The results of all-night catches made twice a month in the cow-shed are tabulated, in the case of *An. h. sinensis* in Table 2 and with *C. p. pallens* in Table 3, together with the maximum, minimum, and mean temperature, and mean relative humidity during each night. The hourly totals of female mosquitos of six species captured throughout the collection are given in Table 4 and those given in relative abundance against the total number (454) are illustrated in Fig. 1 excepting two species of being very few. The similar results obtained in the human-baited-trap are tabulated in Tables 5, 6, and 7 and the relative abundances in nocturnal feeding activity of five mosquito species are illustrated in Fig. 2.

Fig. 1 Relative hourly distribution in nocturnal feeding activity of mosquitoes collected in a Cow-shed, showing in 60% confidence intervals of population percentage numbers (cf. Table 4)

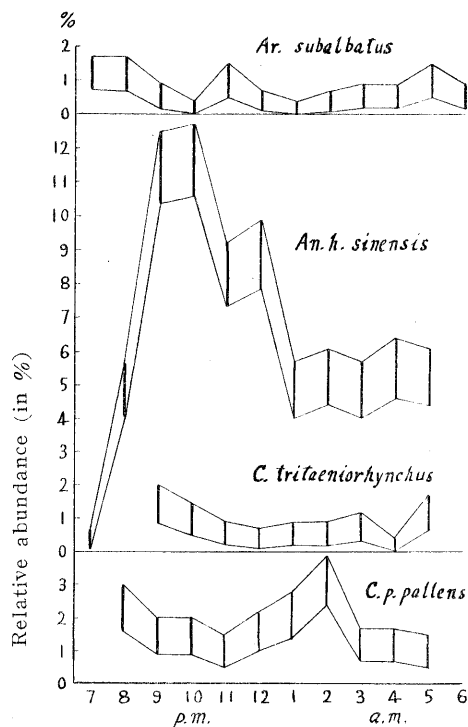


Table 2 Hourly night catches of females of *An. h. sinensis* in a cow-shed

Date	Temp. °C at night			Mean R. H. %	p. m.						a. m.					Total	
	Max.	Min.	Mean		7	8	9	10	11	12	1	2	3	4	5		
May	3	20.0	16.5	18.3	95.5		2	1	1	1	1	0	0	0	1	0	7
	14	15.0	12.0	13.2	82.5		1	0	0	0	0	0	1	0	0	0	2
Jun.	7	22.5	22.0	22.1	92.8		6	14	16	8	8	5	4	6	7	8	82
	19	23.5	22.0	22.9	95.2		8	19	21	18	13	10	9	10	10	4	122
Jul.	2	26.0	25.0	25.9	83.7		0	8	7	5	15	2	4	3	4	4	52
	17	27.0	25.0	26.1	84.3		0	3	2	4	1	1	2	1	2	2	18
Aug.	1	27.0	25.0	26.4	86.7		2	7	4	2	2	3	4	2	1	2	29
	21	25.0	19.0	23.0	94.3		1	0	3	0	0	1	0	0	0	1	6
Sept.	11	22.0	20.0	20.6	88.6	1	1	1	0	0	0	0	0	0	0	2	5
	25	23.0	21.0	22.0	88.9	0	1	0	0	0	1	0	0	0	0	1	3
Oct.	10	21.0	20.0	20.6	81.3	0	0	0	0	0	0	0	0	0	0	0	0
	24	19.0	16.0	17.6	90.7	0	0	0	0	0	0	0	0	0	0	0	0
Total						1	22	53	54	38	41	22	24	22	25	24	326

From these results, especially from Figs. 1 and 2, we can conclude as to the relative abundance, host preference, and hourly prevalence in feeding activity as follows :

*An. h. sinensis* and *C. p. pallens* are the most predominant species in these district. While, *C. tritaeniorhynchus* and *Ar. subalbatus* are rather few and the others are rare.

*An. h. sinensis* is strongly zoophilic and on the contrary, the house mosquito, *C. p. pallens* is strongly androphilic.

*An. h. sinensis* is active in feeding activity all over night and is highly so from 9 to 12 p. m. with a peak in 9—10 p. m. *C. p. pallens* is also active all over night and strongly so from about 9 p. m. to 4 a. m. It is of interest and noteworthy

that the feeding activity of *pallens* agrees well with the nocturnal periodicity of microfilariae in the peripheral blood stream of the carrier.

(2) Seasonal prevalence of nocturnal feeding activity in mosquito.

The seasonal prevalences of night catches of six mosquito species in the cow-shed are shown in Table 8. The relative abundances of these catches against the total number (454) of mosquitoes in the shed throughout the experiment are illustrated in Fig. 3. The similar results obtained in the human-baited-trap are given in Table 9 and Fig. 4. From these tables and figures, it may be said that : *An. h. sinensis* begins to enter cow-shed or human dwelling-house to feed at night early from the beginning

Table 3 Hourly night catches of females of *C. P. Pallens*  
in a **cow-shed**

Date.	Temp. °C at night			Mean R. H. %	p. m.						a. m.					Total		
	Max.	Min.	Mean		7	8	9	10	11	12	1	2	3	4	5			
May	3	20.0	16.5	18.3	95.5		0	0	0	0	0	0	0	0	0	0	0	0
	14	15.0	12.0	13.2	82.5		0	0	0	0	0	0	0	0	0	0	0	0
Jun.	7	22.5	22.0	22.1	92.8		0	0	0	0	0	0	0	0	0	0	0	0
	19	23.5	22.0	22.9	95.2		2	0	0	2	1	1	10	4	0	1		21
Jul.	2	26.0	25.5	25.9	83.7		0	0	0	0	2	3	2	1	1	1		10
	17	27.0	25.0	26.1	84.3		3	1	3	1	3	3	2	0	1	1		18
Aug.	1	27.0	25.0	26.4	86.7		2	4	1	1	1	1	0	0	3	1		14
	21	25.0	19.0	23.0	94.3		2	0	1	0	0	0	0	0	0	0		3
Sept.	11	22.0	20.0	20.6	88.6	0	1	1	0	0	0	1	0	0	0	0		3
	25	23.0	21.0	22.0	88.9	0	0	0	1	0	0	0	0	0	0	0		1
Oct.	10	21.0	20.0	20.6	81.3	0	0	0	0	0	0	0	0	0	0	0		0
	24	19.0	16.0	17.6	90.7	0	0	0	0	0	0	0	0	0	0	0		0
Total						0	10	6	6	4	7	9	14	5	5	4		70

Table 4 Hourly total of night catches of female mosquitoes  
in a **cow-shed**

Species	p. m.						a. m.						Total
	7	8	9	10	11	12	1	2	3	4	5	6	
<i>An. h. sinensis</i>	1	22	53	54	38	41	22	24	22	25	24	0	326
<i>C. p. pallens</i>	0	10	6	6	4	7	9	14	5	5	4	0	70
<i>C. bitaeniorhynchus</i>	0	1	1	0	1	1	0	0	0	0	0	0	4
<i>C. tritaeniorhynchus</i>	0	0	6	4	2	1	2	2	3	0	5	0	25
<i>Ae. togoi</i>	0	1	0	0	0	0	0	0	0	0	0	0	1
<i>Ar. subalbatus</i>	5	5	2	0	4	1	0	1	2	2	4	2	28
Total	6	39	68	64	49	51	33	41	32	32	37	2	454

of May reaching a high peak, especially in cow-shed, at late June and disappearing by the beginning of October. *C. p. pallens* begins to enter houses from the beginning of June reaching maximum in number at late July and decreasing towards the end of September. The active season in nocturnal feeding activity of this house mosquito, in its turn, the most important period in relation to the transmission of filariasis, at least in the district in question, is the months covering from June to August.

Although the periods of being collected are the same, the number of the anopeline mosquito is much greater in cow-shed and that of

the house mosquito is very larger in the human-baited-trap. This shows again that the former is strongly zoophilic and the latter is highly androphilic.

With the other mosquito species, it is difficult to discuss on the states of the seasonal distribution in the feeding activity and the host preference because of the scantiness of their numbers captured at least in this collection.

An additional night catch was made on the night of the first day of our arrival at the section, for 30 minutes from 9 p.m., twice a month from May through October, in the young men's club-house where usually ten young men

Table 5 Hourly night catches of females of *An. h. sinensis*  
in a human-baited-trap

Date	Temp. °C at night			Mean R.H. %	p. m.						a. m.					Total	
	Max.	Min.	Mean		7	8	9	10	11	12	1	2	3	4	5		
May	3	20.0	16.5	18.3	95.5		0	0	2	2	0	0	0	0	0	0	4
	14	15.0	12.0	13.2	82.5		0	0	0	0	0	0	0	0	0	0	0
Jun.	7	22.5	22.0	22.1	92.8		1	1	0	2	0	0	0	2	0	0	6
	19	23.5	22.0	22.9	95.2		0	1	1	0	4	0	0	3	1	2	12
Jul.	2	26.0	25.5	25.9	83.7		0	1	0	1	4	0	0	0	1	2	9
	17	27.0	25.0	26.1	84.3		0	0	2	1	0	0	0	0	0	0	3
Aug.	1	27.0	25.0	26.4	87.0		0	0	1	0	0	0	0	0	0	0	1
	21	25.0	19.0	23.0	94.3		1	0	1	0	0	0	2	1	0	0	5
Sept.	11	22.0	20.0	20.7	88.4	1	0	0	0	0	0	0	0	1	0	0	2
	25	23.0	21.0	22.0	88.9	0	0	0	0	0	1	0	0	0	0	0	1
Oct.	10	21.0	20.0	20.7	81.3	0	0	0	0	0	0	0	0	0	0	0	0
	24	19.0	16.0	17.6	90.7	0	0	0	0	0	0	0	0	0	0	0	0
Total						1	2	3	7	6	9	0	2	7	2	4	43

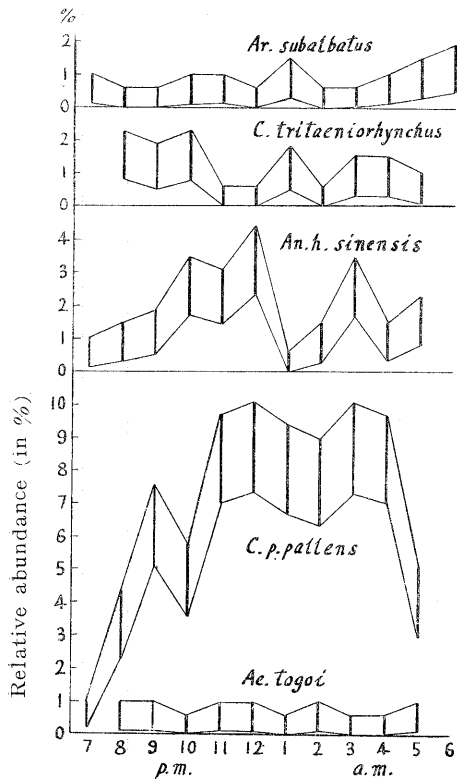
Table 6 Hourly nighth catches of females of *C. p. pallens*  
in a **human-baited-trap**

Date	Temp. °C at night			Mean R. H. %	p. m.						a. m.					Total		
	Max.	Min.	Mean		7	8	9	10	11	12	1	2	3	4	5			
May	3	20.0	16.5	18.3	95.5		0	0	0	0	0	0	0	0	0	0	0	0
	14	15.0	12.0	13.2	82.5		0	0	0	0	0	0	0	0	0	0	0	0
Jun.	7	22.5	22.0	22.1	92.8		0	0	1	3	1	1	1	3	2	1		13
	19	23.5	22.0	22.9	95.2		1	2	1	7	3	5	2	6	9	0		36
Jul.	2	26.0	25.0	25.9	83.7		1	4	1	2	2	2	1	3	1	1		18
	17	27.0	25.0	26.1	84.3		5	6	9	6	12	7	11	7	8	6		77
Aug.	1	27.0	25.0	26.4	87.0		1	2	1	3	6	7	5	3	3	2		33
	21	25.0	19.0	23.0	94.3		0	2	0	1	1	1	1	3	1	1		11
Sept.	11	22.0	20.0	20.7	88.4	1	1	1	0	1	0	0	0	0	0	0		4
	25	23.0	21.0	22.0	88.9	0	0	1	0	1	0	0	1	0	0	0		3
Oct.	10	21.0	20.0	20.7	81.3	0	0	0	0	0	0	0	0	0	0	0		0
	24	19.0	16.0	17.6	90.7	0	0	0	0	0	0	0	0	0	0	0		0
Total							1	9	18	13	24	25	23	22	25	24	11	195

Table 7 Hourly total of night catches of female mosquitoes  
in a **human-baited-trap**

Species	p. m.						a. m.						Total
	7	8	9	10	11	12	1	2	3	4	5	6	
<i>An. h. sinensis</i>	1	2	3	7	6	9	0	2	7	2	4	0	43
<i>C. p. pallens</i>	1	9	18	13	24	25	23	22	25	24	11	0	195
<i>C. bitaeniorhynchus</i>	0	0	0	0	0	1	1	1	0	1	1	0	5
<i>C. tritaeniorhynchus</i>	0	4	3	4	0	0	3	0	2	2	1	0	19
<i>Ae. albopictus</i>	0	0	3	0	0	0	0	0	1	0	2	0	6
<i>Ae. japonicus</i>	0	0	0	1	0	0	0	0	0	0	0	0	1
<i>Ae. togoi</i>	0	1	1	0	1	1	0	1	0	0	1	0	6
<i>Ar. subalbatus</i>	1	0	0	1	1	0	2	0	0	1	2	3	11
Total	3	16	28	26	32	36	29	26	35	30	22	3	286

Fig. 2 Relative hourly distribution in nocturnal feeding activity of mosquitoes collected in a **Human-baited-trap**, showing in 60% confidence intervals of population percentage numbers (cf. Table 7)



gathered at dark to spend the night. The result is given in Table 10. The special features found in this collection are that the 159 females or as high as 90.3% of all mosquitoes captured throughout this collection is the house mosquito and that the times of its appearance and of its reaching maximum are earlier by about one month than in the case of night catch made in the human-baited-trap and moreover the time of its disappearance is later by one month than in the case of the trap. This may suggest that this domestic mosquito would be prefer human dwelling-houses to the human-baited-trap which was

made of cotton netting and set up outdoors.

(3) Host preference in mosquitoes.

In Fig. 5 the host preferences of mosquitoes collected in this section are compared. The comparison is made between the population percentage numbers of mosquitoes for the total sample specimens obtained in the cow-shed at night throughout the months and those for the sample specimens of the sum total of mosquitoes obtained at night in the human-baited-trap and in the young men's club-house, on the other words, between the mosquito association attracted to the cow and that attracted to humans. Fig. 5 clearly shows that *An. h. sinensis* is strongly zoophilic and on the contrary, *C. p. pallens* is highly androphilic. The other mosquito species are too small in numbers collected to discuss their host preferences.

(4) House staying habit of mosquitoes.

The intensity of the house staying habit in any mosquito species is conceivable to be one of the indications of its being domestic and also is a matter of requiring deep consideration in the case of mosquito control by spraying of residual insecticides. Therefore, morning catches of mosquitoes staying in houses were made for 20-40 minutes by house during from 6 a.m. to 8 a.m., on two successive mornings of the second and third day of our arrival at the section, in the three farm houses and also in the young men's club-house. The total numbers of mosquitoes obtained in the farm houses on two mornings are tabulated in Table 11, A, and those collected in the club-house on two mornings are in Table 11, B.

Mosquitoes begin to be found from the beginning of May both in the farm houses and club-house, and disappear after the end of September in the former and after late October in the latter. The numbers of mosquitoes staying in houses are much larger during the period from late June to late July in both cases, though the peak is flat and hill like in the farm houses and very high and sharp in the club-house. The mosquito associations

Table 8 Seasonal prevalence of female mosquitoes collected hourly, through the night, twice a month in a **cow-shed** (cf. Table 4)

Month	May		Jun.		Jul.		Aug.		Sept.		Oct.		Total
Date	3	14	7	19	2	17	1	21	11	25	10	24	
Sun-set	19.05'	19.12'	19.14'	19.32'	19.34'	19.31'	19.21'	19.03'	18.35'	18.15'	18.05'	17.49'	
Sun-rise	5.31'	5.24'	5.12'	5.12'	5.16'	3.22'	5.33'	5.46'	6.00'	6.12'	6.14'	6.24'	
Weather	Cloudy	Fine	Rain	Cloudy	Cloudy	Cloudy	Cloudy	Cloudy, shower	Fine	Fine cloudy	Fine	Fine cloudy	
Temp. °C(1)	18.3	13.2	22.1	22.9	25.9	26.1	26.4	23.0	20.6	22.0	20.6	17.6	
R. H. % (1)	95.5	82.5	92.8	95.2	83.7	84.3	86.7	94.3	88.6	88.9	81.3	90.7	
<i>An. h. sinensis</i>	7	2	82	122	52	18	29	6	5	3	0	0	326
<i>C. p. pallens</i>	0	0	0	21	10	18	14	3	3	1	0	0	70
<i>C. bitaeniorhynchus</i>	0	0	0	1	1	1	0	1	0	0	0	0	4
<i>C. tritaeniorhynchus</i>	0	0	0	2	7	2	5	8	1	0	0	0	25
<i>Ae. togoi</i>	0	0	0	0	0	1	0	0	0	0	0	0	1
<i>Ar. subalbatus</i>	0	0	0	0	1	0	3	13	11	0	0	0	28
Total	7	2	82	146	71	40	51	31	20	4	0	0	454

(1) : The temperature and relative humidity show the respective means of those taken hourly from sun-set through sun-rise.

Table 9 Seasonal prevalence of female mosquitoes collected hourly, through the night, twice a month in a **human-baited-trap** (cf. Table 7)

Month	May		Jun.		Jul.		Aug.		Sept.		Oct.		Total
Date	3	14	7	19	2	17	1	21	11	25	10	24	
<i>An. h. sinensis</i>	4	0	6	12	9	3	1	5	2	1	0	0	43
<i>C. p. pallens</i>	0	0	13	36	18	77	33	11	4	3	0	0	195
<i>C. bitaeniorhynchus</i>	0	0	0	1	0	0	0	4	0	0	0	0	5
<i>C. tritaeniorhynchus</i>	0	0	0	1	1	4	1	6	6	0	0	0	19
<i>Ae. albopictus</i>	0	0	0	0	5	0	0	1	0	0	0	0	6
<i>Ae. japonicus</i>	0	0	0	0	0	0	0	1	0	0	0	0	1
<i>Ae. togoi</i>	0	2	3	1	0	0	0	0	0	0	0	0	6
<i>Ar. subalbatus</i>	0	0	0	0	0	0	5	0	6	0	0	0	11
Total	4	2	22	51	33	84	40	28	18	4	0	0	286

Remark : The astronomical conditions are the same as in Table 8



Fig. 3 Relative seasonal distribution in nocturnal feeding activity of mosquitoes collected in a **cow-shed**, showing in 60% confidence intervals of population percentage numbers (cf. Table 8)

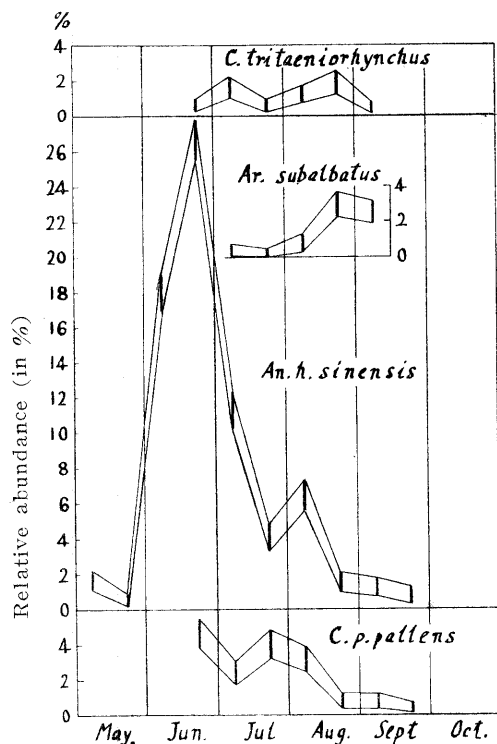
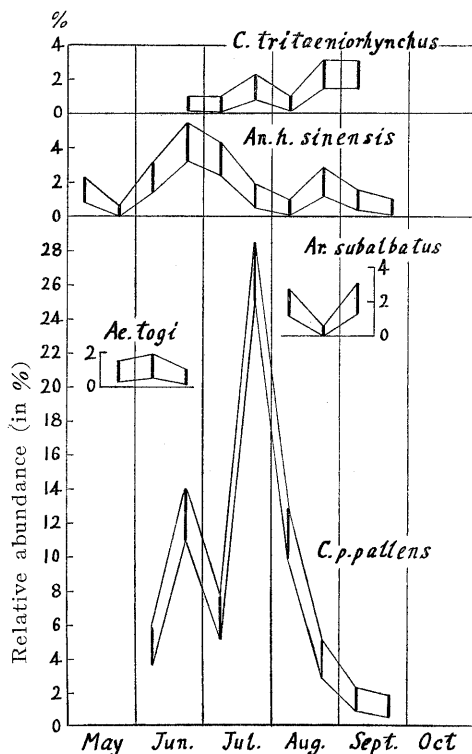


Fig. 4 Relative seasonal distribution in nocturnal feeding activity mosquitoes collected in a **Human-baited-trap**, showing in 60% confidence intervals of population percentage numbers (cf. Table 9)



are nearly similar in both collections showing very high percentage numbers or about 84% in *C. p. pallens* and very low ones or 6.1 and 7.7% in *An. h. sinensis*. However, some little differences are found in the points that in the farm houses *C. tritaeniorhynchus* is a little higher and *Ae. togoi* is very low, while, in the club-house the former species become lower and the latter species a little higher in percentage.

(5) Comparison of seasonal prevalences in *C. p. pallens* collected by different catching methods.

Seasonal distribution curves of *C. p. pallens* collected (1) in a cow-shed at night, (2) in a human-baited-trap at night, (3) in a young

men's club-house at night, (4) in the same club-house in the early morning, and (5) in three farm houses are compared in Fig. 6, showing in percentage number against the total number of this mosquito species collected by all these five methods.

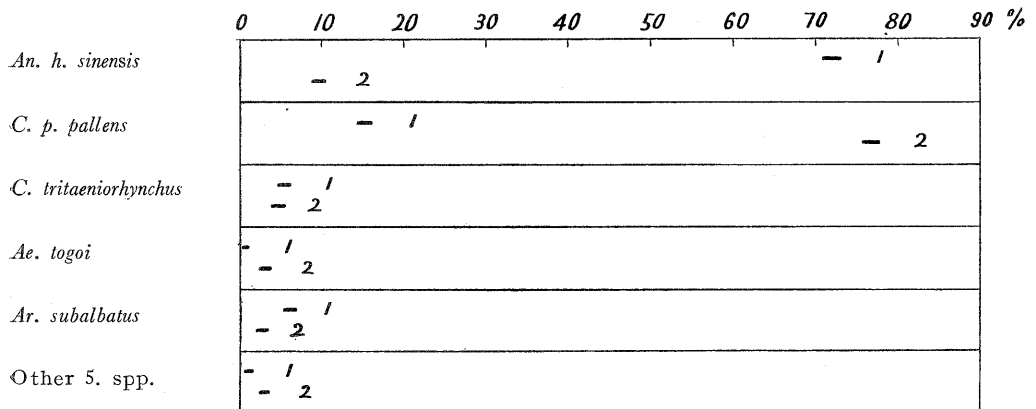
The time of appearance of this mosquito is earlier in the human dwelling-houses or the club-house and later in the trap set up outdoors and the latest in the cow-shed. The females collected at the beginning of May appears to be hibernated ones and those obtained from the beginning of June seems to be newly emerged ones. The situation of the peak in the seasonal distribution curve vary with the

Table 10 Seasonal prevalence of female mosquitoes collected  
for 30 minutes from 9 p. m. in a **young men's club-house**

Species	Date	May		Jun.		Jul.		Aug.		Sept.		Oct.		Total	Total of Tables 9 & 10
		2	15	6	18	3	16	2	20	10	26	9	23		
		18	18	22	24	28	28	27	25	25	22	21	19		
<i>A. h. sinensis</i>		2	0	0	1	0	0	0	0	0	0	0	0	3	46
<i>C. p. pallens</i>		4	5	42	51	14	18	4	15	1	3	1	1	159	354
<i>C. bitaeniorhynchus</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	5
<i>C. tritaeniorhynchus</i>		0	0	0	1	0	1	0	0	1	0	0	0	3	22
<i>Ae. albopictus</i>		0	0	1	0	0	0	0	0	0	0	0	0	1	7
<i>Ae. japonicus</i>		0	0	0	0	0	0	0	0	0	0	0	0	0	1
<i>Ae. nipponicus</i>		0	0	0	0	0	1	0	0	0	0	0	0	1	1
<i>Ae. togoi</i>		1	0	2	0	0	3	1	1	0	0	0	0	8	14
<i>Ar. subalbatus</i>		0	0	1	0	0	0	0	0	0	0	0	0	1	12
Total		7	5	46	53	14	23	5	16	2	3	1	1	176	462

(1) : The temperature was taken at 9.00'-9.30' p. m. in the house

Fig. 5 Host preference of mosquitoes



1 represent the relative abundances being shown in 60% confidence intervals of population percentage numbers for sample specimens of mosquitoes collected in a cow-shed at night (cf. Table 8)

2 represent those for total sample specimens of mosquitoes collected in a human-baited-trap and a young men's club-house at night (cf. Tables 9 and 10)

Table 11 Seasonal prevalence of female mosquitoes collected for 20-40 minutes, early in the morning, on the successive two days in the following house

A In three farm houses with 3, 4, and 5 persons

Species	Date		May		Jun.		Jul.		Aug.		Sept.		Oct.		Total	Total of A & B
	Mean temp. °C(1)	Species	3, 4	15, 16	7, 8	19, 20	3, 4	17, 18	2, 3	21, 22	11, 12	26, 27	10, 11	24, 25		
			17	15	21	23	27	26	27	23	24	23	20	17		
<i>An. h. sinensis</i>			0	0	6	6	1	1	1	0	0	1	0	0	16	40
<i>C. p. pallens</i>			2	2	11	53	50	53	13	12	11	13	0	0	220	480
<i>C. vagans</i>			0	0	0	0	0	1	0	0	0	0	0	0	1	1
<i>C. bitaeniorhynchus</i>			1	0	0	0	0	0	0	1	0	0	0	0	2	2
<i>C. tritaeniorhynchus</i>			0	0	0	0	2	4	6	0	3	3	0	0	18	25
<i>Ae. albopictus</i>			0	0	0	0	1	0	0	0	0	0	0	0	1	1
<i>Ae. japonicus</i>			0	0	0	0	1	0	0	0	0	0	0	0	1	2
<i>Ae. togoi</i>			1	0	0	1	0	0	0	0	0	0	0	0	2	14
<i>Ar. subalbatus</i>			0	0	0	0	0	1	0	0	0	0	0	0	1	7
Total			4	2	17	60	55	60	20	13	14	17	0	0	262	572

B In the young men's club-house in which ten young men usually spent only the night

<i>An. h. sinensis</i>	3	0	1	20	0	0	0	0	0	0	0	0	0	24
<i>C. p. pallens</i>	8	13	18	36	95	54	13	16	2	4	0	1	260	
<i>C. tritaeniorhynchus</i>	0	0	0	2	1	0	0	3	1	0	0	0	7	
<i>Ae. japonicus</i>	0	0	0	0	1	0	0	0	0	0	0	0	1	
<i>Ae. togoi</i>	0	1	2	2	4	2	1	0	0	0	0	0	12	
<i>Ar. subalbatus</i>	0	0	0	0	5	0	1	0	0	0	0	0	6	
Total	11	14	21	60	106	56	15	19	3	4	0	1	310	

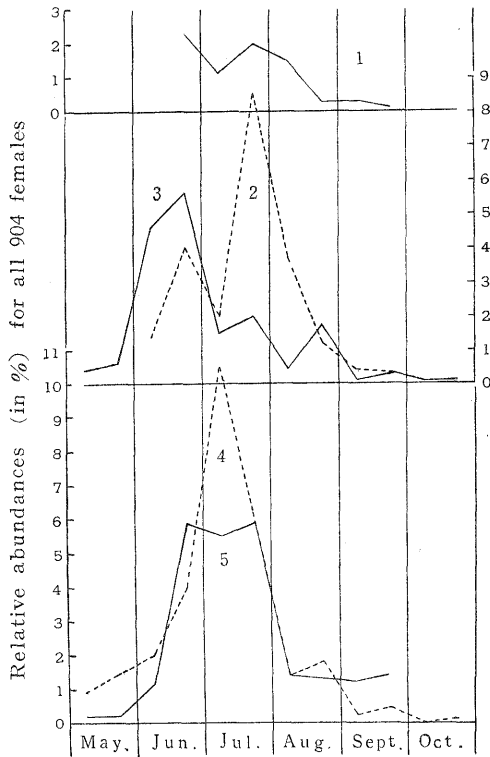
(1) : The mean temperature shows the mean of those taken at the collection times on the successive two mornings.

method of collection. The reason why is now unknown but the peaks are included in a period from late June to late July. However, the season fairly active in feeding activity

covers the months from early June to the end of August.

(6) An ecological consideration on the role of *C. p. pallens* in the transmission of bancroftian

Fig. 6 Seasonal prevalences of *C. p. pallens*, comparing those in cow-shed at night (1), in H. B. T. at night (2), in club-house at night (3), in club-house in the early morning (4), and in three farm houses in the early morning (5).



filariasis in the district in question.

Among the ten mosquito species having been proved experimentally positive for infective filarial larvae in Japan, six species, *C. p. pallens*, *C. vagans*, *Ae. togoi*, *C. bitaeniorhynchus*, *C. tritaeniorhynchus*, and *An. h. sinensis* were collected in this section. Among the above six species *C. p. pallens* must be said to be the only and the most important species because the other species are very few in breeding number in the district or scarcely androphilic, or very low in susceptibility to filarial larvae.

*C. p. pallens* was the most predominant in houses or in human-baited-trap. It is the most androphilic. Its hourly distribution in nocturnal feeding activity agrees well with the nocturnal periodicity of microfilariae in the peripheral blood stream of the carrier. The period of time in which it is predominant in number of entering houses corresponds well to the most favorable season for the development of filarial larvae in mosquito. As above, these ecological features of *C. p. pallens* seems to extremely favor the filaria worm for the maintainance of its own tribe.

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### Summary

1) Mosquito survey was projected on August of 1955 in a filaria endemic section, kamisikama, of Nanatugama village, Nagasaki prefecture in order to make clear the hourly changes and seasonal distribution of nocturnal feeding activity of mosquitoes prevailing in the area, their host preference, and the house staying habit of them.

2) For that purpose, all-night collections were made in a cow-shed and in a human-baited-trap ; a night catch for 30 minutes was made in a young men's club-house ; and morning catches for 20-40 minutes by house were made in three farm houses.

3) Among ten species found in the area, the most abundant ones were *An. h. sinensis* and *C. p. pallens*, while, the others are rather few in numbers. The former species is very active

in nocturnal feeding activity during from 8 p. m. to 12 p. m. while, the latter from 9 p. m. to 4 a. m. The former is extremely predominant in cow-shed, while, the latter in human dwelling houses or young men's club-house.

4) Seasonally, *An. h. sinensis* is abundant during from early June to early July with a peak in late June, while, *C. p. pallens* is abundant in the period from late June to early August, with a peak in late July.

5) It was found that *An. h. sinensis* is obviously zoophilic, while, *C. p. pallens* is extremely androphilic. With the other species, the habit of host preference could not be confirmed in this survey because of their scantiness of the number collected.

6) *An. h. sinensis* begins to enter cow-shed in early May earlier than the other species, while, *C. p. pallens* does to enter human dwelling houses earlier than the others. The latter species is the most intense in house staying habit among the indigenous species.

7) The house mosquito, *C. p. pallens* which has been proved by Japanese authors the most suitable vector of bancroftian filariasis in Japan experimentally as well as in nature, is now confirmed also in the ecological standpoint to be the most important at least in the area in question. That is, it is the most abundant and the most androphilic among the indigenous mosquito species; it is strong in house frequenting habit and also in house staying habit; and moreover its active hours in nocturnal feeding activity agrees well with the nocturnal periodicity of microfilariae in the peripheral blood stream of the carrier; and again the active breeding season covers the months the most favorable for the development of filariae in mosquito.