기 생 충 학 잡 지 제24권 제 1 호
The Korean Journal of Parasitology
Vol. 24, No. 1, 15~24, June, 1986

Epidemiological Studies on Malayan Filariasis in an Inland Area in Kyungpook, Korea

3. Ecological Survey of Vector Mosquitoes of *Brugia malayi**

Hewng-Il Lee, Dong-Wik Choi, Doo Hyun Baik** and Chong Yoon Joo**
*Department of Parasitology, Kyungpook National University School of Medicine, and Department of Parasitology, Keimyung University School of Medicine**, Taegu, Korea*

INTRODUCTION

Since Yun's first report on the occurrence of filariasis malayi in an autopsy case of a 29-year-old male patient with elephantiasis of both legs in 1927, many investigators have made studies on the prevalence of *B. malayi* among the residents (Oh, 1929; Moon, 1939; Senoo and Lincicome, 1951; Whang *et al.*, 1965; Seo *et al.*, 1965 & 1968; Soh *et al.*, 1966; Kim, 1971; Kanda *et al.*, 1975; Seo, 1978; Kim *et al.*, 1980), and on the infestation rate for infective larvae of *B. malayi* in vector mosquitoes (Lee *et al.*, 1964; Chun, 1968; Katamine *et al.*, 1971; Wada *et al.*, 1973 & 1977; Kim, 1974; Kanda *et al.*, 1975), but only few studies on the bionomics of mosquitoes have been published (Whang, 1962; Lee *et al.*, 1969; Joo and Wada, 1985).

As a result, Malayan filariasis among the residents in Korea are found to be distributed sporadically in three regions, *i.e.*, Cheju island and some nearby islands in the southern coastal districts, Nonsan area and some other localities along the Keum River in Chungnam Province, and Yeongju area of Kyungpook Province, in which low infestation rate for the infective larvae of *B. malayi* in intermediate hosts, *Anopheles sinensis* and *Aedes togoi*, had been reported.

Up-to-date information on the species composition, relative abundance and seasonal distribution of vector mosquitoes in this Province is not available. In the past, Whang (1962) studied on the bionomics of anopheline mosquitoes in this Province and other areas in Korea, and Kanda *et al.* (1975) listed the species of mosquitoes collected by human baits and made brief references to the relative abundance of mosquito species in an inland area in Kyungpook Province, Korea.

The objectives of this survey are to determine the species composition, population density and seasonal prevalence of vector mosquitoes in a northern areas of this Province based on light trap collections, and to estimate the recent patterns of infestation for the infective larvae of *B. malayi* in intermediate hosts.

GEOGRAPHICAL CONDITIONS OF SURVEYED AREA

Shincheon-ri in Anjung-myun, Yeongpung-gun is a rural village of about 300 residents and situated along the bank of Namweon stream, one of the large tributaries of the Naktong river. It is about 170 kilometers by road from Taegu city and lies in the hilly and mountainous area of the northern part of Kyungpook Province at 37 degree north latitude. The average elevation is about 170 meters above the sea level. The west corner of this village lies in the foothills of a low mountain range and the east borderline is limited by the bank of the stream (Fig. 1).

* The results of this survey were presented at the 27th annual meeting of the Korean Society for Parasitology in 1985.

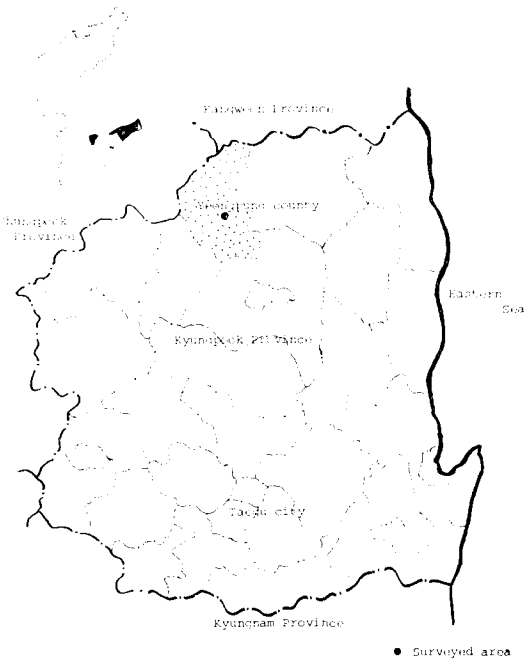

Fig. 1. Surveyed area in Kyungpook Province, Korea.

Most of the house-dwellings lie beside the road, which runs north and south through the village, and a few houses are scattered about in the surrounding rice fields. The rice field irrigation begins in May and ends in late August or early September; during this period the rice fields form the main breeding places for the vector mosquitoes.

The domestic animals are cows, pigs, dogs and chicken, *etc.* The cow-shed is usually one compartment of the house-dwelling and piggery is nearby but separated from the house and is sometimes within the garden. The hen-house may be in the garden or inside the cow-shed with the cows. The dogs have no kennels but are kept by the houses, usually in the space under the floor.

The surveyed areas are under the influence of a typical continental climate of the eastern coast affected by both high atmospheric pressure from the cold continent and low one from the Pacific

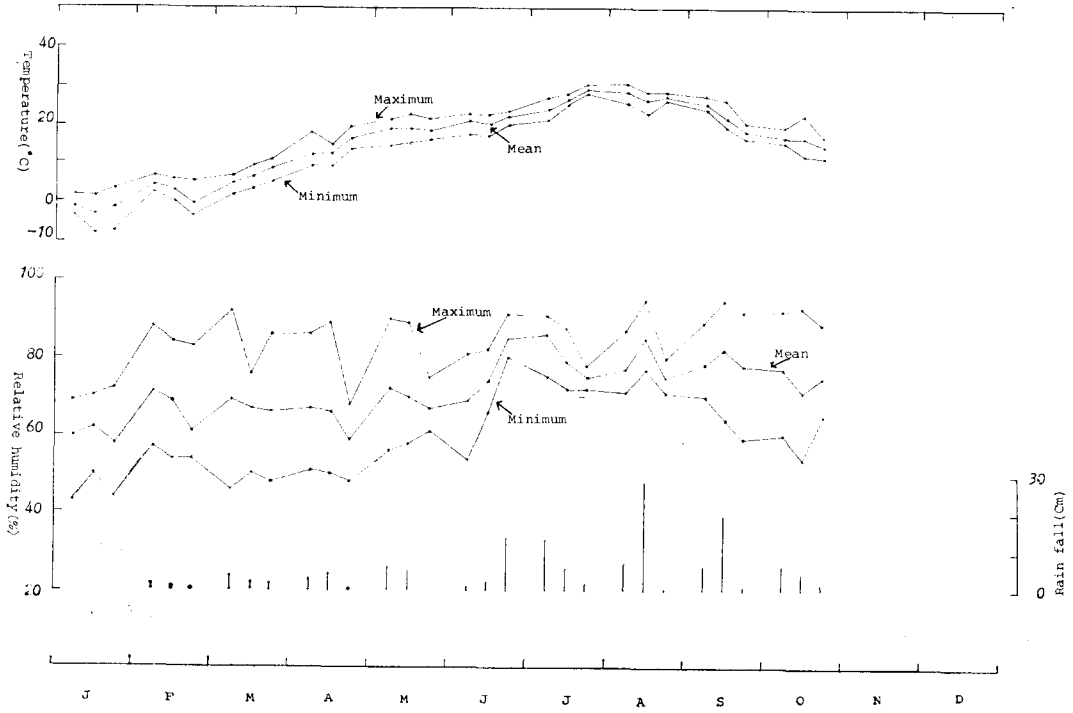

Fig. 2. Fortnightly mean, maximum and minimum temperature, relative humidity and total rain fall (cm) reported by regional Meteorological Center in Taegu, Korea during 1985.

Ocean in the summer season. Therefore, seasonal fluctuation of air temperatures and precipitation, which is of fundamental importance to understand the dynamic of mosquito population, is very large. Meteorological data for the period of the present survey are based on Monthly Reports of the Taegu branch of the Korean Meteorological Agency (Fig. 2).

MATERIALS AND METHODS

During the period of May-November in 1985, the authors carried out ecological studies of *A. sinensis* in order to estimate the species compositions, relative abundance and seasonal prevalence of vector mosquitoes and recent patterns of infestations for the infective larvae of *B. malayi* among intermediate hosts collected.

In order to observe the relative numbers and seasonal prevalence of the vector mosquito population, light trap collections were performed as follows: These light traps were located at three sampling spots; the piggery, cow-shed, and human-dwelling house. A light trap was fixed at 1.5 meters above the ground at a trapping spot, and operated from dusk to dawn on one-night per ten day schedules.

All the mosquito specimens collected were transferred into glass tubes and kept in ice-bottles until they were individually examined for species under a stereomicroscope and counted. The seasonal prevalence and population density of vector mosquitoes were measured by the average number per trap-night.

In order to determine the relative numbers and species of mosquitoes which were attracted by human beings, a collector sat on the floor in a room with the window and doors kept open under the illumination of a 20 watt fluorescent lamp from 19:00 to 07:00 hours on one-night per month schedules.

All the mosquitoes biting or attempting to bite were collected either on the skin with a sucking tube or with an insect net, and killed with ethyl ether. They were transferred into the glass tube and kept in an ice-box until they were individually identified and dissected in the laboratory.

Dissection of the mosquito specimens were made usually from the next morning. After each mosquito was identified and numbers recorded, it was transferred on a slide glass with a drop of 0.6 per cent saline solution. They were examined for the determination of the ovarian age using the method reported by Detinova (1962).

Records were made for each mosquito whether it was nulliparous or parous, and if parous the number of follicular relics was determined. After this all other body parts were examined for filarial infections.

RESULTS

Table 1 lists 9 species of mosquitoes, representing 4 genera, collected in the light traps at Shincheon village. *A. sinensis* Wiedemann was the most abundant species through the year. *Culex tritaeniorhynchus* Giles was the second abundant species, and *Aedes vexans nipponii* (Theobald) ranked third in total abundance. *C. pipiens pallens* Coquillet represented about 2.0 per cent of all collection in this survey.

Fig. 3 illustrates the seasonal prevalence of *A. sinensis* collected with light traps at an inland area of Kyungpook Province in 1985. In general, *A. sinensis* began to be collected from mid-May and the increase in the mosquito population towards the midsummer peak began from the beginning of July, by the emergence

Table 1. Relative abundance of mosquitoes collected by light traps at Shincheon village in 1985

Species	No. collected	Per cent of total
Anopheles sinensis Wiedemann	6,437	84.7
Anopheles sineroides Yamada	237	3.1
Aedes vexans nipponii(Theobald)	312	4.1
Aedes albopictus(Skuse)	10	0.1
Culex pipiens pallens Coquillett	137	1.8
Culex vagans Wiedemann	41	0.5
Culex tritaeniorhynchus Giles	334	4.4
Culex orientalis Edwards	61	0.8
Armigeres subalbatus(Coquillett)	30	0.4
Total number of all species	7,599	

Table 2. Monthly variation in the numbers of *Anopheles sinensis* caught by light traps in an inland area of Kyungpook Province (1985), together with meteorological data

Month	Temperature (Range °C)	Humidity (Range %)	Rainfall (cm)	No. of collection	Total No. caught	Average nightly catch	Per cent of total annual catch
May	14.3~22.8	53~90	10.57	6	6	1.0	0.09
June	17.1~23.8	54~91	16.73	9	958	106.4	14.9
July	21.5~30.6	72~91	18.68	9	2,844	316.0	44.2
August	25.4~30.7	71~89	33.84	9	2,521	280.1	39.2
September	16.7~27.8	59~95	26.20	9	107	11.9	1.7
October	11.8~22.7	55~93	12.40	6	1	0.2	0.02
November	8.8~15.1	62~83	0	3	0	0	0

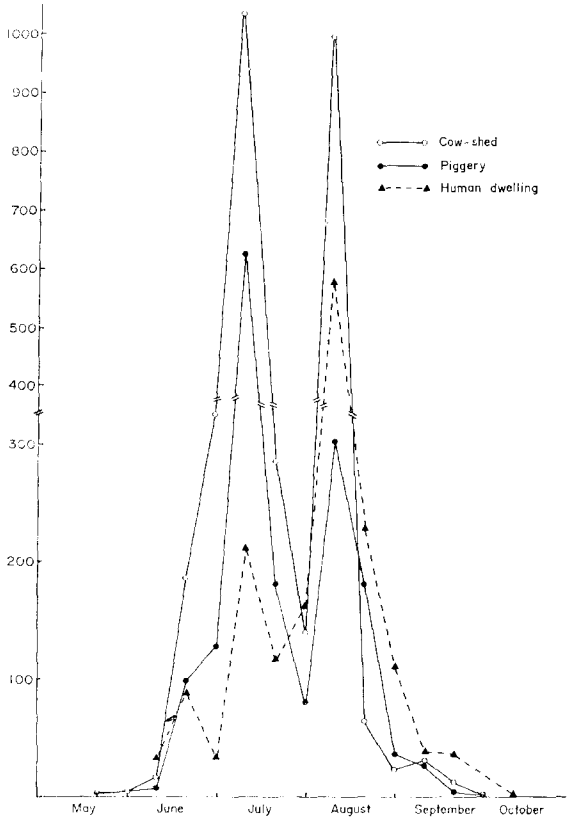

Fig. 3. Seasonal changes in the number of *Anopheles sinensis* collected by light traps in Kyungpook Province, Korea, 1985.

of new adults developed from the eggs deposited by the overwintered females. There occurred a temporary reduction of about 20 days between the months of greatest rainfall and the subsequent further peak of the anopheline population. After this there was a gradual decrease to mid-August and very small number was collected until early October.

The monthly variation in the numbers of *A. sinensis* collected by light traps is summarized in Table 2. The earlist time when *A. sinensis* appeared was the middle of May. At that time the temperature ranged from 14.3° to 22.8°C and the humidity 53~90 per cent.

The month which showed the highest average nightly catch was July, when the temperature was between 21.5° and 30.6°C and the humidity

Table 3. The results of overnight *Anopheles sinensis* collections by human bait traps in two nights, July 17~18 and September 7~8, 1985 in Anjung myun, Kyungpook Province, Korea

Hour	July 17~18		September 7~8	
	No. collected	Per cent total nightly catch	No. collected	Per cent total nightly catch
19 : 00~20 : 00	0	0	5	10.4
20 : 00~21 : 00	7	3.2	14	29.2
21 : 00~22 : 00	26	11.7	4	8.3
22 : 00~23 : 00	43	19.4	8	16.7
23 : 00~24 : 00	30	13.5	3	6.3
24 : 00~01 : 00	27	12.2	3	6.3
01 : 00~02 : 00	15	6.8	4	8.3
02 : 00~03 : 00	22	9.9	3	6.3
03 : 00~04 : 00	28	12.6	1	2.0
04 : 00~05 : 00	11	5.0	1	2.0
05 : 00~06 : 00	10	4.5	2	4.2
06 : 00~07 : 00	3	1.4	0	0
Total	222	—	48	—
Temperature (Range °C)	25.4~26.5		24.3~25.4	
Humidity (Range %)	79~88		73~77	

72～91 per cent. *A. sinensis* disappeared in late October and early November, when the temperature dropped to 8.8°～15.1°C.

The data shown in Table 3 shows the biting rhythm of *A. sinensis* on human beings in July 17～18 and September 7～8, 1985. The biting activity was continued throughout the night. The peak hour of biting differed each month, for example between 22 : 00～23 : 00 hours in July, and 20 : 00～21 : 00 hours in September, when the temperature was between 24.3° and 26.5°C and the humidity 73～88 per cent in the field.

The positive rate for the infective larvae of *B. malayi* in the mosquito specimens reported in an inland area of Kyungpook Province in 1975 was compared with the result in 1985 and tabulated in Table 4. In 1975, the infective larvae of *B. malayi* were found in one species of mosquito whereas no larvae were found in all species collected in this survey. Of 103 mosquito specimens of 7 species examined in 1975, only *A. sinensis* was infested with the larvae with the infection rate of 7.0%, whereas no larval filariae were found infected in 128 mosquito specimens examined in 1985.

The age compositions of *A. sinensis* collected in a dwelling house by human bait during 20 : 00 through 23 : 00 are compared with that of a cow-shed by cow bait and listed in Table 5. The frequency distribution of the *A. sinensis* by the number of follicular relics counted after their dissection, and parous rates in both biting collections were very low, being found in 25.0 per cent in human bait and in 12.1 per cent in cow bait, respectively.

The general figures of the human and cow bait collections in September showed that 56.3 per cent in former and 82.8 per cent in latter were parous. The results indicate that although the absolute numbers of mosquitoes biting man tend to decline from July to September in this area, the per cent of parous tend to increase and the absolute numbers of parous females per night

Table 4. Comparison of demonstration rates for infective larvae of *Brugia malayi* in vector mosquitoes collected in 1975 and 1985

Species	Biting at night				Resting in the daytime			
	Kanda *et al.*(1975)		Authors(1985)		Kanda *et al.*(1975)		Authors(1985)	
	No. examined	%	No. examined	%	No. examined	%	No. examined	%
A. sinensis	71	7.0	53	0	136	0	165	0
A sineroides	0	0	0	0	3	0	7	0
C. tritaeniorhynchus	16	0	59	0	11	0	23	0
C. pipiens pallens	2	0	3	0	1	0	10	0
C. vagans	0	0	4	0	0	0	5	0
A. vexans nipponii	11	0	7	0	15	0	51	0
A. subalbatus	3	0	2	0	1	0	16	0

Table 5. Age composition of *Anopheles sinensis* collected in 1985 as determined by the number of follicular relics

Locality	Date	Method of collection	No. dissected	Frequency distribution by the No. of relic				Per cent parous
				N*	1	2	3	
Shincheon 1st village	July 17	Human bait	76	57	14	4	1	25.0
Shincheon 2nd village	July 17	Cow bait	116	102	12	2	0	12.1
Shincheon 1st village	September 7	Human bait	16	7	8	1	0	56.3
Shincheon 2nd village	September 7	Cow bait	29	5	16	7	1	82.8

* Nulliparous

in September are higher than that in July.

DISCUSSION

The results obtained in this survey indicate that the primary vector of *B. malayi*, *i.e.*, *A. sinensis*, is the most abundant species collected in New Jersey light traps in an inland area of Kyungpook Province, Korea. However, they demonstrated no larval filaria infections in the present study.

The northern area of Kyungpook Province has been known as one of the endemic areas of filariasis malayi in Korea. But recent epidemiological studies on *B. malayi* in this Province revealed a marked reduction in its prevalence among the residents (Kim *et al.*, 1980). In addition, an earlier literature on its vector mosquito (Kanda et al., 1975), studies by Kim *et al.* (1977), and the results in this survey, have indicated that the infestation of the anopheline mosquito with the infective larvae of *B. malayi* remarkably reduced in this area.

However, the details of ecology of the vector mosquitoes in this Province have not yet been studied. Little factual data can be found on the ecology of vector mosquitoes in Korea.

Kobayashi (1929) conducted a study on the seasonal prevalence of mosquitoes in Korea and reported for the first time that adult *A. sinensis* was the most abundant species between July and August, according to the collection method in which fly catching bowl containers were placed in a room in various areas in Korea. Yamada (1936) in a study of zoophilism and anthropophilism of anopheline mosquitoes in Korea reported that among the blood meals of *A. sinensis* collected from animal sheds, 82.5 per cent fed on cows and none on man; however, among those collected in human dwellings and the railway station in Seoul, 54.8 per cent and 80.3 per cent fed on man, respectively.

Eight years later, Yokoo (1944) conducted an investigation on the distribution and biology of the mosquito, especially *A. sinensis* in Korea. From his mosquito survey, it was found that the seasonal prevalence of *A. sinensis* first appeared in late March and they trapped in large numbers during the period from late June to mid-July. They also stressed that *A. sinensis* seemed to serve as a vector of setariasis of domestic animals in Korea.

After the Korean War, the epidemiological and parasitological studies on vector mosquitoes in Korea have made remarkable progress through the efforts of medical parasitologists, public health officials, and medical entomologists serving in the U.S. military service.

Whang (1962) carried out a malaria pre-eradication survey in Korea, and reported that several malaria foci were found in areas situated at the foot of the Taebaek Mountains which run from north to south through the eastern part of Korea. From his mosquito survey, it was found that *A. sinensis* began to appear from late April or May and disappeared in October each year, and their resting places were mainly cow-sheds and outdoors. He also reported that the mosquitoes collected in hibernating places were found to be nulliparous and to have sperms in the spermathecae during the winter months, and claimed that anopheline species hibernated probably in the adult stage. Similar results in the vector mosquitoes have been obtained by Whang *et al.* (1965), Cha *et al.* (1969), Hong (1970), Kanda *et al.* (1975), and Joo and Wada (1985).

In the present survey, the population density of *A. sinensis* collected by light traps in piggery, cow-shed, and human dwelling showed a peak in early July in each sampling spot with a second small peak in early August. The results in this survey are similar to those reported by Whang (1962), Cha *et al.* (1969), Hong (1970), and Joo and Wada (1985). However, they differ considerably in the species number of anopheline mosquitoes collected, *i.e.*, six species reported by Whang (1962), and five species reported by Hong (1970). These differences may be due to the temperature and humidity variations, collection techniques, and geographical variation or general changes in the population distribution of mosquito species.

When the results of monthly light trap collections of anopheline mosquitoes are compared with those reported by previous investigators (Whang, 1962; Hong, 1970; Joo and Wada, 1985), it seems that the month of highest average catch in night was July, when the temperature was between 21.5° and 30.6°C and the humidity 72~91 per cent. The earliest date of appearance and disappearance in this survey was in mid-May and in late October or early November.

The results reported by Joo and Wada(1985) showed that *A. sinensis* was the only dominant species in mid-July and its number decreased in early August, and then showed a small peak in late August. After this, *A. sinensis* suddenly disappeared probably due to low temperature after early October. A study of Hong(1970) reported that *A. sinensis* was the most widely distributed and predominant species in all investigated areas and showed a higher density in plain areas than in mountainous areas. He also claimed that this species appeared from March to October with one peak in July. The main factors contributing to the earliest time of appearance and the changes in the density of the *A. sinensis* each year were considered to be the temperature, humidity, rainfall, and the rice fields and other breeding places irrigation, *etc.*

In the biting rhythm of *A. sinensis* on human beings in this survey, this species appeared to be active throughout the whole night, but was more active during darkness, after sunset to midnight. At that time the temperature was between 25.4° and 26.5°C and the humidity 79~88 per cent. These results are similar to the data reported by Whang(1962), Hong(1970), Kanda *et al.*(1975) and Joo and Wada(1985), although Hong(1970) reported that the peak hour of biting activity showed different in each month. Kobayashi(1929) observed that the activity of blood sucking by *A. sinensis* stopped by the end of September. Whang(1962) also reported that anopheline mosquitoes were rarely found in biting collections on men in late September or on cows in October.

Kanda *et al.*(1975) carried out a study on the relationship between the periodicity of the microfilariae and mosquito biting behavior, including physiological age and stage of filarial infection, combined to further incriminate *A. sinensis* as the vector. They reported that microfilariae appeared in the blood stream after 8 a.m., reached a peak at midnight and disappeared from 9 a.m. until 3 p.m. They also reported that 6.2 per cent of 103 *A. sinensis* collected by the overnight mosquito collections using human baits were infested with the larval stage of filariae, however, only three larvae were the 3rd stage infective ones among 56 observed in 6 mosquitoes. Kim *et al.*(1977) in a study of vector finding and transmission of *B. malayi* in the same area surveyed by Whang(1965) and Kanda *et al.*(1975) also reported that the prevalence of infective 3rd stage larvae was found to be very low in *A. sinensis.*

In the present survey, the population density of *A. sinensis* in an inland area of Kyungpook Province is relatively abundant but no infestation for the larval stage of *B. malayi* was found among 128 female *A. sinensis* dissected. Such a result seems to be affected by the human and environmental factors in relation to the ecology of vector mosquitoes, *i.e.*, the increasing recognition of mosquito-borne diseases, public health education with specific drug administration in malayan filariasis carriers, reduced susceptibility of human populations to the vector populations, and the common use of mosquito nets or insecticide sprays by the residents which may also play a role in the prevention of the disease transmission.

As previously indicated by Kim *et al.*(1980), the demonstration rate of microfilariae from human beings was apparently found to be low in recent years. They also indicated that the gradual elevation of living standards of the residents, gradual awakening and behavior of the residents to protect themselves from mosquito biting using such preventives as mosquito nets and insecticide spray. The relatively short period of mosquito season each year may also affect the

transmission of the malayan filariasis.

SUMMARY

The species composition, population density, and seasonal prevalence of vector mosquitoes in an inland area of Kyungoook Province were studied, based on light trap and human bait trap collections, and the recent patterns of infestation for infective larvae of *Brugia malayi* in these vector hosts were investigated from May to November in 1985. Nine species in four genera of mosquitoes were collected by light trap, human bait trap, and/or by nets.

Anopheles sinensis Wiedemann was the most abundant species collected by light traps during this year. *Culex tritaeniorhynchus* Giles was the second abundant species, and *Aedes vexans nipponii* (Theobald) ranked third in total abundance.

The earlist time when *A. sinensis* were found was the middle of May. At that time the temperature ranged from 14.3° to 22.8°C and the humidity 53~90 per cent.

The month of highest average nightly catch was July, when the temperature was between 21.5° and 30.6°C and the humidity 72~91 per cent. The peak time of biting activity of mosquitoes was different in each month, *i.e.* between 22:00~23:00 in July, and 20:00~21:00 hours in September, when the temperature was between 24.3° and 26.5°C and the humidity 73~88 per cent in the field.

While infective larvae of *B. malayi* were reported to have been found in one species of mosquito in 1975, no larvae were found in any species collected in this survey.

LITERATURE CITED

Cha, C.H., Ham, K.S., Hong, H.K. and Ahn, S.K. (1969) Experimental observation on the vector mosquitoes of malayan filariasis in inland of Korea *Korean J. Parasit.*, **7**:92 (in Korean).

Chun, S.R. (1968) A preliminary survey of mosquitoes of Cheju-do related to filariasis on species, biology and infection status. *Korean J. Publ. Hlth.*, **5**:113-121 (in Korean).

Detinova, T.S. (1962) Age grouping methods in Diptera of medical importance. *WHO monograph series*, No. 47:1-216.

Joo, C.Y. and Wada, Y. (1985) Seasonal prevalence of the vector mosquitoes of Japanese encephalitis virus in Kyungpook Province, Korea. *Korean J. Parasit.*, **23**:139-150.

Hong, H.K. (1970) Anopheline mosquitoes in Korea. *Yonsei Rept. Trop. Med.*, **1**:13-15.

Kanda, T., Choi, D.W. and Joo, C.Y. (1975) Epidemiological studies on malayan filariasis in an inland area in Kyungpook, Korea. *Japanese J. Parasit.*, **24**:177-183.

Kanda, T., Joo, C.Y. and Choi, D.W. (1975) Epidemiological studies on malayan filariasis in an inland in Kyungpook, Korea. 2. The periodicity of the microfilaria and the bionomics of the vector. *Mosquito News*, **35**:513-517.

Katamine, D., Aoki, K., Wada, Y., Sato, A., Tada, I., Fukushima, H., Seo, B.S., Rim, H.J. and Lee, S.H. (1971) An epidemiological study of malayan filariasis in Cheju island, Korea. *Japanese J. Parasit.*, **20**:289-290 (in Japanese).

Kim, D.C. (1974) Epidemiological studies of filariasis in inland Korea. 4. Vector determination of filariasis malayi in Yongju area. *Korean J. Parasit.*, **12**:80 (in Korean).

Kim, D.C., Lee, O.Y. and Lee, K.W. (1977) Epidemiology of malayan filariasis of inland Korea. II. Vector finding and transmission of *Brugia malayi* in Yongju area. *Yonsei Rept. Trop. Med.*, **8**:23-32.

Kim, D.C., Lee, O.Y., Kim, T.W., Han, E.J., Lee, K.W. and Choi, S.H. (1971) Epidemiological studies of human filariasis of inland Korea. Endemicity and transmission of human filariasis in Yongju area. *Rept. N.I.H. Korea*, **8**:147-165.

Kim, D.C., Lee, O.Y., Jeong, E.B. and Jeong, M.G. (1980) Natural transition of endemicity of malayan filariasis in inalnd Korea. Pattern of changes in microfilaria rate among inhabitants of Yongpung (former Yongju) area during the period of the last seven years. *Korean J. Parasit.*, **18**:171-178 (in Korean, English summary).

Kim, J.S., Lee, W.Y. and Chun, S.L. (1973) Ecology of filariasis on Cheju island. *Korean J. Parasit.*, **11**:33-53.

Kobayashi, H. (1929) Studies on seasonal prevalence of mosquitoes. 1. Results of collections and

observations in Korea during 1928. *Mansen no Ikai*, **94**:31-42 (in Japanese).

Lee, K.T., Kim, S.W., Kong, T.H. and Song, J.S. (1964) Malayan filariasis. Second report: Epidemiological investigations on filariasis due to *Brugia malayi* in the residents of southern Cheju-do, island. *J. Korean Med. Assoc.*, **7**:657-664 (in Korean).

Lee, K.T., Im, S.W., Lee, B.K., Yun, C.S. and Chung, Y. (1969) Report on water analysis of breeding places of *Aedes togoi* in Cheju-do. *J. Rural Hlth.*, **3**:275-281 (in Korean, English summary).

Moon, I.J. (1939) Studies on the endemic elephantiasis in Korea. Part 1. Survey in Nonsan and Puyo areas in Chung-nam. *Chosen Iggakai Zasshi*, **29**: 553-575 and 697-710 (in Japanese).

Oh, H.Y. (1929) Filariasis in Korea. *China Med. J.*, **43**:16-21.

Senoo, T. and Lincicome, D.R. (1951) Malayan filariasis, incidence and distribution in southern Korea. *U.S. Armed Forces Med. J.*, **2**:1, 483-1, 489.

Seo, B.S., Rim, H.J., Seong, S.H., Park, Y.H., Kim, B.C. and Lim, T.B. (1965) The epidemiological studies on the filariasis in Korea. 1. Filariasis in Cheju-do (Quelpart island). *Korean J. Parasit.*, **3**: 139-145 (in Korean, English summary).

Seo, B.S., Rim, H.J., Lim, Y.C., Kang, I.K. and Park, Y.O. (1968) The epidemiological studies on the filariasis in Korea. II. Distribution and prevalence of malayan filariasis in southern Korea. *Korean J. Parasit.*, **6**:132-141.

Seo, B.S. (1978) Malayan filariasis in Korea. *Korean J. Parasit.*, **16**:1-108 (Supplement).

Soh, C.T., Lee, K.T., Im, S.W. and Lee, J.H. (1966) Clinical manifestation of *Brugia malayi* infection in Korea. *Korean J. Parasit.*, **4**:1-6.

Song, J.S. and Kim, D.C. (1967) Filariasis from Daeduck gun, Chungnam do. *Rept. N.I.H. Korea*, **4**:163-165.

Wada, Y., Katamine, D. and Oh, M.Y. (1973) Studies on malayan filariasis in Cheju island, Korea. 2. Vector mosquitoes of malayan filariasis. *Jap. J. Trop. Med. Hyg.*, **1**:197-210.

Whang, C.H. (1962) Biological observations on *Anopheles* mosquitoes in Korea, with special reference to *Anopheles sinensis* Wiedemann. *Yonsei Med. J.*, **3**:39-50.

Whang, C.H., Kahn, C.M., Lee, C.S., Song, J.S. and Hong, H.K. (1965) A report on elephantiasis and microfilariasis found in Yongju gun, Kyungpook do, Korea in 1963. *J. Cent. Med.*, **9**:491-496.

Yamada, M. (1936) Zoophilism and anthropophilism of anopheline mosquitoes in Korea. *J. Chosen Med. Assoc.*, **26**:1046 (in Japanese).

Yokoo, T. (1944) An investigation of the distribution and biology of mosquitoes, especially *Anopheles sinensis*. *J. Jap. Soc. App. Zool.*, **15**:43-85 (in Japanese).

Yun, I.S. (1927) Elephantiasis due to filaria in Korea. *Chosen Iggakai Zasshi*, **76**:326-334 (in Japanese).

慶北 內陸地域에서의 말레이絲狀蟲 疫學的 調査

3. 말레이絲狀蟲 媒介蚊의 生態學的 調査*

慶北大學校 醫科大學 寄生蟲學敎室
李 亨 一·崔 東 翊
啓明大學校 醫科大學 寄生蟲學敎室
白 斗 鉉·朱 鍾 潤

1985年 5月부터 同年 11月까지 6個月間 慶北 內陸地域에 出現하는 蚊種類와 季節的 出現消長을 調査함과 아울러 媒介蚊에서의 感染型 幼蟲의 最近 感染狀을 觀察하였다.

調査期間中에 採集된 蚊의 種類는 4屬 9種이었으며, 其中 *A. sinensis*가 最優點種으로 全採集數의 84.7%를 차지하였다.

調査地域에서 *A. sinensis*를 처음으로 採集할 수 있는 時期는 5月 初旬이었으며 이 期間中 氣溫은 14.3~22.8°C, 濕度는 53~90%였으며, 그 密度는 1.0마리였다.

*A. sinensis*의 最大密度 時期는 7月 中旬에서 8月 初旬사이였으며 그期間中 氣溫은 21.5~30.6°C, 濕度는 72~91%였으며 最大密度는 316.0마리였다.

*A. sinensis*의 夜間 吸血 活動狀을 알아 보기 위해 7月 17~18日과 9月 7~8日 2回에 걸쳐 저녁 17時부터 그 다음날 아침 6時까지 1時間 間隔으로 採集하였던 바 活動이 가장 活潑한 時間은 7月에는 22時에서 23時사이, 9月에는 20時에서 21時사이였으며 아침 6時 以後에는 한마리도 採集할 수 없었다.

A. sinensis 218마리를 剖檢하였던 바 이 가운데 絲狀蟲 幼蟲을 전혀 檢出할 수 없었다.

이상의 成績으로 미루어 보아 慶北 內陸地域의 分布 모기중 *A. sinensis*가 優占種이며, 媒介蚊에서 絲狀蟲의 感染型 幼蟲은 전혀 檢出할 수 없음을 알았다.

(*이 논문은 한곡 장학금으로 이루어졌음)