

Ecology of Bancroftian Filariasis

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OBJECTIVE : To investigate the ecology of bancroftian filariasis in rural areas of Sangkhlaburi District, Kanchanaburi Province with the following specific aims.

1) To identify the vector(s) of *Wuchereria bancrofti* by recovery of filariae from wild-caught mosquitoes and by feeding laboratory-reared strains of suspected vector species on known microfilaria-carriers.

2) To gather data on the distribution, larval habitats and bionomics of vector species and to collect correlated series of larvae, pupae and adults of these mosquitoes for taxonomic studies.

DESCRIPTION : In 1970, Harinasuta and associates (1) described an endemic focus of bancroftian filariasis in rural villages located near the headwaters of the Kwai River in the Sangkhlaburi District of Kanchanaburi Province. Microfilaremia in infected villagers was nocturnally subperiodic, with peaks near 2000 hours, but microfilariae were also present in significant numbers in the peripheral blood during daylight hours. Infective stage larvae of *W. bancrofti* were found only in wild-caught mosquitoes belonging to the *Aedes* (*Finlaya*) *niveus* complex. These mosquitoes are among the most common diurnal man-biting mosquitoes in the forested areas of Southeast Asia; but many of the species of this complex cannot be differentiated with certainty at the present time.

During the 1974-1975 SMRL report period, a total of 5141 mosquitoes were caught in biting collections made from villagers during daylight and early evening hours in five villages in the Sangkhlaburi District, Lawa, Wang Kalang, Nithae, Nong Padong and Kupadu. Of these, 45 mosquitoes belonging to eight species (*Aedes niveus* group species "A", *Aedes desmotes*, *Aedes gardnerii*, *Aedes mediopunctatus*, *Aedes imprimens*, *Armigeres annulitarsis*, *Armigeres flavus* and *Mansonia dives*) were found infected with filarial larvae (2). While mature larvae found in "Species A" were typical of *W. bancrofti*, the larvae from the other species were not identified at the time of the last report. Colonized strains of *Aedes aegypti*, *A. albopictus*, *A. togoi*, *Armigeres annulitarsis* and *Culex quinquefasciatus* were fed upon villagers circulating microfilariae of *W. bancrofti*, but development to the infective stages of the parasite was observed only in *A. togoi* and *C. quinquefasciatus*.

PROGRESS : One of the principal objectives of this study was to identify the member(s) of the *Aedes niveus* complex involved in the transmission of *W. bancrofti* in the Sangkhlaburi area. Therefore, the collection and dissection of these and other diurnal mosquitoes was emphasized during

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Table 1. Results of Dissection of Mosquitoes for Filariae Sanghlaburi, 1975 - 76.

Species	Number Dissected	Number Positive
<i>Aedes niveus</i> group (species "A")	73	3
<i>Aedes desmotes</i>	3	1
<i>Aedes gardnerii</i>	4	1
<i>Armigeres subalbatus</i>	3	1
<i>Mansonia dives</i>	117	2
<i>Anopheles barbirostris</i> group	35	0
<i>Anopheles aconitus</i>	29	0
<i>Anopheles balabacensis</i>	66	0
<i>Anopheles maculatus</i>	69	0
<i>Anopheles minimus</i>	307	0
<i>Anopheles nivipes</i>	189	0
<i>Culex vishnui</i> complex	102	0
Other species*	150	0

* Less than 20 specimens per species dissected.

the previous reporting period. During the present period, from April 1975 to February 1976, we concentrated on the examination of nocturnal mosquitoes, especially anophelines. Night-time human-bait collections were made and CDC light traps operated in the five study villages, yielding a total of 1102 mosquitoes for dissection. Essentially the same species of mosquitoes that were positive in the 1974 - 75 studies were again found infected (Table 1). Infective stage larvae of *W. bancrofti* were present only in species "A" of the *Aedes niveus* complex. The filariae found in *Aedes desmotes*, *A. gardnerii*, *Armigeres subalbatus* and *Mansonia dives* during this period have not yet been identified. However, most of the filariae recovered from these same species of mosquitoes during the 1974 - 75 season have been identified as *Dirofilaria* sp. (3). There is some uncertainty about a few of these determinations because first and second stage filarial larvae were found in the thoracic muscles of the mosquitoes rather than in the malpighian tubules which are the typical developmental sites of most *Dirofilaria* species. None of the anophelines dissected during the present period were infected, although Harinasuta et al. reported finding early stage filariae in *Anopheles maculatus*, *An. minimus* and *An. vagus* during their investigations (1).

Colonized strains of *Anopheles balabacensis* and *Anopheles maculatus* were transported to Sanghlaburi and fed on two known microfilaria carriers. Infective stage larvae of *W. bancrofti* were found in the head and mouthparts of both species 21 days after feeding on a patient circulating

Table 2. Mosquitoes Fed on Microfilaria Carriers
Sangkhlaburi, 1975.

Patient No.	Mfl. per cmm.	Mosquito.	No. Fed	No. Diss.	No. Pos.	Percent Pos.
154	5	<i>Anopheles balabacensis</i>	27	13*	0	0
„	„	<i>Anopheles maculatus</i>	27	9*	1	11
305	21	<i>Anopheles balabacensis</i>	100	68*	16	24
„	„	<i>Anopheles maculatus</i>	29	7*	2	28

* Mosquitoes which were alive after 21 day incubation period.

approximately 21 microfilariae per cmm of blood (Table 2). When these mosquitoes were fed on a patient circulating significantly fewer microfilariae, development to infective stages was observed in a single *An. maculatus*.

Mosquito larvae, collected from bamboo oviposition cups set out in the study villages throughout the 1975-76 rainy season, were reared to maturity, and their larvae and pupal skins, together with the correlated adults, were preserved for taxonomic study. Members of the *Aedes niveus* complex most frequently identified from these collections included species "A", *Aedes niveoides* Barraud and *Aedes nipponicus* La Casse and Yamaguti. The females of species "A" closely resemble those of *Aedes albolateralis* (Theobald), but the terminalia of the males are distinctly different. Descriptions of all stages of this apparently undescribed species are being prepared for publication.

REFERENCES :

1. Harinasuta, C. et al.: Bancroftian Filariasis in Thailand, a New Endemic Area. *SE Asian J. Trop. Med. Pub. Hlth.* 1:233-245, 1970.
2. Bailey, C.L. et al.: SEATO Medical Research Laboratory Annual Report, March 1975.
3. Muller, R.: Personal Communication.