

FILARIASIS SURVEY AMONG INDIGENOUS TRIBES OF PALAWAN, REPUBLIC OF THE PHILIPPINES

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INTRODUCTION

During the filariasis survey in Palawan by our team in 1966, some groups of indigenous tribes were not included in the survey due to lack of roads. The distance and rugged terrain made several sitios and barrios inaccessible. This was true of the settlements of the indigenous groups or tribes of Palawan called "Batacs". This tribe inhabits the mountainous area located between Puerto Princesa and Roxas towns which we have previously surveyed. (Cabrera *et al.*, 1966).

In February this year, the Presidential Assistance on National Minorities (PANAMIN) gathered families of "Batacs" to live in barrio Tagabinwit, Puerto Princesa so they can be given assistance by the government. Upon learning of this move, a filaria survey team was immediately dispatched to the area to take night blood smears among them. Blood smears were taken from 17 males and 6 females and were stained and examined. Of the 23 individuals examined, 5 were found positive for microfilaria or a prevalence rate of 21.7 per cent. Of these 5 positive cases, four had *Brugia malayi* (17.4 per cent) and one had *Wuchereria bancrofti* (4.3 per cent). All of these "Batacs" came originally from barrio Caramay, Roxas town.

These findings were rather interesting because our previous surveys in Palawan indicated that *Brugia malayi* infection was confined to the municipality of Quezon, located at the southwestern portion of Palawan island. (Cabrera *et al.*, 1964 and 1966; Rozeboom *et al.*, 1965) However, during these surveys, there was a single case of

Brugia malayi infection found on a 22-year-old male from Taytay, a town north of Roxas. It was thought at that time that this man must have resided for some time in Quezon and visited some friends in Taytay at the time of the survey. However, based on the preliminary findings among the Batacs at barrio Tagabinwit, Puerto Princesa, it would be more logical to theorize that possibly the single *Brugia malayi* case from Taytay, must have contracted the disease from Roxas, rather than Quezon since the latter is more than 150 kilometers south of Taytay, whereas Roxas is just adjacent to Taytay. (Fig. 1) This paper is a report of our survey to establish the

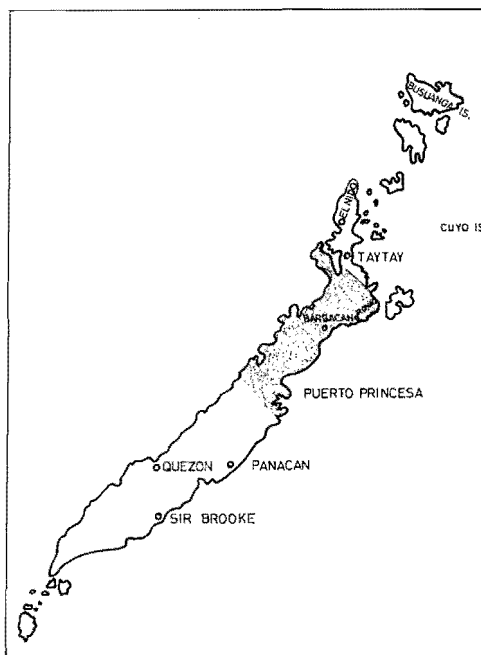


Fig. 1—Map of Palawan.

endemicity of filariasis in Roxas and Puerto Princesa in Palawan.

MATERIALS AND METHODS

Blood Survey Procedures

Guided by the place of origin of the "Batacs" which were gathered at barrio Tagabinwit, Puerto Princesa by the Presidential Assistance on National Minorities (PANAMIN), the survey team was instructed to make Roxas town as the starting point. The survey was to be concentrated among the "Batacs" without, neglecting other groups of people long the way. The rugged terrain and absence of roads made most sitios and barrios very difficult to reach. The team was to cover as many sitios of Roxas as possible and to proceed towards the direction of Puerto Princesa (Fig. 2).

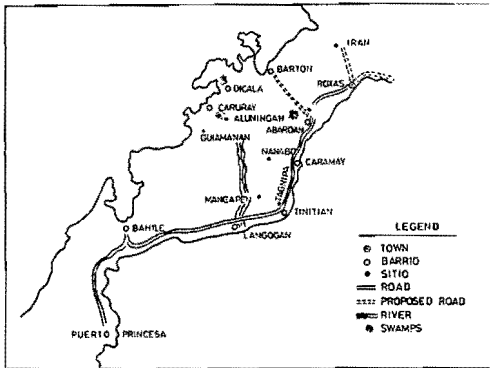


Fig. 2—Surveyed Portion of Palawan.

The technique employed in the preparation of blood smears was the same as those used in our previous surveys. Two thick blood smears approximately 20 c.mm from a finger puncture were taken from each subject. The blood smears were all taken in the evening, dried overnight and stained with dilute Giemsa in the morning according to the method of Wilson (Wilson, 1956). The Giemsa stained slides were shipped by air to the Institute of Public Health in Manila for

examination. Those slides suspected after first examination to be *Brugia malayi* were destained and stained with Delafield's haematoxylin for further verification of species. Microfilarial counts of positive smears were likewise done to determine the density of the parasite in the 20 c.mm blood. The method of obtaining blood from the inhabitants was the house to house survey technique with the help of a local guide.

Mosquito Collection and Identification

In order to find out whether proven vectors of malayan filariasis in the Philippines were present in the area a carabao-baited trap was set at some sitios for several evenings. Mosquitoes were collected early the next morning by means of a glass-tube aspirator. All catches were dried, preserved and brought back to our laboratory in Manila for sorting and identification.

Examination of filaria blood smears for malaria

Inasmuch as the work area is also highly endemic for malaria, the Malaria Eradication Service Unit stationed at Puerto Princesa City was requested to examine the filaria smears for malaria parasites and at the same time include these data in their monthly reports.

RESULTS

The blood survey lasted for one month from May 25 to June 25, 1971, and covered only 4 sitios of Roxas town and 4 sitios of Puerto Princesa. A total of 248 persons (139 males and 109 females) were examined and 34 were found positive for microfilariae or a microfilaremia rate of 13.7 per cent. Of the 34 positive cases 17 were *Brugia malayi* and 17 were *Wuchereria bancrofti* infections.

Table 1 and Fig. 2 show the distribution and prevalence of filariasis due to *Brugia malayi* and *Wuchereria bancrofti* in the four sitios in

Table 1
Prevalence of microfilaremia in selected places, Palawan, 1971.

Place	No. Examined	Positive For					
		<i>W.bancrofti</i>		<i>B.malayi</i>		Both Species	
		No.	%	No.	%	No.	%
Both towns	248	17	6.8	17	6.8	3	1.2
Roxas town	155	15	9.7	9	5.8	2	1.3
Bo. Sandoval (Iran)*	34	0	0	2	5.8	0	0
Bo. Abaroan (Timboan)	29	8	27.6	6	20.7	2	6.9
Bo. Caramay (Nanabo)	42	7	16.6	0	0	0	0
Bo. Tinitian (Tagnipa)	50	0	0	1	2.0	0	0
Puerto Princesa town	93	2	2.15	8	8.6	1	1.1
Bo. Langogan (Mangapin)	14	0	0	0	0	0	0
Bo. Caruray (Dicala)	34	0	0	2	5.8	0	0
(Guiamanan)	15	2	13.3	1	6.6	1	6.6
(Aluningan)	30	0	0	5	16.6	0	0

*Names in parenthesis are sitios.

Note: The three mixed infections are as follows:
12-year-old male from sitio Timboan.

48-year-old male from sitio Timboan.
23-year-old female from sitio Guiamanan.

Roxas town and three sitios from two barrios in Puerto Princesa. Of the 155 persons examined from the sitios of Roxas, 15 were found positive for *W. bancrofti* and 9 were positive for *Brugia malayi* giving prevalence rates of 9.7 per cent and 5.8 per cent respectively. The bancroftian filariasis came from 2 sitios of Roxas and the malayan filariasis came from 3 sitios of the same town. In the 4 sitios of Puerto Princesa, 93 persons were examined and 2 were positive for *W. bancrofti* and 8 were positive for *B. malayi*, giving prevalence rates of 2.2 per cent and 8.6 per cent respectively. The bancroftian filariasis came from one of the four sitios of Puerto Princesa. The malayan filariasis came from 3 of the 4 sitios of the same town. There was an equal number of bancroftian and

malayan filariasis in the whole survey with equal prevalence rates of 6.8 per cent. Three cases of mixed infection were also found, two in sitio Timboan and one in sitio Guiamanan.

Age and Sex Distribution

The age and sex distribution of persons surveyed are shown in Table 2. It appears that males have higher microfilaremia rate than females with microfilaremia rates of 17.9 and 8.2 per cent respectively. A total microfilaremia rate of 13.7 per cent for both sexes was obtained. For *W. bancrofti* infection, the youngest case was a 7-year-old female from barrio Abaroan; the oldest cases were both 56-year-old males from barrio Caramay. For *B. malayi* infection the youngest cases

Table 2
Prevalence of filariasis by age and sex in Roxas and Puerto Princesa, Palawan, 1971.

Age in Years	No. Examined	Males		No. Examined	Females		No. Examined	Both Sexes	
		No. Pos.	% Pos.		No. Pos.	% Pos.		No. Pos.	% Pos.
1 - 5	8	0	0	6	0	0	14	0	0
6 - 10	17	0	0	18	1	5.5	35	1	2.8
11 - 15	21	2(2)*	19.0	15	1	6.6	36	3(2)	13.9
16 - 20	19	(4)	21.0	13	1(1)	15.4	32	1(3)	18.7
21 - 25	10	(2)	20.0	15	1(2)*	20.0	25	1(4)	20.0
26 - 30	15	3(1)	26.6	18	1	5.5	33	4(1)	15.1
31 - 35	9	0	0	3	0	0	12	0	0
36 - 40	11	1(2)	27.2	4	0	0	15	1(2)	20.0
41 - 45	5	(1)	20.0	4	0	0	9	(1)	11.1
46 - 50	3	3(1)*	100.0	4	0	0	7	3(1)	57.1
51 - 55	8	0	0	2	1	50.0	10	1	10.0
56 - 60	7	2(1)	42.8	5	0	0	12	2(1)	25.0
61 - Over	6	0	0	2	0	0	8	0	0
Total	139	11(14)	17.9	109	6(3)	8.2	248	17(17)	13.7

*Mixed infections

Note: 1. Figures in parenthesis are *B. malayi* cases; outside parenthesis are *W. bancrofti* cases.

2. The three mixed infections are as follows:

48-year-old male from sitio Timboan.

12-year-old male from sitio Timboan.

23-year-old female from sitio Guiamanan.

Table 3
Intensity of microfilaremia by sex in Roxas and Puerto Princesa, Palawan, 1971.

Mf. count per 20 c.mm blood	Male		Female		Total	
	<i>B.m.</i>	<i>W.b.</i>	<i>B.m.</i>	<i>W.b.</i>	<i>B.m.</i>	<i>W.b.</i>
1 - 5	7	0	1	2	8	2
6 - 10	4	5	1	2	5	7
11 - 25	2	6	0	2	2	8
26 - 50	0	0	1	0	1	0
51 - 88	1	0	0	0	1	0
Total	14	11	3	6	17	17

Note: 1. Highest microfilarial count for *W. bancrofti*: 12-year-old male, mf. 24.

Highest microfilarial count for *B. malayi*: 27-year-old male, mf. 57.

2. Those mixed infections were found and tallied according to species, microfilarial count and sex subject.

were two 12-year-old males, one from barrio Caramay and the other from barrio Abaroan. The oldest case was a 60-year-old male from barrio Caramay, Puerto Princesa.

Intensity of Microfilaremia

Table 3 shows the intensity of microfilaremia of *W. bancrofti* and *B. malayi* cases by sex for all the areas surveyed. Among male

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Table 4

Intensity of microfilaremia per 20 c.mm blood by age and sex in Roxas and Puerto Princesa, Palawan, 1971.

Age in Years	Male				Female			
	No. Examined	No. Positive	Total mf. count	Ave. mf. count per (r)	No. Examined	No. Positive	Total mf. count	Ave. mf. count per (r)
1 - 5	8	0	0	0	6	0	0	0
6 - 10	17	0	0	0	18	1	9	0
11 - 15	21	2(2)	31(3)	15.5(1.5)	15	1	16	16
16 - 20	19	(4)	(17)	(4.5)	13	1(1)	8(7)	8(7)
21 - 25	10	(2)	(19)	(9.5)	15	1(2)	5(38)	5(19)
26 - 30	15	3(1)	31(57)	10.3(57)	18	1	5	5
31 - 35	9	0	0	0	3	0	0	0
36 - 40	11	1(2)	9(12)	9(6)	4	0	0	0
41 - 45	5	(1)	(8)	(8)	4	0	0	0
46 - 50	3	3(1)	35(9)	11.7(9)	4	0	0	0
51 - 55	8	0	0	0	2	1	14	14
56 - 60	7	2(1)	20(6)	10(6)	5	0	0	0
61 - Over	6	0	0	0	2	0	0	0
Total	139	11(14)	126(131)	11.5(9.4)	109	6(3)	57(45)	9.5(15)

Note : Figures in parenthesis are *B. malayi* infections; outside the parenthesis are *W. bancrofti*.

Table 5

Distribution of individuals examined for microfilaria by residence and tribe and/or place of origin, Palawan, 1971.

Residences	Tribe and/or Place of Origin					Total
	Batacs	Tagbanua	Cuyunin	Visayan	Mindoro	
Roxas town	126 15 (9)	2	27	-	-	155
Bo. Sandoval (Iran)*	32 (2)	2	-	-	-	34
Bo. Abaroan (Timboan)	29 8 (6)	-	-	-	-	29
Bo. Caramay (Nanabo)	42 7	-	-	-	-	42
Bo. Tinitian (Tagnipa)	23 (1)	-	27	-	-	50
Puerto Princesa town	9	39 1 (3)	18 (3)	22 1 (2)	5	93
Bo. Langogan (Mangapen)	9	-	-	5	-	14
Bo. Caruray (Dicala)	-	25 (1)	-	5 (1)	4	34
(Guiamanan)	-	10 1 (1)	3	2 1	-	15
(Aluningan)	-	4 (1)	15 (3)	10 (1)	1	30
Totals	135 15 (9)	41 1 (3)	45 (3)	22 1 (2)	5	248
Percent Distribution	54.4	16.5	18.1	8.9	2.0	99.9

*Names in parenthesis are sitios.

Note : Figures in bold are *W. bancrofti* cases while those in parenthesis are *B. malayi* cases.

subjects, out of 14 *B. malayi* cases 11 or 78.6 per cent had counts below 10 microfilaria per 20 c.mm blood. Among the 3 female subjects of *B. malayi* 2 cases or 66.6 per cent had counts below 10 microfilaria. All the 11 *W. bancrofti* cases among males had between 6-24 per 20 c.mm blood. The highest count for *B. malayi* was on a 27-year-old male from barrio Abaroan with 57 microfilariae per 20 c.mm blood. The highest count for *W. bancrofti* was on a 12-year-old male also from Abaroan with 24 microfilariae per 20 c.mm blood.

Table 4 shows the intensity of microfilariaemia per 20 c.mm blood by age and sex in Roxas and Puerto Princesa. For *B. malayi* filariasis the highest average microfilaria count per positive was 57 among males in the 26-30 age group and 19 among females in the 21-25 age group. The total average microfilaria count per positive for males was 9.4 and 15 for females. For *W. bancrofti* filariasis the highest average microfilaria count per positive was 15.5 among males in the 11-15 age group and 16 among females in the same age group. The average microfilaria count for all ages

Table 6
Number and species of mosquitoes caught by carabao-baited trap in Roxas, Palawan, 1971.

Species	Sitios				Total
	Tagnipa	Timboan	Iran	Aluningan	
<i>Aedes albopictus</i>	6	-	-	-	6
„ <i>lineatopennis</i>	24	8	11	11	54
„ <i>pampangensis</i>	1	-	-	-	1
„ <i>vexans nocturnus</i>	59	239	183	1,295	1,776
„ <i>niveus</i>	-	2	-	-	2
„ <i>pocilus</i>	-	1	-	-	1
„ <i>alboscuteclatus</i>	-	-	-	7	7
<i>Anopheles franciscoi</i>	6	-	-	3	9
„ <i>balabacensis baisai</i>	2	-	-	-	2
„ <i>kochi</i>	3	6	-	31	40
„ <i>minimus flavirostris</i>	-	6	1	3	10
„ <i>peditaenialis</i>	3	1	1	8	13
„ <i>subpictus indefinitus</i>	28	4	1	3	36
„ <i>vagus limosus</i>	94	19	-	20	133
„ <i>samarensis baezai</i>	-	2	2	-	4
„ <i>tessellatus</i>	-	14	-	-	14
„ <i>annularis</i>	-	-	-	1	1
„ <i>lesteri</i>	-	-	-	4	4
„ <i>pseudobarbirostris</i>	-	-	-	3	3
<i>Armigeres</i> sp.	6	1	-	-	7
<i>Culex annulirostris</i>	3	-	-	-	3
„ <i>bitaeniorhynchus</i>	4	-	2	19	25
„ <i>fuscocephalus</i>	250	1	1	293	545
„ <i>gelidus</i>	143	11	10	38	202
„ <i>nigropunctatus</i>	1	-	-	1	2
„ <i>tritaeniorhynchus</i>	221	125	81	728	1,155
<i>Mansonia bonnea</i>	-	-	-	33	33
„ <i>uniformis</i>	1	3	-	114	118
Total	855	443	293	2,615	4,206

Note : At sitio Dicala a total of 140 *Mansonia* sp. were collected and preserved in alcohol as follows: off-human 42 and trap 98. Only *Mansonia* sp. were collected the rest were discarded.

was 11.5 for males and 9.5 for females. It appears that in *W. bancrofti*, the average microfilaria count among males is slightly higher than in *B. malayi* while the reverse is true among females.

Infection Rates among Tribes

Table 5 shows the distribution of individuals examined for microfilariae according to tribe and/or place of origin. Of 155 persons surveyed from the sitios of Roxas 126 or 81.3 per cent were "Batacs", 2 or 1.3 per cent were Tagbanuas and 27 or 17.4 per cent were Cuyonins. On the other hand majority of the people surveyed from the 4 sitios of Puerto Princesa were Tagbanuas and Visayans while the rest were "Batacs", Cuyonins and Mindoreños. The per cent distribution of individuals examined among Batacs, Tagbanuas, Cuyonins, Visayans and Mindoreños were 54.4, 16.5, 18.1, and 8.9 and 2 per cent respectively. There were 9 cases of *B. malayi* among the Batacs, 3 among Tagbanuas, 3 among Cuyonins and 2 among Visayans. In contrast, there were 15 cases of *W. bancrofti* among the "Batacs" one among Tagbanuas and one among Visayans.

Mosquito fauna in some surveyed areas

The number and species of mosquitoes collected from the 4 sitios of Roxas are shown in Table 6. A total of 4,203 mosquitoes were collected and identified. There were 5 genera composed of 28 species of mosquitoes in the collection with *Aedes vexans nocturnus* and *Culex tritaeniorhynchus* as the two predominating species. Sitio Aluningan yielded the greatest number of mosquitoes. There were 290 *Mansonia*s with *Mansonia uniformis* predominating. Sitio Aluningan and sitio Dicala had the greatest number of *Mansonia* mosquitoes.

Malaria among persons surveyed

All the 248 individuals included in the filaria survey were also examined for malaria parasites. The results are shown in table 7. Out of 248 blood smears examined 49 were found positive for malaria parasites or a prevalence rate of 19.8 per cent. Of the 49 positive cases 45 or (92 per cent) were *Plasmodium falciparum* and only 4 or (8.1 per cent) were *Plasmodium vivax* infections. There was a total prevalence rate of 18.1 per

Table 7
Distribution of 248 individuals examined for malaria by sitio and species, Palawan, 1971.

Sitio	No. Examined	No. Positive		% Positive		Total No. Pos.	Total % Pos.
		<i>P.f.</i>	<i>P.v.</i>	<i>P.f.</i>	<i>P.v.</i>		
Iran	34	18	0	52.9	0	18	52.9
Timboan	29	3	1	10.3	3.4	4	13.8
Nanabo	42	6	2	14.3	4.7	8	19.0
Tagnipa	50	7	1	14	2.0	8	16.0
Mangapen	14	6	0	42.8	0	6	42.8
Dicala	34	3	0	8.8	0	3	8.8
Guiamanan	15	0	0	0	0	0	0.0
Aluningan	30	2	0	6.6	0	2	6.6
Total	248	45	4	18.1	1.6	49	19.8

P.f. = *Plasmodium falciparum*.

P.v. = *Plasmodium vivax*.

cent for *P. falciparum* and 1.6 per cent for *P. vivax*. The 3 highest prevalence rates for malaria were found in sitios Iran, Mangapen and Nanabo with rates of 52.9, 42.8 and 19.0 per cent respectively.

Not one of the 17 cases of malayan filariasis had malaria, however, four of the 17 cases of bancroftian filariasis also had *Plasmodium falciparum* malaria. Three of the cases were males, all from sitio Nanabo and one female from sitio Timboan.

DISCUSSION

Our previous filaria surveys in Palawan have established for the first time the existence of malayan filariasis in the Philippines (Cabrera *et al.*, 1964 and 1966, Rozeboom *et al.*, 1965). The first focus was found in Quezon municipality in southwestern part of Palawan island. It appeared at that time, after a relatively extensive filaria survey of the entire province of Palawan in 1966, that malayan filariasis was confined in some sitios of Quezon municipality. Although the aforesaid survey covered most of sitios, barrios and towns that were quite accessible, sitios located too far to reach by foot were naturally left unsurveyed. It was therefore necessary to undertake separate surveys to cover inaccessible areas which are usually inhabited by indigenous tribes of the province. This present survey was brought about by the unexpected and interesting results in the preliminary survey among "Batacs" that were gathered at the outskirts of Puerto Princesa City. The mountainous areas located between the towns of Roxas and Puerto Princesa became therefore another focus for *Brugia malayi* filariasis in the province of Palawan. The first focus being the municipality of Quezon.

Out of 248 persons examined, 34 or 13.7 per cent were found with microfilaremia.

There were 17 cases of *Brugia malayi* and also 17 cases of *Wuchereria bancrofti* filariasis. These positive individuals came from 4 sitios of Roxas and 3 sitios of Puerto Princesa. As in previous surveys, males have higher microfilaremia rates than females (Rozeboom *et al.*, 1965). The intensity of microfilaremia among the subjects was rather low which we would interpret as a relatively recent infection.

Majority of the "Batacs" inhabit sitios of Roxas so that more than 80 per cent of people surveyed belong to this tribe, while the rest were Cuyonins and Tagbanuas. On the other hand, most sitios of Puerto Princesa were Tagbanuas and Cuyonins.

From the data on mosquito collection and identification it appears that *Brugia malayi* filariasis in the areas surveyed will be there to stay because of the presence of *Mansonia* mosquitoes in sitios found endemic for malayan filariasis. These mosquitoes utilizes swampy areas as well as rice paddies which are abundant in the areas. *Mansonia* mosquitoes have been implicated in the transmission of malayan filariasis not only in the Philippines but also in other countries (Cabrera, 1970-1971; Wharton, 1962).

Palawan province is highly endemic for malaria particularly *Plasmodium falciparum*. The finding of positive blood smears for malaria from the same filaria smears further confirms the fact that malaria is highly endemic in Palawan. There was a 19.8 per cent prevalence rate of malaria with 92 per cent of cases being *Plasmodium falciparum* and 8 per cent *Plasmodium vivax* infections. Four persons with microfilaremia of *W. bancrofti* have also *Plasmodium falciparum* malaria infection while none of those with malayan filariasis had malaria. It appears from this finding that filariasis and malaria co-exist in the same geographic area. This fact is understandable inasmuch as the important malaria

vector, *Anopheles minimus flavirostris* is also a proven vector for bancroftian filariasis (Rozeboom *et al.*, 1963 and 1965). The presence of *Mansonia* mosquitoes in the area will sustain the transmission of malayan filariasis among the local inhabitants.

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