

Epidemiologic Survey on Malaria in Some Rural Areas, Especially in Palawan Island, of the Philippines

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Abstract

A field survey was undertaken on the malaria parasite rate and the spleen rate in some rural areas of the Philippines during the period from November, 1969, till March, 1971. The subject areas were Wawa, north from Manila; Sonlon, north from Davao; and Maruyogon, Mainit, Quezon and the Iwahig Penal Colony in Palawan Island. Persons subjected to the survey were residents, prisoners (colonists) in the penal colony and in some areas, primary school children. The spleen rate was examined by manual palpation in children under 12 years. Results obtained were summarized as follows:

- 1) The parasite rate was 2.5% (8/320) at Wawa, 0.5% (1/217) at Sonlon, 4.0% (16/401) at Maruyogon, 15.4% (10/65) at Mainit, 26.7% (8/30) in the native tribe and 5.7% (2/35) in settlers, and 7.1% (21/181) in school children at Quezon.
- 2) The spleen rate was 4.0% (7/177) at Maruyogon, 40.9% (18/44) at Mainit and 15.2% (34/224) at Quezon.
- 3) In the Iwahig Penal Colony, colonists in the Montible and Central Subcolonies were

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employed for the parasite examination. The parasite rate in the Montible was 12.1% (62/521). A significant difference in parasite rate was shown between the central district (6.7%) and the outskirts (16.3%) of the Montible Subcolony. Newcomers into the Orientation Unit of the Montible demonstrated 13.6% (9/66) in parasite detection and this fact would imply the high frequency of a new infection to colonists during the stay of the first 6 months. At the Mangahan (Agronomy) Unit of the Central Subcolony, 10.7% (3/28) in parasite rate was obtained.

4) The parasite species and the proportion observed in this survey were; *P. falciparum* 84.8%, *P. vivax* 13.9%, and *P. malariae* 1.2%.

Introduction

Even at the present time, malaria is regarded as a broadly endemic disease, prevalent particularly in the rural areas, in the Philippines and is still exerting an unfavorable influence to the medical and socioeconomic development of the nation.

According to a report by Russel (1936), malaria was responsible for at least 2×10^6 cases of illness and $1-2 \times 10^4$ deaths in 1935 in the Philippines. The whole population at that time was estimated approximately 13 millions. Until the outbreak of the World War II, this disease had been controlled to some degree by the administration of quinine and other antimalarials, and by anti-mosquito measures. The incidence of malaria, however, is thought to have greatly increased during and after the War. This fact is clearly understood from the annual report by the Disease Intelligence Center of the Philippines, in which the morbidity and mortality rates of malaria per 10^5 population in 1946 were shown to be 1,000.7 and 91.0 respectively. Smith also reported in 1950 that more than 4×10^6 persons would infect with malaria in 1945, the year of the end of the

War. Since the malaria control project was started in 1946, both the morbidity and mortality rates of malaria are recognized to have gradually decreased until the present time, as they showed 90.7 and 3.3 per 10^5 respectively in 1967 according to the report by the Disease Intelligence Center.

Although in the past two decades, a marked reduction in the incidence of malaria was achieved in the Philippines as hitherto stated, numbers of patients are still found in the rural areas (Valera, 1971). Moreover, in recent years, the drug-resistance problem in malaria has been considered to become a large obstruction against the future eradication project of malaria in the country (Ramos *et al.* 1971, Clyde *et al.* 1971, Shute *et al.* 1972, Nakabayashi *et al.* 1973).

This epidemiologic survey was undertaken to know the present state of the prevalence rate of malaria in several rural areas, especially in the Island of Palawan, of the Philippines during the period from November, 1969, to February, 1971, in close cooperation with the Malaria Eradication Service, Department of Health of the Philippines.

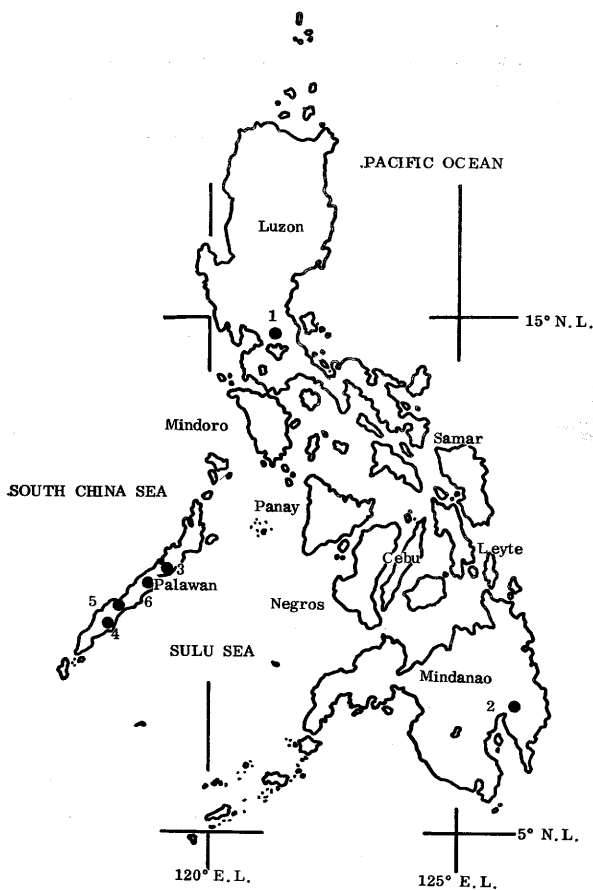


Fig. 1. The survey areas in the Philippines

- | | |
|--------------|------------------------|
| 1. Wawa | 4. Mainit |
| 2. Sonlon | 5. Quezon |
| 3. Maruyogon | 6. Iwahig Penal Colony |

Survey areas and subjects

The following areas and persons were selected for this epidemiologic survey.

1. Wawa in Luzon Island; a small village along the Marikina River in the mountain area located about 60 km northeast from Manila. Subject: residents.

2. Sonlon in Mindanao Island; a small village in the hilly zone located about 110 km northeast from Davao. Subject: residents.

3. Palawan Island, (1) Maruyogon; a village 60 km north from Puerto Princesa, the capital city of Palawan Province. Subject: residents. (2) Mainit; a small village at the foot of a mountain located about 10 km northeast from Brooke's Point, a small town, which was situated south of the island and facing the Sulu Sea. Subject: residents and primary school children. (3) Quezon; a small town facing the South China Sea in the south part of the island. Subject: primary school children. (4) Iwahig Penal Colony; a specially established district of 37 sq. kilometers, neighbouring to Puerto Princesa City, for the rehabilitation of prisoners (colonists) who were mostly transferred from the Muntinlupa Prison in the suburb of Manila. The colony was divided into 5 subcolonies of the Central, Montible and others, where colonists were each engaged in a forced labor, being assigned to a given section or unit such as agronomy,

coconut expansion, forestry and engineering and they usually reside near their place of work. In this survey, colonists of the Central and Montible Subcolonies were chosen as examinees. The survey areas mentioned above were shown in Fig. 1.

Geographical and climatic outlines of the survey areas

The Philippine Archipelago lies between 5° and 20°N. Lat., and is bounded by the Pacific Ocean on the east side and the South China Sea on the west, and encircles the

Sulu Sea together with the northeast corner of Borneo. The country, composed of over 7,000 islands, has nearly 299×10^3 sq. kilometers in area and 35×10^6 population as in 1971.

Climate in the Philippines is generally tropical with high humidity and influenced by the Asian monsoon season with the Northeast Trade Wind. The mean temperature of the country calculated from the weather data of main cities is about 27°C with 2 to 4°C of the mean annual range.

Most parts of the country have two clearly distinguishable seasons; the rainy and dry, in a year. For example, the Manila area has the rainy season in May to October and the dry in the remaining of a year. But some other parts, such as Davao in Mindanao Island, have the so-called wet season throughout a year. Fig. 2 showed the weather data of Puerto Princesa in Palawan Island where the major part of this survey was carried out.

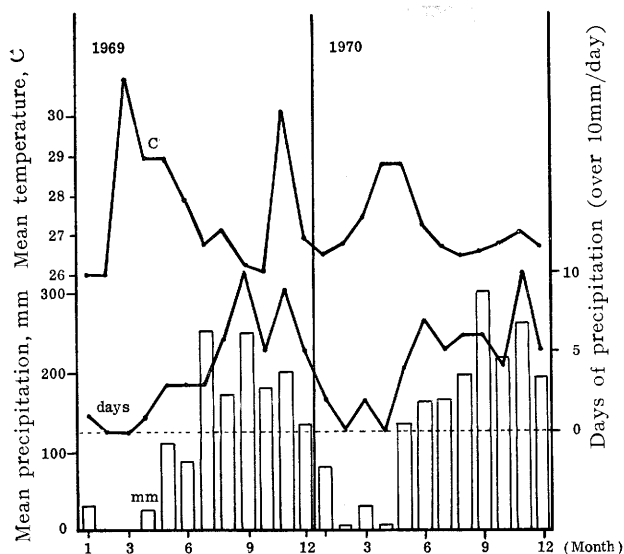


Fig. 2. Monthly mean temperature, mean precipitation and days of precipitation in Puerto Princesa (By courtesy of the Puerto Princesa Weather Bureau)

Survey methods

Blood examination for malaria parasite in all examinees and the measurement of the enlarged spleen in children were made in this survey. At Wawa, Sonlon and Mainit, blood samples were collected from residents by the house-to-house visit, whereas in primary school children at Mainit and Quezon, and in penal colonists, blood was taken at a time from a group.

1) Blood sampling and staining

The sampling of blood and the staining of blood smears were followed on the whole to the method which had been routinely carried

out at the laboratory of the Malaria Eradication Service (MES). A blood sample was taken from the tip of a finger by puncturing with a sterilized pricker, and a thick and a thin films were made either on a single or separate slideglasses, then stained by Giemsa. The blood specimens thus prepared were examined with a microscope at $500 \times$ magnification. Unless any malaria parasite was detected in 100 fields of a thick film, the specimen was defined "negative". In case of "positive", the species, stage and number of the parasites detected were re-

corded.

2) Method of the measurement of splenomegalia

Children under 12 years were subjected to an examination for splenomegalia at Maruyogon, Mainit and Quezon. The following classification described by Hackett (1944) was employed to determine the degree of splenic enlargement:

Class of spleen	Description
0	Normal spleen, not palpable even on deep inspiration
1	Spleen palpable only on deep or at least more than normal inspiration
2	Spleen palpable on normal breathing

but not projected below a horizontal line half-way between the costal margin and the umbilicus, measured along a line dropped vertically from the left nipple

- 3 Spleen with lowest palpable point projected more than half-way to the umbilicus but not below a line drawn horizontally through it
- 4 Spleen with lowest palpable point below the umbilical level but not projected more than half-way towards a horizontal line through the symphysis pubis
- 5 Spleen with lowest palpable point below the lower limit of class 4

Results

A total of 1,833 persons was examined for malaria parasite in the field survey, except outpatients at the Iwahig General Hospital, and 121 (6.6%) were found to be positive in parasite detection. The results grouped

by the areas and times examined were summarized below.

1) Wawa in Luzon Island

There were about 170 houses with some 700 residents. Blood examination was carried

Table 1. Parasite rate at Wawa in Luzon Island (Dec. 1969)

Age	Male		Female		Total		
	Exam.	Pos.	Exam.	Pos.	Exam.	Pos.	Rate, %
0-9	68	1	64	1	132	2	1.5
10-19	17	0	31	2	48	2	4.2
20-29	27	2	24	0	51	2	3.9
30-39	17	2	21	0	38	2	5.3
40-49	17	0	11	0	28	0	0
50-59	3	0	5	0	8	0	0
60-	9	0	1	0	10	0	0
Unknown	—	—	—	—	5	0	0
Total	158	5	157	3	320	8*	—
%		3.2		1.9		2.5	

*(*P. falcip.*; 6, *P. vivax*; 2)

out around the end of the rainy season in December, 1969. Of 320 residents examined, 8 were positive (2.5%). Six of them were identified as *P. falciparum* infection and the rest as *P. vivax*. Table 1 showed the result in which the examinees were grouped by age and sex.

2) Sonlon in Mindanao Island

The approximate number of houses and population in Sonlon were 100 and 630 respectively. Examination was made of 217 blood smears which were prepared from the residents including children of two primary schools in the middle of December, 1969,

Table 2. Parasite rate at Sonlon in Mindanao Island (Dec. 1969)

Age	Male		Female		Total		
	Exam.	Pos.	Exam.	Pos.	Exam.	Pos.	Rate, %
0—9	50	0	52	0	102	0	0
10—19	31	0	39	1	70	1	1.5
20—29	7	0	18	0	25	0	0
30—39	4	0	3	0	7	0	0
40—49	3	0	2	0	5	0	0
50—59	3	0	2	0	5	0	0
60—	1	0	2	0	3	0	0
Total	99	0	118	1	217	1*	—
%		0		0.8		0.5	

*(*F. vivax* ; 1)

Table 3. Parasite rate at Maruyogon in Palawan Island (Jan. 1970)

Age	Male		Female		Total		
	Exam.	Pos.	Exam.	Pos.	Exam.	Pos.	Rate, %
0—9	62	2	67	2	129	4	3.1
10—19	80	5	81	3	161	8	5.0
20—29	21	2	30	1	51	3	5.9
30—39	7	1	16	0	23	1	4.3
40—49	7	0	17	0	24	0	0
50—59	3	0	6	0	9	0	0
60—69	0	0	3	0	3	0	0
70—	0	0	1	0	1	0	0
Total	180	10	221	6	401	16*	—
%		5.6		2.7		4.0	

*(*P. falcip.* ; 14, *P. vivax* ; 2)

and only one positive case (0.5%) by *P. vivax* was found (Table 2).

3) Maruyogon in Palawan Island

Of the whole population (about 700), 401 blood samples were taken from residents, children of the Maruyogon Community School and students of the North Barrio High School in January, 1970. The number of positive in parasite detection was 16(4.0%), of those 14 were identified as *P. falciparum* infection and the rest 2 as *P. vivax*. Twelve positives were detected in the young age under 20(Table 3).

In the spleen examination (Table 6), 7 out of 177 children under 12 years were determined to have a splenomegalia (spleen rate, 4.0%).

4) Mainit in Palawan Island

The population of this village was about 170 and 65 blood smears were prepared from

the residents including children of the Mainit Primary School in February, 1970. Most of children under 12 years were examined for splenomegalia.

It was known that in this village a small population of the so-called "Palawano" a native tribe, had been residing in the mountain area. On the other hand, the residents who occupied the major portion of the whole population in this village were the settlers from the Vissayas and Luzon. They lived on the coastal zone and in the plain area, and were engaged in the cultivation of rice and in the commercial bussiness. The results of examination were summarized separately by the settlers and Palawano in Table 4.

Of 65 blood smears examined, 10 were positive, a rate 15.4%. Eight positives were detected among 30 Palawano, 26.7%, and the rest 2 among 35 settlers, 5.7%. The differ-

Table 4. Parasite rate at Mainit in Palawan Island (Feb. 1970)

	Age	Male		Female		Total		Rate, %
		Exam.	Pos.	Exam.	Pos.	Exam.	Pos.	
Palawano	0-9	7	3	7	2	14	5	35.7
	10-19	4	1	5	1	9	2	22.2
	20-29	0	0	1	1	1	1	100.0
	30-39	0	0	2	0	2	0	0
	40-49	1	0	3	0	4	0	0
	Sum	12	4	18	4	30	8	26.7
Settlers	0-9	9	0	10	1	19	1	5.3
	10-19	9	1	4	0	13	1	7.7
	20-29	0	0	0	0	0	0	0
	30-39	0	0	0	0	0	0	0
	40-49	1	0	2	0	3	0	0
	Sum	19	1	16	1	35	2	5.7
Total		31	5	34	5	65	10*	15.4

*(*P. falcip.* ; 8, *P. vivax* ; 2)

ence in parasite rate between the settlers and Palawano was not significant statistically at 5% level. It was, however, assumed that the incidence of malaria might be higher in Palawano than in the settlers. As to the parasite species, 8 positives were caused by *P. falciparum* and 2 by *P. vivax*. Six positive cases were found in children under 9 years.

The spleen rate in children reached 40.9%. Some difference in spleen rate between the settlers and Palawano could be observed, as it was 31.0% in the settlers and 56.0% in Palawano, although it was not significant

statistically at 5% level (Table 6).

5) Quezon in Palawan Island

In this town, children of the Quezon Central School were employed in both the blood and spleen examinations in February, 1970. Of 281 children, 20 were found to be malaria-positive (parasite rate, 7.1%), as shown in Table 5. The parasite species was identified as *P. falciparum* in 16 and *P. vivax* in 5 (one was mixed). The spleen rate was found to be 15.2% with 34 positives among 224 children under 12 years (Table 6).

6) Iwahig Penal Colony in Palawan Island

There were about 4,000 prisoners (colonists)

Table 5. Parasite rate in primary school children at Quezon in Palawan Island (Feb. 1970)

Age	Male		Female		Total		
	Exam.	Pos.	Exam.	Pos.	Exam.	Pos.	Rate, %
7	12	0	12	0	24	0	0
8	23	2	16	2	39	4	10.3
9	14	2	22	0	36	2	5.6
10	39	2	26	3	65	5	7.7
11	19	4	21	1	40	5	12.5
12	17	0	16	0	33	0	0
>12	19	2	25	2	44	4	9.1
Total	143	12	138	8	281	20*	—
%		8.4		5.8		7.1	

* (*P. falcip.* ; 16, *P. vivax* ; 5, one was mixed)

Table 6. Spleen rate in children under 12 years at Maruyogon, Mainit and Quezon in Palawan Island

Area	No. examined	Class of Splenomegalia						No. of Pos.	Spleen Rate
		0	1	2	3	4	5		
Maruyogon	177	170	0	5	2	0	0	7	4.0
Mainit	44	26	0	12	6	0	0	18	40.9*
Quezon	224	190	0	32	2	0	0	34	15.2

*56.0% in Palawano, 31.0% in the settlers

in the colony at the time of this survey, who were each assigned to one of the Central, Montible, Santa Lucia, Bagong Buhay and Inagawan Subcolonies. Colonists in the Montible and Central Subcolonies were employed for the malaria examination and the total number of blood examination was 549. Results obtained were described below by the times and areas examined.

(A) Montible Subcolony

Approximately 600 colonists were assigned to this subcolony at the time of blood examination in January, 1970. Of 521 colonists examined, 63 were positive in parasite detec-

tion (parasite rate; 12.1%). The parasite species found in the positive cases were *P. falciparum* in 60 cases, *P. vivax* in 2, and both *P. falciparum* and *P. vivax* in the remaining 1. The highest parasite rate, 18.3%, was obtained from the Agricultural Section and the second, 12.5%, from the Development Section as shown in Table 7. These sections were located in the field or on the hilly zone at a long distance from the central district of the subcolony. On the other hand, the sections or units for indoor works such as the Food Service Section and the Administrative Unit which were located

Table 7. Parasite rate and malaria anamnesis in colonists of the Montible Subcolony, grouped by sections and units (Jan. 1970)

Section and Unit	No. of Exam.	Parasite		Anamnesis	
		Pos.	Rate	Pos.	Rate
1. Institutional Section	95	8	8.4%	51	53.9%
Administrative Unit	19	1	5.3	13	68.4
Fishing Unit	17	2	11.8	5	29.4
Handicraft Unit	31	4	12.9	29	93.5
Health Sanitation Unit	4	0	0	3	75.0
Raja Unit	24	1	4.2	1	4.2
2. Agricultural Section	153	30	18.3	137	89.2
Agronomy Unit	90	11	12.2	78	86.7
Animal Husbandry Unit	11	1	9.1	7	63.6
Coconut Expansion Unit	32	9	28.1	32	100.0
Horticulture Unit	20	9	45.0	20	100.0
3. Engineering Section	35	3	8.5	16	45.7
4. Food Service Section	33	2	6.1	9	27.3
5. Property Section	11	0	0	7	63.6
6. Custodial Orientation Section	122	11	9.0	43	35.2
Trusty Force Unit	46	2	4.3	28	60.9
Orientation Unit	66	9	13.6	10	16.7
Guard House Unit	10	0	0	5	50.0
7. Development Section	72	9	12.5	45	62.5
Construction Unit	20	2	10.0	10	50.0
Forestry Unit	52	7	13.5	35	67.3
Total	521	63*	12.1	308	59.1

*(*P. falcip.* ; 61, *P. vivax*; 3, including one mixed infection)

in the central district of the subcolony, showed a low parasite rate below 10% (Table 7).

In this connection, to evaluate clearly a difference in the endemicity of malaria between two residential districts of colonists, a comparison in parasite rate was made between 2 groups of colonists; one consisted of the colonists residing in the central district of the subcolony and the other in the outskirts.

As shown in Table 8, the parasite rate in the outskirts was 16.3% (40 out of 246), while that in the central district was only 6.7% (14 of 209): There was a significant difference between two groups at 5% level.

Table 8. Parasite rate in colonists of the Montible Subcolony, grouped by the residential areas; the central district and outskirts of the subcolony (Jan. 1970)

Residential District	No. examined	No. of Posit.	Parasite Rate
Central District	209	14	6.7%
Outskirts	246	40	16.3
Total	455	54	11.9

Note: Orientation Unit was not included in this result.

Almost half of the colonists examined had an anamnesis of malaria. Especially in the Agricultural section, the rate of malaria anamnesis was as high as 89.2%. The parasite rate was higher in the younger generation than in the older, while the anamnesis rate tended toward an increase with age. Both the rates might have a correlation to the period of stay of colonists in the colony (Tables 9 and 10).

The Orientation Unit, located in the field or forest, was arranged for newcomers from the Muntinlupa Prison to receive a preparatory training for six months. As shown in Table 7, the parasite rate in this unit reached 13.6% (9 of 66). Since the Muntinlupa Prison in the Manila area was said to belong to the non-malarious area, this rate might present us the frequency of a new infection of malaria among the newcomers during the orientation period.

(B) Mangahan (Agronomy) Unit of the Central Subcolony

One patient who was sent from the Mangahan Unit to the Iwahig General Hospital in January, 1971, was diagnosed as *P. malariae* infection. From this finding, some incidences of the quartan malaria were ex-

Table 9. Parasite rate and malaria anamnesis in colonists of the Montible Subcolony, grouped by age (Jan. 1970)

Age	No. of Exam.	Parasite		Anamnesis	
		Pos.	Rate, %	Pos.	Rate, %
10-19	11	3	27.3	4	36.4
20-29	265	39	14.7	144	54.3
30-39	151	12	7.9	98	64.9
40-49	53	6	11.3	35	66.0
50-59	35	3	8.3	23	63.9
60-	4	0	0	4	100.0
Unknown	1	0	0	0	0.1
Total	521	63	12.1	308	59.1

Table 10. Parasite rate and malaria anamnesis in colonists of the Montible Subcolony, grouped by years of stay (Jan. 1970)

Years of Stay	No. of Exam.	Parasite		Anamnesis	
		Pos.	Rate, %	Pos.	Rate, %
0-1	192	33	17.2	76	39.6
2	92	16	17.4	63	68.5
3	49	5	10.2	32	65.3
4	49	3	6.1	39	79.6
5	23	2	8.7	19	82.6
6	24	1	4.2	15	62.5
7	19	0	0	10	52.6
8	39	0	0	30	76.9
9	9	2	22.2	6	66.7
10	6	0	0	4	66.7
11	5	0	0	5	100.0
12	4	1	25.0	3	75.0
Unknown	10	0	0	6	60.0
Total	521	63	12.1	308	59.1

Table 11. Parasite rate in colonists at the Mangahan (Agronomy) Unit of the Central Subcolony (Jan, 1971)

No. examined	No. of Positive	Parasite Rate, %
28	3*	10.7

*(*P. falcip.* ; 2, *P. vivax* ; 1)

pected in the unit. Therefore, this blood survey was conducted.

The parasite rate was 10.7% (3 of 28) and the parasite species in the positives were identified as *P. falciparum* in 2 cases and as *P. vivax* in the remaining one. No case of *P. malariae*, however, could be detected in this blood examination (Table 11).

7) Total account of parasite species

The parasite species in all the positives detected in this blood survey were summarized in Table 12 in which the parasite species in patients at the Iwahig General Hospital were additionally described together.

It was understood that *P. falciparum* was the most, showing 84.8% of all positives and *P. vivax* was the second with 13.9%. As to the *P. malariae* infection, 3 patients (1.2%) were observed at the hospital. One of them was a mixed infection with *P. falciparum*. In enumerating the number of each parasite species detected in the Iwahig Penal Colony, the rate of *P. falciparum* reached as high as 88.6% (163/184, including 4 of mixed infections) This value might clearly indicate us *P. falciparum* to be the most prevailing species in the colony area.

Table 12. The number and percentage of parasite species detected in blood examination, summarized by the subject areas

Area	No. of Pos.	Parasite Species				
		<i>P. falcip.</i>	<i>P. vivax</i>	<i>P. malar.</i>	<i>P.f.&P.v.</i>	<i>P.f.&P.m.</i>
Wawa	8	6	2			
Sonlon	1		1			
Maruyogon	16	14	2			
Mainit	10	8	2			
Quezon	20	15	4		1	
Montible*	63	60	2		1	
Mangahan*	3	2	1			
Iwahig Gen. Hospital*	118	97	16	2	2	1
Total	239	202	30	2	4	1
%		84.5	12.6	0.8	1.7	0.4

Total number and percentage of *P. falcip.* ; 207, 84.8%

Total number and percentage of *P. vivax* ; 34, 13.9%

Total number and percentage of *P. malariae* ; 3, 1.2%

* : Iwahig Penal Colony

Discussion

Since the first pilot project for malaria control in the Philippines was started in 1946, the incidence of malaria has been gradually reduced up to the present time. In 1966, this project was taken over by the Malaria Eradication Service (MES) which was newly established in Department of Health. Since then, the activity of the MES has achieved a great success in the malaria control operation in the country, having a cooperation and assistance from the World Health Organization and the United States (Valera, 1971).

Palawan Island has been known to be one of the most malarious areas in the Philippines and, at present, is designated by the government as the first priority area for the malaria control operation in the country. Under this circumstance, it might be no wonder that both the parasite and spleen

rates obtained in this island were fairly high. Palawan Island has two different seasons ; the rainy from June to November and the dry from December to May. In the rainy season, the malaria control operation in the island became difficult due to the bad weather and the damaged road condition. On the other hand, it was said that the occurrence of *Anopheles minimus flavirostris*, a dominant vector species of malaria in the island, increased in number shortly after the termination of the rainy season. From these facts, it was reasonably understood that the malaria incidence in the island would tend to a rapid increase in the beginning of the dry season, that is, December and January.

In addition to the mass blood examination in the Montible Subcolony and at the Mangahan (Agronomy) Unit of the Central

Subcolony, the blood examination for malaria parasite of outpatients at the Iwahig General Hospital was carried out and gave the result in which 118 positive cases were detected. Therefore, total 184 parasite positive cases were found in the whole colony area and among those, *P. falciparum* infections were most, presenting the high detection rate ; 88.6% (163/184, including 4 of mixed infections), as mentioned above.

From this fact, *P. falciparum* was thought to be the most prevalent species in the colony. As to the parasite species, Alves *et al.* (1963) reported an interesting information that 2 cases of *P. ovale* infection were detected in the colony in 1967. In this survey, however, *P. ovale* was not detected against the authors' initial expectation.

According to the same report by Alves *et al.*, it was pointed out that 55.9% (192/344) in parasite rate fell to 38.8% (155/399) after a mass drug administration with Camoprime (amodiaquine and primaquine). In the mass blood examination of this time, however, the

parasite rate was 12.1% (63/521) in the Montible Subcolony and 10.7%(3/28) at the Mangahan Unit. Since a mass prophylaxis or mass therapy with some of antimalarials and a mosquito control measure had been conducted in parallel or separately in the colony by the MES, it was assumed that the incidence rate of malaria in the colony might have been rapidly reduced.

A parasite rate as high as 13.6% was observed in the Orientation Unit where newcomers from the Muntinlupa Prison situated in a non-malarious area were educated for 6 months. This information gave us an interesting knowledge that the frequency of a new infection of malaria during the stay of the first 6 months in the colony was rather high.

In the Philippines, *Anopheles minimus flavirostris* was regarded as a principal vector of malaria. Concerning the malaria vectors in Palawan, *An. balabacensis balabacensis* has so far been discussed on its transmissibility. The result of survey on the vector mosquitoes of malaria will be reported elsewhere later.

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フィリピンの農山村、特にパラワン島におけるマラリアの疫学的調査

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摘 要

1969年11月より1971年3月の間に、フィリピンの農山村地域で、マラリア原虫率および脾腫率の野外調査を実施した。対象地はマニラ北方約60Kmのワワ、ミンダナオ島ダヴァオ北東約110Kmのソンロン、およびパラワン島のマルヨゴン、マイニット、ケソンおよびイワヒグ囚人部落で、対象人は一般住民、囚人部落では収容中の徒刑囚、またある地域では学童であった。脾腫率は12才以下の小人を対象に触診によって検査した。得られた成績を総括すると次の如くであった。

- 1) 原虫率は、ワワ2.5% (8/320)、ソンロン0.5% (1/217)、マルヨゴン4.0% (16/401)、マイニット15.4% (10/65)、ただし、この地域の原住部族民では26.7% (8/30)、移住者5.7% (2/35)、ケソン中央小学校児童7.1% (21/181) であった。
- 2) 脾腫率は、マルヨゴン4.0% (7/177)、マイニット40.9% (18/44)、ケソン15.2% (34/224) の結果を得た。
- 3) イワヒグ囚人部落ではモンテブレおよびセントラルの両サブコロニーの囚人を対象とした。モンテブレサブコロニーでは、12.1%(63/521)の原虫率をえたが、このサブコロニーの中央地区居住者の原虫率、6.7%と周辺地区居住者のそれ、16.3%との間には、明らかに有意差が認められた。同サブコロニーのオリエンテーション分団への新入囚人では、原虫検出率が13.6% (9/66) であった。この事は新入者の初期6ヶ月間の滞在期間中におけるマラリア感染の頻度を物語るものと思われた。セントラルサブコロニーのマンガハン(耕作)分団での原虫率は10.7% (3/28) であった。
- 4) 検出した原虫種は、熱帯熱原虫がもっとも多く84.8%、三日熱原虫は13.9%、四日熱原虫は1.2%であった。