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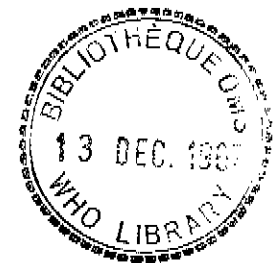
PRELIMINARY SURVEY FOR SCHISTOSOMIASIS IN SOUTH LAOS

by

Toshihiko Iijima¹

and

Rolando G. Garcia²



CONTENTS

	<u>Page</u>
1. Introduction	2
1.1 General background	2
1.2 Survey area	2
2. Objectives	3
3. Methods	3
4. Results	4
4.1 Skin test	4
4.2 Stool examination of the population	4
4.3 Examinations of possible reservoir hosts	4
4.4 Intermediate hosts	5
5. Discussion	5
5.1 Incidence in man	5
5.2 Incidence in reservoir hosts	6
6. Conclusion and recommendations	7
6.1 Conclusion	7
6.2 Recommendations	7
Acknowledgements	7
Tables	
Maps	

¹ Chief, Section of Schistosomiasis, Yamanashi Prefecture Hygiene Laboratory, Kofu City, Japan, WHO Consultant.

² Zoology Section, Schistosomiasis Control Pilot Project, Palo, Leyte, Philippines, WHO Consultant.

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1. INTRODUCTION

1.1 General background

The finding of several cases of Schistosoma japonicum infection in Laos, as well as in other countries along the Mekong river, has raised suspicion that the disease might be endemic in this area. In 1957 Professor Galliard of the Institut Pasteur, Paris, found one case in a Laotian subject from Paksé, on the Mekong river near the Thailand border.¹ Eight other cases were found before 1960 in South Viet-Nam, and since then several cases have turned up in Laotians studying or working in Europe and North America.² Recently, Dr Harinasuta (personal communication, 1966) found an infected Laotian woman in a hospital in Thailand.

Dr Ito¹ in 1960 and Drs Zeville and Santos³ in 1961 carried out investigations in Paksé and Vientiane but found no cases of schistosomiasis. However, questioning of the patients mentioned above revealed that in most cases the person had lived for part of his childhood on the Mekong river near or upon the island of Khong, one of the few parts of the Mekong valley which was not included in the surveys.

In view of the fact that ECAFE plans to undertake extensive irrigation schemes in Sithandone Province, a survey to determine the presence of schistosomiasis was considered necessary. If the infection were present, adequate measures could then be taken to prevent its further spread from the foci of infection.

1.2 Survey area

Khong, the largest island in the Mekong River, is situated in the southern part of Laos near the Cambodian border. It is exactly located between 14°47'E and 14°52'W and 105°15'S and 105°3'N (Map 1).

¹ Ito, J. & Jatanasen, S. (1960) Assignment report, unpublished mimeographed document, WPR/334/61.

² Barbier, M. (1967) Détermination d'un foyer limité de bilharziose artérioveineuse dans la province de Sithadone (Sud Laos) unpublished mimeographed document WHO/BILH/67.61.

³ Zeville, M. & Santos, B. C. (1961) Assignment report, unpublished mimeographed document, WPR/556/61.

The island is about 28 kilometres long and eight kilometres across at its widest portion. The terrain is relatively flat with a predominantly sandy soil. Several streams, rising on the mountain in the centre of the island, flow across the plains towards the periphery to empty into the Mekong River. The highest point of land, which rises to 778 feet (237 m) is covered with virgin forests, while second-growth forests are scattered throughout the island. A great part of the plain is utilized for rice planting; smaller parts are planted with vegetables.

The banks of the Mekong River along the island are steep and devoid of vegetation except for some parts where aquatic plants of the mangroove type thrive luxuriously.

Sithandone Province, to which Khone belongs, has two seasons a year, each of which lasts for about six months. The rainy season starts in April and extends to September; the dry season from October to late March. The annual rainfall is about 2000 mm. No records of the annual temperature were available. Nevertheless, in Faksé, Sedone Province, 150 kilometres north of Khong, the average maximum and minimum temperatures from 1953 to 1957 were 32.1°C and 22°C respectively.¹

2. OBJECTIVES

The objectives of the survey were to:

- (a) obtain information on schistosomiasis in man and the reservoir hosts;
- (b) search for the intermediate host.

3. METHODS

Surveys were made in several towns and villages on Khong Island (Map 1 and 2). Screening of the human population was done by the intradermal skin test using antigen supplied by Professor M. Yokogawa, Faculty of Medicine, Chiba University. For the intradermal test, 0.02 cc of a 1:5000 dilution of antigen prepared from the adult worms of Schistosoma japonicum were injected intradermally on the left forearm. The diameter of wheal was observed 15 minutes later.

¹ Service Météorologique du Laos

Positive wheal: diameter 1.0 cm

Doubtful wheal: diameter 0.7 - 0.9 cm

Negative wheal: diameter 0.6 cm

Stools were examined, using the direct smear method. In cases where the intradermal skin test showed a positive reaction the stools were examined both by direct smear and by the formalin-ether method using approximately one gram of faeces.

Other investigations attempted to find the intermediate and reservoir hosts.

4. RESULTS

4.1 Skin test

As shown in Table 1 and Map 2, Moug Khong, Ban Na, Ban Dong, Kong Nhai and Moug Sene were selected for skin tests. Moug Khong, Ban Na and Ban Dong are located on the east bank of the Mekong River, and Moug Sene and Khong Nhai on the west. The results of the skin tests in 1012 inhabitants were 184 (18.18%) positive, 319 (31.52%) doubtful and 509 (50.30%) negative.

4.2 Stool examination of the population

The results of stool examinations are shown in Tables 2 and 3.

A total of 547 inhabitants, whose skin test had been positive, doubtful or negative, were examined by the direct faecal smear method, and 47 cases (8.59%) were found to be positive for ova of Schistosoma japonicum. The highest percentage of positive cases, 26.47% was found in Moug Khong and the lowest, 0.65%, in Khong Nhai.

The formalin-ether concentration method was then used to examine specimens from 78 persons in the same group whose skin test had been positive. As shown in Table 3, 20 cases were found to be positive for ova of Schistosoma japonicum, but, of these two had already been found to be positive by the direct smear method. Thus a further 18 cases were discovered by the formalin-ether concentration method.

4.3 Examinations of possible reservoir hosts

The stools of 69 buffaloes (24 in Moug Khong, 15 in Ban Dong, 15 in Moug Sene and 15 in Khong Nhai) were examined by Watanabe's concentration method. No ova of Schistosoma japonicum were found.

A total of 45 wild mice collected in the Moung Khong district were dissected. Specimens of their livers were examined microscopically. The results were negative.

4.4 Intermediate hosts

Paddy fields, canals, ponds and swampy areas were searched thoroughly for the snail intermediate hosts. Although the ground had been cracked since the later part of October, a few isolated depressions devoid of cover and containing a little water were surveyed. In view of these conditions, cursory investigations were made along the banks of the Mekong River around the island and neighbouring small islands. All areas inland which could be reached by foot were also investigated.

As no oncomelaniid snails were found in any of these areas, the other snails present were brought to the laboratory for examination. Some were placed in test tubes with water and observed for shedding of cercariae. The snails were later crushed and examined for the presence of cercariae.

No oncomelaniid snails were found on the island or small neighbouring islands. However, species of the freshwater gastropod Wattebledia crosseana, which is closely related to the genus Oncomelania, were observed to be common throughout the island. None of these snails harboured S. japonicum cercariae. Table 4 shows the various kinds of snails collected and examined.

5. DISCUSSION

The investigations to determine the presence of Schistosoma japonicum were carried out in the Khong Island, Sithandone Province, South Laos, and some interesting information was obtained.

5.1 Incidence in man

As mentioned above, the stool examinations of 547 persons produced 65 (11.9%) positive cases. In almost all the endemic areas in Japan and the Philippines, the infection rate of Schistosoma japonicum, using concentration methods for ova in the stool, is less than 10%. The incidence of infection among the inhabitants in this district was, therefore, remarkably high. The high degree of correlation between the positive skin tests and the prevalence of schistosomiasis is obvious.

Local differences in the incidence of the infection were clear. A high rate of infection was found in schoolchildren in Moung Khong and, in general, the positive rate in persons living in areas on the east side of the Mekong River was significantly higher than that on the west side.

The eggs of Schistosoma japonicum found in the stool were measured. The size of the egg was about 80 microns and its breadth 60 microns. Dr Komiya (1960) mentioned that the size of the egg of Schistosoma japonicum found in the stool specimens of inhabitants in south Thailand was somewhat smaller than that in Japan. However, in this case, the general appearance of the egg conforms to the usual description of a Schistosoma japonicum egg.

The number of eggs found in the stools of infected persons was comparatively large. The symptoms of schistosomiasis, however, seem mild in comparison with those in Japan and the Philippines.

Buckley (1958) reported that the cercaria of Schistosoma spindale might cause cercaria dermatitis in man after penetration into the skin. The authors were told that a considerable number of persons suffer from skin itching and dermatitis after bathing in the Mekong River. However, it was not confirmed whether the itching and dermatitis were caused by Schistosoma spindale or Schistosoma japonicum, because neither Endoplasorbis, the intermediate host of S. spindale, nor Oncomelania, the intermediate host of S. japonicum, were found.

3.2 Incidence in reservoir hosts

In the area investigated there were many kinds of domestic animals, such as buffaloes, dogs, cats and pigs. Buffaloes are considered to be the most important reservoir host, because of their frequent immersion in water in the paddy fields, ponds and irrigation canals. For this reason, Watanabe's concentration method was used to examine the stools of 69 buffaloes. Schistosoma ova were, however, never demonstrated.

Dissection of 45 wild mice revealed no Schistosoma japonicum either in the vein of the intestine or the vein of the liver.

Under these circumstances, the authors surmised that there was little possibility of Schistosoma japonicum being transmitted by reservoir hosts in this district. The fact that only humans have been found to be infected is very important. However, if

there are snail colonies in the interior of the island, it is only reasonable to expect that reservoir hosts, such as buffaloes and mice, might also be infected by Schistosoma japonicum.

Based on the known habits of oncomelaniid snails, the type of topography and the duration of the dry season in Khong do not seem favourable to the existence of the intermediate hosts of S. japonicum. Oncomelaniid snails are known to be relatively resistant to extremes of temperature for more than three months, but they prefer shady places and avoid direct exposure to sunlight. Places such as the banks of the Mekong River around the island as described above are frequently subjected to strong currents and waves which may be hazardous to snail breeding, especially to the newly hatched snails which are aquatic for approximately 15 days. An intensive snail survey during the early part of the rainy season would be necessary to confirm or disprove the apparent absence of a snail intermediate host in the Khong area.

6. CONCLUSION AND RECOMMENDATIONS

6.1 Conclusion

Based on the facts mentioned above, the authors assume that endemic foci of Schistosoma japonicum may be present on the riverside of the Mekong River, and/or near the small islands and on the mainland to the east of Khong Island.

6.2 Recommendations

(a) In order to obtain information on the extent of prevalence of Schistosoma japonicum and to establish the endemic area of the disease in the Mekong Basin, including Laos, Cambodia and Viet-Nam, intensive investigations should be carried out as soon as possible. It is essential to determine the intermediate host since a programme to eradicate it is essential for the control of schistosomiasis.

(b) Treatment should be carefully considered, since there are a large number of human cases discharging a great number of ova in the area investigated. The use of trivalent antimony compound and Nitrothiazole derivative is recommended.

ACKNOWLEDGEMENTS

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TABLE 1. RESULTS OF INTRADERMAL SKIN TEST FOR SCHISTOSOMA JAPONICUM

Village		Number tested Nombre des personnes soumises aux épreuves	Number positive Nombres de réactions positives	Number doubtful Nombre de réactions douteuses	Number negative Nombre de réactions négatives
Moung Khong	Male	212	55	102	55
	Female	148	33	80	35
	Total	360	88 (24.44%)	182 (50.56%)	90 (25.0%)
Ban Dong	Male	46	2	11	33
	Female	78	1	12	65
	Total	124	3 (2.42%)	23 (18.55%)	98 (79.03%)
Ban Na	Male	38	6	9	23
	Female	73	22	18	33
	Total	111	28 (25.22%)	27 (24.32%)	56 (50.45%)
Moung Sene	Male	137	30	37	70
	Female	106	20	28	58
	Total	243	50 (20.57%)	65 (26.75%)	128 (52.67%)
Khong Nhai	Male	126	13	17	96
	Female	48	2	5	41
	Total	174	15 (8.62%)	22 (12.59%)	137 (78.79%)
TOTAL		1 012	184 (18.8%)	319 (31.52%)	509 (50.30%)

TABLE 2. RESULTS OF STOOL EXAMINATION USING DIRECT SMEAR METHOD

Village	Number examined Nombre de personnes examinées	No. neg. Nombre de réactions négatives	Helminths found/Helminthes trouvés								Remarks Remarques
			Sj.	As.	Hw.	Str.	T. t.	Ech.	Opis.	Others Divers	
Moung Krong	Male - 72	26	19	11	17	3	17	0	1	-	-
	Female - 64	19	14	15	4	7	0	4	-	-	
	Total - 136	45 (33.09%)	36 (26.47%)	25 (18.38%)	32 (23.53%)	7 (5.15%)	24 (17.65%)	0 (0%)	5 (3.68%)	-	-
Ban Dong	Male - 15	4	1	2	0	4	0	3	-	-	
	Female - 31	12	0	9	1	7	0	3	-	-	
	Total - 46	16 (34.78%)	1 (2.17%)	11 (23.91%)	1 (2.17%)	11 (23.81%)	0 (0%)	6 (13.04%)	-	-	
Ban Na	Male - 23	7	3	4	0	0	1	0	-	-	
	Female - 44	30	1	8	5	4	0	1	-	-	
	Total - 67	37 (55.2%)	4 (5.97%)	12 (17.91%)	5 (7.46%)	4 (5.97%)	1 (1.49%)	1 (1.49%)	-	-	
Moung Sene	Male - 88	46	4	29	2	2	0	4	-	-	
	Female - 56	27	1	21	1	2	0	3	-	-	
	Total - 144	73 (50.69%)	5 (3.47%)	50 (34.72%)	3 (2.08%)	4 (2.77%)	0 (0%)	7 (4.86%)	-	-	
Khong Khai	Male - 116	21	1	60	3	22	1	14	-	-	
	Female - 38	7	0	15	0	6	0	7	-	-	
	Total - 154	28 (18.18%)	1 (0.65%)	79 (51.30%)	3 (1.94%)	28 (18.18%)	1 (0.65%)	21 (13.64%)	-	-	
TOTAL	547	199 (36.38%)	17 (8.59%)	168 (30.71%)	29 (5.47%)	71 (12.98%)	4 (0.73%)	40 (7.31%)	-	-	

Note: Sj. - Schistosoma japonicum
 Str. - Strongyloides sp.
 Opis. - Opisthorchis and/or Clonorchis
 As. - Ascaris lumbricoides
 T. t. - Trichouris trichiura
 Hw. - Ancylostoma duodenale
 Ech. - Echinostoma sp.

TABLE 3. RESULTS OF STOOL EXAMINATION USING FORMALIN ETHER CONCENTRATION METHOD FOR PERSONS WITH A POSITIVE SKIN TEST

Village	Number examined Nombre de personnes examinées	No. neg. Nombre de réactions négatives	Helminths found/Helminthes trouvés								Other cases ^a Divers
			Sj.	As.	Hw.	Str.	T.t.	Ech.	Opis.		
Noung Khong	Male - 34	18	9	5	5	0	0	1	0	0	1
	Female - 9	6	2	0	0	0	0	0	0	0	0
	Total - 43	24 (55.81%)	11 ^b (25.58%)	5 (11.63%)	5 (11.63%)	0 (0%)	0 (0%)	1 (2.33%)	0 (0%)	0 (0%)	1 (2.33%)
Noung Sene	Male - 11	0	5	1	8	0	0	1	0	0	0
	Female - 11	2	1	1	2	0	0	2	0	0	2
	Total - 22	2 (9.09%)	4 (18.18%)	2 (9.09%)	10 (45.45%)	0 (0%)	0 (0%)	3 (13.64%)	0 (0%)	0 (0%)	2 (9.09%)
Khong Khai	Male - 10	0	4	3	4	0	0	2	0	0	1
	Female - 5	0	1	0	0	0	0	1	0	0	0
	Total - 15	0 (0%)	5 (33.46%)	3 (23.10%)	4 (30.77%)	0 (0%)	0 (0%)	3 (23.10%)	0 (0%)	0 (0%)	1 (7.69%)
TOTAL - 78	26 (33.33%)	20 (25.64%)	10 (12.82%)	19 (24.36%)	0 (0%)	0 (0%)	7 (8.97%)	0 (0%)	0 (0%)	4 (5.13%)	

Note: ^a = Others: *Faenia* sp.

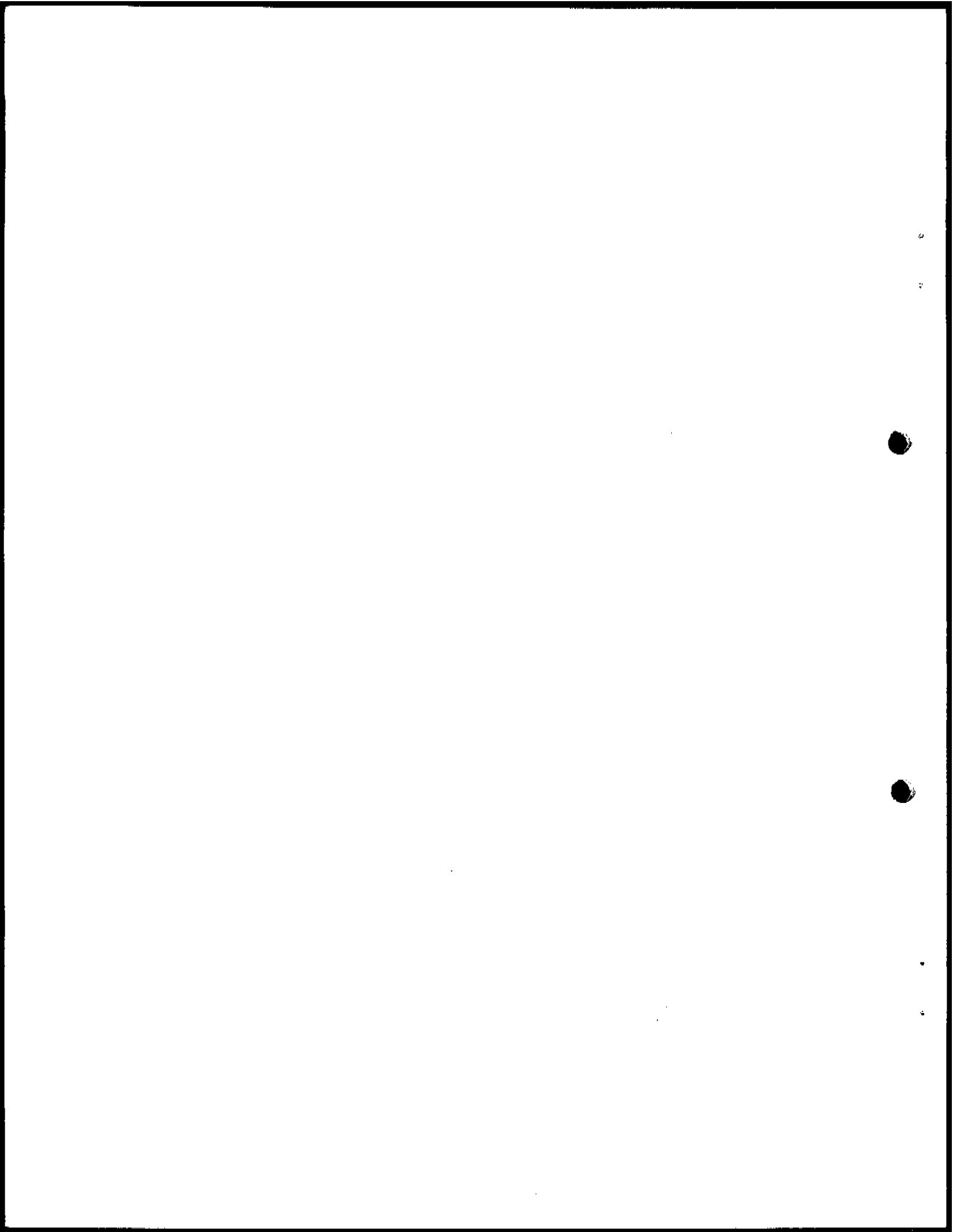
^b = Two of these were also found positive by the direct smear method.

TABLE 4. RESULTS OF SNAIL SURVEY IN XEONG AND NEIGHBOURING ISLANDS

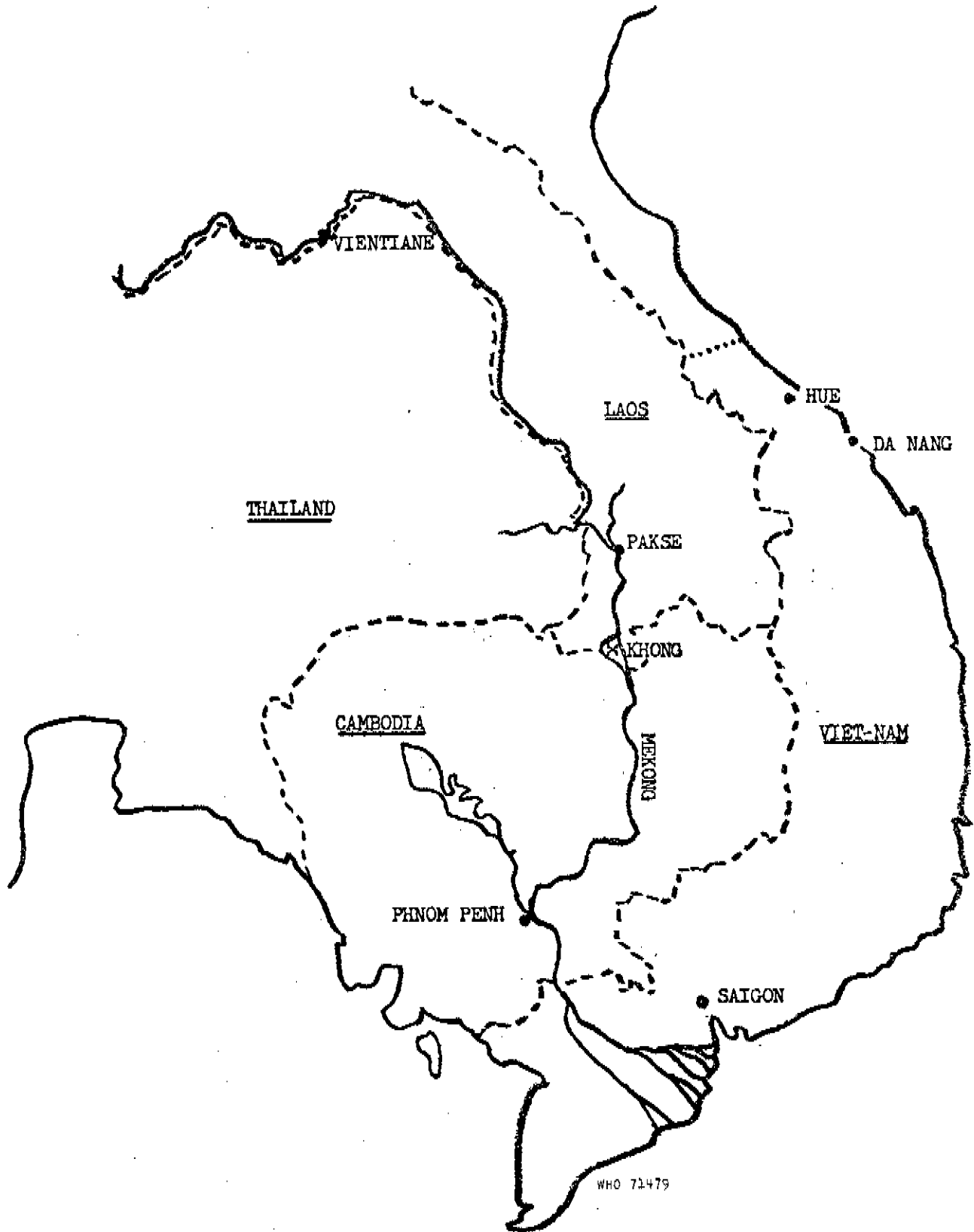
Genus Genre	Number examined Nombre de personnes examinées	<u>S. japonicum</u> infection Infection à <u>S. japonicum</u>	Other trematodes Autres trématodes
<u>Lacunopsis</u> sp.	153	Negative	Negative
<u>Sinotoeia martensi vignesi</u> (Jullien)	80	Negative	Negative
<u>Hobendickia siamensis</u> Brandt	200	Negative	Negative
<u>Pachydrobia variabilis</u> Forner *	-	-	-
<u>Bithynia gomomphelus</u> Murdet	134	Negative	Negative
<u>Mekongia swansoni</u>	57	Negative	Unidentified
<u>Pachydrobia spinosa</u> Feirler *	-	-	-
<u>Hydrobiosola</u> sp. *	-	-	-
<u>Mekongia jullieni</u> (Desnazes)	248	Negative	Unidentified
<u>Heterozoa</u> sp. *	-	-	-
<u>Paraprososteknia</u> sp.	174	Negative	Negative
<u>Wattlebleia crosseana</u> Wattlebled	500	Negative	Unidentified **

* Empty shells

** Metacercaria



MAP. 1 GEOGRAPHICAL SITUATION OF THE AREA SURVEYED



WHO 71479

MAP. 2 KHONG ISLAND

X Areas surveyed for snail intermediate host

