The impact of schistosomiasis on the peoples of the southern fringe of Asia has been very limited. In 1957, schistosomiasis was diagnosed in a Laotian from Paksé, in southern Laos on the Mekong river, at the Institute of Parasitology of Paris. It was long thought that the parasite was Schistosoma japonicum; however, in 1978 it was recognized as a new species, S. mekongi (10). Other cases were reported in 1959 to the west in Thailand and in 1966 in the Khong Island on the border between Laos and Kampuchea (formerly Cambodia). In Malaysia the only known case of schistosomiasis has been found at Pahang, in the centre of the Malay Peninsula (21). In India, urinary schistosomiasis was described in 1952 at Gimvi, in the Ratnagiri district, Maharashtra State.

La schistosomiase a un impact très limité sur les populations de la bordure méridionale du continent asiatique. En 1957, fut diagnosticé, à l’Institut de Parasitologie de Paris, un cas d’infestation chez un Laotien originaire de Paksé, en bordure du Mékong, au sud du Laos. Longtemps on a cru que l’agent pathogène était Schistosoma japonicum ; en 1978, il fut établi qu’il s’agissait d’une espèce particulière dénommée depuis S. mekongi (10). D’autres cas ont été repérés en 1959, plus à l’ouest, en Thaïlande, puis en 1966, à la frontière du Laos et du Kampuchea (ex-Cambodge), dans l’île de Khong. En Malaisie, le seul cas connu de schistosomiase a été mis en évidence à Pahang, au centre de la péninsule malaise (21). En Inde, le plus ancien foyer de transmission de schistosomiase urinaire, découvert en 1952, est situé à Gimvi, dans le district de Ratnagiri, dans l’État de Maharashtra.
I. — POPULATION DISTRIBUTION OF S. MEKONGI INFECTION

A 1960 survey, based on intradermal tests using S. japonicum antigen, showed that 3.3% of the population were positive. The same survey also showed that 0.2% of the population were positive in the Pakse sector (Laos) and 0.3% in the Kompong Cham sector (Kampuchea); however, no stool examinations were positive in either area (13).

In 1967 on Khong Island, 18.8% of intradermal tests were positive, while S. mekongi eggs were present in the stools of 8.6% of the 1,012 persons examined (16). In 1969, on the same island, 28.6% of the intradermal tests were positive among 871 persons while the prevalence was 14.4% by parasitological examinations (18): 25.6% of the residents of Moung Khong village on Khong Island had positive stool examinations. In the same locality the infected persons lived near the open space (37.9%) or near the Dooley Foundation Hospital (41.2%).

During the same period other surveys were done among Laotian and Cambodian population groups living near the Mekong river. There were 16.5% positive reactions to the intradermal tests in the Vientiane district, 13.3% in the Pakse district, 79.6% in the Khong district (Laos), 13.8% in Stung Treng, 35.9% in Kratie, 6.1% in Kompong Cham and 8.5% in Bassac (Kampuchea). On the contrary, parasitological examinations were positive only among the inhabitants of the districts of Khong, Stung Treng and Kratie (19).

In 1981, 3.8% of the Cambodian refugees at Sa Kaew in Thailand, were infected with S. mekongi (12) and 9.3% of Cambodians in the Ban Kaeng camp were also infected. The infection rate of 0.2% in the case were from regions of Kampuchea (Battambang, Takeo, Svay Rieng and Phnom Penh) where schistosomiasis has never previously been reported, which tends to support the idea that the disease is more widespread than generally thought in Kampuchea.

In Thailand, schistosomiasis cases have been reported since 1967 near the Laotian frontier, at Chongmek. However, cases were detected in the south of the country, near the Malaysian frontier, in the cantons of Chawang, Chang Klang and Toong Song, Nakhon Si Thammarat province. At present only the inhabitants of two villages are still affected by S. mekongi. Three cases were reported in 1964 in northern Laos, two coming from the Vientiane region and the third case from Luang Prabang. Two cases coming from the regions of Phitsanuloke (southern part of northern Thailand) and Phichit (northern part of central Thailand) were diagnosed during medical examination in Bangkok hospitals (the first in 1964 and the second in 1971). No active infections were found by parasitological examination.

II. — POPULATION DISTRIBUTION OF THE MALAYSIAN SCHISTOSOME INFECTION

In Malaysia, the schistosoma parasite was detected in 1973 in an Orang Asli aborigine from Fort Betau, Pahang State, in the centre of the peninsula of the Federation. A retrospective study of 231 autopsies led to the discovery of other cases in the same region. In 1975, 25% of the ELISA tests carried out at Pos Iskandar and 13% of those at Bukit Lanjan (two Orang Asli camps near Kuala Lumpur) were positive. In 1984 transmission was reported to occur.

In 1978, Schistosoma was detected in four Macaca fascicularis monkeys at Ranau, in northern Kalimantan (formerly Borneo) but no case of human infection was reported from that locality after examination of 1,089 stool specimens.

III. — POPULATION DISTRIBUTION OF S. HAEMATOBIUM INFECTION

Although the history of urinary schistosomiasis in India dates from 1903 (POWELL), only sporadic case reports appeared in the scientific literature (in 1914, 1936, 1945 and 1949) until 1952. At that time, GADGIL and SHAH (8) confirmed an endemic focus in Gimi village in Ratnagiri district, Maharashtra State, in the hills along the Konkan coast, 16 km from the shore. Among 677 persons examined, four persons were identified with terminal spined eggs in the urine (3). The intermediate host was thought to be Ferrisia tenuis. VAHRA and ANAN in (2) doubt the presence of S. haematobium at Gimi and have suggested that these were infections of schistosomes normally affecting animals.

I. — RÉPARTITION DES POPULATIONS INFESTÉES PAR S. MEKONGI

Une enquête basée sur des tests intradermiques révèle en 1960 un taux de réactions positives après test cutané de 8.6% des individus examinés (1 012) présentant par ailleurs des œufs de S. mekongi dans leurs selles (16). En 1981, sur cette même île, les tests cutanés pratiqués sur un échantillon de 871 individus présentent 28.6% de réactions positives et les examens parasitologiques une prévalence de 14.4% (18). La population la plus atteinte sur l’île de Khong consiste de Moung Khong (28.6% des individus observés éliminent des œufs de schistosome) ; dans cette localité, les gens les plus infestés vivent près de la plage du marché (37.9%) ou près de l'hôpital de la Fondation Dooley (41.2%).

À la même époque, furent menées d’autres études sur la diffusion de S. mekongi au sein des populations laotiennes et cambodgiennes vivant à proximité du fleuve Mékong. Les tests intradermiques font apparaître 16.5% de réactions positives dans le district de Vientiane, 13.3% dans celui de Pakse, 79.6% pour celui de Khong (Laos), 13.8% pour Stung Treng, 35.9% pour Kratie, 6.1% pour Kompong Cham et 8.5% pour Bassac (Kampuchea). Les examens parasitologiques ne révèlent, par contre, d’infestation que chez les habitants des districts de Khong, de Stung Treng et de Kratie (19).


II. — RÉPARTITION DES POPULATIONS INFESTÉES PAR LE SCHISTOSOME MALAIS


III. — RÉPARTITION DES POPULATIONS INFESTÉES PAR S. HAEMATOBIUM

Bien que la schistosomiasis urinaire en Inde ait été signalée dès 1903 (POWELL), seuls des cas sporadiques sont signalés à travers les rapports (en 1914, 1936, 1945 et 1949) et ceci jusqu’en 1952. À cette époque, GADGIL et SHAH (8) notaient la présence d’un foyer endémique à Gimi, village situé dans le district de Ratnagiri (Maharashtra), au long de la côte de Konkan, à 16 km du bord de la mer. 4 cas de schistosomiase ont été examinés par un examen de 607 personnes (3). L’hôte intermédiaire serait Ferrisia tenuis. Certains auteurs (VAFRA et ANAN) (2) doutent de la présence de S. haematobium à Gimi, et pensent que les cas d’infestation correspondent à l’adaptation de l’homme à des schistosomes affectant normalement les animaux, ce qui l’on sait possible.
In 1967, SANTHANAKRISHNAN and SUNDARARAJUJULU noted in (2) reported a second endemic focus in the village of Tirurappankundaram, in Madurai district (Madras State): 30% of the inhabitants were suspected to have urinary schistosomiasis. In 1973, the infection had completely disappeared (1).

In 1969, 53 cases of haematuria were found among 263 urine specimens taken from inhabitants of the village of Lohager in the Rajapur district (Madhya Pradesh State) where a third site of transmission has been suspected (SHRIVASTAVA and ARORA, 1969).

The presence of schistosomiasis in Givni was confirmed by SATHE et al. (1981). The question of the transmission of urinary schistosomiasis elsewhere in India is still unresolved.

IV. -- PHYSICAL GEOGRAPHY OF SCHISTOSOMIASIS

The Mekong river flows over 4,500 km, with an annual variation in water level of more than 10 m every year. High-water level occurs in September, when the tributaries are swollen by the wet monsoon rains and the Mekong is already carrying water from the Tibetan snows. Low-water level occurs in April, when numerous rocky islands emerge with vegetation, particularly rheophytic Euphorbia bushes. This is the period when the largest number of Tricula aperta, the aquatic snail intermediate host of S. mekongi in Laos is easily found (23). Its habitat is at a depth of less than 2 m of water, under stones, wees or branches, usually in highly oxygenated clear water with a high pH (8 to 8.5), with sun exposure. In spite of the great variations in flow (from 15,000 m³/s to 60,000 m³/s in front of Phnom Penh) the snail habitats are stable only in a few sheltered creeks. Optimal conditions are found near the bathing area of Khong village, on the Bam Khiep and Wang beach. Downstream, snail habitats have been reported only as far as the Prêapatang rapids on Khong Island.

In Khong Island, the dog seems to be the only reservoir of S. mekongi. The water buffalo has not been reported to be infected by the parasite. In southern Thailand no schistosomiasis has been found in any of the animals examined (39). Moreover, no intermediate host has so far been identified (41). DAVIS suggested that in southern China, in the Dai region, lying between the Changjiang and the Mekong rivers, there was a divergent evolution of the parasite-snail intermediate host: the S. japonicum-Vivaparana Oncocotylus developing in the Changjiang valley and the S. mekongi-Tricula colonizing the Mekong valley. The geographical extent of transmission of S. mekongi is not known.

In Malaysia, the fact that schistosomiasis has only been reported in Orang Asli aborigines suggested an animal reservoir in the forests. Rattus muelleri and Rattus tiomanicus are the natural hosts of the Malaysian schistosoma. The intermediate snail host appears to be Robertsiella kapoorensis which is found mainly along streams on the roots of Saraca thapigoides trees.

In India, Ferrisia tenuis has been suspected as the snail intermediate host in streams near the village of Givni; Vivipara heliciformis was suggested as the snail intermediate host at Tirurappankundaram (2). The snail habitats are also unstable, and disperse during the period of the heavy rains brought by the south-west monsoon (from June to October), although they flourish during the rest of the year.

V. -- HUMAN ECOLOGY AND SCHISTOSOMIASIS

The village of Moung Khong is located along dikes built between the Mekong river and the rice fields. The population of these village is in permanent contact with the Mekong river for fishing, launguring, bathing or to obtain water for domestic use. The prevalence rates varied: 63.3% among schoolchildren 7-15 years of age; 16.7% among children between 4 and 6 years of age; 19% among farmers; 3.3% among monks, commercial employees or administrative agents. Housewives were not affected (21).
At Krâtié, further downstream, fishermen of Vietnamese origin have been living in this region on rafts ever since the construction of a road obliged them to abandon their former dwellings on the banks of the Mekong (9). Since then every house has been built on a raft constructed of large bamboo stumps together. These rafts, anchored side by side, form a floating village. There are three localities near Krâtié where they enclose areas of stagnant water in which the children like to bathe. There are latrines on these rafts opening directly into the water, and various aquatic snails settle on the bottom of the rafts. However, in 1976 Tricula aperta, the host of S. mekongi in Khong Island, had not yet been detected there. The southern limit of this snail is thought to be at the border between Laos and Kampuchea at the Khôné falls (9).

It is supposed that the populations of floating houses at Krâtié are continually exposed to schistosomiasis, while a seasonal transmission probably occurs at Khong and, upstream, at the junction of the Mekong and the Mæ Nam Mun rivers.

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DEMOCRATIC KAMPUCHEA - KAMPUCHEA DÉMOCRATIQUE


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## LAO PEOPLE’S DEMOCRATIC REPUBLIC - RÉPUBLIQUE DÉMOCRATIQUE POPULAIRE LAO

## THAILAND - THAÏLANDE

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* SC = AMSIII.