THE MEDICALLY IMPORTANT MOLLUSCS OF INDONESIA

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ABSTRACT

At present in Indonesia 32 species of non-marine molluscs which belong to 15 families have been known to be potentially of medicalor veterinary importance, since they are suspected to be capable in transmitting human and animal diseases. The brackish water family Potamididae comprises of 1 species; whereas the freshwater snails are : Viviparidae (3 sp.), Ampullariidae (3 sp.), Bythiniidae (1 sp.). Pomatiopsidae (1 sp.), Thiaridae (7 sp.), Lymnaeidae(1 sp.) and Planorbidae (5 sp.); freshwater bivalve are: Corbiculidae (4 sp.); land snails are: Subulinidae (2 sp.), Achatinidae (1 sp.) and Bradybaenidae (1 sp.); land slug: Veronicelidae (2 sp.) Philomycidae (1 sp.) and Limacidae (1 sp.). All are common species which can be found in the vicinity of human habitation (ponds, rice-field, ditches, gardens etc). The parasitological studies on these molluscs are rather limited, only 9 species have been studied and confirmed to be the intermediate host of parasitic trematodes and nematodes; i.e. **Oncomelania hupensis lindoensis**, the intermediate host of the blood fluke **Schistosoma japonica** in Central Sulawesi: **Pila suctata, Achatina fulica** and **Laevicaulis alte** from several places in Sumatra, Java, Sulawesi and Flores have been found to be harbouring the larvae of the nematode **Angiostrongylus cantonensis**, the causative agent of eosinophilic meningoencephalitis; **Bellamya rudipelis, Gyraulus sarasinorum** and **Corbicula lindoensis** were recorded as the intermediate host of the intestinal fluke **Echinostoma lindoensis** in Central Sulawesi; **Lymnaea rubiginosa** plays an important role in the life-cycle of the cattle liver fluke **Fasciola gigantica** and **F.hepatica**, which may reduce the national meat production; and **Digoniostoma truncatum** from Bali has been recorded naturally infected with radiae and cercariae of **Paramphistoma** sp., the causative agent of the fatal paramphistomiasis of cattle. **Gyraulus convexiusculus** is considered to be the most likely first intermediate host of **Fasciolopsis buski** infection in human in South Kalimantan. Among these moluscan species only **Oncomelania** h. **lindoensis** and **A.fulica** are the most studied species (life-cycle, transmission dynamics, control and ecological aspects), whereas the works on the other species are mostly emphasized on the taxonomic aspect.

INTRODUCTION

Freshwater and land molluscs are known to play an important role in human wellfare. Many species provides substantial source of food supply, while still other species have been known to play a role in the transmission of important helminthic human and animal diseases. The molluscan fauna of Indonesia, with multi insular nature, consists of thousands of species of non-marine (brackish, freshwater and land) molluscs. These many species have to be reckoned as being potentially of medical and veterinary importance, since they are suspected to have the capacity of transmitting human and animal helminthic diseases.

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In Indonesia five snail-borne diseases are recognized; among these are the human diseases; schistosomiasis, echinostomiasis, fasciolopsiasis. Schistosomiasis caused by the blood fluke *Schistosoma japonicum* is an important public health problem in a few areas in Indonesia. It is endemic in the Lake Lindu and Napu Valley, Central Sulawesi. Many of the inhabitants of the villages showed clinical symptoms of schistosomiasis, while the infection rates vary from 12% to 69%[1]. Echinostomiasis, caused by the intestinal fluke *Echinostoma* is of minor importance, althought at least 5 species have been reported in man from Java and Sulawesi [2,3,4]. Angiostrongyliasis causing symptoms of the central nervous system have been recorded from North Sumatra[5] and Central Java[6]. Although angiostrongyliasis is a severe illnes, and may be fatal for man, its prevalence is very low; fasciolopsiasis is caused by another human intestinal fluke; its first autochtonous human case was reported by Hadidjaja et al[7] from South Kalimantan, where an endemic focus has been discovered. Fascioliasis caused by the liver fluke *Fasciola* is a worlwide cattle disease. it is a serious problem in sheep and cattle in many parts of the world. Estimates of losses due to this disease in Indonesia, may amount to over $ 12 million a year. Although the above mentioned snail-borne diseases may cause public health problems, the knowledge of the medical malacology in Indonesia however is far from complete. A great deal of important works on molluscs have been done in the past; most of these works placed their emphasis on the taxonomical aspects. In this paper a review is presented summarising the reports of the snails and clams from Indonesia, of which their parasitological aspect have been studied.

MOLLUSCS INTERMEDIATE HOSTS.

In Indonesia about 34 species of non-marine molluscs, belonging to 15 families (Table 1), have to be reckoned as being of potential medical and veterinary importance; consisting of the brackish water family Potamididae (1 sp.); the freshwater snails:

Viviparidae (3 sp.), Ampullariidae (3 sp.), Bythinidae (1 sp.), Pomatiopsidae (1 sp.), Thiaridae (7 sp.), Lymnaeidae (2 sp.), and Planorbidae (5 sp.); the freshwater bivalves; Corbiculidae (4 sp.); the land snails; Subulinidae (2 sp.), Achtinidae (1 sp.) and Bradybaenidae (1 sp.); and the land slugs: Veronicellidae (2 sp.) Phylomycidae (1 sp.) and Limacidae (1 sp.). These molluscs are all common species, which can be found in the vicinity of human habitation (ponds, rice-fields, ditches, gardens etc.)Among these only 14 species have been recorded as vectors of human and animal diseases.

Family Viviparidae

This is a worldwide family of operculate gastropod molluscs. There are three viviparid genera in Indonesia, *Angulyarga, Bellamya* and *Celetaia*. Among these only one species of the genus *Bellamy*a is potentially important. Parasitological studies have been reported on the species *Bellamya javanica,* which has been revealed as the first and second intermediate host of the intestinal fluke *Echinostoma lindoensis* at Lake Lindu areea, Central Sulawesi (2,3,9). Hadidjaja & Oemijati (4) have found, that *B.javanica* from the rice-fields in the neighbourhood of Jakarta, were infected with *Echinostoma malayanum.* This viviparid snail was also reported as the intermediate host of *Echinostoma illocanum* in Java (8). No parasitic

trematodes and nematodes have as yet been reported to utilize other species of *Bellamya* as intermediate host.

Family Ampullaridae

This is a freshwater snail family with large globous shell, which in Indonesia is only represented by the genus *Pila* (known also as the apple-snail), comprising of three species, namely; *Pila ampullacea, P. polita* and *P. scutata* has been recorded as vector of human diseases. Hadidjaja & Oemijati[4] have found that *P.scutata* collected from the rice-fields in the neighbourhood of Jakarta were naturally infected by an intestinal fluke *Echinostoma malayanum*. A year later Margono[9] has found that *P.scutata* collected from a swampy area in Jakarta, were infected by larvae of *Angiostrongylus cantonensis,* the causative agent of eosinophylic meningitis. Margono & Illahude[10] succeeded to isolated *A.cantonensis* larvae from 5.9% of *P.scutata* collected from Jakarta area.

Parasitogical studies on the two other ampullariid snails, have not been reported from Indonesia.

Family Bythinidae

In this operculate freswater snail family, four genera are known in Indonesia, namely *Digoniostoma, Emmericiopsis, Gabbia* and *Wattebledis*. These include seven species; however only one species *Digoniostoma truncatum* has to be considered as potential intermediate host of parasitic helminths. Darmono et al[11] found 8,69% of *D.truncatum* from eight villages in Bali were infected with radiae and cercariae of *Paramphistomum sp.*, the causative agent of the fatal paramphistomiasis in cattle. *D. truncatum* from several rice-fields in the suburb of Cianjur & Bogor, West Java, were also found infected by cercariae of trematodes[12]; and collections from the vicinity of Bogor were naturally infected by cercariae of echinostomid trematodes.

Family Pomatiopsidae

The pomatiopsids are freshwater snails: until now one species has been recorded as medically important in Indonesia, i.e.*Oncomelania hupensis lindoensis*. This species may be considered as the most medically important mollusc in Indonesia, as it is the intermediate host of the blood fluke *Schistosoma japonicum*, the causative agent of the villages along the shore of Lake Lindu and Napu valley.

Family Lymnaeidae

In Indonesia this family is reprented by the genus *Lymnaea* consisting of four species, *Lymnaea rubiginosa, L.viridis, L.lessoni* and *L. brevispira*. The two first species are known to be of medical and veterinary importance. Margono[9] has experimentally fed a batch of *L. rubiginosa* from the vicinity of Jakarta, with faeces of rat positive with Angiostrongylus-like larvae; all were dead the following day, suggesting that a heavy infection was the possible cause of death. Darmono et als[11] examined specimens of *L. rubiginosa* collected from six villages in Bali, 9.5% of which were infected by rediae and cercariae of *Fasciola hepatica*, the cattle liver fluke. Muchlis[15] studied the life-cycle of another cattle fluke, *Fasciola gigantica*; he experimentally infected *L.rubiginosa* with miracidia of the fluke. After 45 days the first cercariae were shed by the snails. Djajasasmita[13] has found, that 4-30% of *L.rubiginosa* collected from several rice-fields in Bogor, West Java, were naturally infected by cercariae of an echinostome fluke.

No parasitological study of *L.viridis* has been recorded in Indonesia.

Family Planorbidae

This is one of the most medically important pulmonate freshwater snail family, since many of its members play an important role in the transmission of human diseases. In Indonesia this family is represented by nine genera, they are: *Amerianna, Gyraulus, Hippeutis, Indoplanorbis, Miratesta, Patteloplanorbis, Physastra* and *Polypylis.* Among these species, seven are known to play a role in the life-cycle of parasitic trematodes and nematodes. Darmono et al[18] has found that 5.17% of *Gyraulus convexiusculus* from several villages in Bali, were infected by rediae and cercariae of the trematode *Paramphistoma* sp. (most likely *Paramphistoma explanata*), the causative agent of the fatal cattle paramphistomiasis; the infection rate of *Paramphistoma* sp. in Bali cattles was 88.89%. Prior to this discovery, Soetedjo & Adiwinata[16] have succeeded to infect miracidia of *Paramphistoma explanata* to the snail *G. convexiusculus*. 3.3% of the same snail species collected from rice-fields in the vicinity of Bogor, West Java, were harbouring the cercariae of an echinostom trematode[13]. Another species from Central Sulawesi, *Gyraulus sarasinorum,* was reported by Faust et al[8] as the first intermediate host of the intestinal fluke *Echinostoma lindoensis*; and the *Gyraulus* sp. from South Kalimantan should be suspected as the intermediate host of *Fasciolopsis buski,* although Handoyo et al[17] have found that the *Gyraulus* snails from the endemic area are all negative. A planorbid snail, *Indoplanorbis exustus,* from the rice-fields in Bogor area has been discovered by the present author to be infected by cercariae of echinostomid-like trematodes.

Family Corbiculidae

This fresh and brackish water clam family, comprises of three genera, *Corbicula, Batissa* and *Polymesoda*. Among these only the species of the genus *Corbicula* is potentially of medical importance. About 15 species of *Corbicula* are known from Indonesia. Some species have been incriminated as the first and second intermediate host of the intestinal flukes. *Corbicula lindoensis* from Lake Lindu, Central Sulawesi, have been reported by Bonne & Sandground[2] as the intermediate host of the intestinal fluke *Echinostoma lindoensis*; 24-96% of the population of the villages in Lake Lindu area were infected with this intestinal fluke. *Echinostoma lindoensis* was also reported to utilize Corbicula subplanata as its intermediate host[11]. In Java the clams *Corbicula javanica* and *C. rivalis* were recorded as the intermediate hosts of *Echinostoma* sp. [18].

Family Achatinidae

This is a family of African land snails, one of its species, *Achatina fulica*, also known as "the Giant African snail", has successfully penetrated almost all countries of tropical Asia and the islands in the Pacific. This snail plays an important role in the medical field, since it has been found to be responsible for thetransmission of the nematode *Angiostrongyluscantonensis*,the causative agent of eosinophylic meningitis. Margono[9] has isolated larvae of *A. cantonensis* from the snail *A.fulica* from Jakarta. Later Margono & Ilahude[10] have found that 35.1% of the *A.fulica* from the same locality, were infected by larvae of the nematode; the mean worm burden of the snails was 525 larvae. According to Stafford et al[26] 36% of the *A.fulica* from Jakarta were infected. Larvae of *A.cantonensis* have also been found infecting the

snail *A.fulica* from several places in Jakarta[10], Manado in North Sulawesi and Ende in Flores, Jambi in Central Sumatra, Baturaja and Lampung in South Sumatra[19]; the *A.fulica* from the last three localities were also infected by larvae of another species *Angiostrongylus malaysiensis,* which may also cause human angiostrongyliasis.

Family Veronicellidae

This is a family of land slugs, also named Vaginulidae. in this family five genera are known in Indonesia, *Filicaulis, Laevicaulis, Semperula, Sarasinula* and *Vaginulus*. One species, *Laevicaulis alte*, has so far been incriminated as of medical importance. Its parasitological study has been reported by Margono & Ilahude[10]; they found that 35.5% *L. alte* from Jakarta were infected by the larvae of *A.cantonensis,* with an average worm burden of 299 larvae.

The above review illustrates poor knowledge on the medical malacology in Indonesia. Therefore, more studies have to be carried out. Judging the richness of the malaco-fauna of Indonesia, it is not impossible that many more molluscs species, which may be involved in the transmission of human and animal diseases will be discovered.

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QUESTIONS AND ANSWERS :

1. Question: Do the Echinostomes in Indonesia have different species of snails as intermediate hosts or is there an overlap in these intermediate hosts ?

   Answer : There is no overlap in intermediate hosts, since *Echinostoma* spp. have first and second intermediate hosts. The first and second intermediate hosts may be of different species or the same species such as *Echinostoma lindoensis*: its first intermediate host is *Gyraulus convexiusculus* and the second *Corbicula lindoensis*, or *Bellamya javanica* as first and second intermediate hosts.