SCHISTOSOMA HEMATOBIUM

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Schistosomes

Schistosomes are Trematode flukes (Blood flukes), dioecious (Sexes are separate) trematodes, which lead to schistosomiasis(bilharziasis). These are water borne disease constituting an important public health problem and affecting millions of persons in Africa, Asia, and Latin America.

It is estimated that over 200 million people are infected with Schistosoma haematobium, S. mansoni, S. jaonicum each. Two other species of Schistosoma parasitising humans are: S. mekongi and S. intercalatum. Schistosomes were previously called Bilharzia after Theodor Bilharz who in 1851, first observed the worm in the mesenteric veins of an Egyptian in Cairo.

All schistosomes live in venous plexuses in the body of the definitive host; the location varies with the species: *Schistosoma haematobium* affects the urinary bladder, *S. mansoni* affects the sigmoidorectal region, and *S. japonicum* affects the ileocecal region.

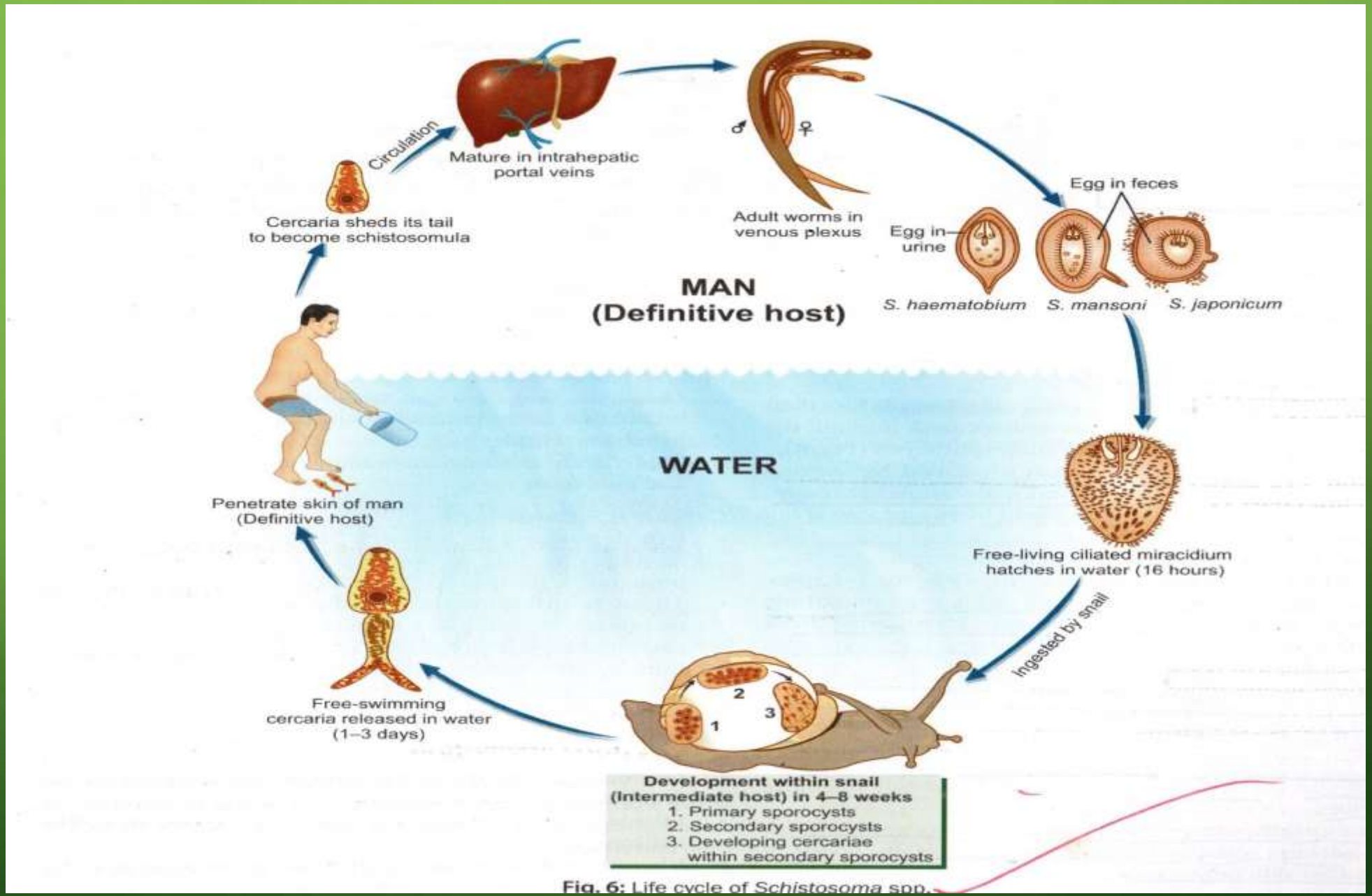


Fig. 6: Life cycle of *Schistosoma* spp.

Schistosoma haematobium.

Schistosoma haematobium (urinary blood fluke) is a species of digenetic trematode, belonging to a group (genus) of blood flukes (Schistosoma). It is found in Africa and the Middle East. It is the major agent of schistosomiasis, the most prevalent parasitic infection in humans.[1] It is the only blood fluke that infects the urinary tract, causing urinary schistosomiasis, and is a leading cause of bladder cancer (only next to tobacco smoking).[2][3]

Morphology:

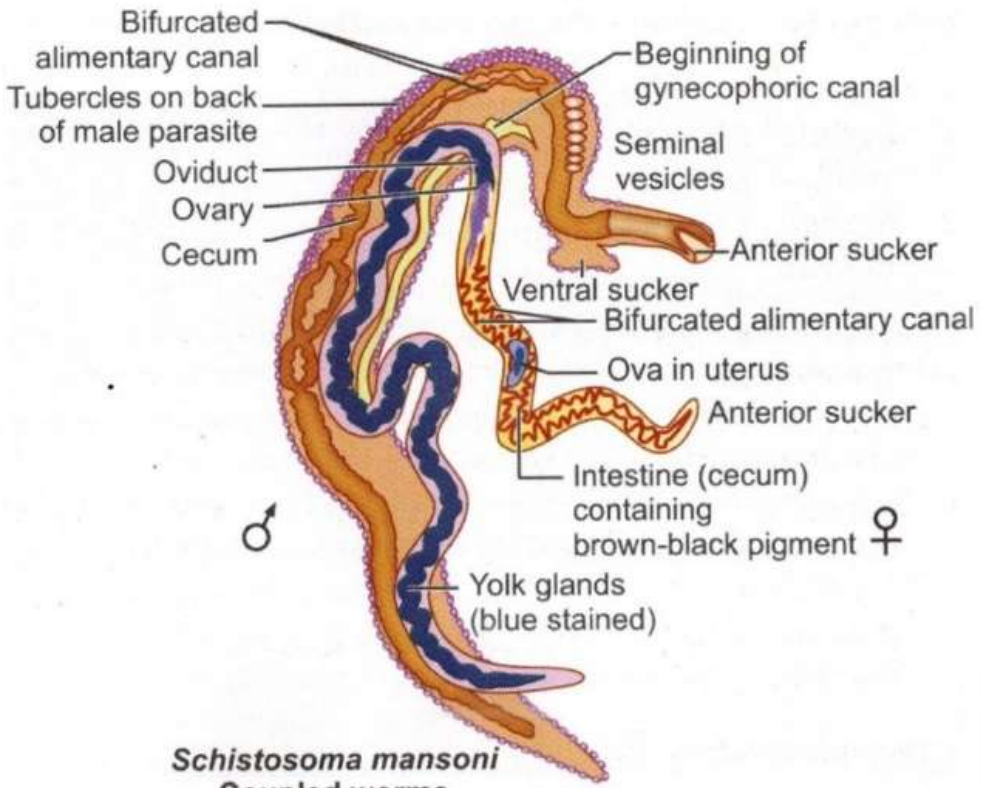
Male and female Schistosoma blood flukes exhibit strong sexual dimorphism: males are shorter, stouter, and possess a gynecophoral canal, while females are smooth, longer, more delicate, and live inside the male by attaching themselves in the gynecophoric canal.

The male is 15 mm long by 0.9 mm thick and covered by a thick tuberculate tegument. It has two muscular suckers: (1) the oral sucker is small, and (2) the ventral sucker is large and prominent.

Beginning immediately behind the ventral sucker and extending to the caudal end is the gynecophoric canal, in which the female worm is held.

The **adult female** is long, thinner and slender (16-22 mm), resembling a roundworm. A gravid worm contains 20-30 eggs in its uterus at one time and may pass up to 300 eggs a day.

Eggs: The eggs are elongated, brownish yellow about 150 µm and have a characteristic terminal spine at one pole.



Schistosoma mansoni
Coupled worms
Giemsa staining, magnification 25X

Fig. 3: Structural details of *Schistosoma* (coupled)

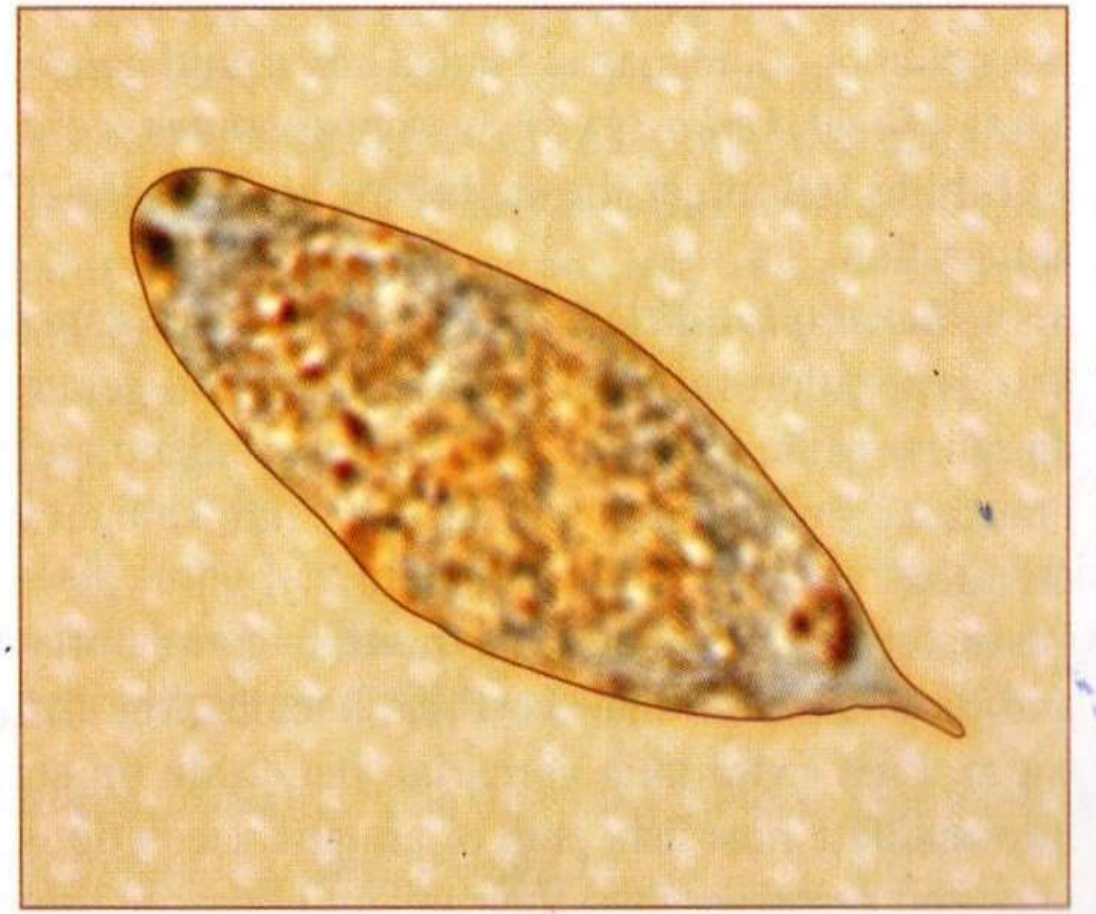


Fig. 4: Egg of *Schistosoma haematobium*

LIFE CYCLE:

S. haematobium completes it life cycle in humans, as definitive hosts, and are the only natural definitive host and no animal reservoir is known. The freshwater snails, act as intermediate hosts, just like in other schistosomes. But unlike other schistosomes that release eggs in the intestine, it releases its eggs in the urinary tract and excrete along with the urine.[15]

Infective form: Cercaria larva.

The eggs that are passed in urine are embryonated and in stagnant freshwater, the eggs hatch within 15 minutes under suitable conditions to release the free living ciliated miracidia.

Each miracidium is either male or female.[25] Miracidia are covered with hair-like cilia with which actively swims searching for snails. Unless they infect a snail within 24–28 hours, they run out of energy (glycogen) reserves and die.

Miracidia swim about in water and on encountering a suitable intermediate host (snails) of Bulinus species in Africa an Ferrissia tenuis in India.

Species of snail belonging to the genus *Bulinus*, including *B. globosus*, *B. forskalii*, *B. nasutus*, *B. nyassanus*, and *B. truncatus*, can harbour the miracidia.[26]

Development in snail:

The miracidia simply pierce through the soft skin of the snail and move to the liver. Inside the snail, their cilia is cast off and extra-epithelial covering forms within 24 hours.

Inside the snail, the miracidia lose their cilia and in about 4-8 weeks, successively pass through the stages of the first and second generation sporocyst.

The mother sporocyst produces many daughter sporocysts. Each daughter sporocyst forms new **larvae called cercariae.** The cercariae are produced by asexual reproduction within the second generation sporocyst.

One mother sporocyst produces half a million cercariae. After a month, the sporocysts rupture and cercariae are liberated. Free cercariae penetrate the liver and move out of the snail into water.

Each cercaria has a **biforked tail** with which it swims to find a human host. Again the cercariae are short lived and can survive in water for 4–6 days unless they find a human host.

References:
1. Paniker's Textbook of Medical Parasitology- Sougata Ghosh.
2. CDC