A Method for the Direct Quantitative Recovery of *Schistosoma mansoni* Cercariae from Natural Waters of Puerto Rico

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A recovery device has been developed to facilitate ecological studies of *Schistosoma mansoni* cercariae in natural waters of Puerto Rico. Continuous recovery of cercariae with the new instrument has made possible quantitative determinations of density in snail-breeding areas.

The instrument utilizes the positive phototropism exhibited under certain conditions by the cercariae of *S. mansoni*. This reaction may be observed when cercariae, which have been kept in the dark for at least 15 minutes, are exposed suddenly to intense light projected from a vertical source. The cercariae rise, apparently with great exertion, to the surface of the water and swim actively for several seconds. After this initial period of sustained activity, the cercariae settle in a zone slightly below the surface and movements occur only sporadically.

This characteristic behaviour is exploited in operating the device, shown schematically in Fig. 1. Water from a natural snail-breeding area is directed into an opaque tube (1) and then into a dark chamber, which is provided with a series of baffles arranged in such a manner that a minimum of 15 minutes is required for the water to move through the chamber. The water then passes into another chamber (2) where smooth flow is permitted. A series of glass funnels (3) are inserted, tops down, into the roof of the chamber (2) so that the rims of the cones are flush with the inner surface of the top of the chamber. The short stems of the funnels are connected to a common outlet (4). When the apparatus is in operation, the entire system is filled with water. A vertical light source (5) above the cones is directed downwards. As water flows through the chamber, any cercariae present pass under the cones, react to the light, and rise to the apex of the funnels. The small flow of water through the collecting system (4) carries the cercariae into a recovery vessel (6). Most of the water (99%) passes through the instrument and is discharged (7). Cercariae are counted with the aid of an attached binocular dissecting microscope and a chamber which controls the flow of water containing the cercariae (Fig. 2).

For field use, the intake nozzle of the recovery apparatus consists of a glass tube which is submerged by means of a vertically adjustable frame to the desired depth in the section of stream or pond to be examined. In order to obtain a representative sample of quantitative accuracy, the glass tubing should permit the velocity at the intake to be approximately the same as the velocity of the stream. A tube, usually an ordinary garden hose with an inside diameter of 1 inch (2.5 cm) and a length of 100 feet (30.5 m), is attached to the intake and extended its entire length along the bottom of the stream or pond in the direction of flow. A minimum of 3 inches (7.5 cm) differential in hydrostatic head must be obtained between the intake of the apparatus and the intake of the hose. This permits a head of 1 inch, which is required for operation of the apparatus. In operation, the entire apparatus is submerged until the lips of the funnels are about an inch under water. Water is allowed to flow into the apparatus, care being taken to remove all air from the system.

Optimum light intensity has been obtained with four flood lamps having a total output of 600 watts at 110 volts. A water screen (8 in Fig. 1) ½-inch (1.2 cm) deep prevents excessive heating of the separator system.

Laboratory tests indicate that 98% of cercariae are recovered with the apparatus. One cercaria introduced into 2 litres of water was recovered in each of three successive tests. These high rates of recovery were obtained from water entering the instrument at quantities up to 0.6 litre per minute. Optimum operating capacity is 0.5 litre per minute, but with certain modifications high recovery at

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FIG. 1
SCHEMATIC VIEW OF CERCARIAE RECOVERY DEVICE
AS DEVELOPED FOR FIELD USE

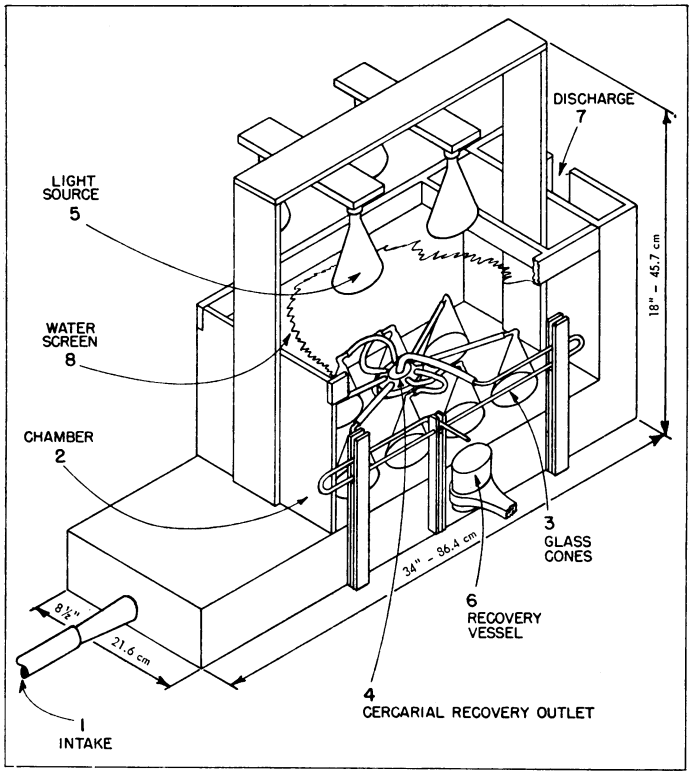
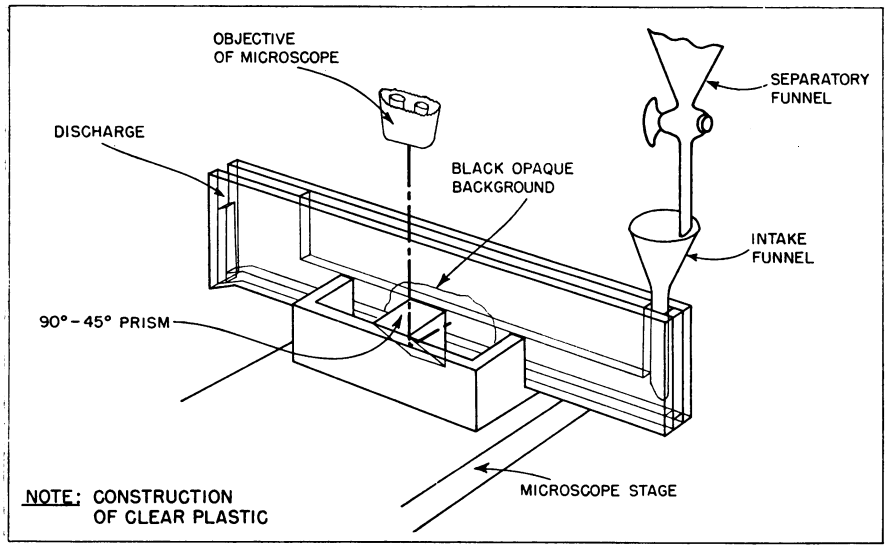


FIG. 2
SCHEMATIC VIEW OF MICROSCOPE STAGE FOR COUNTING CERCARIAE



1.0 litre per minute should be possible. In one field test, water was taken from a depth of 1 inch below the surface of a large pool in the Rio Caguitas and cercariae were recovered at the rate of 0.055 larvae per litre for an interval of approximately 45 minutes. The device has been operated in the field using both electrical currents from public utility lines and from a portable generator.