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OBSERVATIONS ON THE BIOLOGY OF HYDRACHNA TRILOBATA (HYDRACARINA) IN WEST BENGAL, INDIA

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LIFE CYCLE

HOST/PARASITE RELATIONSHIP

ABSTRACT: The biology of Hydrachna trilobata Viet., 1926, as studied in the laboratory at Calcutta, has been provided. Description and duration of various developmental stages are presented. Besides, the host-parasite relationship of the mite with the insect has also been discussed.

INTRODUCTION

Hydrachna trilobata, described by VIETS (1926) from Bihar, India is now known from China (VIETS, 1938), Japan (UCHIDA, 1931; IMAMURA, 1954), Siberia (SOKOLOW, 1931) and Burma (LUNDBLAD, 1969). Its biology or life history has not been studied so far. Numerous species of Hydracarina occur in West Bengal and this species is the most common hydrachnid occurring in most stagnant water bodies in and around Calcutta. It could easily be reared under laboratory conditions for studying its biology in detail and this study was carried out during the year 1980.

MATERIAL AND METHODS

A large number of adults were collected from the pond with the help of a plankton net. Mites were kept in an aquarium filled with water from the collection site. Aquatic plant (Ceratophyllum sp.) was provided since the mite is closely associated with this plant in its natural environment. The rearing method described by PRASAD & COOK (1972) was followed. In each small vial (4 "x 1 1/2") containing pond water, a male and a female and a twig of Ceratophyllum were introduced. The open end of vial was covered with muslin cloth which was tied with rubber band. Five replications were made during the experiment. Observations on the development and life-history were made thrice daily. Slides of different stages of the mite were prepared for morphological study.

RESULTS AND DISCUSSION

In H. trilobata though mating could never be observed extrusion of the egg could be noticed.

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1) A cluster of eggs with the embryo shown for one egg; 2) Ventral aspect of a larva; 3) Pedipalp of a larva (enlarged view); 4) Surface view of a nymphochrysalis; 5) Teleophan stage; 6) Genital field of an adult male; 7) Genital field of an adult female; 8) Dorsal of adult showing antero-dorsal plate near eyes.
**Oviposition** : Egg laying started 2-3 days after collection. Eggs were inserted in rows or batches of 3-5 eggs in the spongy tissue of Ceratophyllum stems. The ovipositing female holds on to the selected site with her legs and pedipalps. The genital aperture is then pressed to the surface and gradually the ovipositor extruded and introduced into the plant tissue. A single female lays 50-63 black-colored eggs and the entire process being completed in about three to four hours. Occasionally the female after laying about 8 to 12 eggs in one place, moves to another place and continues to lay eggs. After the entire batch of eggs is laid the female moves away and pays no further attention to them. She swims normally but does not seem to eat and its movements becomes weaker. After about 5 or 6 days it dies.

**Egg** (Fig. 1) : At first the egg is more or less spherical in shape but after 24-36 hours it becomes slightly depressed and flattened measuring on an average 227 μ in diameter. After about 24 hours they change from black to a pearly-white color. On the 5th day an embryo with 2 tiny dark eye patches become visible within the eggshell. These patches become darker and very prominent by the 6th day.

The development of the appendages (pedipalpi and three pairs of legs) and the commencement of segmentation could be observed in 6-day embryos and embryonic development appears to be completed by the end of 7th day. Now embryos begin to show jerky movements inside the egg case and by the beginning of the 8th day they rotate along the longitudinal axis of the egg with the gnathosoma directed downwards. The frequency of rotation increases towards the end of eighth day or at the beginning of the 9th day and by this time the egg case ruptures and the tiny larva hatches out.

The egg case invariably splits up into two equal or slightly unequal transverse halves. It may be presumed that the pointed ends of the pedipalpi of the rotating embryo come in contact with the inner surface of the egg case and cut a groove along which the egg case splits liberating the embryo.

**Larva** (Fig. 2) : The newly hatched larva is elongate, dorso-ventrally flattened, redish-white in color, with three pairs of legs, a large gnathosoma and a pair of very prominent eye spots. The skin is transparent and papillated. Body is 407-427 μ in length with 150-184 μ as maximum width. The small chelicerae have a very small basal segment and a bent terminal segment. The well developed, 4-segmented pedipalps bear two terminal claws (Fig. 3). Each pedipalp measures 99-110 μ in length. The small, nearly rectangular coxal plates bear three pairs of smooth setae. Coxae-I with 2 pairs and Coxae-III with one pair of setae. Legs are nearly of the same length measuring 160-172 μ. All the legs are five-segmented, the basal four segments are similar in length and shape while fifth segment is the longest and slightly rectangular; each leg terminates in a claw. The distal three segments bear swimming hairs. Excretory pore is situated medially just behind the third pair of coxae. An almost circular suctorial disc is present at the anterior extremity on the ventral side of the body.

The newly emerged larva comes to the surface of the water and floats passively. They float passively for 5 to 7 days and if encounter Water-bug (Ranatra elongata) they attach to it’s body and commence to grow while unattached larvae die by the end of the seventh day. Other insects such as Nepa, Naucoris, Hydrometra, Abedus and naiads of dragon-flies were tried but none were attached to them. A few of the larvae get attached to the host by the second day and during the succeeding two days a larger number larvae got similarly attached. The larvae usually attach to the soft tissue at the base of the respiratory siphon and to the walking legs of the host. Some of them were also found on the soft membrane between the joints of the legs. Attachment to the host is effected by the pedipalpi and thus larvae entered the second stage of life-history i.e. the nymphen stage. The part of the larval body behind the legs now enlarges and comes to appear like a short-necked oval rounded bottomed flask. In the meantime a new case is formed covering the distended position of the larva. This case is pro-
bably the nymphoderm and as the case thickness the body becomes more or less transluscent and obscures the internal changes that continue to take place.

The nymphophan stage lasts for 16-22 days. On the 7th day after attachment, the mass of internal tissue of nymphochrysalis assumes a definite oval shape and from this mass the different organs of nymph are formed.

The 10-day old nymphochrysalis (Fig. 4) is now in the form of an inflated sac measuring about 2088-2160 µ in length and 1150-1224 µ in width. By the 16th day the nymph appears to be fully formed and light jerky movements begin on the 17th day, and the nymphoderm bursts crosswise near its anterior portion. The anterior portion of the empty nymphoderm remains on the body of the host. Dissection of the host’ tissue at the region of attachment of the nymphophan shows branched tubular processes originating from the point of attachment of the larva and spreading out into the host’ tissue. These have been described by MIYAZAKI (1936) as true sucking organs of the parasite.

Nymph : The newly emerged nymph is red color and more or less round in shape, measuring 900-1080 µ in diameter. It is similar to the adult except for the genital field and antero-dorsal plate. The two genital plates are acetabulate and lye close to inner margins of epimera III & IV. The antero-dorsal plate which is situated between the two eyes are not fused antero-medially. The capitulum, palpi and legs similar to those of adult excepting that the legs are provided with fewer hairs.

The nymph is active for as long as 9 days. But after 4 or 5 days of activity the nymph occasionally clings to the aquatic plants. Feeding decreases and by the 8th day it is permanently grasping the submerged object with its legs and mouth parts. This is Teleiophan stage, characterized by the appearance of the teleioderma (Fig. 5).

By the end of the third or the beginning of the fourth day the teleiochrysalis elongates slightly. The full grown adult emerges after seven of eight days the teleioderma ruptures along the mid-dorsal line. After moulting, the coarsely granulated skin, the completely developed horse-shoe shaped antero-dorsal plate characteristic of the adult and the genital plates are fully developed (Figs. 6, 7 & 8). The life cycle is completed in approximately 46 days at the temperature 22 ± 2°C to 30 ± 2°C respectively. None of the adults reared from nymphs in the laboratory laid eggs, although they appeared healthy in all other respects.

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