



Eco- biology of the millipede, *Anoploidesmus tanjoricus*

Deshmukh SV and Gaur AJ

Department of zoology, Bar.R.D.I.K. and K.D. College, Badnera. Dist. Amravati (M.S.)
Email: sharadavd@gmail.com

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ABSTRACT

The present study was undertaken to study the ecology and biology of Millipede *Anoploidesmus tanjoricus*. Under laboratory conditions this millipede species was found feeding on cucumber slices and banana testa. They construct tunnels in soil which they use for egg laying. The female lays a clutch of 150 to 250 eggs in each tunnel. Incubation period is found to be of 10 to 11 days. After hatching the larvae undergo 7 moults and then transform into a miniature adult in about 55 to 56 days.

Keywords: Diplopoda, Millipede, *Anoploidesmus tanjoricus*, Ecology, Biology.

INTRODUCTION

Millipedes are diplopods and are very ancient creatures. They are the common and conspicuous fauna of upper soil and litter layers of the tropical, subtropical and temperate forest regions of the world. Millipedes are found in moist and humid places of forest flora as well as earth's surface, aerial parts of vegetation and are also found under stones, fallen leaves and rotten woods. Ecological study of millipede *Anoploidesmus tanjoricus* showed that it feeds on leaf litter, cow dung and soft parts of garden plants. The millipede species *A. tanjoricus* showed higher breeding activities during the period July to September. Present paper deals with eco-biology of the millipede *A. tanjoricus* in relation to climatic conditions. The ecology of millipede has been studied by many scientists (Attems, 1936; Blower et al., 1968; Tripathi and Shukla 1980a; Hoffman 1990; Mary Bai, 1997; Bano, 1999; Herbert, 2000).

MATERIAL AND METHOD

The investigations were undertaken to determine the feeding habits and life cycle of the millipede *A. tanjoricus*. For this purpose, millipedes were collected from the fields, houses and cow shades during July and August. The collected live individuals were taken in the laboratory and kept in glass aquaria filled with soil and leaf litter brought from the site of collection. During the course of observations leaf litter, green leaves and cucumber slices were provided to these millipedes to study the food and feeding habits. When the female laid eggs in the brood chambers, they were kept in separate glass beakers along with soil and leaf litter to study

the changes taking place in egg size, incubation period, hatching and development. The soil in beakers was moistened with water at regular intervals. During the course of observations, the maximum temperature recorded in the laboratory was 31°C and minimum 28°C. The maximum relative humidity recorded was 99 % and minimum 56 %.

RESULTS AND DISCUSSION

Food and Feeding Habits

In the present study the millipede under experimentation was found feeding on leaf litter, soil, stems and leaves of some plants in their habitat. Under laboratory conditions it was observed that these millipedes preferred cucumber slices and banana testa only.

Tunneling

When the millipedes under study were brought to the laboratory, they start construction of their own tunnels on the very first day and they cover the whole surface of glass aquarium with a layer of soil, having openings at intervals for coming in and going out of the tunnel. The millipedes start construction of tunnels by holding a small mass of soil with the help of its gnathochelarium and labrum and push back with the help of legs. This process was repeated several times until the construction of tunnels is complete. The horizontal tunnels are intercommunicated with each other with a number of vertical tunnels opening at the surface of soil. They young individuals also make small tunnels ending in small chamber in which they undergo moulting.

Sexual dimorphism

The Millipede *A. tanjoricus* shows distinct sexual dimorphism. The females are always longer and broader than males. A full grown specimen of both the sexes is of shiny black colour with a pair of yellow keels per segment on lateral sides. The body bears 20 segments. In both the sexes the first segment is apodal ; second ,third and fourth segments bear a single pair of legs; the third segment is called the genital segment as in both the sexes , this segment is the sight of gonopores. In female, each of the two oviducts end at a female gonopore situated on two eversible pouch like vulvae, just posterior and lateral to the coxae of the second pair of legs. The vulva is surrounded by a

sclerotized operculum. In male, fifth and sixth segments bear two pairs of legs per segment; the seventh segment bears only one pair of leg (posterior leg pair), the anterior pair of leg (8th leg pair) is modified to form gonopods, which are used to transfer spermatophores from male gonopores into the vulvae of female during copulation. In males the third segment bears a pair of gonopores, situated at the bases of coxae of the second pair of legs. The two vasa differentia open to the outside through these gonopores. In female, 5th to 18th segments bear two leg pair per segment. Thus, in males only thirty pairs of legs are present, as one leg pair (8th leg pair) on the seventh segment is modified to form gonopods. The gonopods are intromittent organs. Sperm transfer is indirect and employees the gonopods to move spermatophores from male gonopores (segment III) to the female vulvae present on genital segment (segment III). In females thirty one pairs of legs are present. In all myriapods except in chilopods (centipedes) the gonopores are situated anteriorly on the trunk, thus accounting for the name progonaeta (front gonopores).

Distinguishing Features

These millipedes are elongate, often worm shaped with shiny black colour, bearing yellow ridges or keels laterally. The elongated body is divided into a short anterior head and the long posterior trunk having 20 segments.

Head

The head consists of a sclerotized capsule to which is fused the labrum. The head also bears three pairs of head appendages. The anterior most head appendages are the two, seven jointed antennae. The tip of the distal antennal article has tiny chemoreceptive cones characteristic of diplopods and also numerous mechano receptive setae. A walking millipede continuously taps the ground with the tips of the antennae. A pair of mandible forms the second pair of head appendages and the gnathochelarium forms the third pair. Eyes are completely absent in this millipede.

Trunk

The trunk is divided into 20 segments. The first segment is apodal and is called collum. Second, third and fourth segments are single and bear a single pair of legs each. The remaining segments are diplosegments, formed by the fusion of the two single segments during development. The presence of

diplosegments is, of course the reason for the name diplopoda. The exoskeleton is of typical arthropod type, i.e. each segment consists of four sclerites (a tergite, two pleurites and a sternite) joined to each other by a flexible articular membrane.

Gonopod

Male millipedes transfer spermatophores with the help of a pair of gonopods present on seventh segment. Sperm transfer is indirect and employs the gonopods to move spermatophores from the male gonopores on the genital segment (segment 3 of male) to the female vulvae on her genital segment (segment 3 of female).

Telson

The posteriormost division of the body is the triangular telson (anal ring). A large anus is present on the ventral surface of the telson. The anus is protected on each side by a pair of paraprocts (anal plates) and a hypoproct. The two paraprocts swing out laterally to permit the extrusion of faecal pellets. The hypoproct is used to close the anus.

Courtship and mating

During courtship the male follows the female and then tries to come on its back from the posterior end of the body. After some time, the anterior portion of the male touches the ground and the pair turns laterally, holding each other with the help of legs. The anterior parts of their bodies come in close contact laterally and the genital openings of male and female come in contact. Thus, the copulation is established. They remain in this position for ten minutes or more. After the mating they separate themselves and move away. The female remains in resting position for some time. The temperature, moisture and humidity observed in the months of August and September are found favourable for courtship, mating and egg laying.

Oviposition

In *Anoplodesmus tanjoricus*, the females start egg laying during July to October. The process of egg laying was observed in the laboratory. The female deposits the eggs in a small chamber of soil, constructed at the end of the tunnel. Most of the time it was observed that the females laid eggs at the bottom of the glass aquarium or on the sides of the aquarium which were clearly visible from outside. The female lays a clutch of 150 to 250 eggs in each chamber.

Eggs

The cream-coloured eggs were round in shape measuring about 0.47 mm in diameter. The surface of the eggs appeared smooth. When laid, the eggs appeared creamy white but as they mature, they appear brownish. The eggs were coated with a sticky substance by which they adhere together.

Incubation Period

In this species the incubation period was found to be 10 to 11 days.

Hatching

After incubation the matured eggs hatched by splitting the egg shells into two halves which remain connected with each other by a small connection. After hatching, the larvae were observed daily for detailed study of each stadium. The larvae gradually moulted to miniature adults, after passing through 7 stadia. The time taken for the development of egg into a miniature adult is about 55 to 56 days.

Developmental Stages

The development of an egg into a miniature adult shows seven different 'stadia'.

CONCLUSION

A. tanjoricus is a common millipede species of Amravati District. It was observed that this millipede feeds on leaf litter, cow dung and soft parts of garden plants found in their habitat. Higher breeding activities were noticed during July to September. They construct tunnels in the soil having a small chamber at the end which is used for egg laying and moulting purpose. The female of this species lays a cluster of 150 to 250 eggs. Incubation time recorded in this species is 10 to 11 days. After hatching the larva gradually moults in a miniature adult after passing through seven stadia. The time required for development of egg into a miniature adult is about 55 to 56 days.

Conflicts of interest: The authors stated that no conflicts of interest.

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