

**OVIPOSITION AND SEX RATIO OF  
ARGULUS SIAMENSIS VAR. SIAMENSIS AND  
ARGULUS SIAMENSIS VAR. HESSARGHATTARIS  
(CRUSTACEA:BRANCHIURA) PARASITIC ON  
FRESHWATER FISHES**

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THE fish louse *Argulus* spp. is an external parasite of freshwater, brackishwater and marine teleosts, and occasionally occurs on frogs and salamanders as well<sup>1</sup>. Argulids often cause severe mortality of fish in farm ponds, and sometimes in natural waters, mainly by puncturing the skin of host fish and injecting a cytolytic toxin through their oral sting. In densely stocked fish ponds, Argulid infestation can attain epidemic proportions<sup>2</sup>. In India, Argulid infestations have been reported on several cultivable fishes<sup>3-8</sup>. To evolve a suitable package for effective control of parasite, understanding its biology is useful. But such studies are scanty. The observations reported in this note deal with oviposition and sex ratio in two varieties of *Argulus siamensis* viz. *Argulus siamensis* var. *siamensis* and *A. siamensis* var. *hessarghattaris*.

The parasites collected from infested fishes, catla (*Catla catla*) and grass carp (*Ctenopharyngodon idella*) reared in Vani Vilas Sagar fish farm, Chitradurga district, Karnataka, and guppies (*Lebistes reticulatus*) found in the fish farm at Hessaraghatta, Bangalore were used for this study. The fish lice collected from Vani Vilas Sagar were identified as *A. siamensis* var. *siamensis* (Wilson) and those of Hessaraghatta as *A. siamensis* var. *hessarghattaris* Sundara Bai<sup>7</sup>.

Five parasites from each variety of the same size were grouped. Later, one parasite was released into each one of the petri dishes containing filtered pond water and allowed to lay eggs at room temperature (22°C–29°C) at day and 19°C–23°C at night. The eggs laid were counted and their sizes were recorded.

Sex ratio of the parasite was studied by maintaining the egg masses collected from the adult female during different seasons in petri dishes containing filtered pond water. The sex of the parasite gets distinctly differentiated after ninth day of hatching. Sex was determined based on the narrower abdomen in males of both varieties.

The eggs are whitish and translucent. Within 12 h after oviposition the eggs become yellowish and later brown in colour. The eggs are oval in shape and glued by a thin gelatinous cementing substance which hardens in water and fastens the eggs to the substratum. The eggs of *A. siamensis* var. *siamensis* are slightly larger (0.29 × 0.45 mm) than those of *A. siamensis* var. *hessarghattaris* (0.24 × 0.35 mm). The former parasite oviposited eggs in 3–5 rows, each row comprising 60–70 eggs; the latter, in 2–3 rows of 30–40 eggs in each row. The number of eggs oviposited by *A. siamensis* var. *siamensis* was thus higher (79–304) compared to *A. siamensis* var. *hessarghattaris* (56–220) and showed distinct correlation with the size of females. Statistically also, a high significant dependence between the parasite size and number of eggs oviposited was observed at 1% level (*r* values 0.998 and 0.994 respectively). But the variation in the number of eggs oviposited by the two varieties of the parasite of similar size was not significant. Hoffman<sup>2</sup> compiled information on *Argulus* spp. and reported the number of eggs oviposited by *Argulus* spp. as 20–300 at a time.

The sex ratio of both varieties of *Argulus* differed from that reported by Shimura<sup>9</sup> in *Argulus coregoni*. The latter had more or less equal number of males and females in their new stock. The ratio of males to females was high in the variety *siamensis* compared to that of *hessarghattaris*. In the latter, the ratio of females to males was high. However, the sex ratio in both the varieties varied according to the season. The sex ratio was high (2.45:1) during autumn and low during summer (1.04:1) in *A. siamensis* var. *siamensis*, while in the other variety the ratio of females to males was high (1.77:1) during spring and low (1.14:1) during winter. These differences in sex ratios between the two varieties of the parasite could account for the variations in the number of parasite generations in a year viz. five generations in *A. siamensis* var. *hessarghattaris* and eight generations in *A. siamensis* var. *siamensis*. They could also account for seasonal changes in the incidence and intensity of infestation.

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1. Yamaguti, S., *Parasitic copepoda, branchiura of fishes*, Interscience, New York, 1963, p. 1104.
2. Hoffman, G. L., *U.S. Fish Wildl. Serv., Fish Dis. Lefl.*, 1977, **49**, 9.

3. Southwell, T., *Rec. Indian Mus.*, 1915, **11**, 323
4. Hamid Khan, *Proc. Indian Acad. Sci.*, 1944, **B19**, 171.
5. Ramakrishna, G., *Rec. Indian Mus.*, 1951, **49**, 207.
6. Sundara Bai, A., *Curr. Res.*, 1973, **2**, 73.
7. Das, P., Kumar, D., Ghosh, A. K., Chakrabarty, D. P. and Bhaumick, U., *J. Inland Fish Soc. India*; 1980, **12**, 70.
8. Natarajan, P., *Proc. Indian Acad. Sci. (Anim. Sci.)*, 1982, **91**, 375.
9. Shimura, S., *Parasitology*, 1983, **86**, 537.

### NEW RECORDS OF INSECT PARASITIDS OF LEAF-ROLLER AND FLUSHWORM OF TEA

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THE larvae of the moths, *Caloptilia theivora* (Wals.) (Lepidoptera: Gracillariidae) and *Cydia leucostoma* (Meyr.) (Lepidoptera: Olethreutidae) are commonly called 'leaf-rollers' and 'flushworms' respectively. They are found to attack young tea leaves especially those just coming from pruning, resulting in heavy economic loss. A review of literature shows the occurrence of a wide variety of insect parasitoids, parasitizing these pest larvae in the tea-growing regions of N.E. India, South India and other parts of Asia<sup>1-7</sup>.

The present author collected the 'leaf-roller' and 'flushworm' infested leaves in and around Kil-Kotagiri, Nilgiris, Tamil Nadu (4800' to 5500' above MSL) throughout the years from 1982 to 1986. The flushworm infested shoot could be easily differentiated from the leaf-roller infested leaf in its appearance. The pest larvae were segregated and reared separately in transparent plastic containers to observe the primary and hyperparasites.

The larvae of the above moths could be easily identified from their external characters. While the head of the flushworm is yellowish or brownish and is characterized by the presence of a black 'cheek-spot' behind the simple eyes on either side of the head, the head of the leaf-roller is black, the rest of the body being pale-yellow with the 'cheek spot' absent.

The present author observed the emergence of *Genotropis* sp., an ichneumon parasite from the puparia of leaf-roller. Braconid parasites, *Apanteles* sp. (*octonarius* group) and *Bracon hebetor* (Say.),

an ichneumon, *Diadegma* sp., eulophids, *Pediobius* sp. and *Tetrastichus* sp. (miser-group) and an eurytomid, *Eurytoma* sp. emerged from flushworms as primary parasites. The above parasites on flushworms and leaf-rollers have been recorded for the first time. Investigations on the biology of these parasites are in progress.

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1. Muraleedharan, N. and Selvasundaram, R., *Entomon*, 1985, **11**, 262.
2. Muraleedharan, N. and Selvasundaram, R., *J. Coffee Res.*, 1987, **1**, 118.
3. Rao, G. N., *UPASI Tea Sci. Dept.*, 1978, **4**, 89.
4. Rao, V. P., Datta, B. and Ramaseshiah, G., *Sci. Pub. Ser.*, Tea Board, India, 1970, **5**, 53.
5. Sarma, P. V., *PANS*, 1979, **25**, 237.
6. Takagi, K., *Bull. Nat. Res. Inst. Tea Jpn.*, 1974, **10**, 109.
7. Takagi, K., *Jpn. Res. J. Agric.*, 1978, **12**, 101.

### SEXUAL DIMORPHISM IN THE LARVA AND PUPA OF COCONUT RHINOCEROS BEETLE *ORYCTES RHINOCEROS* (COLEOPTERA: SCARABAEIDAE)

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It is well known that adult *Oryctes rhinoceros* exhibits sexual dimorphism<sup>1,2</sup>, the males, in general, having a longer horn and almost bare pygidium with a blunt tip. The females have bushy pygidium with densely packed hairs and conical tip.

Studies in our laboratory necessitated a reliable method for sexing the insect during the larval and pupal stages. The horn size<sup>2</sup> and body size are not conclusive criteria for sexing the pupa. Hence a large number of larvae and pupae raised in the laboratory or collected from the field were screened under a binocular dissecting microscope. It was found that the ventral surface of the abdominal extremity in the female pupa behind the 8th segment is made up of a fused segment (IX and X) and is divided anteriorly into the right and left rounded slightly convex lobes bearing in between and behind