

When embryos were grown on a medium supplemented with kinetin (0.1 mg l^{-1}) and IAA (0.1 mg l^{-1}), the size of the cotyledon increased considerably. On a medium supplemented with 2,4-D ($0.5\text{--}1 \text{ mg l}^{-1}$) alone or in combination with kinetin (0.5 mg l^{-1}), a fragile and actively growing callus was initiated all over the surface of embryo. On a medium supplemented with kinetin (0.5 mg l^{-1}) and IAA ($3\text{--}5 \text{ mg l}^{-1}$), a good number of roots (7–8) were formed. When embryos were cultured on a medium with a higher level of a cytokinin (5 mg l^{-1}) alone or in combination with IAA ($0.5\text{--}1 \text{ mg l}^{-1}$), numerous shoot buds were formed all over the margins of the expanded cotyledons (figure 2). These buds when subcultured on a medium containing BAP (5 mg l^{-1}) proliferated further into numerous shoot buds. This characteristic feature has been retained during repeated subcultures on the same medium. However, the size of buds remained checked. On subculturing individual buds on a medium supplemented with NAA ($0.1\text{--}5 \text{ mg l}^{-1}$), rooting was induced within 7–10 days, and the best growth of root and shoot buds was observed on 0.1 mg l^{-1} NAA (figure 3, 4).



Figures 1–4. 1. Mature embryo on MS medium $\times 3$. 2. Proliferation of shoot buds on MS + BAP (5 mg l^{-1}). 3,4. Plantlet formation on MS + NAA (0.1 mg l^{-1}).

The plantlets were formed from shoot buds and originated directly from the embryos and not *via* intervening callus formation. The direct regeneration of shoots is advantageous as it preserves the ploidy level of the parental tissue which is an essential feature of clonal multiplication.

Thanks are due to the National Council of Educational Research and Training, New Delhi for providing fellowship to SA.

8 December 1982; Revised 21 February 1983.

1. Morel, G., *Cymbidium Soc. News.*, 1965, 20, 3.
2. Murashige, T., *Annu. Rev. Plant Physiol.*, 1974, 25, 135.
3. Vasil, I. K., Hildebrandt, A. C. and Riker, A. J., *Science.*, 1964, 146, 76.
4. Yamada, T., Nakagawa, H. and Sinoto, Y., *Bot. Mag.*, 1967, 80, 68.
5. Norstog, K., *Dev. Biol.*, 1970, 23, 665.
6. George, L. and Narayanaswamy, S., *Protoplasma.*, 1973, 78, 467.
7. Gunay, A. L. and Rao, P. S., *Plant Sci. Lett.*, 1978, 11, 365.
8. Murashige, T. and Skoog, F., *Physiol. Plant.*, 1962, 15, 473.

PRELIMINARY OBSERVATIONS ON THE BIOECOLOGY OF THE ECTOPROCT — *PECTINATELLA BURMANICA* ANNADALE

G. T. TONAPI AND GEORGE VARGHESE
Department of Zoology, University of Poona,
Pune 411 007, India.

THE ectoprocts are microscopic, sessile, colonial coelomates, permanently fastened in exoskeletal cases or gelatinous material of their own secretion. Generally most ectoprocts inhabit unpolluted and unsilted ponds, shallow lakes, slow and fast streams. All freshwater ectoprocts are from the class phylactolaemata. The class is characterized by horseshoe-shaped, oval, circular or crescentic lophophore covered with ciliated epistome. They are provided with a recurved digestive tract, bringing the anus near the mouth and that lack nephridia and a circulatory system¹. The current information on the Indian phylactolaemates has been reviewed recently². However, reports are scanty and the subject requires more detailed investigations. Some additional observations on the bioecology of the fresh water ectoproct, *Pectinatella burmanica* are reported.

While studying the fresh waters of Pune (Maharashtra), a very dense population of ectoprocts was located in a fresh water pond near the Poona University campus. These animals were found attached to the lower side of the leaves and roots of the aquatic floating macrophyte, *Lemna polyrhiza* Linn. Samples of these plants and pond water were collected in plastic buckets for further analysis.

Water samples collected from the surface were analysed to record the physicochemical conditions of

water, viz dissolved oxygen, carbondioxide and chloride contents³. The pH and the temperature of the water were also measured. The number of ectoproct colonies per plant and the number of individuals per colony were counted by random sampling method. The lophophoral activities of the animals were also observed.

There were 4 to 6 colonies per plant and the individuals per colony were 4 to 13. But some plants were not harboured by these ectoprocts. The frequency of lophophoral movements ranged from 4-10 per min. The colonies were observed as small circular, white gelatinous masses from which the tentacular crowns of the basally-fused zooids protruded. Each polypide contained one statoblast, almost circular with one side slightly flattened. The number of colonies/sq m of the pond was calculated to be approximately 2000 to 3000. Assuming that 50% of the plants were colonised by the ectoprocts, and if the total number of plants/sq m and the area inhabited by the plants were known, the number of ectoproct colonies, each with an average of six individuals would give an estimation of these organisms to be of the order of several lakhs.

Analysis of ten samples of pond water, on an average, showed 7.53 ppm of dissolved oxygen, 22.97 ppm of carbon dioxide and 37.48 ppm of chloride. The day temperature of the pond was $25^{\circ} \pm 2^{\circ}$ with a range of 20-30°C. The water had a pH of 7.4.

These observations were made during August, September and part of October 1982 and a record of the seasonal variations is being maintained. However, it appears that the ectoprocts are abundant from the onset of monsoon season (July-October) and become scarce after this period. The physiological responses of these ectoprocts to environmental stress are under study.

Financial assistance from the Department of Environment, Government of India, is gratefully acknowledged.

26 October 1982; Revised 19 February 1983

1. Annandale, N., *Freshwater sponges, hydroids and polyzoa*, Taylor and Francis, London, 1911, p. 251.
2. Tonapi, G. T., *Freshwater animals of India*, Oxford and IBH publishing Company, New Delhi, 1980, p. 341.
3. American Public Health Association, *Standard methods for the examination of water and wastes including bottom sediments and sludges* 14th ed, New York, 1975, p. 769.

MEAN PARASITIC BURDEN OF NEMATODES AND NEMATODE EGGS IN *PERIPLANETA AMERICANA* (L.)

M. KRISHNAN, R. N. GARGESH AND R. VELAYUDHAN

Entomology Research Institute, Loyola College, Madras 600 034, India.

STUDIES on the biotic association of some domiciliary cockroaches have indicated the potential role of these insects to serve as primary and secondary hosts for several pathogenic helminths¹⁻³. Among the intestinal nematodes of the family Thelastomatidae, *Hammerschmidtella diesingi*, *Leidynema appendiculata* and *Binema mirzaia* have been reported⁴⁻⁶. As no specific information exists on the mean parasitic burden (MPB) of these cockroaches, the present study highlights this aspect in relation to nematodes in *Periplaneta americana* from four different sources. Analysis of faecal matter of *P. americana* to study the number of nematode eggs/g of faecal matter (EPG), and a correlation between the population of nematodes and the EPG in faecal matter, have been attempted.

Cockroaches (*P. americana*) (totalling 1760) were collected from four different sources, viz. oil mills (492)—I, sewers (310)—II, eating houses (391)—III and human dwellings (567)—IV (hereafter mentioned as sources I, II, III and IV respectively). The alimentary canal of the dissected specimens was removed and its contents examined for nematodes. The frequency with which the cockroaches were infected with different numbers of nematodes was calculated for the four sources. Faecal matter for EPG was analysed by taking a known weight of faecal matter, dissolving it in water and examining the smear under the microscope, for nematode eggs.

Table I shows the MPB in cockroaches from the different sources. The adult females from source I had a maximum MPB of 3.78 as compared to the MPB of males (1.59) and nymphs (male nymph 0.99, female nymph 1.01) which indicated no significant difference among themselves. While female cockroaches from source IV indicated a significant difference as compared to the nymphs and males, no such difference was evident in cockroaches collected from sources II and III. Comparison of the MPB of cockroaches from the four sources revealed that the adult males and females from source I had significantly higher MPB than those from sources II, III and IV. Nymphal MPB, however, showed no great variation.

Table I also shows the number of nematode eggs/g of cockroach faecal matter. The female cockroaches