

STUDIES ON THE BIOLOGY AND CULTURE OF  
*Pleuroxus similis* (CLADOCERA, CHYDORIDAE)

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ABSTRACT

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## ABSTRACT

Cladocerans represent a group of mostly small microscopic animals comprising an Order under the sub-class Branchiopoda Crustacea. These microcrustaceans constitute an important fraction of any aquatic biota as these organisms serve as an important link in aquatic food chain by means of energy transfer from one trophic level to another.

The cladocerans are well known as important fish food organisms and they form about 95% of the diet of both young and adult fishes.

Studies on cladocerans started as early as 1883 when Forbes pointed out their importance in the aquatic food chain. Following this a number of investigations were done in the subsequent years. However, most of the work done was on the Genus *Daphnia* (Daphnidae) in comparison to which the Family Chydoridae is much less worked upon, except those by Smirnov 1962-1967; Fryer 1968; Whiteside 1970, 1974; Goulden 1971; Keen 1973; Shan 1975; Frey 1973-1900.

In India, studies on chydorids has been fragmentary even till to-date except for a few occasional papers by Quadri and Yousuf 1977, and Murugan 1982 from western Himalayas and Northern India. There is no detailed work on the chydorids done in the North Eastern regions of India

Shillong (latitude 25°34'N longitude 91°36'E) a small town of North East India is situated on a plateau at an altitude of 1600m above sea level. Further, its location being within 50km from Cherrapunji and Mawsynram - the highest rainfall areas of the world - has a luxuriant vegetation

with humid climate which allows an interesting scope for ecobiological studies. The present work is therefore an attempt to investigate in as much detail as possible the biology of the available cladoceran species in Shillong area with more emphasis being given to relate the field information to laboratory findings in order to obtain a more comprehensive understanding of the basic life history patterns of cladocerans with special reference to the chydorid sp. *Pleuroxus similis*.

The present study comprises the following parts viz.,

- a) Work out the taxonomy of *Pleuroxus similis* and compare it with the description given by different authors elsewhere in the world thereby bringing out their taxonomic relationships and in terms of their zoogeographic distribution.
- b) Study the biology of *Pleuroxus similis* under different laboratory conditions.
- c) Construct a seasonal distribution map of *Pleuroxus similis* in the system studied.
- d) Study certain culture aspects of *Pleuroxus similis* in different nutrient media under laboratory conditions.
- e) Report a preliminary investigation on the karyotype of *Pleuroxus similis*.

In part 'a', the taxonomy of *Pleuroxus similis* was worked out and the description was compared with the original description given by Vavra for the species in 1900 from Valdivia in South America and also with the

description given by other authors like Sars 1901 from Argentina, Smirnov, 1971 from USSR - Northern Caucasus, Lake Issykkul, Tashkent Area, Smirnov and Timms, 1983 from northern New South Wales in Australia. This also gave some indications about the world wide distributional pattern of the species *Pleuroxus similis* that was not hitherto known clearly. Ehippial females and males of this species were reported for the first time during the present study and in this context the gamogenetic strategy of *Pleuroxus similis* was compared with those of other chydorids of Europe and America.

In part 'b' the life cycle patterns of *Pleuroxus similis* reared individually was studied under laboratory conditions using three different culture media viz; chicken manure, rice bran and filtered pond water used as control. Studies were made on life span, instar duration egg production and growth rates for both parthenogenetic females and males, and the results are compared and discussed with those of other chydorid species studied by other authors. The life history strategy adopted by *Pleuroxus similis* with regard to other littoral and planktonic cladoceran species are also discussed.

In part 'c' the seasonal distributional pattern and population dynamics of *Pleuroxus similis* was studied in Ward's lake an artificial impoundment in the centre of Shillong town. Studies were made at fortnightly intervals for a total period of 25 months. The percentage composition of the various categories of *Pleuroxus similis* viz; juveniles, adult with egg, adult without eggs, ehippial females and males, were worked out and was divided into different size classes. The occurrence of peak population density during spring and autumn were discussed in the light of occurrence of gamogenetic females in the population and the distributional pattern was compared with

those of other chydorid species from Europe and America. A few of the major physicochemical parameters vegetational association, as well as biological properties including different groups of phytoplankton zooplankton and associated organisms have also been studied for the entire period of 25 months and their effect on the population density of *Pleuroxus similis* has been discussed. The population dynamics viz; mortality, natality, finite birth rate and coefficient of population growth were worked out and their effect on the population density of *Pleuroxus similis* has been discussed.

Part 'd' deals with studies on laboratory cultures of *Pleuroxus similis* For this part, studies were done on three aspects:

The first aspect includes the studies on life history parameters of *Pleuroxus similis* reared in different culture media viz; chicken manure, rice bran and filtered pond water, with three different inoculum densities of 3, 5 and 8 animals. The different life history parameters studied were the first reproduction time(A), total longevity (w), reproductive life span of the animal, net reproductive rate ( $R_0$ ) total offspring production(S) and an average generation time ( $T_c$ ). The survivorship curves and survivorship fecundity data for the three different media and three different inoculum densities were also worked out. The total population density under the above conditions were also estimated. The results obtained in the three culture media were compared and the most conducive culture medium for the culture of *Pleuroxus similis* was determined and is recommended for future experiments.

The second aspect deals with the effect of inoculum density on different population parameters in *Pleuroxus similis* using chicken manure as

the culture medium. The population parameters studied were growth, survival, fecundity and population density under varied inoculum densities of 3, 5 and 8 and 12 animals and the results obtained were compared and discussed with reference to availability of container space and food.

The third aspect deals with the population growth of *Pleuroxus similis* as a direct function of available space. For this study flasks of varied capacities of  $15\text{cm}^3$ ,  $30\text{cm}^3$ ,  $60\text{cm}^3$ ,  $100\text{cm}^3$ ,  $250\text{cm}^3$  and  $500\text{cm}^3$  were used and the mean population size of *Pleuroxus similis* were observed in each flask. It was noticed that the population density in general tended to rise with increasing flask capacities the maximum being in the flask capacity of  $500\text{cm}^3$ . However, under space condition of  $1.5\text{cm}^3/\text{individual}$ , there was no progeny production or in other words a minimum space of  $3\text{cm}^3/\text{individual}$  (flask capacity of  $30\text{cm}^3$ ) was required for growth and survival of *Pleuroxus similis*. This result was compared and discussed with those for other cladoceran species cultured under laboratory conditions.

Part 'e' deals with the karyological changes during the different phases of life history of *Pleuroxus similis*. Cladocerans are well known for their difficulties in karyological studies. In this study a preliminary report on the karyotype was obtained, and the chromosome number in parthenogenetic females of *Pleuroxus similis* were determined, and the result compared with those of *Daphnia* sp.

Finally, the various results obtained from the field population and the laboratory data are discussed together in detail and some fundamental knowledge regarding the biology and culture aspects of the animal *Pleuroxus similis* is presented.

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