J. mar. biol. Ass. India, 1987, **29** (1 & 2) : 60-62

EURYHALINE BEHAVIOUR IN TWO SPECIES OF FRESHWATER ATYID PRAWNS *CARIDINA GRACILIPES* AND *C.* PROX. *SHENOYI*

ARUNA S. KADREKAR AND K. N. SANKOLLI

Marine Biological Research Station and College of Fisheries, Konkan Krishi Vidyapeeth, Ratnagiri-415 612, Maharashtra State, India

ABSTRACT

Family Atyidae is one of the oldest decapod groups, comprising prawns, mostly belonging to genus *Caridina*, that are considered to have completely established in freshwater. However, two of the three *Caridina* species available in Ratnagiri area, west coast of India *viz. Caridina gracilipes* and *C.* prox. *shenoyi* could not complete their metamorphosis without addition of some amount of sea-water to culture media. Salinity experiments were, therefore, conducted both on adults and larvae. The results which indicate their euryhaline behaviour also reveal that adults can tolerate salinity ranges upto 28.0 and 31.0 ppt while the larvae can successfully metamorphose in ranges from 3.5 to 24.5 ppt and 3.5 to 28.0 ppt respectively. Number of larval stages is not affected by salinity.

INTRODUCTION

THE RATNAGIRI AREA is known on the fisheries map of India for its rich contribution of marine prawns. But this area is also traversed by many freshwater bodies like rivers, streams, tanks, *etc.* which harbour as yet unexplored inland freshwater prawn fauna.

The family Atyidae is represented in the study area by three species *viz. Caridina gurney lonavalensis* (Almelkar, 1983), *C. gracilipes* De Man and *C.* prox. *shenoyi* Jalihal *et al.* Of these, the first is a freshwater species as indicated by its occurrence in impounded waters of a temple tank and a private well and by its completion of metamorphosis in purely freshwater (Almelkar, 1983 ; Kadrekar, 1985). The other two species collected from a coastal stream, however, could not complete their metamorphosis without saline water.

The family Atyidae is known as an ancient freshwater family (Ortmann, 1895 ; Bouvier, 1925). As such, salinity dependence of larvae for metamorphosis is an interesting observation. Experiments were, therefore, conducted both on adults and larvae to study their salinity behaviour which is discussed in the present paper.

The authors thank Konkan Krishi Vidyapeeth for the facilities and one of the authors (A.S.K.) is grateful for the award of Sir. D. B. Vikaji Taraporevala scholarship during the course of study. Special gratitudes are expressed to Dr. (Smt.) Shakuntala Shenoy for her guidance and keen interest.

MATERIAL AND METHODS

The nearest source of flowing freshwaters in the study area is the Kasarveli stream about 7 km from Ratnagiri town. This stream is about 2 m wide downstreams gradually increasing to about 4 m upstreams with bank wall of laterite stones. It is separated from the

creek by a small bridge of about 3 m width and the tidal effect ranges upto a distance of 30 m after which it is all freshwater. About 60 m upstream is a temporary earthen dam built during summer to store the water for paddy irrigation, washing and other domestic purposes. This water dries during hot summer. During monsoon the dam is removed to allow the water to flow seawards. About 30 m upstream of the dam is a huge tree with roots spread over wide area and surrounded by bamboo clones. Both the species *i.e. C. gracilipes* and *C.* prox. *shenoyi* occur together in this area, take shelter both under the roots of tree, under decayed leaves, stones and pebbles or in the crevices of laterite stones of the embanking walls. While *C. gracilipes* is quite abundant and can be collected over an extensive open area on aquatic weeds and grassy banks, *C.* prox. *shenoyi* is less abundant and restricted to sheltered places under debris, dead and decaying leaves *etc.* (It must be noted that the third species collected from impounded waters, does not occur in this area.)

The prawns were collected periodically using a rectangular hand-net (22 × 15 cm) made of mosquito net cloth of about 1 mm mesh size. These were transported to the laboratory in plastic bucket with lids having holes for air passage and filled with locality water and a few weeds as shelter. After due conditioning in the laboratory, they were subjected to salinity experiments.

Different salinity grades were prepared by adding pure seawater to freshwater. Each grade differed from immediately higher or lower grades by 10%. Thus, 0% seawater means 100% or pure freshwater and 10% means 90 parts of freshwater with 10 parts of seawater.

Adults : The adults were conditioned in freshwater in the laboratory for 3 to 5 days before the experiment. Five prawns each were introduced directly into 1 litre beakers containing different salinity grades.

Salinity grades in which atleast 50% individuals survived at the end of 48 hours have been considered to be within the tolerance range and rest as lethal.

Larvae : The berried females were conditioned as above in pure freshwater. Larvae on hatching were transferred to various salinity grades directly and their development was followed in each grade. Plastic vials of 10 ml capacity were used for rearing the larvae individually. Ten larvae were reared in each grade and they were fed on a few drops of greenwater rich in phytoplankton. However, phytoplankton species were not identified. Water in each vial was renewed daily after checking for moults.

Results

Adults

C. gracilipes : Salinity of seawater = 34.50 ppt. The specimens could survive for more than 48 hours in salinity ranges from freshwater (0.0 ppt) to 80% (27.60 ppt) while they died after 24 hours in ranges from 90%and above (31.05 to 34.50 ppt). Therefore, the tolerance limit of this species has been considered as 27.60 ppt or 80% seawater.

C. prox. *shenoyi* : Salinity of seawater= 34.5 ppt. The specimens could survive for more than 48 hours in salinity ranges from freshwater (0.0 ppt) to 90% (31.05 ppt) while they could survive for less than 24 hours in 100% *i.e.* 34.50 ppt. Therefore, the tolerance limit of this species has been considered broadly as 31.05 ppt or 90% seawater.

Larvae

C. gracilipes : Salinity of seawater = 27.0 and 35.0 ppt respectively since the experiment

was conducted twice during different months like just after monsoon and summer.

The larvae could successfully metamorphose after 7 zoeal stages in salinity ranges from 3.5 to 28.0 ppt. In salinities below 3.5 ppt and above 28.0 ppt there was mortality in various stages with prolonged duration. The total duration of larval development varied from 15 to 28 days due to differences in intermoult period in each grade. However, there was no change in number of larval stages.

C. prox. *shenoyi :* The survival rate of the larvae of this species was poor when reared in pure freshwater and they could not metamorphose to postlarvae, requiring atleast some amount of salinity for completion of lifehistory. Salinity of seawater = 35.0 ppt.

The larvae could successfully metamorphose after 6 zoeal stages in salinity ranges from 3.50 to 24.15 ppt. Range between 10.50 to 20.70 ppt seemed to be the optimum. In salinities above 24.15 ppt survival was poor with prolonged duration and larvae could reach only upto second stage. In salinity ranges below 3.50 ppt larvae died either in second or third stages.

Since the intermoult period in each grade differed, the total duration upto postlarval stage was from 11 to 18 days. However, the total number of larval stages does not change in different sainity grades.

Discussion

The present experiments do have their limitations like broad ranges of salinity used or being repeated only once. Yet, the results which can be summarized as follows are indicative of euryhaline behaviour in both adult and larval phases of *C. gracilipes* and *C.* prox. *shenoyi.* (i) Wide range of salinity tolerance by adults—28.0 and 31.0 ppt respectively. (ii) Heavy mortality rate in early stages when reared in freshwater alone. (iii) Completion of metamorphosis only in saline waters—3.50 to 24.50 ppt and 3.50 to 28.0 ppt respectively. (iv) Very poor survival of larvae in salinities higher than above, larvae reaching only second or third stage with prolonged duration of stages. (v) Total number of larval stages in metamorphosis not affected by salinity.

The results are interesting considering the fact that Atyidae is recognised as a freshwater family with great antiquity. Only possible explanation for this euryhalinity of present species may be : (i) Marine origin of the group (Ortmann, 1895 ; Jalihal *et al.*, 1981) and (ii) Process of freshwaterization not yet completed resulting in salinity dependence during larval phase of some coastal species like *C. gracilipes* and *C.* prox. *shenoyi.*

References

Almelkar, G. B. 1983. *Studies on the freshwater prawns of the Bombay area.* Ph. D. Thesis, Konkan Krishi Vidyapeeth, Dapoli.

Bouvier, E. L. 1925. Recherches sur la morphologie, les variations, la distribution geographique des crevettes de la famille des Atyides. *Encycl. Ent.*, ser. A, 4 : 1-370.

Jalihal, D. R., Shakuntala Shenoy and K. N. Sankolli 1981. Adaptational significance of salinity tolerance in some freshwater prawns. *Proc. Symp. Ecol. Anim. Popul. Zool. Surv. India,* 2 : 175-187.

Kadrekar, A. S. 1985. *Studies on some atyid prawns,* Caridina *species from Ratnagiri.* M. Sc. Thesis, Konkan Krishi Vidyapeeth, Dapoli.

Ortmann, A. E. 1895. A study of the systematic and geographical distribution of the decapod family Atyidae Kingsley. *Proc. Acad. nat. Sci. Philadelphia* (1894) : 397-416.