

Investigations into the salinity preferences of successive larval developmental forms of five indigenous species of the freshwater prawn *Macrobrachium*

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Abstract

The salinity preferences of the larvae of 5 indigenous species of *Macrobrachium* namely *M. lepidactylus*, *M. rude*, *M. petersi*, *M. scabriculum* and *M. australe* was investigated. Results showed that saline conditions are definitely required for the survival and development of the early larval stages. Survival and morphological development of the larvae of all 5 species studied improved markedly once the salinity of the medium used was increased to levels exceeding 5 S ‰ with the most satisfactory levels being above 10 S ‰.

Introduction

The genus *Macrobrachium* Bate, 1868 occurs throughout the tropics and in several subtropical areas (Holthuis, 1980). Almost all the species spend part of their life cycle in freshwater (Holthuis, 1980) and the term "freshwater prawn" has been applied to representatives of the genus (Goodwin and Hanson, 1975). Of the 125 known species, most are of edible size and it is likely that they would be used as food wherever they occur (Holthuis, 1980).

With the exception of the proposed culture of *Macrobrachium* in Ghana (Prah, 1980), very little information appears to be available on the utilisation of freshwater prawn resources in Africa, for the purpose of aquaculture (Rabanal, 1980). Holthuis (1980) reported that the commercial culture of *M. rosenbergii* has been investigated in Malawi, Mauritius and the Seychelles.

Production of *M. rosenbergii* reached a commercial level by 1980 in Mauritius (Thompson, 1980) and by 1981 at an inland production unit for the same species in Zimbabwe (Kenmuir, 1981). Production trials with *M. rosenbergii* have also been conducted in the Transvaal (Taylor et al., 1992).

While *M. rosenbergii* (De Man) is a universal choice for commercial culture, the Directorates of Nature Conservation in South Africa are naturally concerned about the possible introduction of this prawn into South African waters where it might pose a potential threat to the indigenous species. In addition, climatic conditions over much of South Africa are not entirely satisfactory for culturing this tropical species whilst the local species may possibly provide a suitable alternative in the more temperate regions of the country. It was therefore decided to investigate aspects of factors affecting larval development of 5 of the indigenous species of *Macrobrachium*, namely:

Macrobrachium lepidactylus (Hilgendorf, 1897)

Macrobrachium rude (Heller, 1862)

Macrobrachium petersi (Hilgendorf, 1879)

Macrobrachium scabriculum (Heller, 1862)

Macrobrachium australe (Guerin, 1838).

These species vary in their distribution, with *M. rude*, *M. lepidactylus* and *M. scabriculum* occurring along the east coast of Africa and Madagascar and extending as far as India. *M. australe* is distributed over a similar area (see Schoonbee et al., 1989), but extends as far as Polynesia (Holthuis, 1980). The present record of this species from the African continent (Schoonbee et al., 1989) is apparently the first according to Professor Holthuis, (Leiden, Netherlands) who identified the material. *M. petersi* appears to be restricted in distribution to the southeast coast of Africa (Holthuis, 1950; Read, 1982; 1985a,b; Coetzee, 1988; Bickerton, 1989). Available information indicates that, with the exception of *M. petersi* for which no relevant data are available, the various species of *Macrobrachium* are used for food in the areas where they occur, being fished to varying degrees (Holthuis, 1980). Fishing for *M. rude* is regular in certain parts of India and Bangladesh (Holthuis, 1980). This species is listed as a cultivated species by Panikkar (1968). Studies of the field biology of *M. rude* have been conducted (Ling and Costello, 1976), but no data on its possible commercial exploitation are available. The large-scale freshwater prawn culture became possible mainly as a result of the discovery by Ling (1962) that *M. rosenbergii* larvae required saline conditions for their survival and development. A knowledge of the salinity requirements of the various larval forms of our local *Macrobrachium* species is therefore a prerequisite for their culture.

The basis for the present series of experiments was the hypothesis of Knowlton (1974) that a hierarchy of developmental processes existed, based on the utilisation of food energy. Knowlton (1974) found that larval morphogenesis of *P. vulgaris* closely paralleled growth but not moulting history, and that there was a cessation of morphogenesis with cessation of growth. Thus evidence of morphological change was taken as an indication that the larvae were growing. For the purpose of this study it was necessary to establish whether development was taking place among the larvae being reared. As specimens were taken from communal rearing containers, no moulting history was available and it was necessary to use changes in morphology as a yardstick of development.

Materials and methods

The design of the present experiments was largely based on the

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