ISSN: 0975-833X

Available online at http://www.journalcra.com

International Journal of Current Research
Vol. 8, Issue, 10, pp.39725-39729, October, 2016

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

RESEARCH ARTICLE

STUDY OF BIOLOGY OF MACROBRACHIUM HENDERSODAYANUM (CRUSTACEA: DECAPODA: PALAEMONIDAE) FROM TARAI REGION OF UTTARAKHAND, INDIA

[1,*]Meena Kumari, [1]Bisht, H. C. S. and [2]Dharmendra Rathore

[1]Department of Zoology, DSB Campus Kumaun University Nainital, Uttarakhand, India
[2]Department of Zoology, S.V. Government Post Graduate College, Lohaghat (Champawat), Uttarakhand, India

ARTICLE INFO

Article History:
Received 20th July, 2016
Received in revised form
15th August, 2016
Accepted 28th September, 2016
Published online 30th October, 2016

Key words:

Macrobrachium Hendersodayanum,
Identification,
Size Composition,
Morphology,
Reproductive Biology,
Feeding Habit.

ABSTRACT

The paper deals with some biological aspects of *Macrobrachium hendersodayanum* a fresh water commercially important crustacean which is highly preferred by the consumers locally at river Jagbuda in village Melaghat, tehsil Khatima (79^0 45' E Long. and 29^0 0' N Lat.) of district Udham Singh Nagar, Uttarakhand, India. The successful culturing of animal requires a basic understanding of its key biological processes. About 200 specimens of this species were collected monthly between August 2013 to July 2014 and studied with particular refrence to size composition, distribution, identification, morphology, reproductive biology and food and feeding habits. This study revealed that it was not a continuous breeder and showed only one breeding peak periods in a year before onset of monsoon. Males were larger than the female. But female sexually matures faster than males. More than 60 % berried females were found in the total length ranged between 5.2-6.5 cm The largest male (carapace length=2.0-2.2cm) with strongest chelate legs showed its dominance over recessive and non breeding males. Both male and female attained maturity at the age of about 4-6 months after hatching. It has omnivorous feeding habit. It was observed that diatoms, algae, crustaceans and other plant materials were its most preferred food.

Citation: Meena Kumari, Bisht, H. C. S. and Dharmendra Rathore, 2016. "Study of biology of Macrobrachium hendersodayanum (Crustacea: Decapoda: Palaemonidae) from Tarai region of Uttarakhand, India", *International Journal of Current Research*, 8, (10), 39725-39729.

INTRODUCTION

The prawns, *Macrobrachium* species belonging to the family Palaemonidae are decapods crustaceans of high economic importance world-wide and have been subjected to intense aquacultural practices. The *Macrobrachium* genus has about 210 species variously described and recognised throughout the world Holthuis (1952); Coelho & Ramos-Porto (1985); Melo, *et al*. (1988); Pinheiro and Hebling, (1998); Pereira, *et al*, (2002); Melo, (2003); Short, (2004); Jayachandran, *et al*, (2007), with nearly half of these described in the 50 or so years since the last major revisionary works on the group by Holthuis (1950). The biology and ecology of this group is diverse and complex, probably as a consequence of its adaptation to various environments during evolution Pereira (1997); Bauer, (2004). Freshwater prawn fishery is an emerging industry in India. In north India study on the freshwater prawns is in infant stage due to its small size as well the small weight. Here, the fish farmers still depend upon natural seed supply for stocking their ponds.

Corresponding author: Meena Kumari,
Department of Zoology, DSB Campus Kumaun University Nainital, Uttarakhand, India.

The prawn species *Macrobrachium hendersodayanum* is commonly found in variety of freshwater bodies of Kumaun region of Uttarakhand, India. The genuscontribute to a subsistence level freshwater prawn fishery locally in tarai region of Kumaun, Uttrakhand, India. *Macrobrachium hendersodayanum* completely adapted for fresh water habitat Tiwari (1955b). The prawn species *Macrobrachium hendersodayanum* is important food item because of its fast growth, better meat quality, omnivorous feeding habit and are good item for exports when fully recruited for aquaculture. The local people used to catch them using different kinds of trap for consumption. This species can be reared in culture ponds along with other species. Due to its economic importance the detailed scientific study of the candidate prawns attracts attention of biologists. There is very little information available about this species in India. Hence a thorough investigation of general biology of this prawn is necessary. This paper provide informations on various biological aspects of *M. hendersodayamnum* with particular emphasis on the size composition, growth pattern, food habits and reproductive biology.

MATERIALS AND METHODS

This study was carried out in the Department of Zoology, D.S.B. Campus, Kumaun University, Nainital. Tarai waters of river Jagbuda in village Melaghat, tehsil Khatima (79^0 45' E Long. and 29^0 0' N Lat.) of district Udham Singh Nagar, Uttarakhand has been selected as the area for the regular collection of research material. Sampling was done for one year from August 2013 to July 2014. Monthly samples of *M. hendesodayanum* were collected in the river Jagbuda from fisher folks. The fishing was done with cone-shaped bamboo basket traps described by Solarin, *et al*, (2003) and Jimoh, *et al*, (2009). Some specimens were taken live to the laboratory or some preserved in 75% ethanol, these are measured by slide caliper. Detailed observations were made under a camera lucida. Male pereopods were examined and illustrated after being detached. Size of specimens is indicated by carapace length (CL) measured from the orbital margin to the posterodorsal margin. All type specimens and other material are deposited in the department of Zoology, Kumaun University, Nainital.

Diversity and distribution

Tiwari (1955b) studied this species *M. hendersodayanum* as hill stream species and possessing longitudinal grooves beset with pubescence on fingers of second cheliped ('fluted fingers') and fits it into '*hendersoni* group' of prawns other species of this group *assamensis assamensis* Tiwari (1958), *siwalikensis* Tiwari (1952) and *dayanum* Henderson (1893) closely resemble *hendersodayanum* as also discussed by Tiwari (1951), but can be differentiated mainly on rostrum and second cheliped characters. According to Tiwari (1952 & 1955b) *hendersodayanum* is so far known only from Western Ghats from Satara District (Maharashtra state) to Mysore (Karnataka) state .These species are also scattered in tarai regions of Kumaun, Uttarakhand. Local peoples generally called it as"Jhinga machi". There are large areas that have not been fully investigated by scientists . Therefore we believe that more cave dwelling decapods will be found in the future.

Taxonomy

Kingdom - Animalia
Phylum - Arthropoda
Subphylum - Crustacea
Class - Malacostraca
Order - Decapoda
Sub-order - Pleocyemata
Infraorder - Caridea
Superfamily - Palaemonoidea
Family - Palaemonidae
Genus- *Macrobrachium*
Species- *hendersodayanum*
Jalihal, *et al* 1988

Identification and Morphology

It is a medium-sized species with subcylindrical body form rostrum short, reaching upto the end of antennular peduncle. Rostral formula: 7-9/2-5. General body colour yellowish brown with deep violet or black patches. *M. hendersodayanum* has strong and stout chelipeds,but shorter than body and exhibiting sexual dimorphism in mature stages (Figure-1). The body consists of the head (cephalothorax) and tail (abdomen) and is divided into 19 pair of appendages. Of these appendages, 13 are in the cephalothorax and covered by a shield known as the carapace. The front portion of the head has 5 pair of appendages, and the thoracic region has 8 pair of appendages. The abdomen consists of 6 appendages (Table-1).

Size composition

An average total length ranges from 2.4- 6.5 cm in females with carapace length from 0.8- 2.0 cm and total weight from 0.98-3.85 gm. While in males average total length ranges between 2.1-7.4 cm with carapace length from 0.7-2.2 cm and total weight 1.08-4.14 gm. Maximum berried females were found in between the total length ranges from 5.2- 6.5 cm. Mean values of common morphometric characters of male and female *M. hendersodayanum* of one year given in (Table-2).

Sexual dimorphism

Male prawns are larger than females of the same age. The male has a head (cephalothorax) proportionally larger than the abdomen and the chelipeds are long, massive and large which are sexually most active. The female prawn, which is smaller in size than males of the same age, has a smaller head and slender claws. Secondary sexual character appendix masculine in the second pleopods of male is a most reliable taxonomic character for their identifications. In females the first three abdominal pleura are elongated and broad to form a brood chamber for incubating eggs. The genital pores are located at the base of the third walking legs in female and fifth walking legs in males. On basis of changes in ovaries colour females were classified into four stages (Table-3).

Reproductive biology and Life cycle

Eggs deep greenish in colour, very large, measuring 1.18 to 1.25x 0.92 to 1.15mm and 60 to 130 in numbers. Development totally abbreviated consisting of only 1 larval + 1 postlarval stages, completed in purely freshwater. First zoea with pereiopods and pleopods segmented and functional, telson rounded and bearing 11 or 12+11 or 12. *M. hendersodayanum* regularly cast off their exoskeleton like other crustaceans in order to grow, a process known as moulting. There are five distinct phases in this prawn life cycle: egg, larva (zoea), postlarva (PL), juvenile and adult (Figure-2). The time spent in each phase and its growth rate is affected by the environment, especially water temperature and food. The male and females reach first maturity at about 3-5 gm within 6-8 months. For larval development temperature should be maintained at 25-28ºC and water should be renewed every day. Survival from hatching to PL shouldbe 80% or higher but can be as low as 10% if any of the above factors are not suitable.

Food and feeding habits

The larvae are carnivorous and in culture they are fed on boiled flesh of other prawns and fishes chopped to small pieces. Juvenile and adult prawns are omnivorous, and feed on a wide variety of food items such as aquatic worms, insects and their larvae, small molluscs and crustaceans, flesh and other animals, sand and debris, algae and stems of aquatic plants etc. The frequency occurrence of various food items of candidate prawn were summarized in a graph shown in Figure-3. They generally prefer plant, algae and diatoms as food, and sometimes may even be cannibalistic and coprophagous.

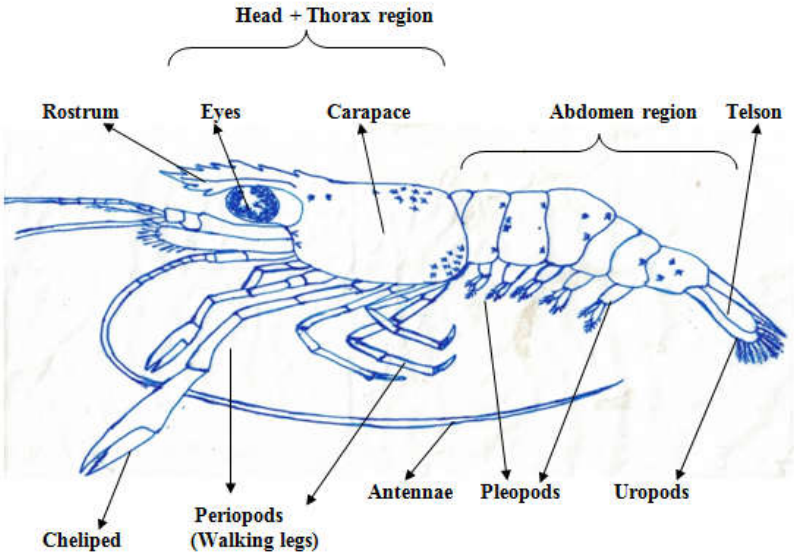

Figure 1. General morphological features of *Macrobrachium hendersodayanum*

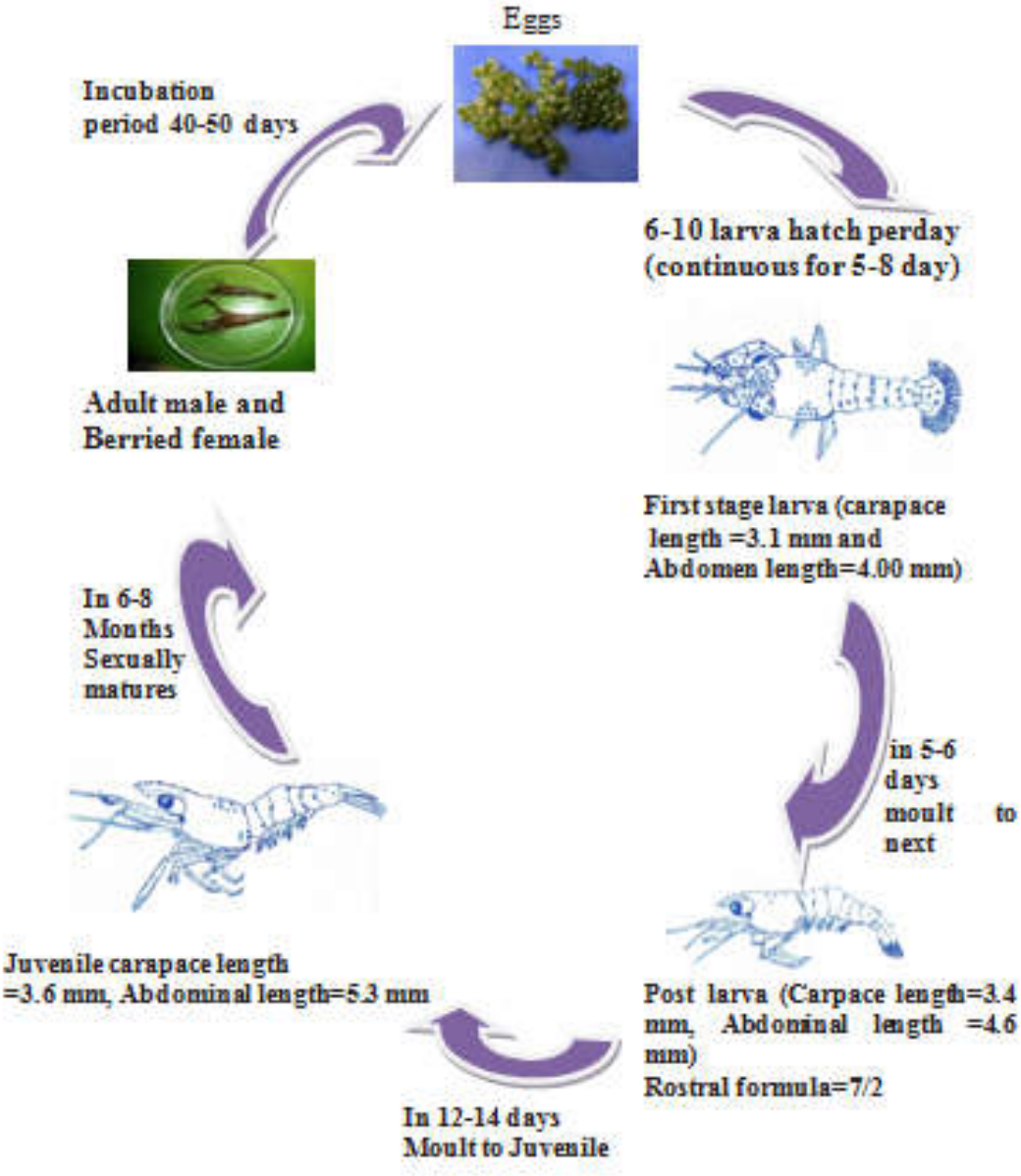

Figure 2. Life cycle pattern in *Macrobrachium hendersodayanum*

Table 1. Summary of morphological features in *Macrobrachium hendersodayanum*

Appendages	Location	Total numbers	Function
Antennule	Head region	One pair	
Antennae		One pair	
Mandible		One pair	used to grind food
Maxillae		One pair	transfer food into the mouth
Maxillula		One pair	
I, II and III Maxillipedes	Thoracic region	One pair of each	function as mouthparts
I and II Chelate legs (pereiopods)		One pair of each	used for capturing and holding food and the others
I, II and III Non-Chelate legs (pereiopods)		One pair of each	are used for walking
5 sets of Swimmerets (Pleopods)	Abdomen region	One pair of each	used for swimming
Uropods (along with single telson)		One pair	Used for backward moves or jerks

Table 2. Mean value of Total length, Carapace length and Total weight of male and female *M. hendersodayanum* from August, 2013 –July, 2014

Species	Mean±SD		
	Total Length(cm)	Carapace Length (cm)	Total Weight (gm)
Female *M. hendersodayanum*	6.5±2.14	1.8±1.45	3.54±2.23
Male *M. hendersodayanum*	6.8±2.22	2.1±0.78	3.96±1.65

Table 3. Female *M. hendersodayanum* at different stages of ovarian maturity

Stage of ovarian maturity	Ovary color in *M. hendersodayanum*
Immature	Opaque white
Maturing	Light green
Mature	Green
Spent	Transparent white

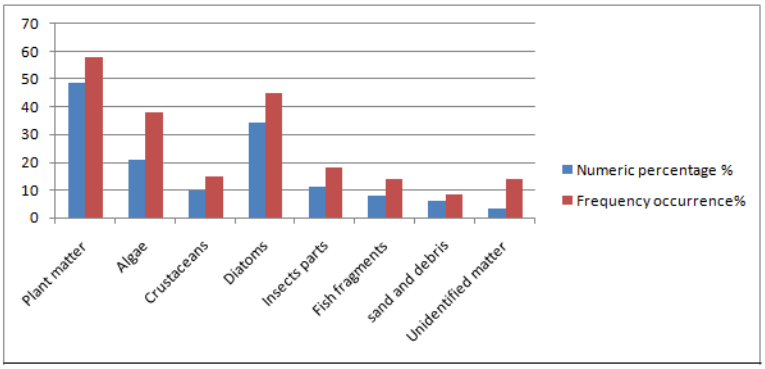

Figure 3. Summary of feeding habits of prawn *Macrobrachium hendersodayanum*

Prawns locate their food mostly by touch with their antennae. Due to its territorial nature food is often not completely eaten immediately, so feeds which last well in the water and maintain an attractive odour needed in farmed conditions.

Summary

This is the comprehensive study on the *Macrobrachium hendersodayanum* species (Family- Palaemonidae) from Kumaun tarai region of Uttarakhand, India. It is a medium sized species which shows its own distinctive characters. The information on the species is rather meagre despite the abundance of variety of freshwater bodies and subsistence level of fishery in many areas due to small size as well as small weight of the species. *M. hendersodayanum* is a dioecious species, breeding occurs maximum from February to March. Male and female species sexually matured at the age of 6-8 months. The fecundity in this species increases with the increase in size of females. Growth and development in this species is discontinuous process associated with successive moults as similar to other crustaceans Hartnoll, (2001). It clearly reveals that this species completely adapted to fresh water habitat Tiwari (1955b).

A comprehensive knowledge of identification, size composition, reproductive biology and feeding habits of *M. hendersodayanum* from this study would provide valuable informations for the mass production of this species in culture practices. Some new informations has been added on the species covered in the present study for easy identification and culturing of the species. This will help to meet local demands and possibility to generate the employment for local peoples as well as foreign-exchange for the country.

Acknowledgement

The authors are grateful to the Department of Zoology Kumaun University Nainital, Uttarakhand, India for the facilities provided for this study.

REFERENCES

Bauer, R.T. 2004. “Remarkable Shrimps-Adaptations and Natural History of the carideans”. University of Okddhoma Press, Norman.

Coelho, P.A. and Ramos-Porto, M. 1985. "Camaroes de aqua doce do Brasil: distribulcao geografica," Rev. Bras. Zool., 2:405-410.

Hartnoll, R.G. 2001. "Growth in Crustacea – twenty years" on. Hydrobiologia, 449:111‑122.

Henderson, J. R. 1893. "A contribution to Indian carcinology". *T,.ans. Linn, Soc., Lond.,* 5 ; 325·458.

Holthuis, L. B. 1950. "The Palaemonidae collected by the Siboga and Snellius expeditions, with remarks on other species. I. Subfamily Palaemoninae". Siboga Exped., 39: 1-268.

Holthuis, L.B. 1952. "A general revision of the Palaemonidae (Crustacea, Decapoda, Natantia) of the Americas. II. The subfamily Palaemoninae". Allan Hancock Foundation Publications, Los Angeles. p.396. (Occasional paper, 12).

Jalihal, D.R., Shakuntala, S. and Sankolli, K.N. 1988. Rec. Zool. Surv. India, Occ. Paper N0. 112.

Jayachandran, K.V., R.S. Lal Mohan and A.V. Raji. 2007. "A new spesies of *Macrobrachium* Bate 1868 (Decapodes palemonidae) from the dolphin trenchs of Kulsi River, N.India, possibly under trea"t. *Zoologischer Anzeiger* 246 43-48.

Jimoh, A. A., Clarke, E.O., Whenu, O.O. and Adeoye, H.B. 2009. "Food and feeding habits of the African river prawn (*Macrobrachium vollenhovenii*, Herklots, 1857) in Epe Lagoon, southwest Nigeria". *Inter J Fish Aqua* 3: 10-15.

Melo, G. A. S. 2003. "Manual de Identificação dos Crustacea Decapoda de Água Doce do Brasil. Edições Loyola: Centro Universitário São Camilo". Museu de Zoologia, Universidade de São Paulo. São Paulo. 430 p.

Melo, G.A.S., Lobão, V.L. and Fernandes, W.M. 1988. "Redescrição de *Macrobrachium birai*, Lobão, Melo & Fernandes e de Macrobrachium petronioi, Melo, Lobão & Fernandes (Crustacea: Decapoda), palaemonídeos da região sul do estado de São Paulo, Brasil". Bol. Inst. Pesca, 15:89-97.

Pereira, G.A. 1997. "A cladistic analysis of the freshwater shrimps of the family Palaemonidae (Crustacea, Decapoda, Caridea)". Acta Biol. Venez., 17(suppl.):1-69.

Pereira, G.A., Stefano, H., Staton, J. and Farrel, B. 2002. "Phylogenetic relationships in some species of the genus Macrobrachium based on nucleotide sequences of the mitochondrial gene cytocrome oxidase I". In: Escobar-Briones, E. & Alvarez, F. (eds.) Modern approaches to the study of crustacea. Kluwer Academic, New York.p.319-322.

Pinheiro, M.A.A. and Hebling, N.J. 1998. "Biologia de Macrobrachium rosenbergii (De Man, 1879)". In: Valenti, W.C. (ed.) Carcinicultura de água doce. IBAMA/FAPESP, Brasília. p.21-46.

Short, J. W. 2004. "A revision of Australian river prawns, *Macrobrachium* (Crustacea: Decapoda: Palaemonidae)". *Hydrobiologia*: 525: 1-100.

Solarin, B.B., Udolisa, R.E., Omotoyo, N.O., Lebo, P.E. and Ambrose, E. 2003. "Hook, line and sinker – The small scale fishing gear in Nigeria". ICSF Chennai India /Brusels, Belgium. Samudra 35: 41-46.

Tiwari, K. K. 1952. "Diagnosis of new species and subspecies of the genus *Palaemon* Fabricius (Crustacea: Decapoda)". *Annals and Magazine of Natural History*, (**12**)5, 27–32.

Tiwari, K. K. 1955b. "Distribution of the Indo-Burmese fresh-water prawns of the genus Palaemon Fabr. (Crustacea:Decapoda)". *Bull.nation.Inst.Sci.India*, 7:230-239.

Tiwari, K. K., unpublished. Ph. D. Thesis, 1951. "Studies on the Indo-Burmese freshwater prawns of the genus *Palaemon* Fabr"·

Tiwari, K.K. 1958. "New species and sub species of India freshwater prawns". *Rec. Ind. Mus*. 53: 297-300.

****