



International Journal Of
**Recent Scientific
Research**

ISSN: 0976-3031
Volume: 7(6) June -2016

DESCRIPTION OF APPENDAGES CHARACTERIZING SEX DIFFERENTIATION
IN HIMALAYAN PRAWN, *MACROBRACHIUM DAYANUM*

Apurva Sharma, Seema Langer and Nipoon Sharma



THE OFFICIAL PUBLICATION OF
INTERNATIONAL JOURNAL OF RECENT SCIENTIFIC RESEARCH (IJRSR)
<http://www.recentscientific.com/> recentscientific@gmail.com



ISSN: 0976-3031

Available Online at <http://www.recentscientific.com>

International Journal of Recent Scientific Research
Vol. 7, Issue, 6, pp. 12071-12075, June, 2016

**International Journal of
Recent Scientific
Research**

Research Article

DESCRIPTION OF APPENDAGES CHARACTERIZING SEX DIFFERENTIATION IN HIMALAYAN PRAWN, *MACROBRACHIUM DAYANUM*

Apurva Sharma¹, Seema Langer² and Nipoon Sharma³

Department of Zoology, University of Jammu, Jammu – 180006 (India)

ARTICLE INFO

Article History:

Received 16th March, 2016

Received in revised form 24th April, 2016

Accepted 23rd May, 2016

Published online 28th June, 2016

Key Words:

Breeding dress, *Macrobrachium dayanum*,
Brood chamber, Appendix masculina

ABSTRACT

The present communication is a small component of the study pertaining to the investigation on characteristic pattern of breeding dress of Himalayan Prawn *Macrobrachium dayanum* (Henderson 1893). During the sexually active phase, animal develops various morphometric characters that differentiate i) Reproductive active form from the inactive form and ii) Males from female. A special emphasis has been laid on the identification of characteristic feature like Appendix masculina, petasma and thelycum, brood chamber etc.

Copyright © Apurva Sharma et al., 2016, this is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original work is properly cited.

INTRODUCTION

Macrobrachium dayanum is a fresh water commercially important decapod (fig1). Decapod crustaceans represent a large diverse biological group with significant potential as aquaculture resource. The prawns along with other species provide the animal protein to a great number of people. This fact has been very well established that *M. dayanum* enjoys a culturable status (Jhingran 1991) and nutritionally stands at par with other culturable fishes and prawn species (Langer et al. 2004). However, a detailed study of their breeding dress characterization which is a prominent feature of this species has not been studied so far. The market value of *M. dayanum* is high and is highly preferred by the consumers as whole as well as dry powder (parween et al., 2003). The analysis of secondary sexual characters for sexual dimorphism in crustaceans began with Hartnoll (1978) who studied the relative growth of certain body structures for different brachyuran species. A number of studies on *Macrobrachium dayanum* in Jammu has so far been carried pertaining to their different aspects viz occurrence (Langer et al. 2002), nutrition (Langer et al., 2004a,b; Langer et al. 2008), food preferences (Bakhtiyar, 2008); gonadal cycle (Kailoo, 1984; Jyoti and Kailoo, 1985; Malik, 2006; Sharma 2006; Samyal, 2007; Kant et al. 2016); fecundity, length weight relationships (Langer et al., 2013); morphometry (Langer et al. 2009); taxonomy and population dynamics (Chalotra 2002, Sharma 2013); colouration (kant 2014).

Sexual dimorphism is used to differentiate the males and females along with mature and immature population in many decapods, which shows sexual dimorphism in maturity stages (Pinheiro & Fransozo, 1998).

MATERIAL AND METHODS

The live specimens of *Macrobrachium dayanum* were collected from their natural habitat in Gho-Manhasan stream of Jammu city (32 67° latitude N), (74 79 longitude E). Collection was made with the help of sweep net during morning hours. The Gho-Manhasan stream was chosen because of easy access and availability of prawn in abundance. The entrapped specimens were transferred from sweep net to buckets filled with stream water. The buckets were then brought to departmental laboratory where they were kept at room temperature for acclimatization and fed on artificial feed. Numerical & morphometric measurements were made.

RESULT AND DISCUSSION

On the basis of monthly morphometric data it was observed that males attain larger body size in terms of length increment as well as weight parameters as compared to females. The maximum size observed in males was 6.0cm while in females it was 5.8cm to the maximum. The mean size range data as observed is shown in table 1 and graph 1. Similar results have also been reported by Koshy (1971), Mantellato & Barbosa (2005) in *Macrobrachium brasiliense*, Langer et al. (2009) & Sarkar et al. (2012) in *Macrobrachium dayanum* and Bauer et al. (2014) in *Cinteorhynchus shrimp* sps. Contrasting results

*Corresponding author: Apurva Sharma

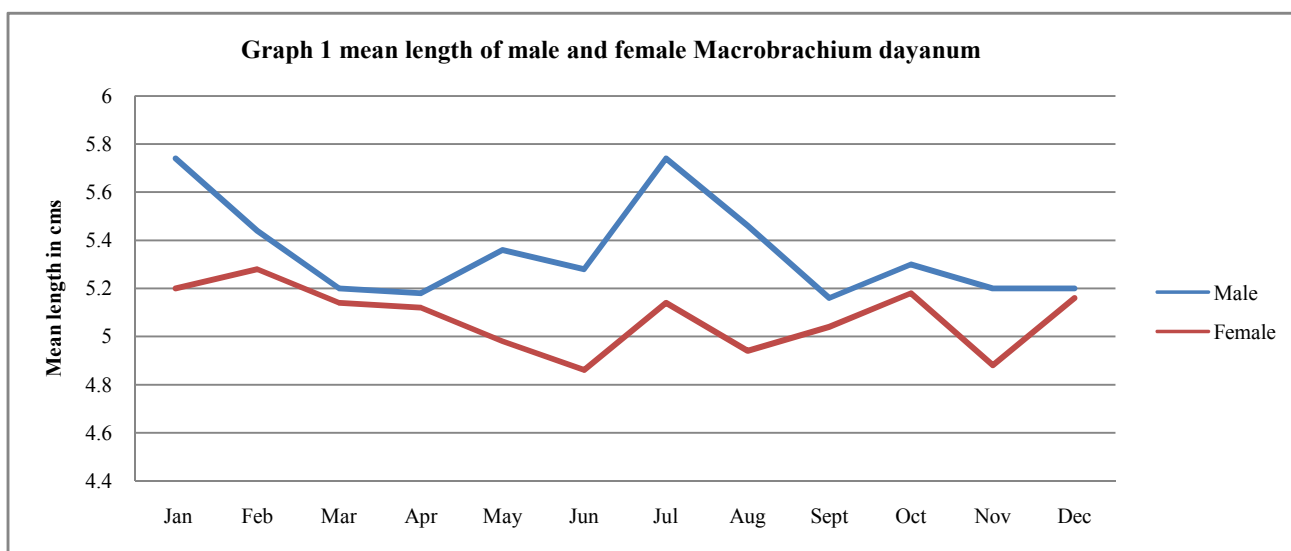
Department of Zoology, University of Jammu, Jammu – 180006 (India)

however, are on record wherein females have been reported to attain mean larger size than males as has been witnessed by Paschoal et al. (2013) in *Palaemon panadaliiformis* in north east of Brazil, Yamada et al. (2007) in *Trachysalambria curvirostris* in Tokyo bay & Rosenthal (2012) in shrimp *Betaeus lilianae*.

The present study is in accordance with the earlier findings of King & Moffitt (1984) in tropical deep water shrimps, Almeida et al. (2010) in fresh water shrimp *Atya scabra* from Brazil. Nagamine & Knight (1980), Sandifer & Smith (1985) came with the similar findings in Malaysian prawn, *Macrobrachium rosenbergii* and some fresh water prawns.

Table 1 showing monthly variations in size (in cm) of male and female of *Macrobrachium dayanum* during the study period.

Month	Male			Female		
	Minima	Maxima	Mean(SD)	Minima	Maxima	Mean(SD)
Jan.	5.4	6.0	5.74± 0.24	4.4	5.7	5.2± 0.40
Feb.	4.9	5.8	5.44± 0.37	4.3	5.5	5.28± 0.31
Mar.	4.6	5.7	5.2±0.48	4.7	5.6	5.14± 0.43
Apr.	4.4	5.9	5.18± 0.70	4.4	5.6	5.12± 0.69
May	4.5	5.8	5.36± 0.53	4.5	5.5	4.98± 0.54
Jun.	4.8	5.6	5.28± 0.31	4.7	5.5	4.86± 0.40
July	5.4	6.0	5.74± 0.24	4.4	5.3	5.14± 0.36
Aug.	5.0	5.8	5.46± 0.32	4.3	5.6	4.94± 0.43
Sept.	4.5	5.7	5.16± 0.49	4.2	5.8	5.04± 0.46
Oct.	4.8	5.7	5.3± 0.33	4.5	5.6	5.18± 0.40
Nov.	4.7	5.7	5.2± 0.43	4.8	5.6	4.88± 0.54
Dec.	4.5	5.7	5.2± 0.48	4.6	5.6	5.16± 0.61



Graph 1 Showing monthly variations in mean length of male and female *Macrobrachium dayanum*

Appendix masculina is the most prominent and consistent secondary sexual character for males (fig 2). Appendix masculina, a slender structure adjacent to appendix interna on the median side of endopodite occurs on the second pleopod of males where as it is absent in females. It is located between the endopodite and appendix interna.



Fig 1 Showing specimen of *Macrobrachium dayanum*

Present findings on *M. dayanum* is first report in this regard.

The petasma in males and thelycum in females represent the principal sexual characteristics (fig 3&4). The petasma in males is present in the abdominal region and formed by the modification of the right and left endopodite of the first pair of pleopods.



Fig 2 Showing Appendix Masculina



Fig 3 Showing Petasma in Male

It is an elongated structure with expanded middle portion while the thelycum in female is a small anterior median longitudinal ridge between the 4th and 5th periopods. Similar results were also reported by Babu & Manissery (2008); Burukovskjii (1980); Nagamine & knight (1980); King and Moffitt (1984); Correa & Theil (2003); Unis & Erkan(2012). The role of petasma and thelycum are not understood properly and presumably petasma is of significance in insemination Bauer (1996).

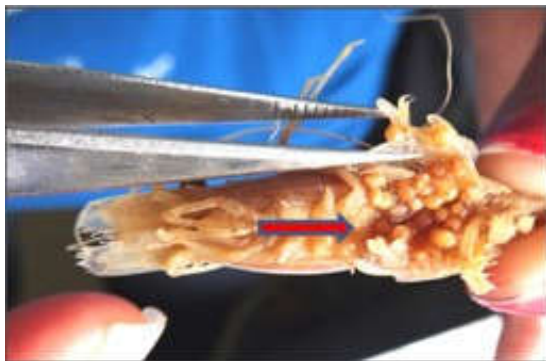


Fig 4 Showing Thelycum in Female

Brood chamber is exclusively sexual dimorphic character for females formed by the 1st, 2nd & 3rd abdominal pleurae (fig 5). Brood chamber is formed by the widely spaced pleopods in females while in males pleopods are closely arranged as brood chamber has no role to play in males and hence absent. Similar results were observed by Antheunisse *et al.* (1968), Nagamine & Knight (1980), & Habashy (2010).



Fig 5 Showing Brood chamber in female

The basal segments of pleopods, especially first three pairs were provided with enlarged soft long setae called ovigerous setae which bear the eggs. These setae are short or absent in males but present in numerous amount during breeding season

in females. Some of the ovigerous setae are not permanently present as they appear in numerous number during breeding season only in mature females (fig 6). Similar results were observed by Rajyalakshmi(1980) in *Macrobrachium malcolmsonii*, Nagamine and knight (1980) in *Macrobrachium rosenbergii*, Bauer (1986) in shrimp *Thor Manningi*; Yamane *et al* (2003) in *Macrobrachium nipponense*; Habashy (2010) in *Macrobrachium rosenbergii*. Similar studies in *Macrobrachium dayanum* are however, lacking and therefore undertaken during present investigation.

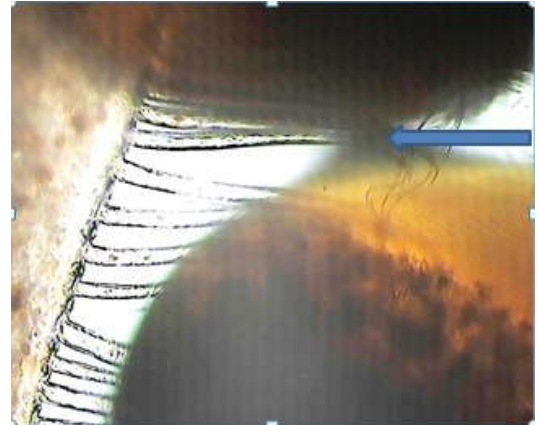


Fig 6 Microscopic view showing Ovigerous Setae holding eggs in Female

Thus various morphometric parameters which characterize the sexual dimorphism in *M.dayanum* are:

- Large sized males as compared to female.
- Presence of appendix masculina associated with appendix interna of second pleopod
- Presence of petasma and thelycum in male and females respectively.
- Formation of brood chamber by 1st, 2nd and 3rd pleopod in females for bearing developing eggs.
- Presence of large number of setae especially on first three pair of pleopods to bear eggs during spawning season.

References

- Almeida, A.O., Mossolin, E.C. and Luz, J.R. 2010. Reproductive Biology of the Freshwater Shrimp *Atya scabra* (Leach, 1815) (Crustacea: Atyidae) in Ilheus, Bahia, Brazil. Zoological Studies 49(2):243-252.
- Antheunisse, L J., Van den Hoven, N. P. and Jefferies D.J. 1968. The breeding characters of *Palaemonetes varians* (Leach) (Decapoda, Palaemonidae). Crustaceana, Leiden, 14: 259-270.
- Bakhtiyar, Y. 2008. Food preferences of *Macrobrachium dayanum* (Henderson) and *Labeo rohita* (Hamilton) and nutritional status and culture of food organisms. Ph.D. Thesis, University of Jammu.
- Bauer, R.T. 1986. Sex change and life history pattern in the shrimp *Thor manningi* (Decapoda: Caridea): A novel case of partial protandric hermaphroditism, Biol. Bulletin, 170, 11-31
- Bauer, R.T.1996. Role of the Petasma and Appendices Masculinae during copulation and insemination in the penaeoid shrimp, *Sicyonia dorsalis* (Crustacea:

- Decapoda: Dendrobranchiata. Invertebrate Reproduction and Development, 29:3 173-184
- Bauer, R.T., J. Okuno, and M. Thiel. 2014. Inferences on mating and sexual systems of two Pacific *Cinetorhynchus* shrimp (Decapoda, Rhynchocinetidae) based on sexual dimorphism in body size and cheliped weaponry. *Zoo keys* 457: 187-209.
- Chalotra, R. K. 2002. Studies on early life history of fresh water Prawn, *M. dayanum*. M.Phil. Thesis, Jammu University, Jammu.
- Correa, C. and Thiel M. 2003. Mating systems in caridean shrimp (Decapoda: Caridea) and their evolutionary consequences for sexual dimorphism and reproductive biology. *Revista Chilena de Historia Natural* 76: 187-203.
- Dineshbabu, A.P and Manissery J.K 2008. Reproductive biology of ridgeback shrimp *Solenocera choprai* (Decapoda, Penaeoidea, Solenoceridae) off Mangalore coast, South India. *J. Fisher. Sci.* 74:796-803.
- Habashy, M.M. 2010 On the breeding behavior and reproduction of the freshwater prawn, *Macrobrachium rosenbergii* (Decapoda-Crustacea) under laboratory conditions *African J. Biol. Sci.*, 6 (2): 63-73
- Hartnoll, R. G. 1978. The determination of relative growth in crustacean. *Crustaceana*, 34(3): 281-293.
- Jhingran, 1991. Fish & fisheries of India, 3rd edition. Hindustan Publishing Corporation, Delhi (India).407-727.
- Jyoti, M.K, Kailoo, U.C. 1985. Spawning season of *M. dayanum* Henderson Inhabiting Jammu waters, India. *Zoologica Orientalis Z*: 45-48.
- Kailoo, U.C. 1984. Studies on systematics and reproductive biology of freshwater prawns of Jammu waters. M. Phil. Thesis, Jammu University.
- Kant, K.R, Gupta, K, Langer, S, Angral, C. 2016. Studies on ovarian development of freshwater prawn *Macrobrachium dayanum* (Henderson). *International Journal of Fauna and Biological Studies*.; 3(1): 117-120
- Kant, K.R, Langer, S, Gupta, K.2014.Effect of eye-stalk ablation on coloration in prawn *macrobrachium dayanum*. *Journal of international academic research for multidisciplinary* 2(4):445-451.
- Koshy, M. 1971. Studies on the sexual dimorphism in the freshwater prawn *Macrobrachium dayanus* (Henderson, 1893) (Decapoda, Caridea) Part I. *Crustaceana*, 21: 72 – 78.
- Langer, S., chalotra, R. and Kour, T. 2002. The occurrence and description of male morphotypes of *Macrobrachium dayanum*. *J. Anim. Morphol. Physiol.*, 49(1&2): 49-54.
- Langer, S., Kour, T. and Bakhtiyar, Y 2004a Studies on the effect of varying levels of dietary protein on growth and survival of freshwater prawn *Macrobrachium dayanum*. *J. Aqua Biol.*, 19(1): 187-191.
- Langer, S., Kant, K.R. and Koul, S. 2013. Fecundity length weight relationship and sex ratio in Freshwater prawn *Macrobrachium dayanum* from Gho- Manhasan stream, Jammu, Jammu & Kashmir, India. *International Journal of Scientific Research*, 2(7): 533-534.
- Langer, S., Kumari, A., Bakhtiyar, Y., and Samyal, A. 2009 Studies on the Morphometry of *Macrobrachium dayanum* (Decapoda, Palaemonidae), *Biosciences, Biotechnology Research Asia* .:1 6 (1) , 131-138.
- Langer, S., Kour, T., Chalotra, R., 2004b, Effect of different dietary protein level on the growth of post larvae of the freshwater Prawn, *M. dayanum*. *Applied Fisheries and Aquaculture*, 4 (1): 34-36.
- Langer, S., Manhas, M. and Bakhtiyar, Y., 2008. Studies on the biochemical composition of *Macrobrachium dayanum* and *M. kistensis*. *U.P.J. Zool.*, 28(2): 211-214.
- Malik, N., 2006. Studies on female Reproductive system of *Macrobrachium dayanum* (Henderson). M.FSc. Dissertation, Submitted to Directorate of Distance Education, University of Jammu.
- Mantellato, F. and L. Barbosa. 2005. Population structure and relative growth of freshwater prawn *Macrobrachium brasiliense* (Decapoda, Palaemonidae) from Sao Paulo State, Brazil. *Acta Limnol. Brasil.* 17: 245-255
- Michael G. King and Robert B. Moffitt 1984. The Sexuality of Tropical Deepwater Shrimps (Decapoda: Pandalidae). *Journal of crustacean biology.* 4(4):567-571
- Nagamine, C. M. and Knight, A. W, 1980. Development, maturation, and function of some sexually dimorphic structures of the Malaysian prawn *Macrobrachium rosenbergii* (De Man) (Decapoda, Palaemonidae). *Crustacea* 39, 141-152.
- Parween, S. Ahsan, M.K., Ali, A.A., Rahman, S.R. and Hossain, M.A. 2003 Distribution and production potentiality of the small prawn species in the Greater Rajshahi District. Proceeding of the BAU-DANIDA/ENRECA SIS workshop on Potentials of Small Indigenous spp. of Fish (SIS) in Aquaculture and Rice-field stocking for Improved Food & Nutrition Security in Bangladesh. BAU, Mymensingh, 30-31, October, 2002. M.A. Wahab, S.H. Thilsted, & M.E. Hoq (eds). pp. 97-101.
- Paschoal, L.R.P., Guimaraes, F, J. and Couto, E.C.G. 2013. Relative growth and sexual maturity of the freshwater shrimp *Palaemon pandaliformis* (Crustacea, Palaemonidae) in northeastern of Brazil (Canavieiras, Bahia). *Iheringia, Serie Zoologia, Porto Alegre* 103: 31-36.
- Pinheiro, M.A.A. and Fransozo, A. 1998. Sexual maturity of the speckled swimming crab *Arenaeus cribrarius* (Lamarck, 1818) (Decapoda, Brachyura, Portunidae), in the Ubatuba littoral, Sao Paulo State, Brazil. *Crustaceana*, 71(4): 434-452.
- Rosenthal, A.F. 2012. Differences Between Morphological Andphysiological Size At Maturity Of The Shrimp *Betaeus Lillianae* Boschi, 1966 (Decapoda, Alpheidae) And Its Relationship With Mating Strategies Thalassas, 28 (1): 19-31An International Journal of Marine Science.
- Samyal, A. 2007. Seasonal dynamics in biochemical composition of muscles, hepatopancreas and ovary of freshwater prawn, *Macrobrachium dayanum* (Henderson). M.Phil. Thesis, Jammu University.
- Sandifer, P.A. and Smith, T.I.J. 1985. Freshwater prawns. In: *Crustacean and Mollusc Aquaculture in the United States* (ed. by J.V. Huner & E.E. Brown), pp. 63-125. AVI Publishing, Westport.

- Sarkar, I., Basu. A., Dutta, S. and Roy, S. 2012. Male mating tactics and mating activity in freshwater prawn, *Macrobrachium dayanum* (Henderson, 1893) Paleomonidae: Caridae. *International Journal of Aquatic Science*. 3(2),: 56-70
- Sharma, K. 2006. Studies on the male reproductive system of *Macrobrachium dayanum* (Henderson). M.F.Sc. Dissertation, Directorate of Distance Education, University of Jammu
- Sharma, N. 2013. Taxonomy and population dynamics of freshwater prawns inhabiting some Jammu waters. M.Phil, Thesis, Jammu University.
- Unis, C., and Erkan, M.B. 2012. Morphology and development of the female reproductive system of *Astacus leptodactylus* (Eschscholtz, 1823) (Decapoda, Astacidae). *Turkish Journal of Zoology*, 36(6), 775-784.
- Yamada, R., K. Kodama., T. Yamakaw., T. Horiguchi, and I. Aoki. 2007. Growth and reproductive biology of the small penaeid shrimp *Trachysa lamkria curvirostris* in Tokyo Bay. *Marine Biology* 151: 961-971.
- Yamane.T., Hiraishi.T., and Yamaguchi.Y. 2003. Differences in the external shape of the pleopods of *Palaemon paucidens* and *Macrobrachium nipponense* in terms of swimming ability. *Fisheries Science*.69, 1103-1108.

How to cite this article:

Apurva Sharma *et al.* 2016, Description of Appendages Characterizing sex Differentiation In Himalayan Prawn, *Macrobrachium Dayanum*. *Int J Recent Sci Res*. 7(6), pp. 12071-12075.

T.SSN 0976-3031



9 770976 303009 >