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Gonadal cycle of freshwater crab *Paratelphusa masoniana* (Henderson) of Gho-manhasan stream a tributary of river Chenab, J&K state, India

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Abstract

The gonadal cycle of freshwater crab *Paratelphusa masoniana* (Henderson) has been studied in the lower reaches of river Chenab. Paratelphusa masoniana (Henderson) is a seasonal breeder that breed twice in a year (June-July and December- January). These crabs exhibits well marked seasonal variation that can be depicted on the basis of colour and size of gonads. The gonadal cycle of these crabs has been studied on morphological basis of gonads only. In males the gonads shows variation with respect to size of the body while in females they exhibits variation both with respect to body size as well as seasonal variation.

Introduction

Crabs are the most advanced members of the phylum Arthropoda belonging to order decapoda and suborder brachyuran. Freshwater crabs like marine counterpart exhibits well marked sexual dimorphism (Nayan *et. al*, 2007). In india most of work has been done on marine crabs (Shanmugham and Bensam, 1980, Parsad and Neelakantan, 1989 and Sukumaran and Neelakantan, 1996) and very few literature available on freshwater crabs. In J&K state where freshwater is the only source of aquatic fauna and people mostly rely on fishes as food thus freshwater crabs can contribute as one of the main food item due to its high nutritional value (Manhas, 2012). Crabs shows stepped development and their gonads exhibit well marked seasonal cycle that can be determine either on morphological basis (Shanmugham and Bensam, 1980) or morphological basis (Sigana, 2002) or by both (Rasheed and Mustaquim, 2010). Morphological changes of gonads corresponded to physiological changes (Wild, 1983). In J&K state very scanty work has been reported on freshwater

crabs *P. masoniana* (Henderson) and that too confine to nutritional value (Manhas, 2012) & parasitic infection (Anjuman, 2012) and no work has been reported on gonadal cycle. As morphological gonadal variations indicates the histological changes thus presently an attempt has been made to study the gonadal cycle of these crabs on morphological basis. The present study will support the aquaculture of these crabs and thus will generate an economy for unemployed people.

Material and methods

Studies was carried carried out in lower reaches of river Chenab in Jammu region of J&K state. Crabs were collected by using drag net, segregated sex wise and brought to the laboratory. Size of the crabs were determine by using varnier calliper scale. Some crab of different class size were deep freezed and other release in the river. The deep fridge crabs were washed and dissected out and the morphology of gonads (colour and size) of crabs belonging to different class size were recorded on monthly basis.

Results

Morphological observation of gonads of both males and female crabs were found to exhibit seasonal variation in their size and colour (table 1, fig. 1-6). It is evident from this table that in presently studied crabs the colour and size of testis in males and ovaries in females of size 2-3 cm cw was observed to be transparent/yellow in colour throughout year and occupied approximately $1/6^{th}$ of body cavity (fig. 1 &4). Females and males of 3-4 cm cw, however, exhibited some differences in their respective gonads. Testis in males now were observed to be creamy white (fig.2). Crabs of this size, however, never witnessed any further change and rather remained as such throughout year. In females on the other hand the ovaries of crabs of 3-4 cm remained transparent throughout year except during June–July and December–January when they were observed to acquire yellowish red colour (fig. 4). Both testis and ovaries in these 3-4 cm cw crabs now occupied $1/4^{th}$ of body cavity. Compared to this the crabs having size 4-5cm cw and above had milky white testis (fig. 3) & were observed to occupy full length of cephalothoracic cavity in males. In females the ovaries exhibited conspicuous changes i.e. they now became orange red coloured (fig. 6) during June–July and December–January.

Form the above observation on gonadal size and colour it can be very emphatically deduced that of (a) gonads of females of 4-5 cm cw in contrast to males of same size exhibit clear cut seasonal variations in size, colour and the extent of body cavity they occupy during June–July and December–January (b) testis, though exhibit variation in size but they almost were observed to be creamy white throughout year.

However in females the gonads shows well marked variation with respect to size as well as season also. Seasonal changes in ovarian size, the space of

body cavity they occupy and colour at different class size is given in table (1). It has been found that ovaries of female crabs of size>2-3 cm cw which exhibited transparent /yellowish colour and occupied $1/6^{th}$ of body cavity acquired yellowish red colour and now occupied $1/4^{th}$ of body cavity at 3-4 cm cw size.

Females at size 4-5 cm cw were observed to exhibit conspicuous seasonal variations in their ovaries as is evident from table 1. Ovaries which were transparent/yellowish during ending January typically represented immature stage. From here onward ovaries observed increase in their size during February-March and through continued increase acquired yellowish red colour during April-May. These ovaries have been presently designated as maturing stage. During month of June-July ovaries, continuing their pace of increase, appear fully extended occupying full length of cephalothoracic cavity and now were orange red in colour. These ovaries are typically representative of mature stage of ovarian development. From here onward ovaries were seen to again become flaccid during ending July simply to witness increase in size and become yellow/transparent in colour during August–September. Ovaries again acquire yellowish red colour during October-November to become deep orange occupying full length of cephalothoracic cavity during December – January.

The flaccid consistency of ovaries during August–September and February-March seemingly indicate that spawning as taken place and after it crabs again enter into next cycle. On the basis of these observations, it can be safely stated that these crabs of 4-5cm cw are exhibiting physiological maturity.

Based on morphology of gonads the different developmental stages of gonads were classified into three stages viz. Immature, maturing and mature (table 2).

Table 1: Monthly crab collection, class size and gonadal variation in both male and female crabs

Months	**Classsize (cms)**	**Total no. of crabs caught**		**Colour and size of gonads in males**	**Colour and size of gonads in females**
		Males	**females**		
Jun.	2 – 3	0	0	-	-
	3 – 4	8	8	Creamy white occupying $1/4^{th}$ of c.th. cavity	Yellowish red; occupying $1/4^{th}$ of *c.th. cavity.
	4 – 5	14	12	Milky white occupying full c.th. cavity	Orange red; occupying full c.th. cavity.
	5 – 6	25	0	Milky white occupying full c.th. cavity	-

	6 – 7	2	0	Milky white occupying full c.th. cavity	
Jul	2 – 3	0	0	-	-
	3 – 4	6	5	Creamy white occupying 1/4th of c.th. cavity	Yellowish red; occupying 1/4th of c.th. cavity
	4 – 5	7	14	Milky white occupying full c.th. cavity	Orange red; occupying full c.th. cavity.
	5 – 6	10	4	Milky white occupying full c.th. cavity	Orange red; occupying full of c.th. cavity.
	6 – 7	0	0		
Aug.	2 – 3	2	5	Transparent/ creamy white occupying 1/6th of c.th.cavity	Transparent/yellow; occupying 1/6thc.th. cavity.
	3 – 4	4	8	Creamy white occupying 1/4th of c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity.
	4 – 5	3	11	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	5 – 6	5	0	Milky white occupying full c.th. cavity	-
	6 – 7	0	0	-	-
Sep.	2 – 3	1	4	Transparent/ creamy white occupying 1/6th of c.th.cavity	-
	3 – 4	3	6	Creamy white occupying 1/4th of c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	4 – 5	5	9	Milky whsite occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	5 – 6	6	3	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	6 – 7	0	0	-	-
Oct.	2 – 3	0	0	-	
	3 – 4	3	5	Creamy white occupying 1/4th of c.th. cavity	yellowish red; occupying 1/4thc.th. cavity

	4 – 5	5	16	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	5 – 6	8	4	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	6 – 7	0	0	-	-
Nov.	2 – 3	0	0	-	-
	3 – 4	3	9	Creamy white occupying 1/4th of c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	4 – 5	7	12	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	5 – 6	8	3	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	6 – 7	0	0	-	
Dec.	**2 – 3**	0	0	-	
	3 – 4	8	7	Creamy white occupying 1/4th of c.th. cavity	Yellowish red; occupying 1/4th of c.th. cavity
	4 - 5	13	17	Milky white occupying full c.th. cavity	Orange red occupying full c.th. cavity
	5 – 6	22	3	Milky white occupying full c.th. cavity	Orange red occupying full c.th. cavity
	6 - 7	2	0	-	-
Jan.	**2 – 3**	0	0	-	-
	3 – 4	7	5	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4th of c.th. cavity
	4 – 5	8	6	Milky white occupying full c.th. cavity	Orange red occupying 1/4th of c.th. cavity
	5 – 6	12	4	Milky white occupying full c.th. cavity	Orange red occupying 1/4th of c.th. cavity
	6 - 7	0	0	-	-
Feb.	**2 – 3**	0	0	-	-
	3 – 4	2	10	Creamy white occupying 1/4th of c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity

	4 – 5	4	12	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	5 – 6	10	6	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	6 – 7	0	0	-	-
Mar.	**2 – 3**	0	0	Transparent / creamy white occupying 1/4th c.th. cavity.	-
	3 – 4	4	12	Creamy white occupying 1/4th of c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	4 – 5	5	14	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	5 - 6	7	5	Milky white occupying full c.th. cavity	Transparent/yellow; occupying 1/6thc.th. cavity
	6 - 7	4	0	-	-
Apr.	**2 – 3**	0	0	-	-
	3 – 4	4	10	Creamy white occupying 1/4th of c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	4 - 5	7	16	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	5 – 6	9	7	Milky white occupying full c.th. cavity	Yellowish red colour; occupying 1/4hc.th. cavity
	6 – 7	0	0	-	-
May	**2 – 3**	0	-	Transparent/ creamy white occupying 1/6th of c.th.cavity	-
	3 – 4	7	6	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	4 – 5	5	19	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	5 – 6	8	5	Milky white occupying full c.th. cavity	Yellowish red; occupying 1/4thc.th. cavity
	6 – 7	0	0	-	-

Table 2: Stages of sexual maturity of crab based on their morphology of their Gonads.

Stages	Testis	Ovaries
Immature	Transparent/creamy in colour, occupying 1/6th of body cavity.	Transparent/ creamy in colour;occupying 1/6th of body cavity.
Maturing	Creamy white; occupying 1/4th of body cavity	Pink; occupying 1/4th of body cavity
Mature	Milky white; occupying full body cavity	Orange red; occupying full body cavity

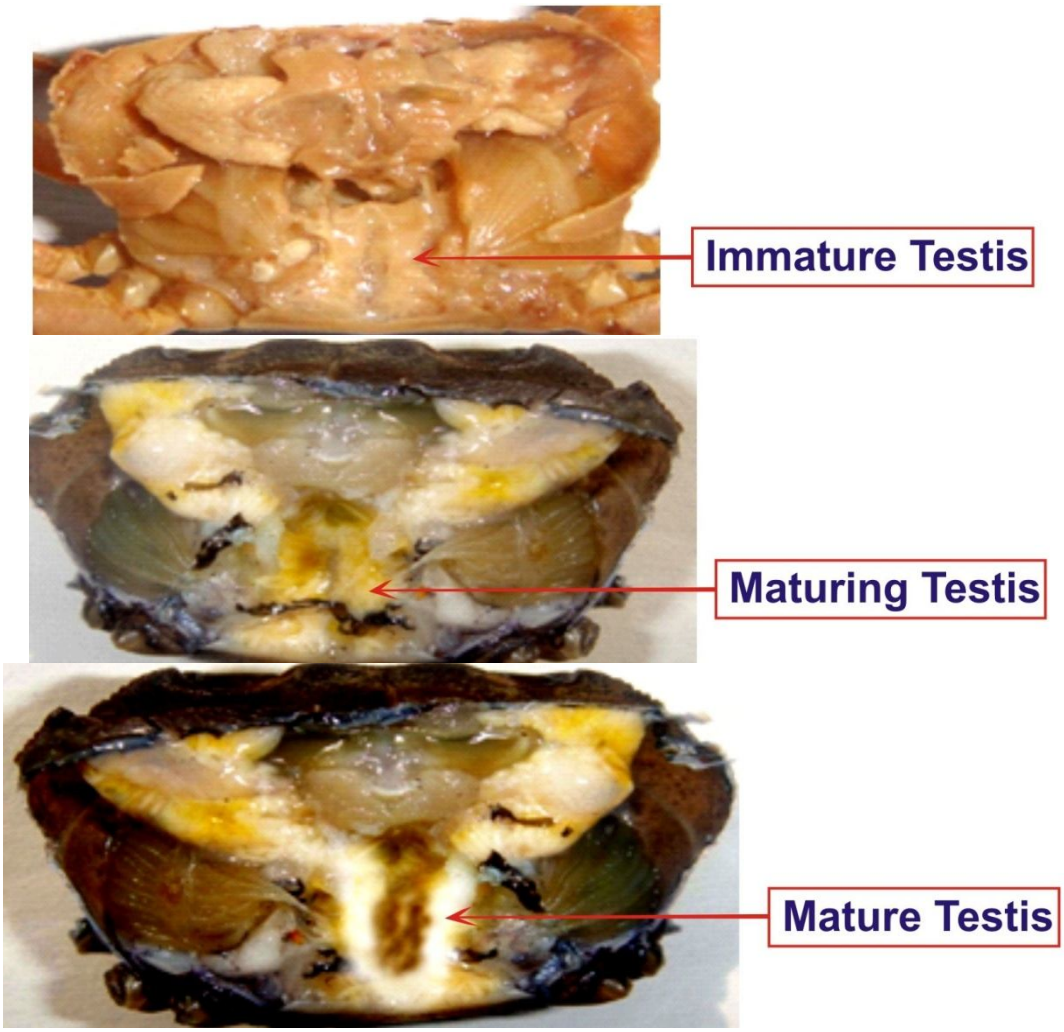

Fig. 1-3 Showing different stages of Gonadala development in male *Paratelphusa masoniana* (Henderson)

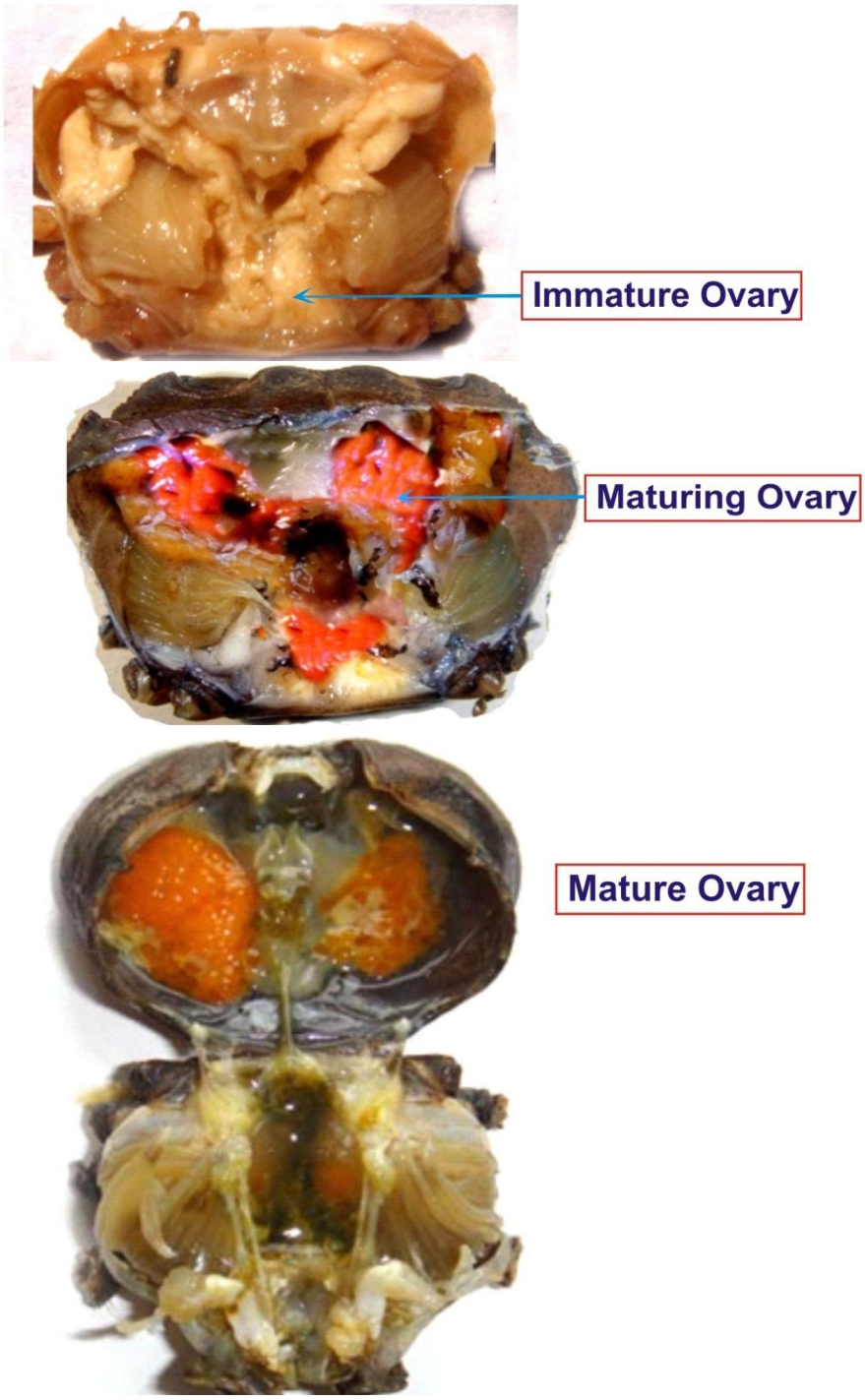

Figure 4-6

Discussion

Crabs can be seasonal or continuous breeder and thus seasonal breeder crabs shows well marked gonadal cycle compared to continuous breeder. Studies on gonadal cycle on the basis of their morphological studies have been carried out by many workers (Pillay and Ono, 1978; Wild, 1983; Parsad and Neelkantan, 1989; Onyano, 1995 and Castiglioni & Fransozo, 2006). Parsad and Neelakantan (1989) while working on crab *Scylla serrata* observed that the gonads of these crabs exhibits change in both colour as well as size in different class size. Further based on the morphology of gonads they identified four developmental stages of the ovaries which were recognised on the basis of colour changes. Seemingly Onyano (1995) in case of crab *Thalamita chaptali* reported the variation of colour and size of gonads at different stages of development. Based on the morphology of gonads they identified three stages of gonads in crab *T. chaptali*. They reported that colour in gonads of these crabs was ranged from creamy white to yellow to brown which is in contrast to the under studied crabs.

Present work is in tune with shanmugham and Bensan (1980) who while studying morphology of gonads of crabs *Scylla serrata* reported that the gonads shows well marked seasonal variation. They held that in case of males the gonads shows variation with respect to size only and the colour of these gonads varied from transparent to creamy white to milky white while in females it varies from transparent to pink to orange.

The female crabs attain gonadal maturity at comparatively smaller class size (3-4 cm cw) then males (4-5) that may be attribute to the reason that female crabs have to spend large amount of energy in their gonadal cycle than for somatic growth as in case of males. Similar to present findings may workers (Diaz & Conde, 1989; Greco, 2000 and Mantelato, 2003) also held that since females have to spent most of energy in the gonadal cycle and incubation of eggs so they attain gonadal maturity comparatively at smaller size than male counterpart.

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