



STUDIES ON SOME REPRODUCTIVE ASPECTS AND GONADAL MATURATION IN FRESHWATER CRAB, *BARYTELPHUSA GUERINI*

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ABSTRACT:

Decapod crustaceans like crab, prawn, lobster and some molluscs are commercially important as they are with high nutritional value. In the present investigation, the reproductive cycle of freshwater crab, *Barytelphusa guerini* was studied by measuring percentage of different reproductive phases of male and female crab. The annual reproductive cycle of the crab, *Barytelphusa guerini* was studied during the year 2015 by observing the colour of gonads, calculating gonad index and measuring carapace length. The gonads of the most individuals attained sexual maturity and spawning began in the months of June and July. The ovarian index is ranged between 0.789 ± 0.19 to 4.872 ± 0.022 . The testis index was ranged between 0.457 ± 0.003 to 2.459 ± 0.015 . The colour of the gonad varies in different reproductive phases.

Keywords: *Barytelphusa guerini*, reproductive stage, carapace length, gonad index.

INTRODUCTION:

The process of reproduction is essential for the continuation of life. The reproductive phenomenon can be examined in terms of molecular, cellular, physiological, and behavioral adaptations of individual to its environment. The annual reproductive cycle can be divided into pre-reproductive, reproductive and post reproductive stages. In accordance with the sequence of happening of each event, and this determines the pattern of breeding cycle i.e. semi-annual, bi-annual or continuous breeding (Giese and Pearse, 1974). Mirajkar (1980) studied breeding behaviour and factors affecting reproduction in freshwater prawn, *Macrobrachium kistnensis*.

In crustacean the carapace length is another parameter to ascertain the reproductive maturity. The morphological maturity related to carapace length in male crab, *Paralomis*

granulosa and its reproductive phase was inferred by observing the size and carapace length (Hoggarth, 1993). The carapace growth is an important indication of reproduction in male and female crabs. Ghorpade and Patil studied the length weight relationship and condition factor of *Barytelphusa cunicularis*.

Gonad index is a function of breeding cycle in marine, estuarine and freshwater crustaceans (Sarode and Patil, 2016). Giese (1959) formulated a relationship between gonad maturity and body weight.

MATERIAL & METHODS:

Freshwater crab, *Barytelphusa guerini* were collected from Shirsatwadi and Mohori Lake near Pathardi for the period from January to December 2015. The total number of male and female were counted. The crabs were towelled with blotting paper and were maintained in glass

troughs containing sufficient water. The animals were acclimated to the laboratory conditions for two to three days.

The carapace length (CL) was measured from the posterior margin of the orbit to the midpoint of the posteriodorsal margin of the carapace. The CL was measured with the help of vernier caliper, scale nearest to 0.01 millimetre. The percentage of immature, maturing, matured male and females were calculated. The colour of ovary and testis was also noted and then carefully transferred to previously weighed aluminium foil-pan.

The wet weight of gonads was recorded and the gonad index in male and female was calculated by following formula (Giese, 1959)

$$\text{Gonad index} = \frac{\text{Wet weight of the gonad}}{\text{Wet weight of the animal}} \times 100$$

RESULTS & DISCUSSION:

The observations revealed that the reproducing females and males of *Barytelphusa guerini* were found throughout the year. The percentage of different reproductive phases of female crab is represented in (Fig 1). The increase in percentage of matured male and female crab was related to reproductive season. The maximum percentage of immature female crab was observed in the month January. The percentage of immature female was 49 in January 2015. The maximum percentage of maturing female crab was observed in the month May. The percentage of maturing female was 32 in May 2015. The maximum percentage of matured female crab was observed in the month July. The percentage of matured female was 66 in July 2015. The maximum percentage of spent female crab was observed in the month November. The percentage of spent female was 57 in November 2015.

Mature female crabs were recognized by their bulging abdominal pleopods. When the eggs

extruded gets attached to them with the help of sticky substances and opening of spermathecae were clearly seen.

The percentage of different reproductive phases of male crab *Barytelphusa guerini* is represented in (Fig 2). The maximum percentage of immature male crab was observed in the month January. The percentage of immature male was 50 in January 2015. The maximum percentage of maturing male crab was observed in the month September. The percentage of maturing male was 41 in September 2015. The maximum percentage of matured male crab was observed in the month August. The percentage of matured male was 58 in August 2015.

The carapace length of female crab *Barytelphusa guerini* was observed maximum in the month of September. The carapace length of female crab in September 2015 was 65.8 mm. The average carapace length for female ranged from 20.6 mm to 65.8 mm throughout the year (Fig.3). The carapace length of male crab *Barytelphusa guerini* was observed maximum in the month of September. The carapace length of male crab in September 2015 was 56.6 mm. The average carapace length for male ranged from 20.2 mm to 56.6 mm throughout the year (Fig.3).

In *Barytelphusa guerini* the gonad index values were high during the reproductive period. The gonad indices for female crab were observed maximum in the month of June and July. The ovarian index in the month of July 2015 was 4.872 ± 0.022 . The range of ovarian index was 0.789 ± 0.19 to 4.872 ± 0.022 , (Table 1). In male crab the testis index was highest in the month of June. The testis index in June 2015 was 2.459 ± 0.002 (Fig. 4).

The ovaries of *Barytelphusa guerini* are paired and located beneath the heart, dorsolateral to the alimentary tract, joined in the vicinity of the heart by a transverse bridge. Slightly behind the transverse bridge, the short, straight oviduct

descends from each lobe to the genital opening at the base of third walking leg. The ovary of *Barytelphusa guerini* like other decapods goes through changes in size and colour during its initial development to maturity and in succeeding cycles of vitellogenesis and oviposition.

The ovaries were creamy white when immature, later changed to bright yellow or light orange and lastly to a darker orange during vitellogenesis phase.

In crustacean's reproduction is known to dominate all other physiological process. Gangotri et al., (1978) reported the breeding period of *Barytelphusa guerini* extended from May to August. The freshwater crab *Candidopotamon rathbunae* is annual breeder. All these references indicated that the reproductive cycle of an animal mainly depends on its habitat where the animal is dwelling. In successful breeding cycle the surrounding conditions i.e. ecological parameters play an important role as well the reproductive hormones play a key role in the reproduction. Hence, the balance of reproductive hormones and environmental factors together leads to successful reproductive cycle of an animal.

In present investigation it was reported that the crab *Barytelphusa guerini* is an annual breeder. It has been observed that breeding season coincided monsoon season. During June to September maximum number of ovigerous females were observed and it revealed that breeding peak was correlated with maximum development of gonads in the crab. Similarly maximum number of males with full carapace growth was also observed in the month of June to September with maximum development of testis. Occurrence of matured males and females during June to September ultimately helped in successful breeding behaviour in these months. Similar reports have been cited in *Barytelphusa cunicularis* (Diwan 1971) and *Barytelphusa guerini* (Kengar 1998) however in *Uca annulipes*,

Portunus pelagicus and *Metapenaeus affinis* (Pillay and Nair 1971). In hermit crab *Clibanarium clibanarium* (Varadraj and Subramoniam, 1980), rainy season hampered the breeding activity, hence crustaceans showed reproductive activity in non- rainy season.

The carapace length considered as measure of sexual maturity in crustaceans. The observations on carapace length of male and female of *Barytelphusa guerini*, is supportive to confirm breeding cycle. The relationship between carapace length and maturity in crabs and prawns has been carried out by the many workers. The morphological maturity related to carapace length in male crab, *Paralomis granulosa* and its reproductive phase was inferred by observing the size and carapace length (Hoggarth, 1993).

In crustacean different stages of ovarian maturation classified on the basis of colouration. In immature female of *Barytelphusa guerini* ovary was white and translucent whereas in maturing it was yellowish and in matured crab the appearance of ovary was dark yellow or orange. Similar reports were cited in other crabs (Khapate, 1995). In male *Barytelphusa guerini* there was no distinct colour change in the testis however immature testes were transparent and mature testes were milky white. These colour changes clearly observed during reproductive phases of *Barytelphusa guerini*.

Gonadal index has been widely used as a measure to determine reproductive phase in many groups of crustaceans (Giese and Pearse 1974). When gonadosomatic index dropped, crab entered into reproductive season. In *Barytelphusa cunicularis* the maximum gonadal index was in January (Khapate 1995). In present investigation the gonad index values of *Barytelphusa guerini* showed that it is annual breeder. In female crab the gonad index was high in July and low in January whereas gonad index

of male crab was more in June and it was less in December. The variation in the period of maximum gonad indices of the crab in the present study and previous may be due to different hydrobiological conditions.

CONCLUSION:

The reproductive aspects of freshwater crab, *Barytelphusa guerini* was studied for a period of year 2015. i.e. January to December 2015. Various parameters such as percentage of immature, maturing and matured male and female, percentage of ovigerous females, carapace length for attainment of maturity, gonad index, were taken into consideration to conclude the reproductive activity.

The observations revealed that the reproducing females and males of *Barytelphusa guerini* were found throughout the year. Mature female crabs were recognized by their bulging abdominal pleopods. The carapace length of female and male crab *Barytelphusa guerini* was observed maximum in the month of September.

In *Barytelphusa guerini* the gonad index values were high during the reproductive period. The gonad indices for female crab were observed maximum in the month of June and July. The ovaries were creamy white when immature, later changed to bright yellow or light orange and lastly to a darker orange during vitellogenesis phase.

The knowledge of reproductive aspects of freshwater crab, *Barytelphusa guerini* will be helpful to aquaculture workers for culturing the species.

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Fig.1 Percentage of immature, maturing and matured females of *Barytelphusa guerini* for the period Jan 2015 to Dec 2015.

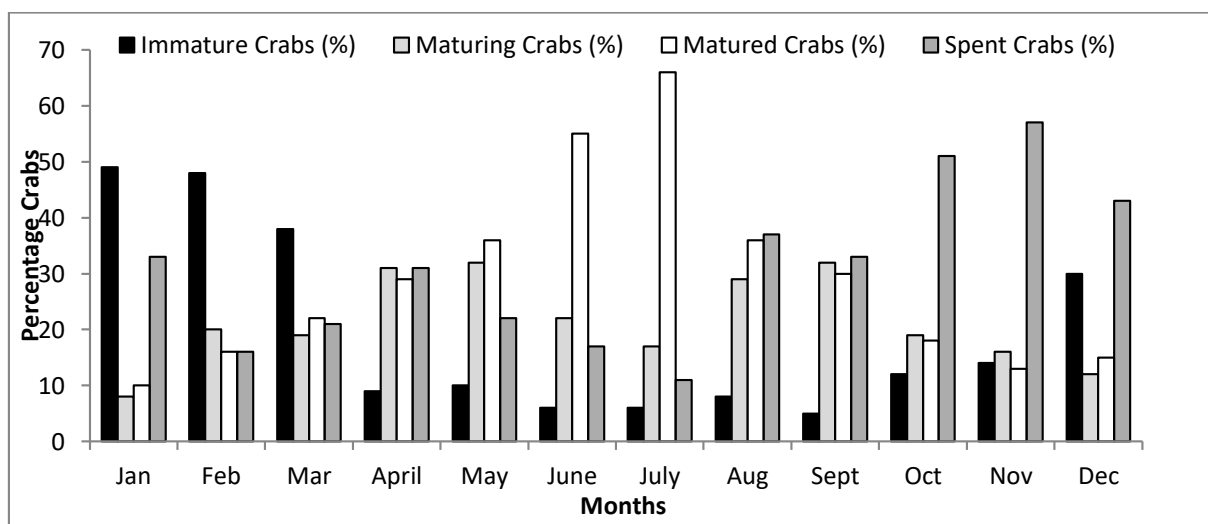


Fig. 2 Percentage of immature, maturing and matured males of *Barytelphusa guerini* for the period Jan 2015 to Dec 2015.

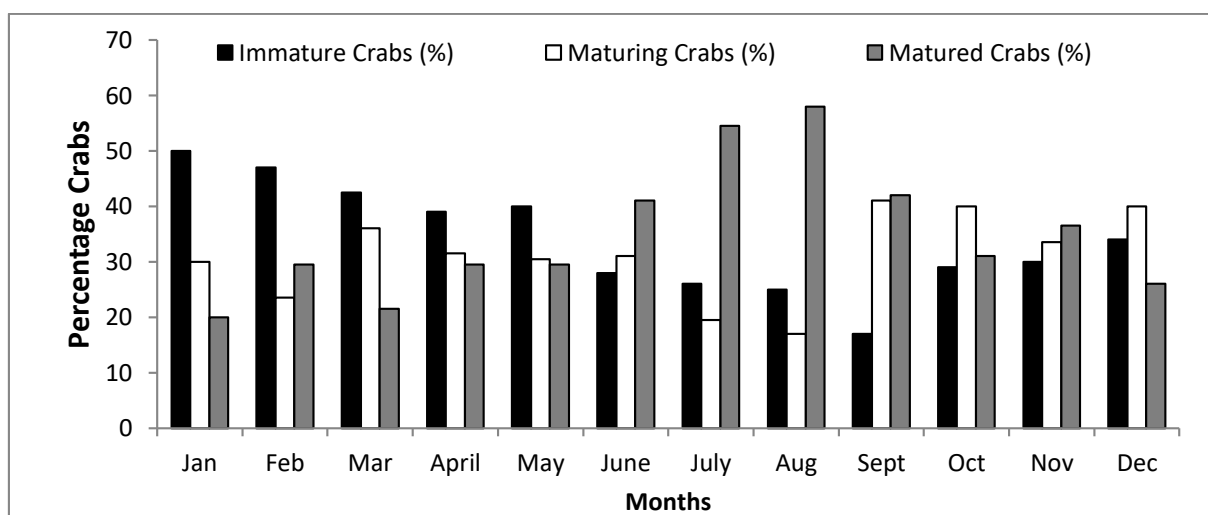


Fig. 3 Seasonal variation in the carapace length of *Barytelphusa guerini* for the period Jan 2015 to Dec 2015.

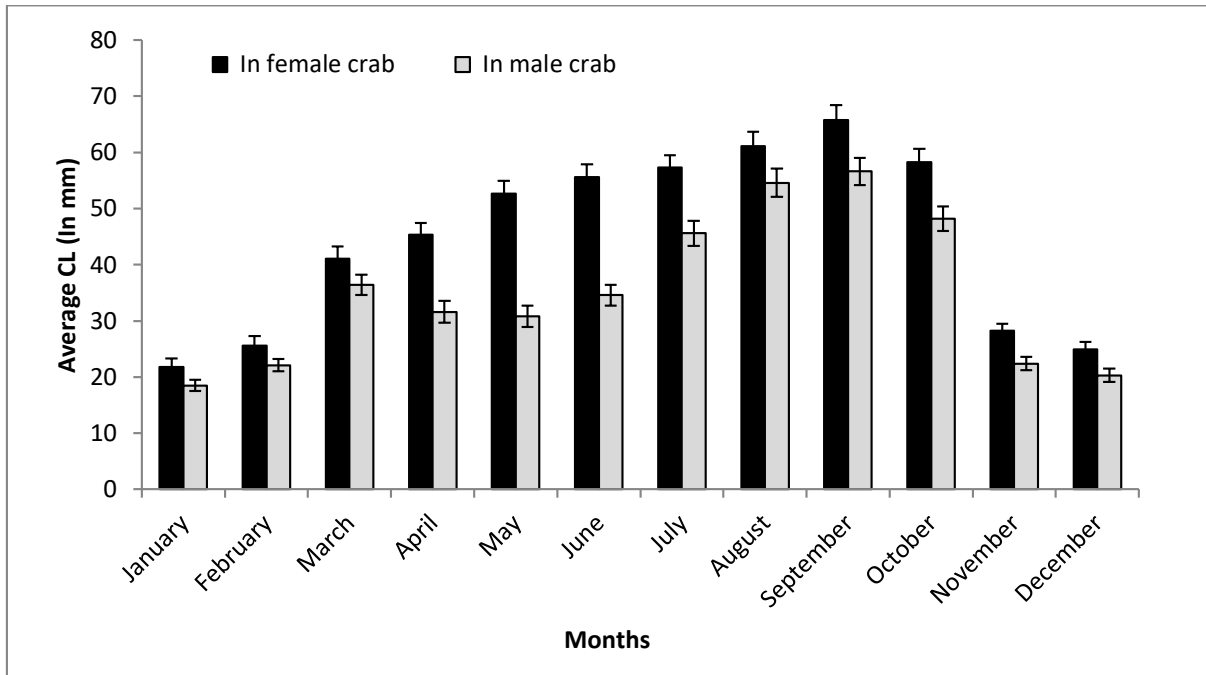


Fig 4 Seasonal variation in the testis index of *Barytelphusa guerini* for the period Jan 2015 to Dec 2015.

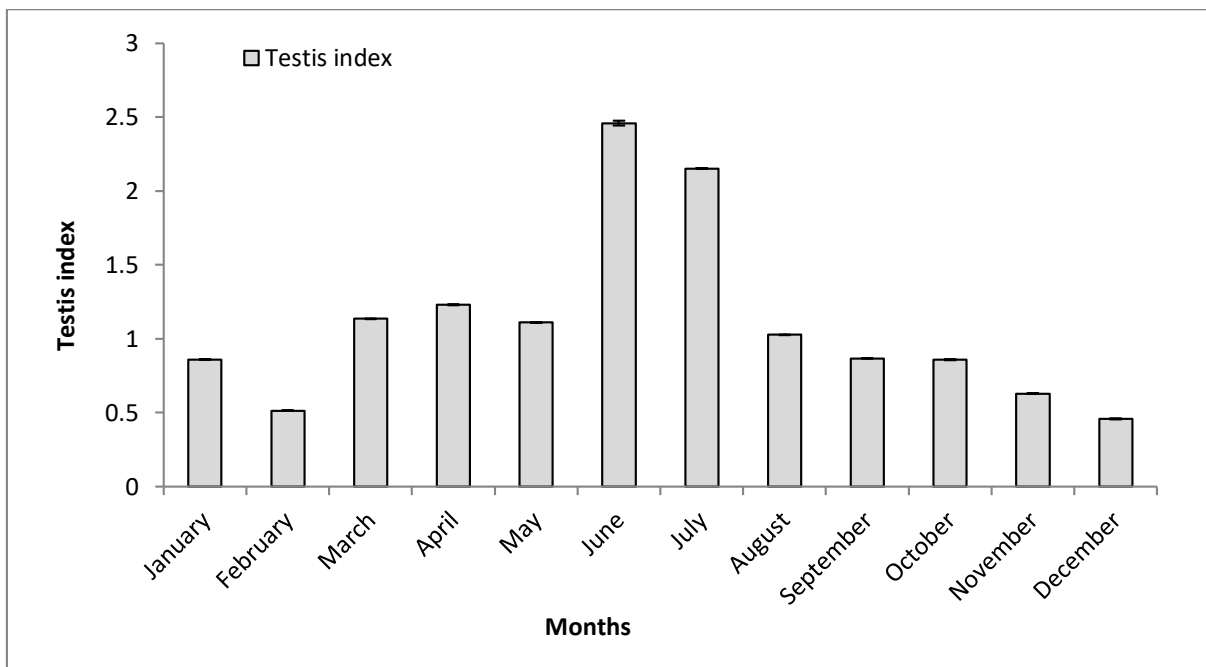


Table 1: Seasonal variation in the ovarian colouration and ovarian index of *Barytelphusa guerini* for the period Jan 2015 to Dec 2015.

Month and year	Colour of the Ovary	Ovarian index ± Std dev
January	White or pale yellow	0.789 ± 0.19
February	Yellowish white	1.584 ± 0.003
March	Yellowish white	1.872 ± 0.021
April	Yellow	1.930 ± 0.015
May	Dark yellow	2.033 ± 0.025
June	Dark yellow or orange	4.812 ± 0.031
July	Dark yellow or orange	4.872 ± 0.022
August	Yellowish red	2.568 ± 0.023
September	Yellowish brown	2.066 ± 0.021
October	Pale yellow	1.912 ± 0.004
November	White or pale yellow	1.419 ± 0.030
December	White or pale yellow	0.887 ± 0.020