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COMPARATIVE STUDIES ON REPRODUCTIVE CYCLE IN FRESHWATER CRUSTACEANS

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Abstract:- *The production of young ones which so important for continuation of life is called* ***reproduction.*** *If an individual of a species forget to reproduce, then the species become extinct. The reproductive cycles and the sexual periodicity of invertebrates belonging to different parts of the world have been dealt by many workers (Giese et al., 1964). Boolootian R. A. (1965) investigated the effects of environmental factors on the reproductive cycles of Brachyuran and Annomuran crabs of Monterey bay. Giese (1959) worked on the reproductive cycles of some of the west cost invertebrates of U. S. including Echinoderms, Mollusca and Crustaceans. Butter (1960) investigated maturity and breeding of the pacific edible crab,* ***Cancer magister*** *of Northern British Columbia.*

Crab, Prawn, Shrimp, Oyster and Fish culture, with recent research advancement in nutrition, reproduction and development with new biotechnological tools are essential (Kengar, 1998, Devi et al., 2001).

In Marathwada region water sources in the form of lakes, rivers and other impounded water bodies are still unstudied. It is desirable to understand the source of freshwater crustaceans available therein. Such type of studies has potential to upgrade the quality of life of rural population through a direct impact on their socio-economic status.

The freshwater crab ***Barytelphusa cunicularis*** *and prawn* ***Macrobrachium kistnensis,*** *economically important crustaceans are locally available in Yeldari reservoir at Parbhanai district (M.S.) where the investigation was carried out. Spider crab* ***Pyroia tuberculata*** *(Furota, 1996) and* ***Callinectes ornatus*** *(Negreiros et al., 1995) are found to be continuous breeder collected from Tokyo bay, Japan and Fortaleza bay Brazil respectively.*

Key words: Crustaceans, ***Barytelphusa cunicularis, Macrobrachium kistnensis,*** **Reproductive parameters, Eco-physiology.**

Introduction:

In crustaceans the carapace length is a parameter to ascertain their reproductive maturity. The freshwater crab ***Barytelphusa cunicularis*** enters into puberty after attaining the carapace length of 40 mm for males and 44 mm for females. Cracco and Fontoura (1996) reported the carapace growth is an important indication of reproduction in male and female ***Cytograpus angulatus.***

Gonadal index is another parameter, which gives an idea about the maturation phase in crustaceans. Giese (1959) formulated a relationship between gonadal maturity and body weight. Similar methodology was adopted by Farooqui (1980) and Mirajkar et al. (1982).

It has been well evidenced that ecological parameters viz. rainfall, photoperiod temperature water pH etc. plays major role in determining the reproductive cycle and breeding behavior in crustaceans. Similar aspects were carried out by Viswanathan (1992) in brackish water crab, ***Uca tringularis bengali.*** Kengar (1998) observed role of Eco physiological parameters in freshwater crab, ***Barytelphusa guerini*** from west Maharashtra, Devi et al. (2001) reported environmental impacts on culture of ***Macrobrachiu rosenbergi.***

From the survey of literature, it can be visualized that Eco- physiological parameters exist an important relationship with gonad growth and breeding cycle in crustaceans. With special emphasis on histo- architecture of ovary and testis was presented during reproductive season. The extensive studies were also performed to confirm the reproductive season during annual growth, by taking into account the growth parameter viz. carapace length, gonad index and conclusive interrelations with eco-physiological parameters.

Materials and Methods:

The freshwater crab, ***Barytelphusa cunicularis*** and prawn, ***Mcrobarachium kistnensis*** were collected from Yeldari reservoir, in Parbhani district, Maharashtra State, India. The collection was done for a period of one year from October 2020 to September 2021. The crustaceans were maintained in plastic troughs containing sufficient aerated water, later animals were sacrificed to undertake following studies.

Crab: Barytelphusa cunicularis

Prawn: Macrobrachium kistnensis

Breeding behavior, carapace width and length, gonadal index were calculated by formula (Giese, 1959). In addition to gonad index method, histological changes in the gonads were studied to assess the reproductive cycle of crab ***Barytelphusa cunicularis*** and prawn ***Marobrachium kistnensis.*** To conform the reproductive phase and detailed changes followed in the gonad, the histological observations were done for the gonads throughout the year. This method gives an idea about size frequency distribution of the oocyte in the ovary as well as seminiferous tubules diameter in the testis. The reproductive phases of crustaceans were interpreted. For this purpose the testis and ovaries were fixed in Bouin's fluid. After 24 hours of fixation, the tissues were dehydrated, embedded in paraffin wax. The sections of thickness were cut and sustained with Harri's Haematoxylin stain.

The environmental factors playing an important role in maturation of gonads were studied. The breeding activity, rainfall, natural photoperiod and temperature fluctuations data was compiled for one year from October 2020 to September 2021.

Observations and Results:

The data shows that the matured crab ***Barytelphusa cunicularis*** male and females were found throughout the year, but an increase in the percentage of matured crabs was related to reproductive season. The maximum percentage of matured males was 66% in July and 68% in August 2021. The highest percentage of immature male crab was 44% in February 2021.

The maximum percentage of the mature females was highest 66% in June and 56% in July 2021. Similarly, the highest percentage of the immature females was more 64% in January 2021. The number of berried females increased during June to September; this period coincided with the reproductive season. On an average 3000 to 5000 eggs were counted in every female pleopods. The testes were also well developed in most of the specimens during this period.

Similarly the maximum berried female prawns were 46% in February 2021. The observations on the percentage of immature, matured and berried prawns were done for one year. The data showed that there were two peaks in breeding cycle. The major peak was from January to April and minor peak was from September to October though few berried females were always present in the collection.

The data indicates that the male crabs measured 64.4 mm, a highest carapace width in October and the range for carapace width for male crab was 10.5 to 64.4 mm, whereas the maximum size attained by female crab was in September and October. The highest carapace width was observed 78.3 mm in October 2020.

Most of the male prawn's carapace length was 21 mm during January to April 2021. The maximum carapace length of male prawn was 9 mm in May 2021. The maximum carapace length attained by female prawn was 25.6 mm in April 2021.

The data indicates that the male crab's gonad index ranged between 0.43 to 2.67 mm. The gonad index for the month of June, July and August 2021 was 2.64, 1.37 and 1.17. In January – February 2021 the gonad index were 0.55 and 0.43. The gonad indices for reproductive peak were 5.74, 3.07, 2.71 and 2.39 from June to September 2021.

From data the gonad index range for male prawns was 0.95 to 2.46. In male the gonad indices from January to April 2021 were 2.29, 2.07, 2.06 and 2.00. The gonad index of female prawns ranged in between 1.15 to 6.97. The gonad indices for major peak were 5.75, 6.42, 5.35 and 4.74 from January to April 2021. The minor peak values were 3.39 in September for the study period.

The results obtained on other crustaceans such as ***Daphnia scholeri*** (Parker, 1966), ***Balanus balanoides*** (Barnes, 1963) ***Ocypoda quadrata*** (Haley, 1972) and ***Orconectes*** (Rice and Armitage, 1974) agree with the present findings.

Conclusion:

The sexual biology of crab and prawn was studied for one year during October 2020 to September 2021. Various parameters such as percentage of male and female crab at various reproductive phases, berried female crabs, ovigerous female prawn, carapace width in crabs and carapace length in prawn for attainment of maturity, gonad index, histological observations of the testis and ovary were compared over a span of time in order to correlate with reproductive activity.

Along with annual reproductive cycle, the effects of environmental factors on the reproductive activity of the crab and prawn were also studied. The photoperiod and temperature regulated the reproductive cycle of crab and prawn. It was found that long day

photoperiod induced cycling of the ovary maturation and resorption of the oocytes and short day photoperiod tended to stabilize the ovary in mature condition.

The low temperature showed maturation of the oocytes while elevated temperature cause quick maturation and disintegration temperature caused quick maturation and disintegration of the ovary. The male crabs and prawns showed similar results.

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