

Sexual maturity and breeding behaviour in the freshwater crab, *Barytelphusa guerini* Milne Edwards

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Abstract. Sexual maturity and breeding behaviour were studied in the freshwater crab, *Barytelphusa guerini* from April 1976 to March 1977. Animals attain sexual maturity at a carapace width of about 45 mm. The breeding period is from May to August with the peak activity during June and July. The post-reproductive and quiescent period is from September to December and the preparatory period for reproductivity extends from January to April. Adult animals with a carapace width of 45-60 mm are reproductively more active while the activity declines in older animals. The animals show annual reproductive cycle and take part in reproduction twice during the life span, more so during the second year and less in the third year.

Keywords. Sexual maturity; breeding behaviour; freshwater crab; *Barytelphusa guerini*.

1. Introduction

There are several studies on the physiology of reproduction in crustaceans especially the decapods (Adiyodi and Adiyodi 1970, 1974). However studies on sexual maturity and breeding behaviour in crabs are very few. Earlier studies on these lines have been on *Cancer magister* (Mackay and Weymouth 1935; Clever 1949; Butler 1960), *Paratelphusa guerini* (McCann 1937; Ali 1955), *Paratelphusa jacquemonti* (Chacko and Thyagarajan 1952) and *Barytelphusa cunicularis* (Diwan 1973).

The crab, *Barytelphusa guerini* is available in large numbers and is being extensively used in our laboratory for physiological and endocrinological investigations. An attempt was therefore made to study the sexual maturity and reproductive behaviour in this crab.

2. Materials and methods

The crab, *Barytelphusa guerini* was used. The sexual maturity of the animals was determined by the morphological and gravimetric analysis of the gonads. The animals with a carapace width (CW) of 30-65 mm (body weight (BW) = 10-70 gm) were dissected and the gonads were isolated completely and weighed accurately. Sexual maturity was determined by morphological analysis (Diwan 1973). The posterior parts of the testis are small and translucent in the immature crabs while they are opaque and white due to the storage of spermatozoa in the mature ones.

In the case of females, the immature ovary is thin and translucent while the mature one is thick and bulky in appearance due to laden ova.

Gonadal indices were determined by converting the gonadal weights into per cent of the body weight.

Breeding behaviour was noted by following the percentage of females with eggs or young ones attached to the abdominal appendages during the different months of the year. An estimate of the eggs or young ones found in each female was also made. These investigations were carried out from April 1976 to March 1977.

3. Results

3.1. Sexual maturity

The testis weight was very low in the crabs with CW of 40 mm (BW = 20 gm) and it was intermediate in those with CW of 40-45 (BW = 20-30 gm). However, the testis weight was significantly higher in animals with a CW of more than 45 mm (BW more than 30 gm) and it also increased with CW and body weight beyond this range (figure 1A). The weight of ovary in female crabs also showed a similar trend (figure 1B). The female gonads were always found to be heavier than male gonads irrespective of animal size.

It appears that the gonads are heavier in larger animals because of the attainment of sexual maturity and the presence of sperms and ova. Morphological studies on the reproductive organs upon dissection also revealed that the animals with CW of 40 mm and below are sexually immature, while those with a CW of 45 mm and above are sexually mature. Animals with a CW of 40-45 mm represent a transitional stage as some are mature and others immature. The frequency of mature gonads is maximal in animals with CW of 45-60 mm (BW = 30-60 gm) (table 1). These observations show that the animals with CW of 40 mm and below are juveniles, sexual

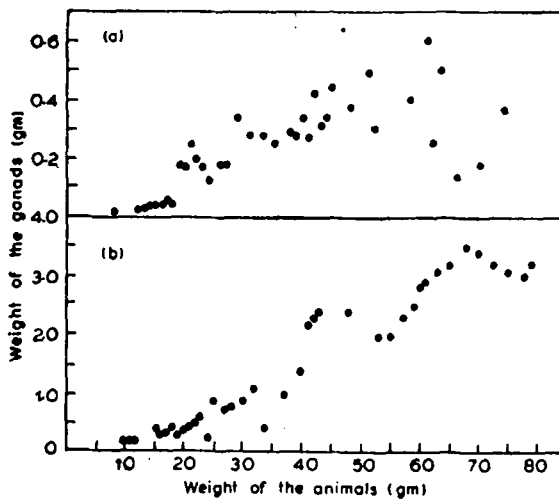


Figure 1. Relation of gonadal weight to body weight in the male (a) and female (b) crabs.

maturity sets in at a CW of 40-45 mm and those with CW of 45 mm and above are sexually mature and reproductively more active. Animals with a CW of more than 60 mm are older and hence reproductively less active.

3.2. Gonadal indices

The gonadal indices showed annual variations in both the sexes in relation to the breeding behaviour (figure 2). In the case of males, the values were high during the

Table 1. Relation between carapace width and maturity of the reproductive organs.

Carapace width (mm)	Testis		Ovary	
	immature	mature	immature	mature
30 and above but below 35	6	—	8	—
35 and above but below 40	10	—	8	—
40 and above but below 45	8	4	10	2
45 and above but below 50	—	10	—	12
50 and above but below 55	—	10	—	12
55 and above but below 60	—	8	—	8
60 and above but below 65	—	4	—	6

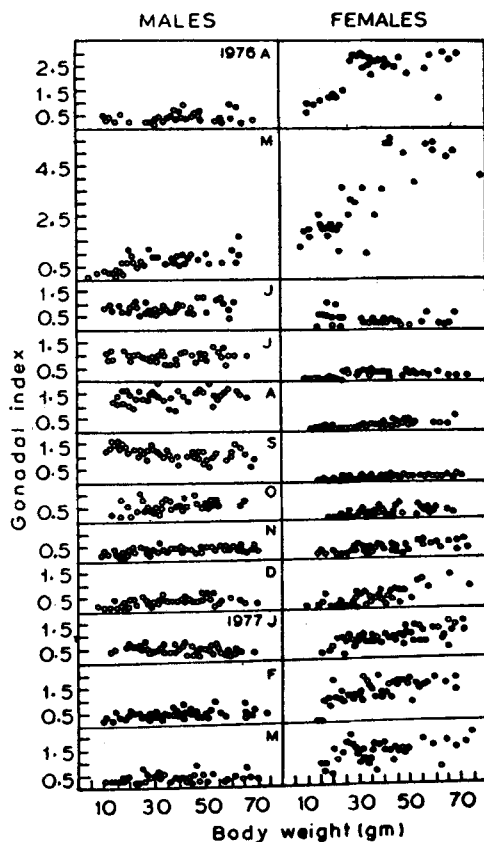


Figure 2. Annual variations in the gonadal index of male and female crabs of different body weights during the period from April 1976 to March 1977.

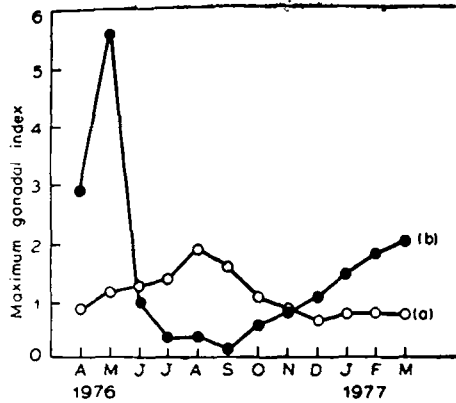


Figure 3. Annual variations in the maximum gonadal index of male (a) and female (b) crabs during the period from April 1976 to March 1977.

period—May to September, decreased gradually later and came to minimum during January and February. The values did not change with body weight except during the month of May when they increased slightly with body weight. In the case of females, the gonadal indices were high during April and May, decreased in June, minimal from July to December and increased again from January to reach the peak in April and May. The values did not vary with body weight during most of the period but increased with it during April and May. Morphological studies revealed that during these two months, the ovaries were laden with ripe eggs and the number of eggs in the ovary also increased with body size in the animals with CW of 45-60 mm (BW = 30-60 gm).

There was also a time lag in the occurrence of maximum gonadal index in the two sexes (figure 3). The males had higher gonadal index values between June and September while in females maximum values occurred earlier i.e., during April and May. The maximum values were higher in males during the period June to November, while they were higher in females during other months. Thus it was evident that the values showed opposite trend in the two sexes.

3.3. Breeding behaviour

Examination of the abdominal portion of females revealed that they carry either eggs or young ones attached to the pleopods during the period May to August. Presence of berried females was noted in May while those with young ones were seen in June. The maximum number of berried females was in June while the maximum number of females with young ones was in July. From September to April, however, no females with either eggs or young ones were seen (table 2). This reveals that the breeding starts during May and continues up to August and the peak period of breeding is during the months of June and July.

Data on the number of eggs and young ones in the abdomen of females during the months of June and July (table 3) revealed that they increase with body size to a certain extent and the maximum is found in the animals with a CW of 45-60 mm. This suggests that the sexually active animals are intermediate-sized, while those

Table 2. Percentage of berried females and those with young ones obtained in the different months of the year.

Year and month	Berried females	Females with young ones
1976 April	—	—
May	15.16	—
June	21.87	26.73
July	5.00	53.48
August	5.00	10.56
September	—	—
October	—	—
November	—	—
December	—	—
1977 January	—	—
February	—	—
March	—	—

Table 3. Number of eggs and young ones found in abdomen of female crabs of different sizes in the months of June and July 1976

June 1976				July 1976			
Weight of the animal (gm)	Carapace width (mm)	No. of eggs	No. of young ones	Weight of the animal (gm)	Carapace width (mm)	No. of eggs	No. of young ones
32	47	102	—	32	48	—	56
36	49	—	204	33	49	—	65
37	50	—	205	34	48	—	192
37	48	254	—	35	50	—	115
38	49	—	175	37	49	—	196
39	49	—	188	38	48	—	214
40	52	222	—	40	53	—	112
42	51	—	222	41	54	—	116
45	52	—	218	42	50	—	251
45	52	300	—	48	58	—	192
47	55	—	292	49	58	—	252
51	53	—	251	50	59	—	173
56	57	—	300	57	57	—	285
				66	61	—	425
				73	62	—	300
				88	65	—	270

with CW of 60 mm and above are probably older ones and thus their reproductive activity is very low.

4. Discussion

It is reported earlier that the female *Cancer magister* from British Columbia attains sexual maturity on attaining a CW of 100 mm (Mackay and Weymouth 1935) but in Washington the smallest mature female is less than 80 mm in CW (Clever 1949). It is also reported that the males with a carapace width of 116 mm or more are sexually

mature, but females with a carapace width of 100 mm or more are sexually mature (Butler 1960). The freshwater crab, *B. cunicularis* attains sexual maturity on attaining a CW of about 40 mm in the case of males and about 44 mm in the case of females (Diwan 1973).

From the present study involving the size of gonads, gonadal indices, breeding behaviour, number of eggs in females and number of eggs and young ones in the abdomen of females during breeding season, it is clear that the crab, *B. guerini* attains sexual maturity on reaching a CW of about 45 mm in both the sexes. The data also indicate that the intermediate sized animals with a CW of 45-60 mm are reproductively more active and the reproductive activity declines in older animals with a CW of 60 mm and above.

Studies on growth rate revealed that the animals attain a CW of 35 to 40 mm in the first year, 50-55 mm in the second year and up to 65-70 mm in the third (Venkatachari *et al* unpublished observations). As such it appears that the animals attain sexual maturity during the second year and continue to reproduce during the third year also but the peak period of reproductive activity seems to be confined to the second year.

Different species of crabs breed during different periods. The breeding periods are prior to spring season for *P. guerini* of Salsetteis land (McCann 1937), June to September for the same species occurring at Bombay (Ali 1955), February to April for *P. jacquemonti* of Peninsular India (Chacko and Thyagarajan 1952) and June to September for *B. cunicularis* of Aurangabad (Diwan 1973). The present study revealed that *B. guerini* breeds from May to August with the peak period during June and July as revealed from gonadal indices and breeding behaviour of females. High gonadal indices in females during April and May are due to the presence of a large number of ripe eggs in the ovaries. The decrease in the gonadal index during June and July is due to the release of eggs and it is supported by the presence of eggs and young ones in the abdominal region during these two months. High gonadal indices occur in males with a time lag during the period May to August. From this time lag it appears that by the time the testes get ripe the eggs from females descend down the ovary and possibly fertilisation takes place while the eggs descend into oviducts or abdominal cavity.

From the breeding behaviour and the annual variations in the gonadal indices, the annual reproductive cycle in the crab may be divided into (1) reproductive (breeding) period (May to August), (2) post-reproductive and quiescent period (September to December) and (3) preparatory period for reproductive activity (January to April).

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