



Sex ratio of the portunidae crab *Charybdis natator* (Herbst, 1794) from Nagapattinam, south east coast of Bay of Bengal, India

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ARTICLE INFO

Article history:

Received: 10 November 2011;

Received in revised form:

11 November 2011;

Accepted: 12 November 2011;

Keywords

Sex ratio,

Chi-square (χ^2)

Charybdis natator.

ABSTRACT

The portunidae crab *Charybdis natator* were collected from the offshore region of Nagapattinam (Lat. 10° 46' NS and Long. 79° 51' EW) on south east coast of Bay of Bengal. A random collection of specimens were made and sex ratio of male and female crabs were thoroughly studied in a period of two year January – 2009 to December – 2010. The result it clearly indicates that there was slight variation in both sex numbers. Among the total crabs 1748, the males were 864 and females were 884. The overall sex ratio of male and female was found to 1:1.01 ratio. The chi-square (χ^2) test analysis indicated that the ratio was not significantly differ from the expected 1:1 ratio. Hence it is suggested that the variation in sex ratio mainly depends on migration of crab for feeding, breeding, types of gear and craft used in that season.

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Introduction

In sexually reproducing organisms there are two types of individuals namely male and female. The informations recording sex ratio of decapod crustaceans have been reported by many worker (Thompson, 1951; Prasad and Tampi, 1953). In a population of brachyuran crabs equal number of male and females are normally expected. In most of the species the sex ratio slightly deviated from the expected ratio or not significantly varied from the expected 1:1 ratio (Radhakrishnan, 1979; Sethuramalingam *et al.*, 1980; Litulo, 2005 and 2006). However in some species the sex ratio is deviated from expected ratio of 1:1 (Asakura, 1995; Ali *et al.*, 2004). The differences in sex ratio and differential growth rate are influenced by many factors (Sigana, 2002; Mzighani, 2005; Teixeira *et al.*, 2009; Omolara and Barakar, 2009; Omolara, 2010).

The deviation in sex ratio is mainly due to migration of one sex and utilization of different habitats by the two sexes (Booolootian, 1965; Du Preez and Mclachlan, 1984). The environmental factors such as temperature, salinity, rainfall, water current, pH are also responsible for an apparent alternation of sex ratio (Wenner, 1972; Krajangdara and Watanabe, 2005; Oriola *et al.*, 2005). The present study deals with sex ratio of marine crab *Charybdis natator* from Nagapattinam coast.

Materials and Method

Monthly random collection of male and female brachyuran crab *Charybdis natator* were collected from offshore region of Nagapattinam coast for a period of two years from January 2009 to December 2010. A total of 1748 crabs were examined for the present study. Sex was determined using the method described by (Barnes, 1974 and Kwei, 1978). The overall sex ratio was obtained using the χ^2 test (King, 1977; Zar, 1999).

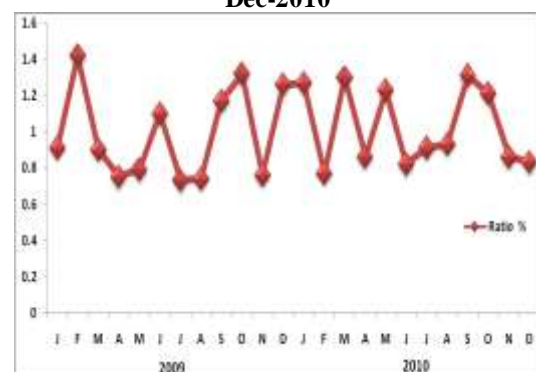
$$\text{Sex ratio} = \frac{\text{No. of female crabs}}{\text{No. of male crabs}}$$

$$\chi^2 = \frac{(\text{O} - \text{E})^2}{\text{E}}$$

Result

In the present investigation sex ratio of marine crab *Charybdis natator* were thoroughly studied and result are given in the Fig. 1 and Table 1. From the result it clearly indicates that there was slight variation in the male and female numbers. Among the total crabs 1748, the males were 864 and females were 884. The overall sex ratio of male and female was found to 1:1.01 ratio. The chi-square (χ^2) test analysis indicated that the chi-square value slightly deviated from the expected 1:1 ratio in both year. The male individuals were abundant in post monsoon and monsoon season in the year 2009 and 2010. The females were dominant in summer and monsoon month in the year 2009 and summer and monsoon season in the year 2010. In both year male were predominant in post monsoon month and females were found to be predominant in monsoon months when peak breeding occurred. The variation in sex ratio mainly depends on migration of crab for feeding and breeding.

Fig. 1. Sex ratio of *Charybdis natator* during Jan -2009 to Dec-2010



Discussion

The occurrence of male and female individuals in a population of particular species depends on many factors. Environment factors either directly or indirectly influence the sex ratio. In the present study marine crab *Charybdis natator* there was a slight deviation observed in male and female numbers. The chi-square value for sex ratio slight deviation from the expected 1:1 ratio. Similar observations reported by earlier workers (Radhakrishnan, 1979; Sethuramalingam *et al.*, 1980).

Booolootian (1965) while working on the crab *Pachygrapsus crassipes* found that during the reproductive season, ovigerous females migrated towards the water, whereas during non-reproductive season males and females were equally distributed. Differential normality between sex ratio, differential growth rates are depends on migration of one sex and utilization of different habitats by the two sexes and factors responsible for and apparent alteration of sex ratio (Wenner, 1972). In marine crab *Portunus sanguinolentus* the sex ratio slightly deviated from the expected sex ratio of 1:1 whereas in *Portunus pelagicus* the sex ratio nearest to expected 1:1 ratio (Radhakrishnan, 1979).

According to Sethuramalingam *et al.*, (1980) in *Thalamita chaptali* and *Portunus spinipes* the sex ratio did not deviated from the expected 1:1 ratio. In *Ovilipes punctatus*, the number of females was significantly greater than the number of males (Du Preez and Mclachlan, 1984). In hermit crabs sex ratio deviation from the expected 1:1 ratio. The females were predominant under natural condition because males have higher mortality due to their more intense competition for shell and mates (Asakura, 1995). In *Thalamita crenata* the sex ratio was significantly deviated from the expected sex ratio 1:1 (Sigana, 2002). In *Scylla serrata* the sex ratio was not significantly different from expected ratio of 1:1 (Sigana, 2002). Ali *et al* (2004) observed uneven number of male and females in mud crab *Scylla serrata*. The monthly sex ratio of *Ranina ranina* varied between 1:0.56 and 1:2.77 which was deviated from expected ratio (Krajangdara and Watanabe, 2005). In *Cardiosoma armatum* and *Callinectes pallidus* the sex ratio showed slightly deviated from expected ratio (Oriola *et al.*, 2005).

In *Uca annulipes* and *Uca chlorophthalmus* (Litulo, 2005 and 2006), there was a no significant differences in the sex ratio. In *Callinectes amnicola* the sex ratio was found to be 1:1: 96 and not significantly differ from the expected ratio of 1:1 (Omolara, 2010). However there was a significant deviation observed in sex *Portunus pelagicus* (Thompson, 1951; Prasad and Tampi, 1953). In crab *Anadara antiquata* (Mzighani, 2005), *Portunus validus* (Omolara and Barakar 2009) and *Acanthonyx scutiformis* (Teixeira, 2009) significant deviation observed in male and female populations.

In the present study slight deviation in sex ratio was observed 3 or 4 month in 2009 and 2010. The female were predominant during intensive breeding periods. During other months the female probably migrate to deeper water resulting in predominance of male and causing change in the expected sex ratio. Thus it is inferred that a slight variation in sex ratio could be attributed to the migration of female in relation to breeding activity.

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Table 1. Sex ratio of *Charybdis natator* during January 2009 to December 2010

Months	Male	Female	Total	Male (%)	Female (%)	Ratio (%)	Chi square (χ^2)
Jan - 09	32	35	67	47.76	52.24	0.91:1	0.13
Feb - 09	37	26	63	58.73	41.27	1.42:1	1.92
Mar - 09	27	30	57	47.37	52.63	0.90:1	0.16
April-09	24	32	56	42.86	57.14	0.75:1	1.14
May - 09	23	29	52	44.23	55.77	0.79:1	0.69
June - 09	45	41	86	52.33	47.67	1.10:1	0.19
July - 09	39	53	92	42.39	57.61	0.73:1	2.13
Aug - 09	37	50	87	42.53	57.47	0.74:1	1.94
Sep - 09	41	35	76	53.95	46.05	1.17:1	0.47
Oct - 09	45	34	79	56.96	43.04	1.32:1	1.53
Nov - 09	36	47	83	43.37	56.63	0.76:1	1.46
Dec - 09	39	31	70	55.71	44.29	1.26:1	0.91
Jan - 10	38	30	68	55.88	44.12	1.27:1	0.94
Feb - 10	30	39	69	43.48	56.52	0.77:1	1.17
Mar - 10	35	27	62	56.45	43.55	1.30:1	1.03
April-10	25	29	54	46.30	53.70	0.86:1	0.30
May - 10	27	22	49	55.10	44.90	1.23:1	0.51
June - 10	41	50	91	45.05	54.95	0.82:1	0.89
July - 10	39	43	82	47.56	52.44	0.91:1	0.20
Aug - 10	42	45	87	48.28	51.72	0.93:1	0.10
Sep - 10	46	35	81	56.79	43.21	1.31:1	1.49
Oct - 10	46	38	84	54.76	45.24	1.21:1	0.76
Nov - 10	37	43	80	46.25	53.75	0.86:1	0.45
Dec - 10	33	40	73	45.21	54.79	0.83:1	0.67
Total	864	884	1748	1189.3	1210.7	24.15	21.18
Average	36	36.83	72.83	49.55	50.45	1.01:1	0.88