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Fecundity of edible marine crab *Portunus sanguinolentus* (Herbst, 1783) (decapoda : brachyuran : portunidae)

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ABSTRACT

Brachyuran crabs used in the present study were collected from the Salem fish market (Lat. 11^0 39 NS and Long. 78^0 12 EW) on south east Tamil Nadu, India. A random collection of berried crabs *Portunus sanguinolentus* were taken and their fecundity were studied from the year of 2013. The number of eggs in *Portunus sanguinolentus* ranged from 1, 42,413 to 6, 44,533eggs the lesser number of eggs observed in small size group of carapace width 50-59mm and more number of eggs in large size group of carapace width 120-129mm. The study indicated that with an increase in carapace width there was a definite increase in the total number of eggs. There was a direct a relationship noticed between the weight of the animal and diameter of the ovary. Variation in number of eggs was observed within the same class probably indicating synchronous spawning within the same reproductive period. The present investigation suggested that the ovigerous female of large size is suitable for brook stock collection and maintenance for production of more number of seeds in aquaculture practice.

Introduction

Fecundity study deals with the reproductive potentiality or egg production capacity of an organism or population. Fecundity is one of the most important parameter in studying the breeding pattern, reproductive strategies and potentiality of egg production (Kannathasan, 2011). Fecundity provide information on the rate of replacement in natural population (Efford, 1969; Heydson, 1969; Lopes *et al.*, 2009). In crabs fecundity is traditionally measured as the number of eggs produced in each clutch, and it is described as a function of body size (Litulo, 2004; Morley *et al.*, 2005; Kannathasan and Rajendran, 2010). The number of egg produced by females deponds on many exogenous and endogenous factors. The total number of eggs per female was significantly varied with reference to habitate (Sethuramalingam and Natarajan, 1982; Thurman, 1985; Wennes, 1987; Simon *et al.*, 2003).

In most of the brachyuran crabs the number of eggs increased with increasing carapace length and width. Fecundity was positively correlated to carapace length (Bird, 1978; Radhakrishnan, 1979; Du preez and Mc Lachlan, 1984; Haddon, 1994; Alexander and Fosca, 2001; Tallack, 2007; Doi *et al.*, 2008; Bello olusoji *et al.*, 2009; Omolara, 2010) and body weight of the animal (Andres *et al.*, 1996; Alison *et al.*, 2006). The fecundity of marine crab varied with various seasons (Jeffrey *et al.*, 1991; Kobayshi 2001; Bas *et al.*, 2007). The fecundity and brood size highly correlated with carapace width. (Arshad *et al.*, 2006; Rasheed and Mustaquim, 2010; Ragupathi *et al.*, 2014).

According to Fernando and Adilson (1997) the female of same class presenting a wide amplitude of variation in total number of eggs. However very low variation on fecundity was observed with in the same size class (Litulo *et al.*, 2005). The lack of relationship noticed between environmental features and fecundity (Okamori and Cobo, 2003; Valter *et al.*, 2008). The present study summarises the relationship between size class and number of eggs in the population of *Portunus* collected from Salem fish market area on the south east Tamilnadu India.

Materials and methods:

Systemetic position

Domine	:	Eukaryota (Whittaker & Margulis, 1978)
Kingdom	:	Animalia (Linnaeus, 1758)
Phylum	:	Arthropoda (Von Siebold, 1848)
Super class	:	Crustacea (Brunnich, 1772)
Class	:	Malacostraca (Latreille, 1802)
Order	:	Decapoda (Latreille, 1802)
Sub order	:	Pleocyemata (Burkenroad, 1963)
Infra order	:	Brachyura (Latreille, 1802)
Super family	:	Portunoidea (Rafinesque, 1815)
Family	:	Portunidae (Rafinesque, 1815)
Sub family	:	Portuninae (Rafinesque, 1815)
Genus	:	*Portunus* (Weber, 1795)
Species	:	*Sanguinolentus* (Herbst, 1783)
Scientific name	:	*Portunus sanguinolentus* (Herbst, 1783)
Vernacular name	:	Mukkan nandu (Kannathasan, 2011)


PLATE-1: Study area


PLATE-2: *P. saguinolentus* Dorsal view

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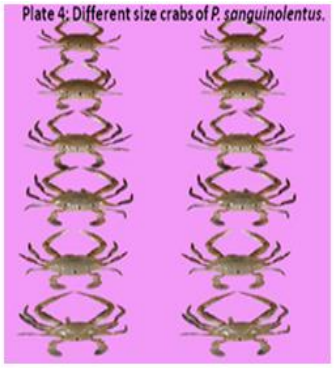


Random collections of 93 ovigenous crabs were collected from the Salem fish market (Lat. 11^0 39 NS and Long. 78^0 12 EW) on south east Tamil Nadu, India. The specimens were individually packed in plastic bags and transferred to laboratory. Length and width of the carapace were measured to nearest millimeter. The weights of the animals were noted and eggs were removed by forceps and blotted with filter paper to remove the excess of water. Then eggs were weighted as accurately as possible nearest to 0.01mg. The samples were taken at different places and the weight of the sample was noted. The fecundity was estimated by the method of Kwei (1978). From the weight of the egg mass, total number of the eggs, present in the brood was calculated using the formula (Zar, 1999; Kannathasan, 2011).

$$F = \frac{\text{Number of egg}}{\text{Weight of the sample}} \text{ x Total egg mass Wt.}$$

The carapace width was chosen as the main reference dimension, Correlation and linear relationship between carapace width and total number of eggs were also calculated.

Fecundity (F) was related to carapace width (CW) and Body Weight (BW) by the least square linear regression. Log $_{10}F = a + b \log (CW)$ or (BW) described by (Parsons, 1988).

Result:

The data obtained in the present study are graphically represented in fig a-c. From the data it shows that the number of eggs in *Portunus sanguinolentus* was related to different size group of the crabs. In minimum size class 50-59mm, having mean carapace width 55.75mm and mean body weight 64.00g. The total mean wet weight of the egg mass was 6.900g, with mean total number of eggs 1, 42,413. The second size group 60-mm having mean carapace width 64.75mm with mean body weight 72.250g. The total mean wet weight of the egg mass was 8.172g with mean total number of eggs 1, 67,207. The third size group 70-79mm having mean carapace width 75.40mm with mean body weight 81.000g. The total mean wet weight of the egg mass was 10.670g with mean total number of eggs 2, 51,785. The fourth size group 80-89mm having mean carapace width 86.25mm with mean body weight 92.750g. The total mean wet weight of the egg mass was 1115.052g with mean total number of eggs 3, 04,114. The fifth size group 90-99mm having mean carapace width 94.75mm with mean body weight 103.500g. The total mean wet weight of the egg mass was 18.935g with mean total number of eggs 3, 81,992. The sixth size group 100-109mm having mean carapace width 105.25mm with mean body weight 117.00g. The total mean wet weight of the egg mass was 23.170g with mean total number of eggs 4, 66,055. The maximum size group 120-129mm having mean carapace width 124.4mm with mean body weight 164.00g. The total mean wet weight of the egg mass was 32.134g with mean total number of eggs 6, 44,533. The mean not wet weight of the egg per females as well as the mean total number of eggs per female increased with increasing carapace width. Fecundity (F) was related to carapace width (CW) and Body weight (BW) by the equation respectively Table-1.

Table: 1. Fecundity of *Portunus sanguinolentus* per size class

S. No	Size group (mm)	Nummber of observations	MCW (mm)	MBW (g)	MEMW (g)	MTNE
1	50-59	13	55.75	64.0	6.90	1,42,413
2	60-69	10	64.75	72.25	8.17	1,67,207
3	70-79	12	75.40	81.00	10.67	2,16,109
4	80-89	10	86.25	92.75	15.09	3,05,035
5	90-99	15	94.75	103.5	18.93	3,81,992
6	100-109	11	105.25	117.0	23.17	4,66,054
7	110-119	12	115.25	135.0	28.60	5,74,852
8	120-129	10	124.4	164.0	32.13	6,44,533

Fig-a. Relationship between fecundity and carapace width in *P. sanguinolentus*

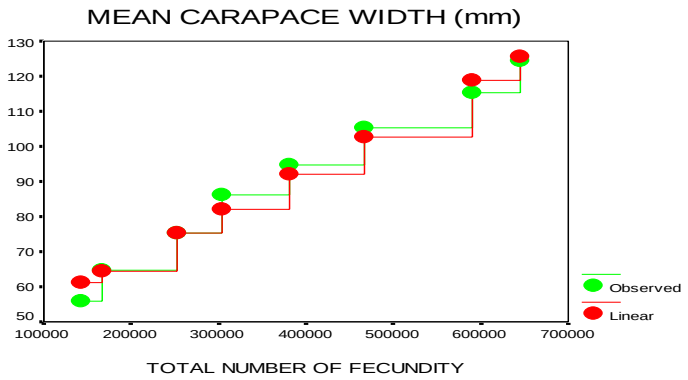
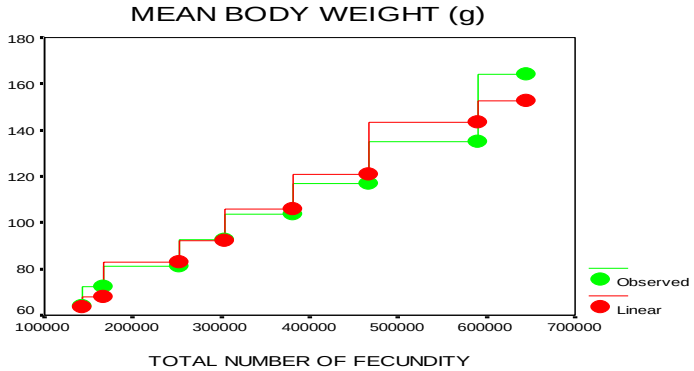


Fig-b. Relationship between fecundity and body weight in *P. sanguinolentus*

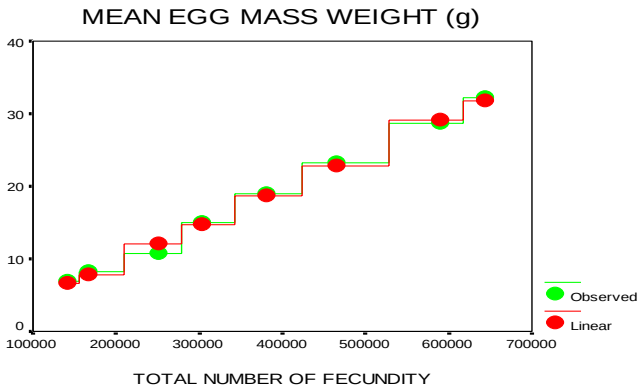


Discussion:

An actual increase in total number of eggs appears to be related to both carapace width and body weight of the animal. In the present study in *Portunus sanguinolentus* total number of egg increased with increasing carapace width. Fecundity positive correlated with carapace width. In the same size class there was a slight fluctuation in the total number of eggs. This crab is a continuous breeders and subsequent broods may possible be liberalized within the spawning period. The number of eggs may be more in the first time and may show a tendency

to decline in the subsequent brood. Similar observations reported by earlier workers (Kannathasan and Rajendran, 2010).

Fig-c. Relationship between fecundity and egg mass weight in *P. sanguinolentus*



The number of eggs increasing with increasing body size (Heydson, 1969). Efford (1969) reported widely different values for the number of eggs produced equivalent size group in *Emerita analoga*. In grapsid crab *Sesarma catenata* may carry up to 92,000 eggs, with an increase in the number of eggs as the crab grows larger (Bird, 1978). In *Portunus pelagicus* and *Portunus sanguinolentus* the number of eggs were variable in relation to width of the carapace. (Radhakrishnan, 1979). In *Ovalipes punctatus* large female can produce more eggs per brood. The total number of eggs per female increases with size of the female (Du preez and Mc Lachlan, 1984). In *uca subcyllindrica* comparatively large ova low fecundity and low per capita egg production are adaptations to habitate (Thurman, 1985).

Wennes *et al*., (1987) observed that the number of eggs in *Emerita analoga* increased as length or width of carapace of the crab increased. The log body size and log fecundity relationship changed significantly with seasons. (Jeffrey *et al.*, 1991). No relationship was found between mean egg size and carapace width (Haddon, 1994). There was a positive correlation observed between fecundity and body size of *Thalamita chaptali* and *Portunus sinipes* (Sethuramalingam and Natarajan, 1982) *Platyxamthus patagonicus* (Andres *et al.*, 1996); *Callinectes amnicola* (Omolara, 2010); *Portunus sanguinolentus* (Ragupathy *et al.*, 2014).

According to Kobayashi (2001) the fecundity increased with increasing carapace width and decreased in the later ovi position. Alexander and Fosca (2001) the fecundity of all species was positively correlated to the size of the individuals. The higher number of eggs production by *Portunus pelagicus* during the spawning season (Simon *et al.*, 2003). In *Uca annulipes* the egg number increased significantly with increase in crab size (Litulo, 2004) Fecundity was observed to increase with body size, but reproductive allocation was found to differ significantly between species (Morley *et al.*, 2005). Very low variation on fecundity was observed with same size class (Litulo *et al.*, 2005).

In *Portunus pelagicus* the total number of eggs ranged from 148, 897, 64 to 835, 401, 32 eggs with brood size highly correlated to carapace width (Arshad *et al.*, 2006). In crab *Limulus polyphemus* larger female laid a higher percentage of the eggs (Alison *et al.*, 2006). In *Uca chlorophthalmus* brood size was positively associated with female size (Litulo, 2006). Significant relationship was found in size and fecundity of crab *Concer pagurus* and *Ne Cora puber* (Tallak, 2007). In *Chasmagnathus granulatus* fecundity and biomass per egg were higher at beginning as compared to the end of the reproductive season (Bas *et al.*, 2007). Physico-chemical parameters showed no significant relationship on fecundity (Valter *et al.*, 2008). The batch fecundity of *Charybdis bimaculata* ranged from 8,300 to 38,400 eggs per female and was positively correlated with body size (Doi *et al.*, 2008).

According to Lopes *et al.*, (2009) increased fecundity as well as improved embryo quality. In crab *Sodanonautes africanus* there was no. significant relationship noticed between egg size and carapace length (Bello olusoji *et al.*, 2009). In *Portunus sanguinolentus* the number of eggs ranged from 2, 72,000 and 1,395,000 in crab having 63mm and 120mm respectively (Rasheed and Mustaquim, 2010). In *Charybdis natator* the fecundity was positive correlated with body weight of the animal (Kannathasan, 2011). In the present investigation of *Portunus sanguinolentus* an increase in width of the carapace thus increases the number of eggs which coincides with the above findings. Further it suggested that the ovigerous female of large size is suitable for brook stock collection and maintenance for Production of more number of seeds in aquaculture practice.

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