



### Short Communication

## Relationship between morphometric characteristics and fecundity of *Portunus pelagicus* (Linnaeus, 1758)

\*Raghunath Ravi, Mary K. Manisseri and Somy Kuriakose

Central Marine Fisheries Research Institute, Post Box No. 1603, Ernakulam North P.O., Kochi – 682 018, Kerala, India. \*E-mail: raghunathravi@yahoo.com

### Abstract

The relationship of various morphometric characteristics, carapace width, carapace length, body weight, abdomen width, propodus length and propodus height with fecundity in *Portunus pelagicus* was investigated using linear regression analysis. All the morphometric characteristics studied showed positive correlation with fecundity and the degree of relationship varied considerably. Among these, the carapace width was found to be the most ideal morphometric character to predict the fecundity of *P. pelagicus*.

**Keywords:** Morphometric characteristics, fecundity, *Portunus pelagicus*

### Introduction

*Portunus pelagicus* (Linnaeus, 1758) (Decapoda, Brachyura) is one of the important crab species available for culture in India. The importance of evolving a viable hatchery technology for the species has been emphasized due to the growing demand of seeds for grow-out, fattening and stock replenishment. Development of broodstock with high reproductive potential is the first step towards standardising a hatchery methodology. Morphometric parameters such as carapace width and body weight are generally used as criteria for selecting the broodstock. Hence knowledge about the relationship between morphometric parameters and fecundity is important.

According to Mantelatto and Fransozo (1997), fecundity determines the reproductive potential and stock size. In crabs, studies on the relationship between the morphological features and fecundity are scanty. Positive correlation between carapace width and fecundity was reported in crabs such as *Paralithodes camtschatica* (Matsuura *et al.*, 1972), *Clibanarius antillensis*, *C. sclopetarius* and *C. vittatus* (Turra and Leite, 2001) and *Carcinoplax vestita* (Doi *et al.*, 2007). The

abdomen width and fecundity exhibited a positive correlation in *Menippe nodifrons* (Bertini *et al.*, 2007). Similar relationship has been observed between carapace length and fecundity in *Platyxanthus patagonicus* (Carsen *et al.*, 1996). The present study was carried out to investigate the reproductive performance measured as fecundity in relation to various morphometric characters such as carapace width, carapace length, body weight, abdomen width, propodus length and propodus height in *P. pelagicus*.

### Material and methods

Live berried females of *P. pelagicus* bearing light yellow eggs collected from the landing centres at Mandapam, Tamil Nadu were transported to the laboratory and maintained in 1 ton FRP tanks. After tagging, 50 crabs were measured using precision calipers for body dimensions such as carapace width (distance between the tips of the ninth antero-lateral spines), carapace length (distance between the frontal marginal teeth and the posterior margin of the carapace), body weight (to the nearest 1 g), propodus length (distance between the tip of the claw to the origin of the propodus), propodus height (the width of the broadest part of the propodus) and abdominal width

(width at the broadest part of the fifth abdominal segment). Five egg samples each were taken from different regions of the light yellow berry of the crabs to assess fecundity. Crabs with damaged carapace or incomplete appendages were not considered. The animals were maintained until hatching (6-8 days) and the fecundity was assessed using random egg sample count of berry and berry weight (difference in animal weight before and after egg release). Linear regression analysis was used to understand the relationship between fecundity and carapace width, carapace length, body weight, abdomen width, propodus length and propodus height (Hines, 1982).

### Results and Discussion

For studying the relationship between carapace width (CW) and fecundity, berried females of CW range 120-155 mm were used. A significant ( $p < 0.05$ ) positive linear relationship with high  $r^2$  value (0.86) was observed between carapace width and fecundity (Fig. 1). The estimated regression equation of CW on fecundity was  $F = 20938 \text{ CW} - 2000000$ . Similar relationship was observed between CW and fecundity by Erdman and Blake (1988) in *Geryon fenneri*, Koolkalya et al. (2006) in *Scylla olivacea* and Tallack (2007) in *Cancer pagurus*. In a study on the reproductive cycle of *P. pelagicus* off southern Australia, Kumar et al. (2000) reported a rise in fecundity by 83.9% with an increase in carapace width from 105 mm to 125 mm. According to Tallack (2007) the positive

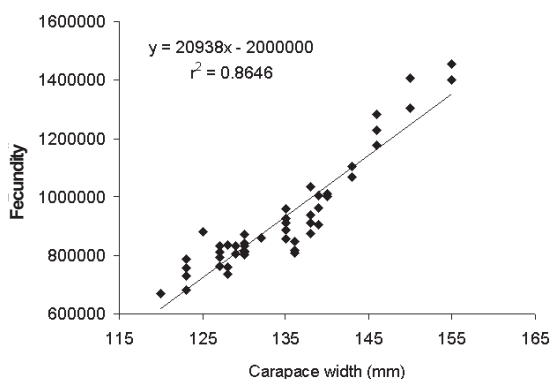


Fig. 1. Linear relationship between carapace width and fecundity of *P. pelagicus*

correlation between fecundity and carapace width in *Necora pube* is not significant.

The relationship between carapace length (CL) and fecundity was studied using berried females of CL 52-67 mm. The fecundity increased with increase in carapace length as observed in the study between CW and fecundity and could be expressed as  $F = 44240 \text{ CL} - 2000000$  ( $r^2 = 0.835$ ) (Fig. 2). A similar relationship between carapace length and fecundity was observed in *Lithodes aequispina* (Jewett et al., 1985) and *Platyxanthus patagonicus* (Carsen et al., 1996).

To study the relationship between fecundity and body weight (BW), animals of body weight 118-227 g were used. The relationship between

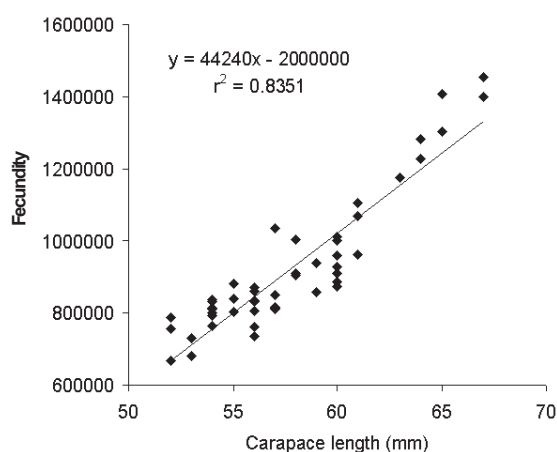


Fig. 2. Linear relationship between carapace length and fecundity of *P. pelagicus*

body weight and fecundity showed a positive correlation with high  $r^2$  value viz., 0.826 and was expressed as  $F = 5623 \text{ BW} + 50124$ . Similar positive correlation between BW and fecundity with high  $r^2$  value (0.908) was reported by Haddon (1994) in *Ovalipes catharus*. Studies by Villegas et al. (1986) on the shrimp *Penaeus monodon* and Sharma and Subba (2005) on the freshwater prawn *Macrobrachium lamareii* also showed positive relationship between body weight and fecundity, but with low  $r^2$ . The abdomen width (AW) of crabs used in the study ranged from 40 to 55 mm. A significant positive relationship ( $p < 0.05$ ) was

observed between AW and fecundity, which was expressed with the linear regression equation  $F = 41314 AW - 1000000$  ( $r^2 = 0.656$ ). A similar positive correlation was shown for many brachyuran crabs by Hartnoll (1974). Mantelatto and Fransozo (1997) have reported that the fecundity of *Callinectes ornatus* increased with an increase in abdomen width and carapace width. Fransozo *et al.* (2002) suggested that the changes in the abdomen width of female *Ocypode quadrata* are related to the capacity of the female to incubate the egg mass. Thus an animal with a larger abdomen has a greater berry size and a higher fecundity as evident in the present study. The propodus length (PL) and propodus height (PH) range of animals used for the regression analysis were 53-85 mm and 15-27 mm respectively. As these traits showed a very low  $r^2$  value (0.196 and 0.295), the fecundity predicted using their regression equations would be less accurate in comparison with the other morphometric characteristics studied. Similar relationship with low  $r^2$  values has been reported for PL and PH in *Orconectes limosus* by Stypinska (1972).

In the present study, though all the morphometric characteristics studied *viz.*, carapace width, carapace length, body weight, abdomen width, propodus length and propodus height had a positive correlation with the fecundity, there was significant difference in the precision of prediction of fecundity using regression equations. Among them, the carapace width was found to be the most suitable characteristic for predicting fecundity of *P. pelagicus*.

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