

Some biological aspects of the swimming crab *Portunus pelagicus* (Linnaeus, 1766) (Decapoda: Portunidae) in NW Arabian Gulf

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Abstract - The blue swimming crab *Portunus pelagicus* (Linnaeus, 1766) was collected from Al-Fao region, southern Iraq. The carapace width for the adult males, was ranging between 80.15 and 120.34 mm, and for the adult females was ranging between 60.1 and 100.69 mm. The carapace length for the adult males ranged between 40.03 and 50.93 mm, while those of the adult females were 30.84-50.14 mm. The chelae length ranged between 50.21 and 90.06 mm and between 40.77 and 60.57 mm for males and females, respectively.

Introduction

Crabs are belonging to the order Decapoda, a crustacean order that also includes the lobsters, shrimps, and hermit crabs. All decapods possess a full carapace or head thorax shield and five pairs of walking legs, the first three pairs of thoracic appendages are modified into maxillipeds, or feeding legs, in crabs and lobsters, the very first pair of the walking legs is sizable claws that serve for defense and to grasp and manipulate food (Watanabe, 2001). There are more than 4,500 living species of crab worldwide (Abbott, 1980).

Portunus pelagicus matures within a year and in temperate regions females mate only once a year (Kangas, 2000). This is because mature crabs moult only once a year. In general, female crabs (which have settled into estuaries/nurseries during the late summer/autumn period the year before) move from estuaries to oceanic waters to spawn in summer (Kangas, 2000). Blue crabs are swimming crabs and have their last pair of legs modified as swimming paddles, their carapace is rough in texture (Kailola *et al.*, 1993). *Portunus pelagicus* is found in near shore marine and estuarine waters throughout the Indo-West Pacific (Stephenson, 1962; Kailola *et al.*, 1993), and live in a wide range of inshore and continental shelf areas, including sandy, muddy or algal and sea grass habitats, from the intertidal zone to at least 50 m depth (Williams, 1982; Edgar, 1990).

Spawning takes place all the year round in tropical and subtropical waters (Campbell and Fielder, 1986; Potter *et al.*, 1987). In temperate areas, after mating, the sperm is retained by the female in spermatheca over the winter period (Smith, 1982). Generally, females leave inshore estuarine areas and move offshore to spawn. This migration is thought to be necessary for the survival of the larvae due to lowered oxygen levels and lack of suitable food in estuaries (Meagher, 1971). Meagher (1971) suggests that the transition in distribution from an offshore, semi-planktonic habitat to the onshore, benthic habitat occurs in juveniles somewhere between 0.4 cm and 1.0 cm carapace width (CW).

Rapid growth occurs in the estuaries and protected bays over summer. Juveniles and adults immigrate out into the ocean during winter to avoid the freshwater flow and many then migrate back into the estuaries before the summer (Potter *et al.*, 1983). The culture and growth of blue swimming crab (*P. pelagicus*) has been extensively investigated (Jiampreecha and Chantarasri, 1980; Yoodde, 1981; Tuntikul, 1983; Singhagraiwan, 1989 and Ngansakul and Pimoljinda, 1994). Blue swimming crabs are opportunistic, bottom-feeding carnivores and scavengers. Their diet chiefly consists of a variety of sessile and slow-moving invertebrates, including bivalve molluscs, crustaceans, polychaete worms and brittle stars (Patel *et al.*, 1979; Williams, 1982; Edgar, 1990). Diet is largely dependent upon local availability of prey species. The main food for intertidal stages being small hermit crabs and gastropods, while sub tidal *P. pelagicus* feed mainly on bivalves and ophiuroids (Williams, 1982). Due to their strong swimming ability, *P. pelagicus* are capable of moving substantial distances, with one recorded as travelling 20 km in one day in Moreton Bay, Queensland (Sumpton and Smith, 1991).

The purpose of the present study was to identify the biological aspects and provide data on *Portunus pelagicus* in Southern Iraq to assist in targeting new research initiatives which will provide additional information on population separation in our area.

Materials and Methods

Physical parameters were measured (air temperature, water temperature, pH, dissolved oxygen (DO), depth, salinity and total dissolved solids (TDS)) by using YSI system, Kalbunch Company (U.S.A. made). Bringing sediment sample from the sampling station to determine the sediment structure, by using grain size analysis, according to Forth and Turk (1972).

The specimens were collected by fishing net (trawler) from Al-Fao region in June 2010, brought a live to the laboratory, these specimens were measured, the carapace length, carapace width, and the chela length by varneir caliper to the nearest 0.02 mm.

These specimens were categorized to males and females then weighed (the wet weight), dried in oven at 60 °C for 24 h. and weighed (the dry weight), then they placed in a muffle furnace at 500°C for 4h., and weighed (the ash free dry weight), by microbalance.

Results and Discussion

Al-Fao region is located between latitude 29° 58' 57.66" N and longitude 48° 28' 36.62" E (Fig. 1). The physical parameters of the water of this region in June 2010 were: Air Temp. 31°C, water temp. 23.88 °C, pH 7.74, Sal. 0.64‰, Depth 8 m, DO 10.92 mg/l, TDS 0.832 g/l. The texture of the substratum was muddy to silt.

As a fact the males have much more clear colour than the females, the male of the swimming crab have bright blue colour with white spots and with characteristically long chelipeds (Plate 1) while, the females have a duller green/brown, with a more rounded carapace. Their carapace is rough in texture.

Figures (2 and 3) show the dimensions of the carapace length (mm), chelae length (mm) and carapace width (mm) of the males and females, respectively of *Portunus pelagicus*, at Al-Fao site. It is obviously seen that these three dimensions of the males were larger than those of the females, but, the carapace width (mm)/carapace length (mm) ratio was 1.537 and 2.167 for males and females, respectively. The carapace width (mm) ranged from 80.15-120.34 and 60.1-100.69 for males and females respectively. The carapace length (mm) ranged from 40.03-50.93 and 30.84-50.14 for males and females, respectively. The chelae length (mm) ranged from 50.21-90.06 (average 61.676) and 40.77-60.57 (average 51.765) for males and females, respectively. These dimensions look very different between male specimens and female specimens of this crab.

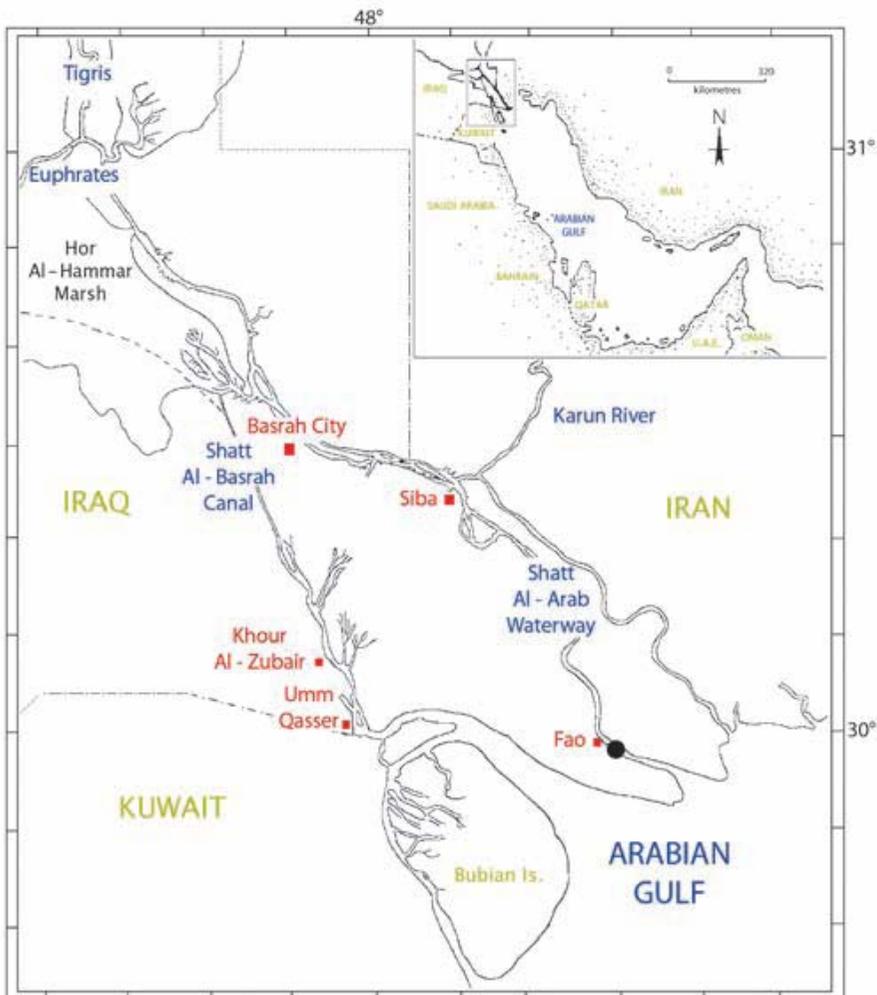


Figure 1. The sampling station.



Plate 1. Dorsal view, frontal view and ventral view of the swimming crab *Portunus pelagicus*.

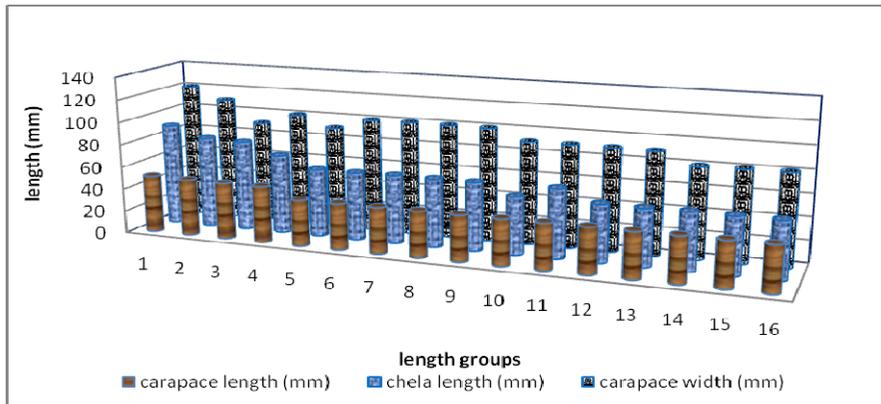


Figure 2. The dimensions of the carapace length (mm), chelae length (mm) and carapace width (mm) of the males of *Portunus pelagicus* in Al-Fao site.

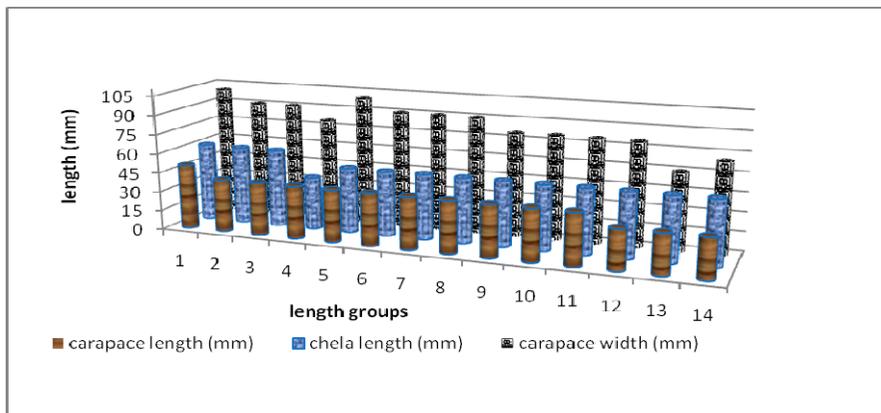


Figure 3. The dimensions of the carapace length (mm), chelae length (mm) and carapace width (mm) of the females of *Portunus pelagicus* in Al-Fao site.

The relationships:

The relationships between carapace width (mm) and the wet weight (mg) of the males and females crabs are shown in Figures (4 and 5), respectively. The correlation coefficient of the fitted lines ranged between 0.898 and 0.792 ($P < 0.05$), respectively, and the slopes ranged between 84.56 and 52.80 males and females, respectively.

The dry weight (mg) of the swimming crab *Portunus pelagicus* was plotted as a function of carapace width (mm) and the relationships between them for the males and females were given in Figures (6 and 7), respectively. The correlation coefficient of the fitted lines were 0.906 and 0.775 ($P < 0.05$) and the slopes were 20.54 and 2.059 for males and females, respectively.

The ash free dry weight (mg) was plotted as a function of carapace width (mm) and the relationships between them for the males and females were given in Figures (8 and 9), respectively. The correlation coefficient of the fitted lines were 0.80 and 0.733 ($P < 0.05$) and the slopes were 7.907 and 1.876, for males and females, respectively.

Portunus pelagicus (Linnaeus) have these common names: Blue swimmer crab, blue manna crab, sand crab, blue crab and Flower crab, and these synonyms: *Cancer pelagicus*: Linnaeus (1766), *Neptunus pelagicus* De Haan (1833), *Lupea pelagica*: Milne-Edwards (1834) (Kangas, 2000).

Portunus pelagicus lives in water temperature around 23.88 °C in Al-Fao estuary. Smith (1982) found that the eggs of this crab hatch after about 15 days at 24°C water temperature, the development of the eggs depends on water temperature, and it takes eight days at 25 °C for fully developed and ready for release and at 20 °C it takes 18 days, the eggs and larvae are planktonic, maximum width of adults is about 20 cm (7.9 in) and a weight of up to 1 kg in the Indo-West Pacific.

It is obviously seen from the values of the dimensions of the carapace length (mm) and carapace width (mm) of the males and females in Figures (2 and 3) that this crab has a rectangular shape. In South Australia, *P. pelagicus* reaches a size of 150 mm CW in about 18 months (Smith, 1982), while, in south-west India, a size of 132.5 mm CW is reached by females in one year (Sukumaran and Neelakantan, 1997). From the relationships above in Figures (4 and 5; 6 and 7; 8 and 9) we could see that this crab has somehow a heavy weight ranged from 34.05-111.24 (mg) wet weight, from 12.85-33.52 (mg) dry weight and from 7.81-18.18 (mg) ash free dry weight for males, while for the females the measurements are as follow: 27.85-76.2 (mg), 13.66-23.71 (mg) and 8.08-15.21 (mg) for wet weight, dry weight and ash free dry weight, respectively.

Potter *et al.* (1983) showed that the differences are observed between the weight-carapace width relationships for male and female *P. pelagicus*, at the same size (CW), males are heavier than females, the relationship between body weight (g) and carapace width (CW) for crabs in the Peel-Harvey Estuary in Australia as given by Potter *et al.* (1983) are:

Males: $\log W = \log 2.56 \times 10^{-5} + 3.260 \log CW$

Females: $\log W = \log 5.97 \times 10^{-5} + 3.056 \log CW$

P. pelagicus is living in muddy to silty substrates in Al-Fao estuary, it is commonly enters estuaries for food and shelter, and its life cycle is dependent on estuaries as the larvae and early juveniles use these habitats for growth and development. The female moves into shallow marine habitats, releases her eggs and the newly hatched zoea I larvae move into estuaries, however, evidence have shown that early juveniles cannot tolerate low salinities for extended periods, which is likely due to its weak hyperosmoregulatory abilities (Romano and Zeng, 2006). They move to deeper water in response to changes in water temperature and inshore salinity, they are active swimmers, but when they are inactive they usually bury themselves in the bottom sediment, leaving only their eyes, antennae and gill chamber opening exposed (Romano and Zeng, 2007).

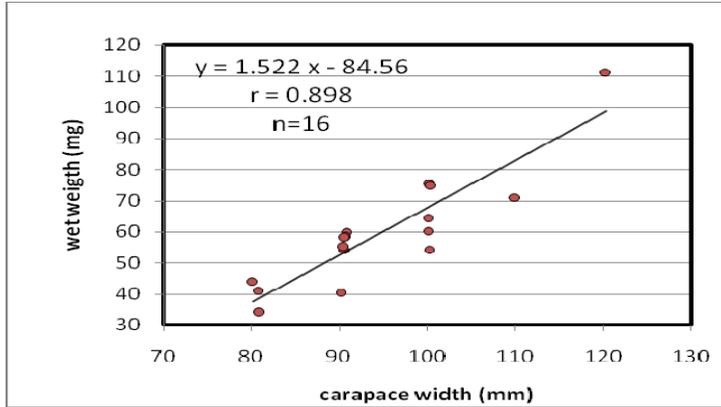


Figure 4. Relationship of carapace width (mm), and wet weight (mg) of males *Portunus pelagicus* at Al-Fao site.

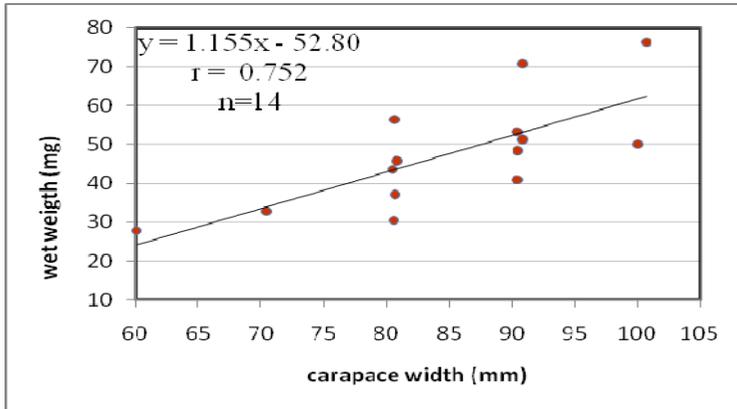


Figure 5. Relationship of carapace width (mm), and wet weight (mg) of females *Portunus pelagicus* at Al-Fao site.

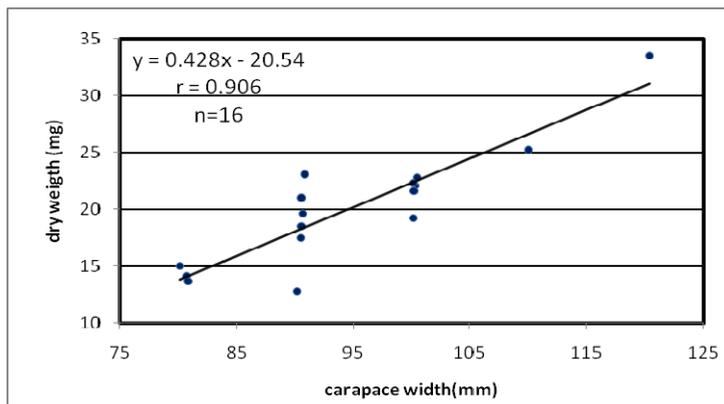


Figure 6. Relationship of carapace width (mm), and dry weight (mg) of males *Portunus pelagicus* at Al-Fao site.

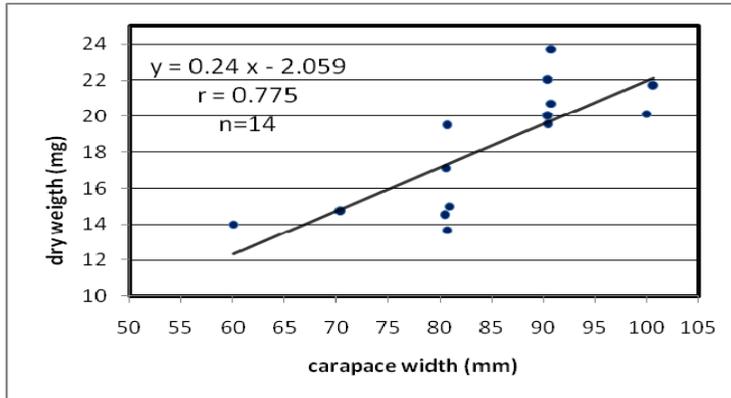


Figure 7. Relationship of carapace width (mm), and dry weight (mg) of females *Portunus pelagicus* at Al-Fao site.

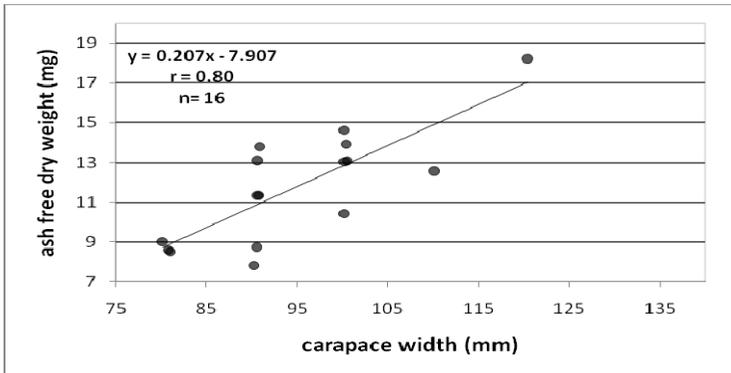


Figure 8. Relationship of carapace width (mm), and ash free dry weight (mg) of males *Portunus pelagicus* at Al-Fao site.

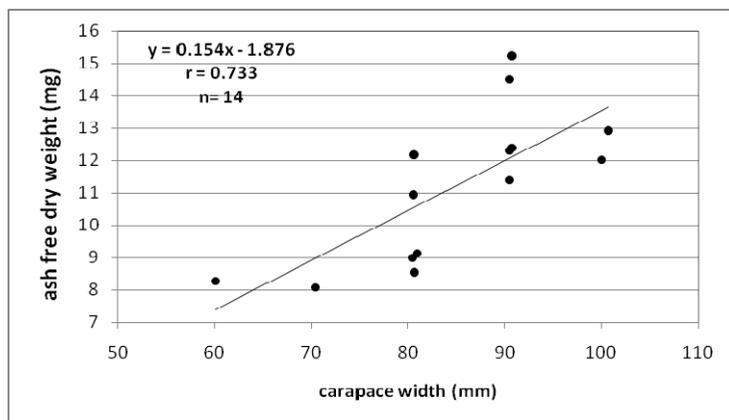


Figure 9. Relationship of carapace width (mm), and ash free dry weight (mg) of females *Portunus pelagicus* at Al-Fao site.

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بعض الجوانب الحياتية للسرطان السابح
***Portunus pelagicus* (Linnaeus, 1766)**
في شمال غرب الخليج العربي (Decapoda: Portunidae)

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المستخلص - جمعت عينات السرطان الأزرق السابح *Portunus pelagicus* (Linnaeus, 1766) من منطقة الفار في جنوب العراق. تراوحت قياسات عرض الدرغ من 80.15 - 120.34 (ملم) للذكور ومن 60.10 - 100.69 (ملم) للإناث بينما تراوحت قياسات طول الدرغ للذكور البالغة من 40.03 - 50.93 (ملم) وتراوحت قياسات طول الدرغ للإناث البالغة من 30.84 - 50.14 (ملم). تراوحت أطوال الملاقظ بين 50.21 (ملم) و 90.06 (ملم) وبين 40.77 (ملم) و 60.57 (ملم) للذكور والإناث على التوالي.