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Some phenotypic characteristics of the Hepu mitten crab, *Eriocheir hepuensis* Dai, 1991 (Grapsoidea: Brachyura), from Shatt Al-Arab

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Abstract

Some phenotypic characteristics of the Hepu mitten crabs, *Eriocheir hepuensis,* were studied, Eighty individuals of the crab males and females were collected from Shatt Al-Arab River. The width of the carapace ranged from 4.2-9.4 cm and 3.4-8.8 cm, and their wet weights ranged from 76.17-299.34 g and 92.27 199.27 g for males and females respectively. The study aims at finding the relationship between the carapace width and wet and dry weights, ash and organic matter as well as finding a relationship between the length of the chela and dry weights, ash and organic matter in the Shatt Al-Arab, as it is now possible to extract the length and width of the carapace without directly calculating them, but by relying on weight. The results showed high significant differences between the width of the carapace with wet and dry weights, ash and organic matter as well as a correlation between the length of cheliped with dry weight and the weight of ash and organic matter. It is noted that there is a strong to weak correlation at the probability level of 0.05 between cheliped length and dry weight ash and organic matter.

Key words: *Eriocheir hepuensis*, Hepu mitten crab, cheliped, invasive species.

Introduction

There are four species of the "hairy" or "mitten" crabs currently assigned to *Eriocheir* De Haan, 1835, there are *E. japonica* (De Haan,

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1835), *E. sinensis* H. Milne Edwards, 1853, *E. hepuensis* Dai, 1991, and *E. ogasawaraensis* Komai, Yamasaki, kobayashi, Yamamato and Watanabe, 2006 (Ng *et al.*, 2008). Species of *Eriocheir* are indigenous to china, the Korean Peninsula and Japan, and are all catadromous i.e spending most of their lives in fresh water, but returning to higher salinity water for mating, spawning and larval development (Naser *et al.*, 2012). Clarck *et al.* (2006) identified the species of *Eriocheir* in the Shatt Al-Arab canal and the Arabian gulf as *E. sinensis*, but latter careful examination of the Iraqi specimens as *E. hepuensis* (Naser *et al.*, 2012). *E. hepuensis* was indigenous to China, and the discovery of it in Iraq represent the first record outside China (Naser *et al.*, 2012).

It has been suggested that the invasion of *Eriocheir* species to countries outside China is through the ship balance water (Gollash, 2011). However, *E. sinensis* was classified among the list of the 100 worst invasive species in the world (Lowe *et al.*, 2004).

Chinese crab tolerates wide ranges of temperature changes (eurythermal), as adults can live at temperatures ranging from 4–32 °C, and in winter at 5 °C in estuarine waters and at freezing point 0 °C (Czerniejewski, and Wawrzyniak, 2006).

The objective of the present study was to make correlations the Hepu mitten crab body wet weight and carapace width in order to establish mathematical relationships between the variables, so that if one variable is known, the other could be computed approximately.

The relationships between the Hepu mitten crab body wet weight and body sizes (carapace length and width) will be helpful to the crab biologists to measure length and width of Hepu mitten crab.

Materials and methods

Crab samples were collected from different areas of the Shatt Al-Arab and northwest of the Arabian Gulf by means of fishing trawl nets. Live samples were placed inside refrigerated boxes until they reached the laboratory, and they were divided into males and females, then phenotypic measurements were taken.

A- The wet weights of the samples were taken using a Sartorius balance of a Chinese origin. Then the measurements of the length and width of the carapace and the length of the Chela were taken using a Vernier caliper and simple ruler.

B- The samples were dried in an Oven of American Type Binder at a temperature of 60°C for 24 hours to obtain the dry weight.

C-To get the weight of the ashes, the dried samples were burned in a Furnace at a temperature of 550° C for 24 hours, after which the ashes were weighed using a Sartorius balance.

D- The organic matter (gm) was extracted by calculating the difference between the dry weight and the ash weight.

The dry weight, ash and organic matter were taken, and the lengths of the chelipeds were measured. The relationship of length to weight was represented by the following equation:

$Y = ax^b$

Y = weight, X = length, a, b = constants

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$Y = ax^b$

Y = weight, X = length, a, b = constants

Results

The Chinese crab is characterized by an almost square-shaped shield, greenish-brown in adults and yellowish-brown in large juveniles, and there are four spines in the front of the head between the eyes, as well as there are four spines on both sides of the carapace resembling teeth with five pairs of legs called pereopods, the first pair of chelipeds, which are large in size and completely covered with hair in the male (Plate 1), while female chelipeds are smaller and partially covered with hair (Plate 2).

Phenotypical measurements were taken for 80 individuals, male and female, of the Chinese river crab *E. hepuensis*. The width of the carapace ranged from 4.2-9.4 cm and 3.4-8.8 cm, and their wet weights ranged from 76.17-299.34 g and 92.27-199.27 g for males and females respectively. The results showed that there were high significant differences between the width of the carapace and the weights of water, dry, ash and organic matter in the Chinese crab. The correlation values for males reached r= 0.870, 0.642, 0.642, and 0.634 for males, while in the females, the correlation reached r= 0, 00.729, 93. 79 and 0.69, respectively (Fig. 1, 2).

Plate 1: Chinese male crab *E. hepuensis* from Shatt Al-Arab River, Basrah

plate 2: Chinese female crab *E. hepuensis* from Shatt Al-Arab, Basrah

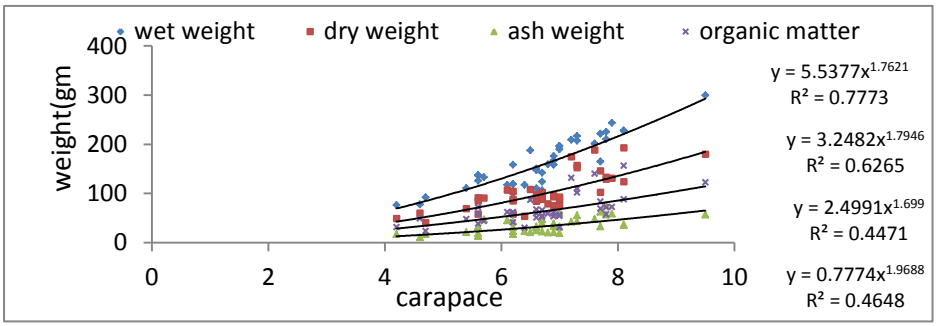

Figure 1: The relationship between carapace width, wet weight, dry weight, ash weight and organic matter in male *E. hepuensis* from Shatt Al-Arab River, Basrah

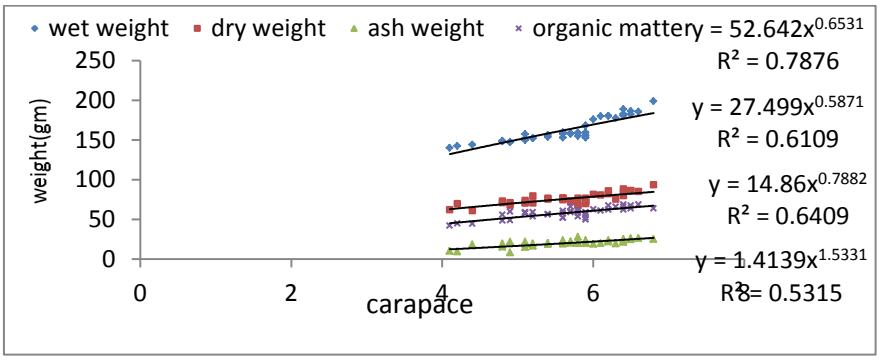

Figure 2: The relationship between carapace width, wet weight, dry weight, ash weight, and organic matter in Chinese females *E. hepuensis* from shatt Al-Arab River, Basrah.

Figure (3, 4) showed highly significant between dry weights, ash, organic matter and cheliped height in male and female Chinese river crabs through the correlation values, whose values in males reached r = 0.78, 0.67, 0.65 and in females were r=0.82 0.74 0.61.

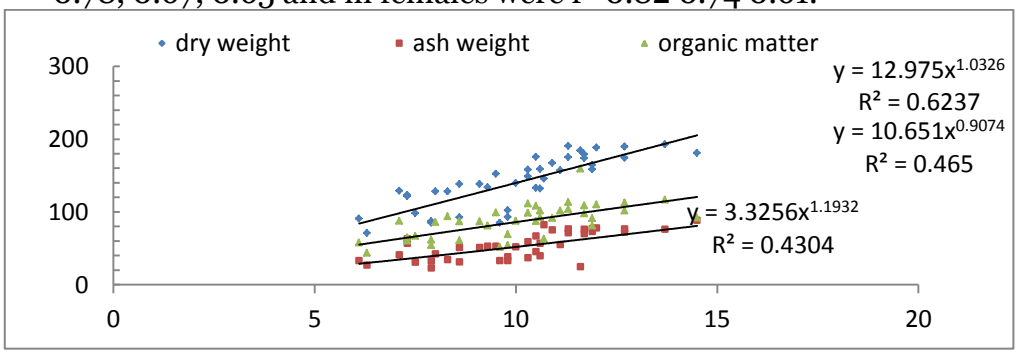

Figure 3: The relationship between the length of chelipeds, dry weight, ash weight and organic matter in male Chinese crab male *E. hepuensis* from Shatt Al-Arab river, Basrah

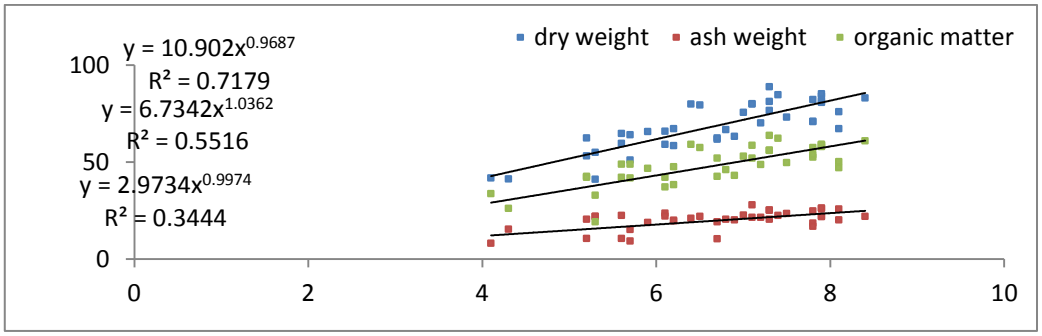

Figure 4: The relationship between the length of chelapids, dry weight, ash weight and organic matter in females Chinese crab *E. hepuensis*

Discussion

The relationship between length and weight is used in the management of fisheries and the field of culture and aquaculture assessment, as the information about phenotypic measurements represented by length, width and weight are very important as they contribute to determining the size of the stock and knowing whether it is in a state of decline or prosperity (Josileen, 2011; Tina, 2015). The importance of the length-weight relationship in managing water bodies is that it is an evidence of the safety and health of societies, especially the economically important species (Corgos and Freire, 2006). Lengths take a long time (Atar and Secer, 2003), so it is possible to obtain the length through the mutual transformation between length and weight and vice versa through an equation to find one of the two variables in terms of the other variable (Gorce *et al*; 2006; Sangun *et al*; 2009). The linear regression equation and the correlation coefficient were used to determine the relationship between the wet and dry weights and the length and width of the carapace of the Chinese crab *E. hipuensis*. It is noted that the greater the width of the carapace, the greater the weight, and this is consistent with many previous studies, (Abdul-Sahib, 2012; Smith, 1982; Afzaal *et al*, 2016)**.**

There are no previous studies on the life of Chinese crab in the Arabian Gulf and southern Iraq, but only a first record of its presence in southern Iraq, such as Hashim (2010) and Clark *et al.* (2006) as the study of Clark *et al.* (2006) is the first record of the presence of a single ovigerous female of the Chinese crab *E. sinensis* from the Shatt al-Basra, southern Iraq. The study of Hashim 2010 came to confirm the presence of numbers of male and female Chinese crab in southern Iraq.

Table 1: Lengths and weights of the Chinese mitten crabs, mainly *E. sinensis* from different regions compared with those of *E. hipuensis* from Southern Iraq.

Carapace width(cm)	body weight (gm)	Locality	references
4.6-8.8	45.1-306.5	Poland	Czerniejewski *et al*., 2006
5-7.8	24.5-164.17	Baltic Sea	Dagmara & Normant, 2014
5.3-8.8	45.1-169	Baltic Sea	Normant *et al*., 2000
4.3-4.5	40-40.57	Portugal	Dagmara *et al*., 2014
4.5-8	52.9-232	Baltic Sea	Egidijus & Gasiunaite, 2008
3.8 -8.9	30.9-321.9	Poland	Fudalewska and Saremba,2016
5.3-5.6	-	southern Iraq	Hashim,2010
3.4-9.4	76.17-299.34	southern Iraq	The current study

Moisture percentage is a good indicator and guide for the total energy components of the body represented by protein and fats (Ali *et al*, 2005).

As for the dry matter, it represents the remaining part of the wet matter after drying and is divided into organic matter represented by proteins, fats and carbohydrates, while the inorganic matter includes ash. (Yang *et al*., 2014).

Crabs have a pair of large-sized chela that they use to catch prey, cut food, fight, mating and courtship (Rasheed and Mustaquim, 2010). In male Hipu mitten crab, the chelipeds are large and completely covered with thick brown hair, their lengths are 7.3-11.7 cm, while in females they are smaller 4.1-8.4 cm and partially covered with hairs (Rudnick *et al*., 2000).

In the Hepu mitten crabs, it is noted that the weights of small sizes and sexually immature individuals are very close, due to the small size of the chelipeds and the incomplete growth of hairs on them. As for the larger individuals, a discrepancy is observed between the weights, especially the weights of ash and organic matter, due to the presence of hairs in the chelipeds and legs in mature individuals Sexually, it may increase the organic matter and decrease the ash rate in the

Hepu mitten crab, as the chemical composition of different types of hair is protein, fat, fiber and mineral elements (Robbins, 2012), or it may be due to the presence of some organisms that live on the bristles that cover the clips, in addition to species that are attached to the carapace and gills, such as some types of mites, especially in large and mature crabs, which provide a suitable environment for many organisms (Normant *et al*., 2007), and this explains the high percentage of organic matter and the low percentage of ash in Hepu mitten crab.

Conclusions

1- In Hepu mitten crab, the increase is threefold: length, width, and weight. As the weight increases, the length and width of the carapace increases, so there is no difference between the length and width of the carapace, as it is square in shape.

2- The percentage of organic matter in Hepu mitten crab is more than the dry matter, as it is a good indicator and guide for the components of the total energy of the body represented by protein and fat.

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دراسة بعض الصفات المظهرية للسرطان كثيف الشعر ***Eriocheir hepuensis*** **Dai, 1991 (Grapsoidea: Brachyura),** في شط العرب

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المستخلص

درست بعض الصفات المظهرية للسرطان كثيف الشعر *Eriocheir hepunesis*، جمع 80 فرداً من السرطانات قسمت الى ذكور واناث تراوح عرض الدرع من 4.2–9.4 سم و 3.4–8.8 سم و اوزانها الرطبة من 76.17–299.34 غم و92.27–199.27 غم على التوالي، تهدف الدراسة الى إيجاد العلاقة بين عرض الدرع والاوزان الرطبة والجافة والرماد والمادة العضوية كذلك إيجاد العلاقة بين طول الكلابات والاوزان الجافة والرماد والمادة العضوية في شط العرب اذ اصبح الان من الممكن استخراج طول وعرض الدرع بدون حسابهما بشكل مباشر وانما بالاعتماد على الوزن، بينت النتائج وجود فروق معنوية عالية بين عرض الدرع مع الاوزان الرطبة والجافة والرماد والمادة العضوية كذلك علاقة ارتباط بين طول الكلاب مع الوزن الجاف و وزن الرماد والمادة العضوية يلاحظ وجود علاقة ارتباط قوية الى ضعيفة عند مستوى احتمالية 0.05 بين طول الكلاب والوزن الجاف والرماد والمادة العضوية.

الكلمات المفتاحية: الانواع الغازية *Eriocheir hepunesi* ، السرطان الصيني النهري chelipede

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