**Modern Environmental Science and Engineering (ISSN 2333-2581)**
**September 2020, Volume 6, No. 9, pp. 1015-1018**
**Doi: 10.15341/mese(2333-2581)/09.06.2020/009**
**Academic Star Publishing Company, 2020**
**www.academicstar.us**

# Preliminary Morphometric Data on the Blue Crab Callinectes Sapidus (Decapoda, Portunidae) in the Maliakos Gulf, Greece

Sokrais Thalassinos[1], Stefanos Kavvadas[1], Persefoni Megalofonou[2], and Kostas Kapiris[1]

*1. Inter-Institutional Postgraduate Course (IIPGC) "Oceanography and Management of the Marine Environment", National and Kapodistrian University of Athens, Greece*

*2. Department of Biology, National and Kapodistrian University of Athens, Greece*

**Abstract:** The aim of the present paper is to study the morphometry and relative growth of *C. sapidus* in the Maliakos Gulf, to add new data to the literature, and thus to contribute to the management of this resource. Morphometric analyses were conducted in 139 specimens of *C. sapidus* (106 female and 82 male) caught during the period September 2018-May 2019 in the area of Maliakos Gulf with traps. The results showed a clear sexual dimorphism in *C. sapidus.* Males were larger and heavier than females. The relative growth of the body parts in relation to carapace length, significant inter-sex differences.

**Key words:** invasive species, Crustacea, Callinectessapidus, Eastern Mediterranean

## 1. Introduction

The blue crab (*Callinectes sapidus* Rathbun, 1896) is a native species of the Western Atlantic Ocean, with a wide geographical distribution from the Canadian mountains to the northern coast of Argentina. It usually occurs in estuaries and coastal water up to 90 meters deep. It has entered the entire Mediterranean since the early 20th century [1, 2] — where it is considered an invading species [3] and in the Black Sea [4]. There is little information on the biology and ecology of this commercial species [1, 2]. The blue crab, although its presence has been recorded in several areas of Greece has not been extensively study in the Greek area. The present study examines the morphometric differentiation of the blue crab *Callinectes sapidus* in the area of Maliakos gulf in Greece.

**Corresponding author:** Sokrais Thalassinos, E-mail: sitrakos@gmail.com.

## 2. Material and Methods

Samples have been collected as part of the program "Study of the marine biological resources of the Gulf of Maliakos, the impact of climate change on the marine ecosystem and proposed management measures for the optimal exploitation of the fisheries of the area" on a monthly basis, since September 2018 until May 2019. Sampling was carried out in the Maliakos area and samples were collected with fish traps ("baskets"). Morphometric measurements were performed with a caliper to the nearest 0.1 mm in a total of 139 individuals. For each blue crab carapace length (CL), carapace width (BB), antero-lateral border (ALB), postero-lateral border (PLB), frontal margin length (FML), chelar propodus length (CPL), chelar propodus height (CPH), 5th abdomen width (W5). The weight was measured using 0.01 g precision scales. Comparison of medians between the sexes was performed using Mann-Whitney statistical test at significance level a = 0.05.

**Fig. 1 Study area of Maliakos gulf, Greece.**

The relationships of the above components with respect to carapace length (CL), were calculated using the linear model Y = loga + blogX, with X = CLY the other morphometric measurements while a and b are the constants.

The carapace length body weight relationship was calculated using the logarithmic model of the allometric increase equation W = a.CLb, where W = body weight (g), CL = carapace length (cm), a and b are the constants. Values a and b were calculated using the least squares method. ANOVA and student's t-test were used to compare the differences between the sexes.

Condition factor (Fulton's K) was calculated separately for males and females according to the formula K = 100 W/L3 [5], where W is the total body weight (g) and L is the carapace length (cm). Gender differentiation was tested by t-test (P < 0.05). All statistical analyses were performed using the Statgraphics statistical program.

## 3. Results and Discussion

Males showed slightly wider carapace lengths (47-93 mm, mean 71.36 mm ±7.54 mm) than females

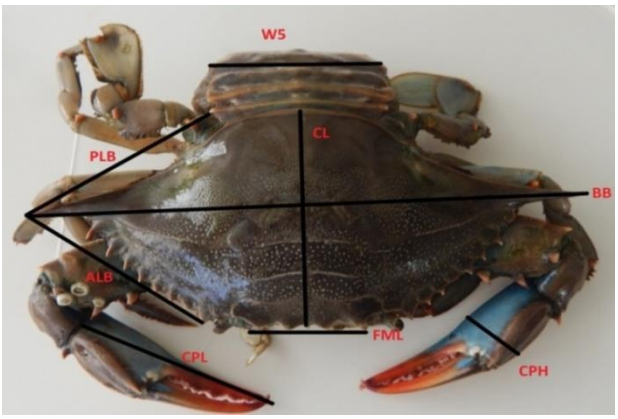


**Fig. 2 Morphometic measurements on *C. sapidus* Rathbun, 1896.**

(47-83 mm average 67.37 mm ±7.54 mm) (Mann-Whitney test P > 0.05) Similar patterns of carapace lengths have been found in the Southeast Adriatic [6], respectively (males 75.61-516.18 g) were heavier than females (69.55-317.95 g). In Albania, males have also been found to be heavier than females of the same size [7].

There is no work in the international literature on the morphometry of this decapods. Little work has been done on the morphometry of species belonging to the same family (Portunidae), e.g., Of *C. danae* [8] or *Portunus segnis* [9]. The allometric relationships studied between the morphometric characteristics showed that the growth is different between the sexes (Table 1). A negative allometry of female body parts other than chelar propodus height (CPH) was found to be isometric, whereas in males there was an isometric increase in body parts and carapace length, except frontal margin length (FML). In the present study,

**Table 1 Relationships beween carapace length (CL) and appendages of *C. sapidus*.**

| | a | b | r | Aometric | t-test | | a | b | r | Alometric | t-test |
|---|---|---|---|---|---|---|---|---|---|---|---|
| females | | | | | | males | | | | | |
| BB | 0.23 | 0.90 | 0.79 | negative | 39.7 | BB | -0.56 | 1.04 | 0.94 | Isometry | 28.08 |
| ALB | -0.57 | 0.84 | 0.84 | negative | -5.8 | ALB | 1.09 | 1.03 | 0.94 | Isometry | -8.9 |
| PLB | -0.63 | 0.84 | 0.85 | negative | 8.7 | PLB | -0.57 | 1.09 | 0.93 | Isometry | -7.2 |
| FML | -0.80 | 0.72 | 0.87 | negative | -43.3 | FML | 2.45 | 0.85 | 0.93 | negative | -30.3 |
| CPL | -0.63 | 0.86 | 0.84 | negative | -4.5 | CPL | -0.42 | 1.38 | 0.91 | Isometry | 3.71 |
| CPH | -0.47 | 1.11 | 0.74 | Isometry | -54.3 | CPH | -0.93 | 1.35 | 0.87 | Isometry | -35.6 |
| W5 | -1.35 | 0.87 | 0.79 | negative | -18.3 | W5 | -1.56 | 0.85 | 0.94 | negative | -19.9 |

the values of parameter b were slightly higher in males. The size most closely related to male sexual maturity is the length of the chelar (CPL) [10]. The present study shows that the present measurement shows a positive allometry with carapace length, indicating that it increases more rapidly than carapace length.

The carapace-body-weight relationship is given by the relation W = 0.061. CL1.90) (r = 0.95) for females and W = 0.0006.CL3.005 (r = 0.73) for males (Figs. 3-4). Body weight shows a negative allometry for females and an isometry for males. In all cases, the correlations were statistically significant (analysis of variance, P < 0.01). The large difference of parameter b between males and females has been observed in many species of the genus Callinectes and the b values indicate intense sexual conformity between the sexes of the species. Length-weight relationships can provide useful information for population weight development and can be used in comparative studies between different populations [11].

Condition factor values (Fulton's K) were different for both sexes (t-test = 7.13, P < 0.05). In males condition factor ranged from 0.45 to 0.93 (mean = 0.75-0.05) and in females from 0.38 to 0.85 (mean = 0.56-0.11). Condition factor is largely influenced by environmental factors, gonad development, nutrition and the species growth tendency [5].

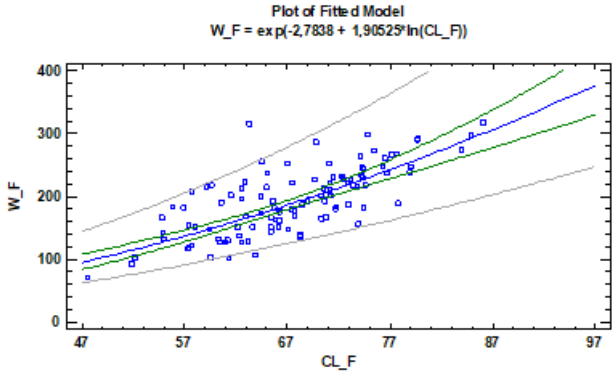


**Fig. 3 Carapace length (CL)-Body weight (W) relationships in *C. sapidus* females caught in the Maliakos Gulf.**

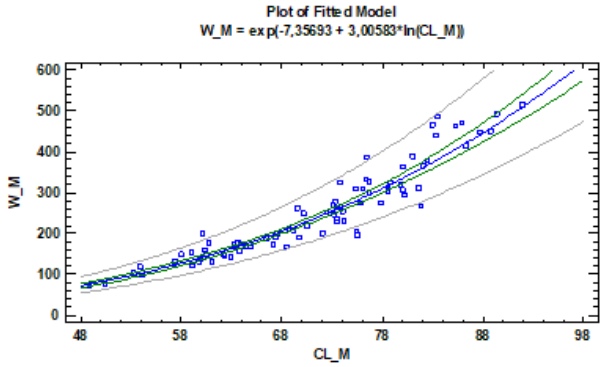


**Fig. 4 Carapace length (CL)-Body weight (W) relationships in *C. sapidus* males caught in the Maliakos Gulf.**

## 4. Conclusion

Studies of the morphometry of economically important species are of great interest to evolutionary biologists and fishery managers. The present study aims to be the first scientific step for a future allometric study of all populations of the species in the Mediterranean, so that through the structures of populations, strategies for managing its important stocks can be identified.

## Acknowledgments

This study is part of my postgraduate diploma thesis that was done within the research program of Hellenic Centre for Marine Research and I would like to thank Kostas Kapiris and Stefanos Kavvadas for their help and guidance.

## References

[1] G. Mancinelli, P. Chainho, L. Cilenti, S. Falco, K. Kapiris, G. Katselis and F. Ribeiro, The Atlantic blue crab *Callinectes sapidus* in southern European coastal waters: Distribution, impact and prospective invasion management strategies, *Marine Pollution Bulletin* 11 (2017) 95-111.

[2] G. Mancinelli, P. Chainho, L. Cilenti, S. Falco, K. Kapiris, G. Katselis, F. Ribeiro and M. Zotti, On the Atlantic blue crab (*Callinectes sapidus* Rathbun 1896) in southern European coastal waters: time to turn a threat into a resource? *Fisheries Research* 194 (2017) 1-8.

[3] A. Zenetos, M. E. Çinar, M. A. Pancucci-Papadopoulou and J. G. Harmelin et al., An annotated list of marine

alien species in the Mediterranean with records of the worst invasive species, *Mediterranean Marine Science* 6 (2005) (2): 63-118.

[4] O. Ak, A. Hasimoglu and K. Bayram, Southeastward expansion of the blue crab Callinectes sapidus (Rathbun, 1896) in the Black Sea, *Cahiers Biologie Marine* 56 (2015) 397-399.

[5] R. Froese, Cube law — Condition factor and weight-length relationships: history, meta-analysis and recommendations, *Journal of Applied Ichthyology* 22 (2006): 241–253.

[6] J. Dulcic, P. Tutman, S. Matic-Scoko and B. Glamuzina, Six years from first record to population establishment: The case of the blue crab, *Callinenctes sapidus* Rathbun, 1896 (Brachyura, Portunidae) in the Neretva river delta (south-eastern Adriatic sea, Croatia), Department of Aquaculture, Cira Carica, 2011, p. 4.

[7] S. Beqiraj and L. Kashta, The establishment of blue crab *Callinectes sapidus* Rathbun, 1896 in the Lagoon of Patok, Albania (south-east Adriatic Sea), *Aquatic Invasions* 5 (2010) (2) 219-221.

[8] A. A. Guimaraes-Silva, R. A. Shinozaki-Mendes and H. A. Andrade, Morphometric analysis of swimming crabs *Callinectes danae* (Crustacea, Portunidae) from the Santa Cruz Canal, Pernambuco (Brazil), *Pan-American Journal of Aquatic Sciences* 10 (2015) (3) 203-211.

[9] G. Hajjaj, A. Sley and O. Jarboui, Morphometrics and length-weight relationship in the blue swimming crab, *Portunus segnis* (Decapoda, Brachyura) from the gulf of Gabes, Tunisia, *International Journal of Engineering and Applied Sciences* 3 (2016) (12).

[10] M. Hosseini, J. Pazooki, M. Safaie and F. Tadi-Beni, The Biology of the Blue Swimming Crab *Portunus segnis* (Forskal, 1775) along the Bushehr Coasts, *Environmental Studies of Persian Gulf* 1 (2014) (2) 81-92.