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The Occurrence of Blue Crab (*Callinectes sapidus*, Rathbun 1896) in the Vaini Lagoon

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Abstract

The blue crab, *Callinectes sapidus*, Rathbun 1896, is a species that inhabits estuarine and shallow coastal waters up to 90 m depth, native to the western Atlantic coast. Its presence in our coast has been recorded since 2006, meanwhile different reports confirm its wide distribution in the Adriatic coast. During June 2019, 45 individuals (36 males and 9 females) were sampled from the catches of the artisanal fishers in the Vaini Lagoon. Carapace length, width and total weight were measured for all the sampled individuals. Carapace length ranged between 6.3 and 8.6 cm, carapace width ranged between 11.3 and 16.7 cm and the total weight ranged between 76 and 294 g. Males were found to be larger than females according to all the parameters measured. According to the carapace measurements, 91% of the sampled crabs (41/45) can be considered as mature. Further studies, related to the impact of this species on the artisanal fishery in its areas of distribution, may be important in the development of fishery management plans.

Key words: Crustacean, Artisanal fishery, Biological invasion

1. Introduction

The blue crab (Callinectes sapidus, Rathbun 1896) is a native species of the western Atlantic waters; it inhabits shallow waters up to 90 m depth and is progressively expanded from the Atlantic Ocean to the Mediterranean and Black Sea (Galil et al., 2002; Cerri et al.2020). This species is characterized by a wide ecological tolerance, it is usually found in muddy and sandy bottoms, during its life history it utilizes both oceanic and estuarine habitats (Hines et al., 1987). This species is considered among the 100 worst invasive species of the Mediterranean (Streftaris & Zenetos, 2006), which has manifested competitive interactions against native species and impacts on small scale fisheries (Cerri et al.2020).

Even though the exact date of its entrance in the Mediterranean cannot be established, because in the past it was often mistaken with another crab species, Portunus *segnis* or *Neptunus pelagicus*, (Castriota et al. 2018), its first Mediterranean record is in the northern Adriatic, Venice lagoon (Giordani Soika, 1951). After its first record, C. sapidus presence has been reported in different Mediterranean regions (Galil, 2002). In the last two decades it has experienced a fast expansion, invading the coasts of many countries in the Baltic Sea, Black Sea and Sea of Azov and at least 12 Mediterranean states, including Adriatic countries where established populations exist (Azzurro et al., 2019). Its presence in the Albanian coast is noted since 2006, in the

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Patoku lagoon where nowadays it has established a population (Beqiraj & Kashta, 2010).

Although the presence of this species in the Albanian coast has been registered since the last decade, this paper presents evidence of its distribution in new areas along the Albanian coast, in terms of providing additional information of blue crab specimens. Since the impact of this species is very high, linked to its high aggressive behaviours, it is important to track its distribution, population dynamics and interactions in order to gain information for a better management and prevent potential adverse effects on local ecosystems.

2. Materials and Methods

The data presented in this paper are based on the observation of 45 individuals of *C. sapidus*, caught in gill nets and fyke nets in the Vaini Lagoon, north west coast of Albania, in June 2019. The carapace length (CL - distance between the center of the anterior interorbital margin and the center of the posterior margin) and carapace width (CW - maximal distance between the posterior anterolateral spines) were measured to the nearest millimeter and all the individuals were weighted with a digital balance (Table 1). The carapace width-weight relationship was described by the equation:

$$W = a \times CW^b$$

Where W is total weight (g), CW is carapace width (cm), and *a* and *b* are constants. The length frequency distributions between sexes were analyzed.

Table 1. Carapace width, carapace length and body weight of male and female individuals of *Callinectes sapidus* caught in the Vaini Lagoon.

	Individuals	*Carapace width (cm)*			*Carapace length (cm)*			*Weight (g)*		
		Mean ± SD	Min.	Max.	Mean ± SD	Min.	Max.	Mean ± SD	Min.	Max.
Female	9	13 ± 1,2	11,9	15,1	6 ± 0,6	5,3	7	122,4 ±29,1	76	162
Male	36	13,7 ± 2,1	11,3	16,7	6,7 ± 0,7	5,4	8,6	172,1 ± 46,1	102	294

3. Results and Discussion

During this study a total of 45 individuals were examined. Among the sampled individuals there were 36 males and 9 females. The ratio between male and female individuals present in the sample, may be linked with their preferences for different environmental conditions. Previous studies have shown that males are higher in number in lower salinities, while females are present higher in number in more saline environments, they migrate to higher salinity coastal waters to lay eggs and tend to remain there (Castriota et al., 2012).

CL ranged from 5,3 cm to 8,6 cm, CW ranged between 11,3 and 16,7 and weight ranged between 76 to 294 g. According to our data, males were bigger and heavier compared to females. In particular, CL for males ranged between 5,4 and 8,6 cm (Mean CL = 6.7 cm ± 0.7), CW between 11,3 and 16,7 cm (Mean CW = 13,7 cm ± 2,1), with weight between 102 and 294 g (Mean W = 172,1 g ± 46,1). For females, CL ranged between 5,3 and 7 cm (Mean CL = 6 cm ± 0,6) CW between 11,9 and 15,1 cm (Mean CW = 13 cm ± 1,2), with weight between 76 and 162 g (Mean W = 122,4 ± 29,1) (Figure 1).

The carapace width (CW)-to-weight (W) relationship was calculated (for both sexes) as $W = 0.6*CW^{2.11}$ ($R^2 = 0.456$). According to the carapace measurements, 91% of the sampled crabs (41/45) can be considered as mature, based on the classification of Cadman and Weinstein (1985), according to them the maturity is reached at carapace width of 120 – 170 mm. Among 45 individuals, 93% (42/45) can be considered as large, while 7 % as medium - sized, based on the classification of Harding (2003), which uses carapace width to classify blue crabs as small (CW < 80 mm),

medium (CW 80-120 mm), and large (CW > 120 mm).

In the eastern part of the Adriatic Sea, the blue crab was first reported in October 2004, when four specimens were caught near Ston in a hypersaline lagoon (Onofri et al., 2008). Meanwhile, in the Albanian coast, Beqiraj & Kashta (2010) reported 12 specimens caught in the Lagoon of Patok. According to the authors, taking into account the high abundance and the presence of juveniles and ovigerous females, the population of the blue crab *Callinectes sapidus* can be considered as established in Patok area.

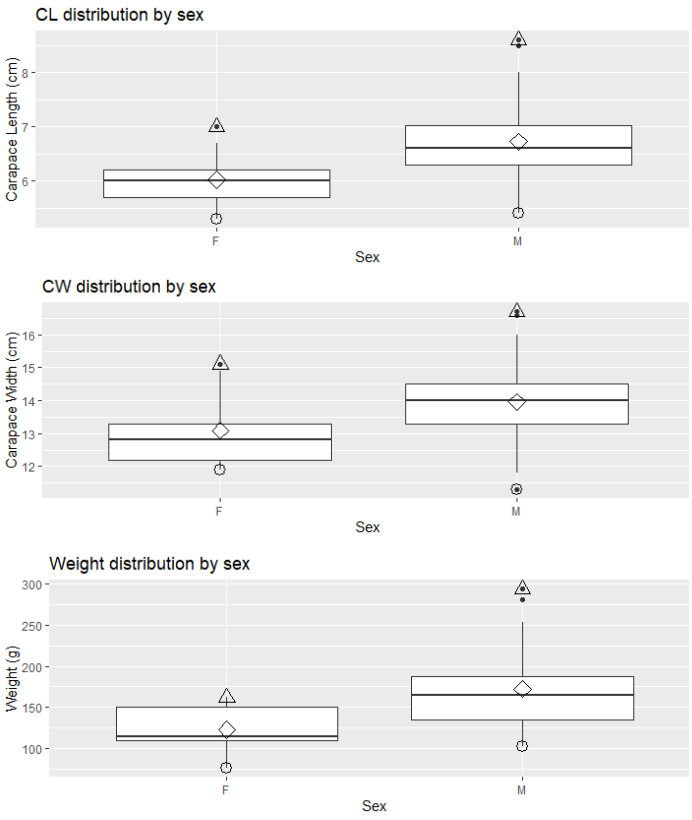

Figure 1. Carapace length, carapace width and total weight distribution for male and female individuals (○ – indicates the minimum values, ◊ - indicates the mean values, Δ – indicates the maximum values)

According to the fisherman, the blue crab has been introduced to the Vaini lagoon in 2004 and since then it has shown a constant increase in its abundance, while later (from the year 2015) it has shown its highest levels of abundance. Its high fecundity rate and aggressivity against local species and fishing gears make this species a serious potential threat on environment and local fishery.

4. Conclusions

The blue crab has been reported as a highly aggressive species with an impact on both biodiversity and socio-economics (Streftaris & Zenetos, 2006), its biological characteristics have made it a successful invader. The present study provides clear evidence of dispersal of *Callinectes sapidus* in new areas along the Albanian coast. Since its first introduction in the lagoon, it has shown a remarkable increase in abundance. Most of the individuals sampled (91%) were considered as mature. Adult specimens are excellent swimmers, in different stages of their lifetime they migrate from seawater to rivers, and vice versa.

The swimming ability might have helped them move away from the site of introduction toward adjacent locations, sometimes even farther. Especially females who, after matting, migrate toward high salinity coastal waters to lay their eggs (Van Engel, 1958). Its aggressive behavior and diverse diet make it a possible threat to all species in the habitat (Dulčić et al., 2011). We strongly recommend a continuous monitoring of this species dynamics and spreading along the Albanian coast and the development of management plans in order to reduce its potential negative impacts on both biodiversity and socioeconomics.

5. References

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