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## **FURTHER RECORDS OF *CALLINECTES SAPIDUS* (RATHBUN, 1896) IN CENTRAL PART OF ADRIATIC COAST IN ALBANIA**

### **SUMMARY**

The distribution of the Atlantic blue crab *Callinectes sapidus* is reported from marine, transitional and freshwater environments along the coasts of Adriatic Sea (Albania, Eastern Mediterranean Sea). Numerous specimens of the invasive blue crab were caught in the period from 2011 to 2019 in the area of Karavasta Lagoon. Our study was carried out during the September 2019. In addition to the morphometric parameters, some physic-chemical parameters were measured as well. These note documents further records of the species in one of the most important site for biodiversity in Mediterranean Sea that is currently seriously threaten by the presence of invasive alien species.

### **INTRODUCTION**

The first records on presence of the blue crab *Callinectes sapidus* in Albania have been documented by BEQIRAJ and KASHTA (2010) and that was based on specimens collected in the Lagoon of Patok. Further on the species has been expanded with its presence in entire Albanian coast going parallel in similar patterns with other Mediterranean and Black sea countries (DULČIĆ *et al.*, 2011; CASTEJÓN and GUERAO, 2013; CARROZZO *et al.*, 2014; ORHAN *et al.*, 2014; CILENTI *et al.*, 2015; DABAN *et al.*, 2016; MANCINELLI *et al.*, 2016; CULURGIONI *et al.*, 2020). According to STREFTARIS and ZENETOS, 2006 the Atlantic blue crab stands among the most invasive species within Mediterranean Sea.

## MATERIAL AND METHODS

Data were derived from the field collections, monitoring of fishing activities and questionnaires performed at the survey focus area i.e. Adriatic marine coastal areas, lagoons and channels within wider area.

### Site survey

The site survey is fitting with area of Divjaka-Karavasta National Park (Fig. 1; Tab. 1). This National Park is considered one of the most important natural areas in Albania. Divjaka-Karavasta National Park is 22,230 ha large. It has been designated as a National Park in 2007 through the Decision of the Council of Ministers (DCM) No. 687, dated 19.10.2007.

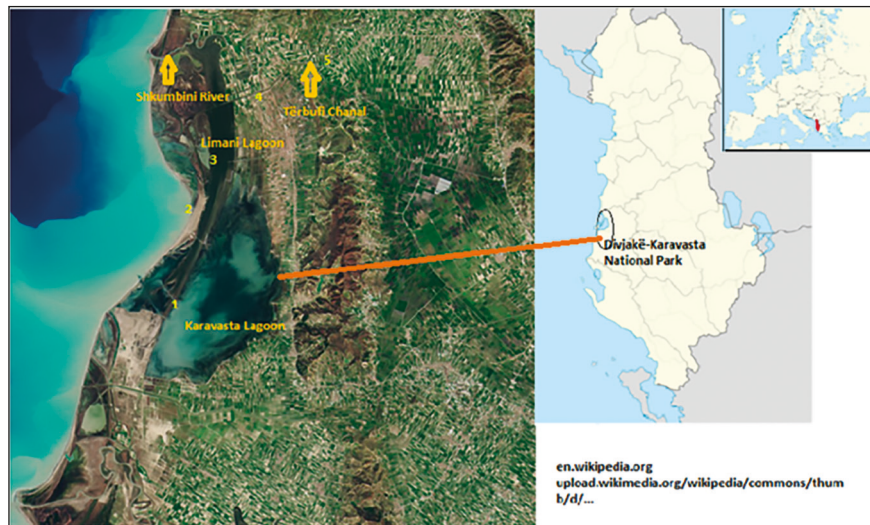


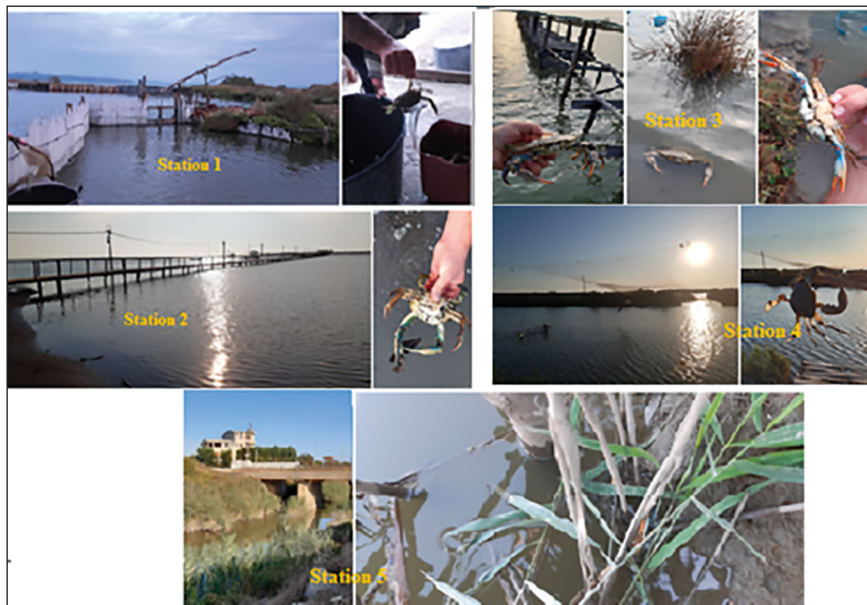
Fig. 1- Map of Divjakë – Karavasta National Park.

### Specimen collection

Specimens were ascribed to the genus *Callinectes* based on morphological characters, namely the lack of spines in the inner margin of the carpus of cheliped (OGBURN *et al.*, 2011), which differs from the other genera of portunid crabs. The crabs were weighed with a digital scale (total weight, TW), and the carapace length (as the distance between the center of the anterior interorbital margin and the center of the posterior margin, CL) and width (as the distance between the tips of posterior anterolateral spines, CW) were measured to the nearest mm. Individuals from the other sites were identified from photographs.

**Tab. 1-** Coordinates of the sampling stations.

| Sampling Stations                            | N (North)    | E (East)     |
|--|--------------|--------------|
| 1. Main Dalani Chanal (Waypoint 1)           | 40° 55' 21'' | 19° 27' 40'' |
| 2. Divjaka Resort Bridge (Waypoint 2)        | 40° 58' 25'' | 19° 28' 27'' |
| 3. Limani Lagoon (Waypoint 3)                | 40° 59' 30'' | 19° 28' 52'' |
| 4. Drainage channel of Terbufi (Waypoint P4) | 40° 01' 17'' | 19° 30' 17'' |
| 5. Bridge of Shenepremte (Waypoint 5)        | 41° 02' 07'' | 19° 32' 49'' |



**Fig. 2-** Sampling Stations 1, 2, 3, 4, 5 (photos September 2019, first author).

## RESULTS AND DISCUSSION

PH tolerance varies in pH 6-8. Waters with a pH less than 6 are lethal (WILCOX, 2004). The data on pH and temperature at which the blue crab was observed during the study are respectively 18° C minimum temperature and 23° C maximum temperature, while the pH values range from 7.0 to 7.5. There are no specific studies on blue crab mortality under natural conditions, whereas in laboratory conditions adult mortality occurs when concentrations of dissolved oxygen in water fall below 0.6 mg / l for more than 24 hours at a temperature of 24°C, (CHÁZARO-OLVERA and MARK, 2004). The values of dissolved oxygen at stations 1 and 2 are

approximately similar to those given by GRILLAS and SHUMKA, 2015. Blue crab is tolerant of oxygen levels at all stations from 5.78 to 8.84 mg / L (Tab. 2)

**Tab. 2-** Some physico-chemical parameters.

| Data       | Parameters                       | Sample stations |      |      |      |      |
|------------|----------------------------------|-----------------|------|------|------|------|
|            |                                  | 1               | 2    | 3    | 4    | 5    |
| 07.09.2019 | pH                               | 7.5             | 7.5  | 7.0  | 7.5  | 7.0  |
| 15.09.2019 |                                  | 7.5             | 7.5  | 7.0  | 7.5  | 7.0  |
| 22.09.2019 |                                  | 7.5             | 7.5  | 7.0  | 7.5  | 7.0  |
| 07.09.2019 | Temperature<br>°C                | 20              | 21   | 23   | 18   | 20   |
| 15.09.2019 |                                  | 19              | 20   | 23   | 18   | 19   |
| 22.09.2019 |                                  | 18              | 19   | 22   | 18   | 18   |
| 07.09.2019 | Dissolved O <sub>2</sub><br>mg/L | 8.65            | 7.43 | 6.45 | 6.35 | 5.78 |
| 15.09.2019 |                                  | 8.37            | 7.34 | 6.42 | 6.37 | 5.84 |
| 22.09.2019 |                                  | 8.84            | 7.57 | 6.52 | 6.41 | 5.92 |

**Tab. 3-** Morphometric data of individuals of the Liman Lagoon (in the red color are represent the males with high differences of morphometric, meanwhile in the black color are differences of female).

| Morphometric parameters     |                     |                         |                        |
|-----------------------------|---------------------|-------------------------|------------------------|
| Number of individuals M / F | Total weight TW (g) | Carapace length CL (cm) | Carapace Width CW (cm) |
| 1 ( M )                     | 280                 | 7.5                     | 13.8                   |
| <b>2 ( M )</b>              | <b>400</b>          | <b>8.5</b>              | <b>16.2</b>            |
| <b>3 ( F )</b>              | <b>180</b>          | <b>5.8</b>              | <b>10.7</b>            |
| 4 ( F )                     | 200                 | 5.5                     | 10.5                   |
| 5 ( M )                     | 200                 | 6.2                     | 11.5                   |
| 6 ( M )                     | 250                 | 7.3                     | 14                     |
| 7 ( M )                     | 270                 | 7.0                     | 16                     |
| 8 ( M )                     | 300                 | 7.7                     | 15                     |
| 9 ( F )                     | 100                 | 5.4                     | 10.5                   |
| 10 ( M )                    | 300                 | 8.0                     | 15                     |
| 11 ( F )                    | 100                 | 5.2                     | 9                      |
| 12 ( F )                    | 100                 | 5.5                     | 9.5                    |
| 13 ( M )                    | 200                 | 6.7                     | 12.8                   |
| 14 ( F )                    | 150                 | 6.6                     | 11.5                   |
| <b>15 ( F )</b>             | <b>90</b>           | <b>5.8</b>              | <b>11.0</b>            |
| 16 ( M )                    | <b>280</b>          | <b>7.2</b>              | <b>17</b>              |
| 17 ( F )                    | 100                 | 5.6                     | 11                     |
| 18 ( M )                    | 310                 | 7.7                     | 13.2                   |
| 19 ( F )                    | 150                 | 6.2                     | 11.8                   |
| 20 ( F )                    | 100                 | 5.8                     | 10.5                   |



**Fig. 3-** The smallest individual.



**Fig. 4-** The largest individual.

**Tab. 4-** Morphometric data of individuals of the Karavasta Lagoon (in the red color are represent the males with high differences of morphometric, meanwhile in the black color are differences of females).

| Morphometric parameters        |                        |                            |                           |
|--------------------------------|------------------------|----------------------------|---------------------------|
| Number of individuals<br>M / F | Total weight TW<br>(g) | Carapace length<br>CL (cm) | Carapace Width<br>CW (cm) |
| 1 (F)                          | 100                    | 6.0                        | 9.8                       |
| 2 (M)                          | 350                    | 8                          | 14.8                      |
| 3 (M)                          | 200                    | 6.7                        | 13.8                      |
| 4 (M)                          | 355                    | 7.7                        | 15.4                      |
| 5 (F)                          | 100                    | 5.6                        | 10.6                      |
| 6 (M)                          | 350                    | 8                          | 15.4                      |
| 7 (F)                          | 150                    | 6.0                        | 12.0                      |
| 8 (F)                          | 100                    | 5.8                        | 10.8                      |
| <b>9 (F)</b>                   | <b>100</b>             | <b>5.6</b>                 | <b>10.5</b>               |
| 10 (M)                         | 300                    | 8.2                        | 15.8                      |
| 11 (F)                         | 110                    | 6.8                        | 11.8                      |
| <b>12 (F)</b>                  | <b>150</b>             | <b>6.6</b>                 | <b>14.3</b>               |
| 13 (F)                         | 130                    | 6.4                        | 11                        |
| 14 (F)                         | 145                    | 5.7                        | 10.5                      |
| <b>15 (M)</b>                  | <b>400</b>             | <b>8.4</b>                 | <b>16</b>                 |
| 16 (F)                         | 160                    | 5.5                        | 10.3                      |
| 17 (M)                         | 150                    | 5.8                        | 10.8                      |
| 18 (M)                         | 300                    | 7.5                        | 12.6                      |
| <b>19 (M)</b>                  | <b>50</b>              | <b>4.3</b>                 | <b>7.4</b>                |
| 20 (M)                         | 300                    | 7.6                        | 14.4                      |

**Tab. 5-** Grouping of individuals by HINES *et al.*, 1990.

| Individuals by age  | 1-1 year<br>(CW <100 mm)    | 1-2 year<br>(CW from 100 to 170 mm) | >2 year<br>(CW >170 mm) |
|---------------------|-----------------------------|-------------------------------------|-------------------------|
| Lagoon of Liman     | 2 F ( 10 % )                | 18 (90 %), 10 M (50%), 8 F (40%)    | 0 %                     |
| Lagoon of Karavasta | 2 (10%), 1 M( 5%), 1 F (5%) | 18 (90%): 9 M (45%), 9 F (45%)      | 0%                      |

**Tab. 6-** Grouping of individuals by age based on carapace width according to HARDING, 2003.

| Grouping by age     | Juvenile (CW <120 mm)                 | Adult (CW >120 mm)    |
|---------------------|---------------------------------------|-----------------------|
| Lagoon of Liman     | 11 (55 %) : 10 F ( 50% ), 1 M ( 5 % ) | 9 M ( 45%), 0 F ( 0%) |
| Lagoon of Karavasta | 11(55%): 9 F (45%), 2 M (10%)         | 1 F (5%), 8 M (40%)   |

**Tab. 7-** Grouping of individuals by body size into small, medium, and large based on carapace width according to CADMAN & WEINSTEIN 1985.

| Grouping by body size, M / F | Small body<br>(CW < 80 mm) | Medium body<br>(CW = 80 -120 mm) | Large body<br>(CW>120 mm) |
|------------------------------|----------------------------|----------------------------------|---------------------------|
| Lagoon of Liman              | 0%                         | 11 ( 55 %): 10 F (50%), 1 M (5%) | 9 M, (45%), 0 F ( 0 % )   |
| Lagoon of Karavasta          | 1 M (5%)                   | 10 ( 50%): 9 F (45%), 1M (5%)    | 9 M (45%), 1 F (0%)       |

The study of the structure of the two populations of blue crab, respectively that of Karavasta Lagoon and Godulla or Lagoon of Liman shows that there are no significant structural differences between them (see Tabs. 2, 3, 4, 5, 6, 7).

## CONCLUSIONS

During this study, it results that individuals of *Callinectes sapidus* were observed about 10 km away from the sea coast. The values of the physico-chemical parameters of pH, dissolved oxygen and the temperature of the environment where the study was carried out are tolerated by the blue crab. They are respectively for pH 7 to 7.5, for oxygen from 5.78 to 8.84 mg/l, which are higher than the lethal values, pH < 6 and O < 0.6 mg/l.

During the morphometric study of the individuals of the two populations, no structural difference was observed between these populations.

More complete studies are needed regarding the effect of physico-chemical factors on the life of the blue crab in different aquatic ecosystems.

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