



A study on egg number and morphology of common moon crab *Matuta victor* (Fabricius, 1781)

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Abstract

Matuta species belong to the superfamily Calappoidea and are widely distributed in the Indo-Pacific region, including the New Hebrides, Fiji (from Southeast Asia) and the Red Sea. They live in sandy coastal areas and at depths between 0-20m. To date, the studies of *Matuta victor* have generally focused on the first record/occurrence. In addition, egg morphology and fecundity studies are limited due to the difficulty in encountering ovigerous female individuals. In this study, the number of eggs and egg morphology of an ovigerous female individual belonging to the *M. victor* species caught from Antalya Bay (in August 2022) were investigated. In the metric measurements, the length of the carapace was 2.53 cm, the width of the carapace was 2.62 cm, and the characteristic distance between the end points of the lateral spines on the carapace was 3.90 cm. The weight of the individual was measured as 7.380 g. The average diameter of 100 eggs was calculated as $331.75 \pm 7.62 \mu\text{m}$. The number of oil droplets observed in the eggs was 1 and the the oil drop diameter was measured as a minimum of 59.64 μm , a maximum of 73.12 μm and an average of $64.16 \pm 3.21 \mu\text{m}$. The yolk diameter in eggs was measured as a minimum of 264.96 μm , a maximum of 299.56 μm and an average of $286.10 \pm 9.19 \mu\text{m}$. The ratio of oil drop diameter to yolk diameter was calculated as $0.22 \pm 0.01 \mu\text{m}$. Since there are very limited studies on *M. victor* in the Mediterranean, and there is no study on egg morphology and fecundity, especially in Antalya Bay, this study presents novel data that can be used for comparison in other egg morphology studies of *M. victor* or another species belonging to the same genus.

Keywords: *Matuta victor*, Moon crab, Crab egg, Egg morphology

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1. Introduction

Crustaceans are the second most abundant group among non-indigenous species (NIS) in the Mediterranean Sea. More than 90 species of these Crustaceans belong to the order Decapoda. Approximately 400 decapod species have been reported from the Mediterranean Sea, of which 24% of which are non-indigenous species (Coll et al., 2010; Galil et al., 2015). The most recent records of Decapods in the Mediterranean Sea include the moon crab, *Matuta victor* (Fabricius, 1781), originating from Indo-Pacific and the Red Sea (Dailianis et al., 2016; Kondylatos et al., 2018).

Matuta species belong to the Calappoidea superfamily and live in sandy coastal areas and at depths between 0-20 m.

When they feel in danger, they can be quickly buried in the sand (Bellwood et al., 2002; Ateş et al., 2017; Hanim et al., 2021). *M. victor* is a voracious scavenger and an omnivorous predator, displaying interspecies nutritional competition and aggressive behavior. Although it mainly preys on mollusks and crustaceans, small individuals feed on small soft-shelled species, while larger individuals feed on slow-moving invertebrates such as gastropods, anomurans and bivalves (Innocenti et al., 2017; Galil et al., 2015). They are widely distributed in the Indo-Pacific region, including the New Hebrides, Fiji (from Southeast Asia) and the Red Sea, are caught by the local population with nets, handheld or beach purse seines (Carpenter & Niem, 2001; Hanim et al., 2021; Zviely et al., 2021).



On the Mediterranean coast, *M. victor* was first reported from the Eastern Mediterranean in the Gulf of Haifa (Israel) in 2012 (Galil & Mendelson, 2013). It was reported from Batroun (Lebanon) in 2013, Tyr and Saida (Lebanon) in 2014 (Crocetta & Bariche, 2015), from Antalya Bay (Türkiye) in 2015 (Dailianis et al., 2016), from Muğla, İztuzu Beach (Türkiye) in 2017 (Ateş et al., 2017), from the Syrian coast in 2017 (Zeini & Hasan, 2017), from Rhodes Island (Greece) in 2018 (Kondylatos et al., 2018) and from the Iskenderun Bay (Türkiye) in 2019 (Yeşilyurt et al., 2019).

To date, the number of studies on *Matuta victor* is very limited. Most of the studies that have been done are the first record or occurrence studies. There is only one research on the fecundity and number of eggs of *Matuta victor* conducted by Naderi et al. (2021) in the Gulf of Oman. In this study, the number of eggs and egg morphology of *M. victor* caught from Antalya Bay were examined. Since there is no study that includes the egg characteristic of *M. victor*, which is especially difficult to obtain ovigerous female, this study brings to the literature the data that can be compared in other egg morphology studies to be made about this species or another species belonging to this genus.

2. Material and Methods

The sampled *M. victor* ovigerous female individual was caught by a fisherman in the Aksu region (36° 51' 17.971" N - 30° 56' 1.346" E) of Antalya, Türkiye (Figure 1) with a fishing line in August 2022. Then dead individual delivered to Akdeniz University Faculty of Fisheries for information purposes since it is a rare species.

In order to determine the morphological features of *M. victor*, the lengths were measured with a digital caliper and the weights were measured with a precision balance (Kern, Germany) with 0.001 precision. A micro spatula was used to separate the eggs from the abdomen. The gravimetric egg counting method, a popular method in crab egg counting, was used to determine the number of eggs which were separated from the abdomen (Aydın, 2013; Aydın et al. 2014).

Eggs were photographed with a computer-assisted stereo microscope (Olympus SZX16, Japan), and the developmental stages and egg types of the eggs were determined. In addition, egg diameter, yolk diameter, number and diameter of oil droplets were measured with the help of an ocular micrometer. The mean and standard deviation of the measurement results were calculated with the SPSS v26.0 program (IBM Corp., 2019).

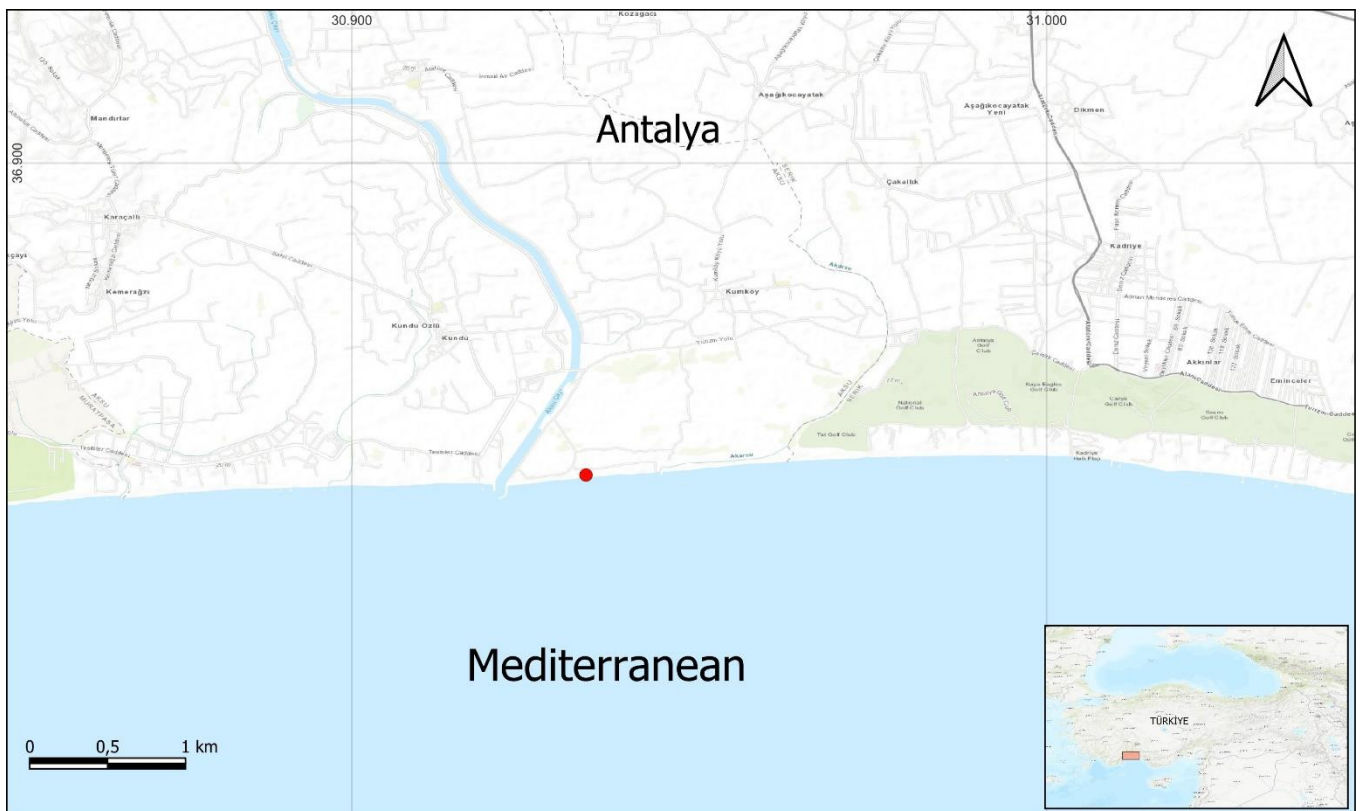


Figure 1. The sampling area of this study

3. Results

In the measurements, the length of the carapace was 2.53 cm, the width of the carapace was 2.62 cm, and the characteristic distance between the end points of the lateral spines on the carapace was 3.90 cm. (Figure 2).

The weight measurement of the sampled *Matuta victor* individual was made with the help of a precision scales and it was measured as 7.380 g. After the measurement, the eggs were collected using a micro spatula and weighed separately, and the total egg weight was determined as 1.050 g. Three 0.05 g sub-samples were taken from the eggs and each egg was counted individually under the microscope. The number of eggs in each sub-sample was determined as 1858, 1851 and 1870, respectively. The average total number of eggs was calculated as 39053 ± 164.76 .

The mean diameter of a total of 100 eggs, whose diameters were measured with an ocular micrometer, was calculated as $331.75 \pm 7.62 \mu\text{m}$. (Figure 3). The number of oil droplets observed in the eggs was one, with a minimum oil drop diameter of $59.64 \mu\text{m}$, a maximum oil droplet diameter of $73.12 \mu\text{m}$, and an average oil droplet diameter of $64.16 \pm 3.21 \mu\text{m}$. The yolk diameter in eggs was measured as a minimum of $264.96 \mu\text{m}$, a maximum of $299.56 \mu\text{m}$ and an average of $286.10 \pm 9.19 \mu\text{m}$. The ratio of oil droplet diameter to yolk diameter was calculated as 0.22 ± 0.01 .

Since the color of the eggs under the abdomen is still a distinct yellow-orange color and has not lost its transparency when viewed under the microscope, it has been determined that the eggs are still in Stage I (Perez, 1990; Boolootian et al., 1959).

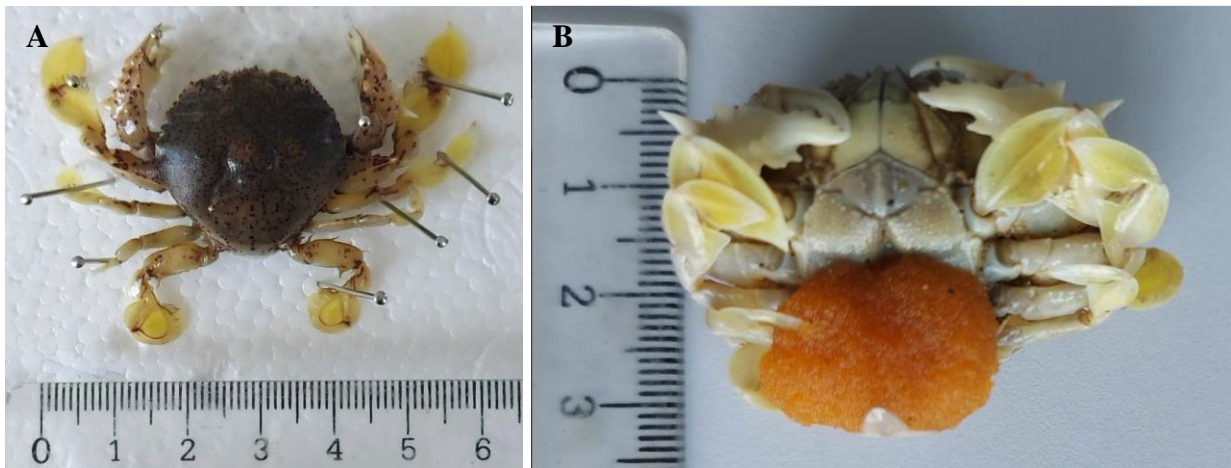


Figure 2. Top view (A) and bottom view (B) of an ovigerous female *M. victor* sampled from Antalya Bay



Figure 3. *Matuta victor* eggs photographed with a computer-assisted stereo microscope

4. Discussion and Conclusion

The number of eggs counted in this study was 39053 ± 164.76 . Naderi et al. (2021) reported that the lowest number of eggs was 11635 with a carapace width of 2.86 cm and a weight of 8.79 g, while the highest fecundity was obtained from an individual with 43423 eggs with a carapace width and a weight of 2.67 cm and 6.25 g in the fecundity study conducted on *M. victor* in the Gulf of Oman. The number of eggs was found to be very similar to the individual with the highest fecundity obtained in the study of Naderi et al. (2021).

Results from the fecundity and egg morphology study of Perez, (1990) on *Matuta lunaris*, another member of the *Matuta* genus distributed along the Indian Ocean coasts, especially in the Bays of Oman and Bengal, show that the diameters of the eggs belonging to Stage I were measured $291 \pm 2.08 \mu\text{m}$. According to these data, it was determined that the egg diameter of *M. lunaris* found in Oman Bay was smaller than the egg diameter of *M. victor* species found in Antalya Bay.

According to a study by Kobayashi (2013), it was found that ovigerous females are generally observed from May to early September. Studies on embryonic development have shown that eggs are mostly laid between May and August and hatch between July and September. In this particular study, an ovigerous female was captured in early August. The findings are consistent with those reported in the literature.

Since there are very limited studies on *M. victor* in the Mediterranean and there are no studies on egg morphology, especially on the coasts of Türkiye, this study will serve as a source for comparison in other egg morphology studies to be conducted on this species or another species belonging to this genus. Moreover, the results presented here will contribute to future studies on *M. victor* to further understand its fecundity, reproductive biology, and reproductive ecology.

Conflict of interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required. All applicable international, national, and/or institutional guidelines for the care and use of animals were followed.

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