

PAPER • OPEN ACCESS

## The proportion of the egg berried female crabs and the hatching time based on differences in the eggs colour of the blue swimming crab in the crab box apartment

To cite this article: L Qomariyah *et al* 2023 *IOP Conf. Ser.: Earth Environ. Sci.* **1251** 012056

View the [article online](#) for updates and enhancements.

You may also like

- [Ti atom and Ti ion number density evolution in standard and multi-pulse HiPIMS](#)  
M Fekete, J Hnilica, C Vitelaru et al.
- [Novel metallic Bi-Pb-Cd-Ag alloys for shielding against neutrons and gamma rays](#)  
A M Reda and A A El-Daly
- [Influence NiO on the structure, elastic properties and buildup factor of BaO-CdO-borosilicate glasses](#)  
M I Sayyed, M A Abdo, H Elhosiny Ali et al.



245th ECS Meeting • May 26-30, 2024 • San Francisco, CA

[Learn more & submit!](#)

Present your work at the leading electrochemistry & solid-state science conference.

Network with academic, government, and industry influencers!

Submit abstracts by December 1, 2023



# The proportion of the egg berried female crabs and the hatching time based on differences in the eggs colour of the blue swimming crab in the crab box apartment

L Qomariyah<sup>1</sup>, R Z Wicaksono<sup>1\*</sup>, K C Nugroho<sup>1,2</sup> and W Setioko<sup>1</sup>

<sup>1</sup> Indonesian Blue Swimming Crab Association (Asosiasi Pengelolaan Rajungan Indonesia-APRI), Surabaya, Indonesia

<sup>2</sup> School of Business, IPB University, Bogor, Indonesia

\*E-mail: rajunganindonesia@gmail.com

**Abstract.** Fishermen in Pagagan Village who get the egg-berried female (EBF) of blue swimming crabs can store them in the Crab Box Apartment that has been provided on the coast so that the crabs incubate their eggs. The placement of EBF crabs in the crab box apartment showed fishermen actively participating in sustainable crab management. The EBF crabs are quite varied, especially in egg colour (yellow, orange, brown, and grey). This study used descriptive analysis to identify the EBF crab's hatching time based on the egg colour that is incubated in the crab apartment. The result showed that the EBF crabs with yellow eggs have an average hatching time of more than 7 days. The orange eggs are, on average 5 days, the brown eggs are about 3 days, and the grey eggs are only 1 day. These hatching time records can also improve the implementation of the crab box apartment, which is a way to minimize the presence of EBF crabs in the supply chain and increase compliance, which leads to sustainability.

**Keywords:** blue swimming crab, crab apartment, egg-berried female

## 1. Introduction

Blue swimming crab (*Portunus pelagicus*) is a type of crab with its natural habitat only in the sea. This biota is a member of the phylum Arthropoda and class Crustacea which has a segmented body that looks very clear. Blue swimming crabs are found in Indonesian waters, which are spread in almost all shallow marine waters to estuary areas including coral, mangrove and seagrass areas [1]. Based on the activity of catching crabs, this area is one of the most productive fishing and landing centres, among others. The astronomical location of Pagagan Village is 7.228660 LS-113.502658 BT is one of the most productive fishing and landing among others location in Pamekasan, especially the activity of catching blue swimming crabs. The eastern border of the village is bordered by Majungan Village, the northern boundary is bordered by Jarin Village, the western village boundary is bordered by Baddurih Village, and the southern part of the village borders the Madura Strait. The area of this village is about 256,609 ha, which has a coastline of 1,528 km and a height of 3 meters above sea level [2].

The crabs are spread over a very wide area and live in algal habitats to seagrass habitats with sandy to muddy substrates [3]. In addition to habitat, the spread of crabs is largely determined by their feeding and spawning habits. The crabs are spread from the intertidal (tidal) zone to more than 50 meters deep. Young crabs are mostly found in coastal waters with relatively shallow depths, while in deeper waters adult crabs are more common [4].



Fishing pressure, decreasing catch per fishing effort and smaller catch size from year to year indicate a decline in the status of crab resources in nature [5]. The government's efforts to maintain the crab population are by limiting the size that can be caught and their reproductive conditions. Management for export needs has been regulated in PERMEN KP Regulation Number 12 of 2020, which has been revised in the latest regulation, namely PERMEN KP Number 17 of 2021 which regulates the size of crabs that are allowed to be caught and crabs in laying conditions [6].

The EBF crabs can be stored in the Crab Box Appartement so that the crabs incubate the eggs first before being sold to collectors. So if there are fishermen when catching crabs and then get crabs that lay eggs, the crabs endeavoured to survive so that later they are put into the crab Crab Box that has been provided on the coast of Pagagan Beach. The egg-berried female crabs that fishermen get are quite varied, especially in terms of the different colours of crab eggs.

The gonadal maturity level is an important aspect of crab reproductive biology that can be determined by looking at the external organs such as the abdomen and carapace. Egg maturity can be seen from changes in colour pigment [7]. Determining the level of gonad maturity of female crabs is identified morphologically by observing their colour, shape and distribution according to [8] in [9]. The maturity level of the gonads is categorized into five levels, namely *no sign of gonads*, *gonad immature*, *gonad maturing*, *gonad mature*, and *ovigerous*. According to [10] scientifically, there are 5 stages of gonad maturity, namely *immature*, *early maturing*, *advanced maturing*, *mature*, *spawned or developing ovary*. However, in this study just focus on stage 5. Therefore, this study aims to determine the proportion of EBF crabs and observe the hatching time of the EBF crabs by the egg colour in the Crab Box Appartement.

## 2. Research methodology

This research was conducted from August 2021-May 2022 in the coastal village of Pagagan. The sampling activity in this study was obtained from the catches of trap fishermen who got live EBF crabs and then stored them in the Crab Box Appartement. Observing and recording the colour of the eggs obtained. After that, observe the hatching time of each egg colour from EBF crabs (yellow, orange, brown, and grey). Then the data obtained is entered into a table with parameters such as the date, egg colour of EBF crabs, number of EBF crabs that are placed into the Crab Box appartement, release date of eggs, and duration or time of hatching. Ms Excel and descriptive analysis were used to determine the proportion of EBF crabs that fishermen placed in the crab box appartement and the hatching time of the egg by changing colour.



**Figure 1.** Map of Pagagan Village in Pamekasan Regency, East Java Province.

### 3. Results and discussion

Management of blue swimming crabs needs to be done so that the potential of swimming crabs in the waters continues to be sustainable. Minister of Maritime Affairs and Fisheries Regulation No.17/PERMEN-KP/2021 regarding the prohibition of catching small crabs with a width of <10 cm and egg-battered females has not been fully complied with. For this reason, blue swimming crab fishermen coordinate with the village government as well as with the Pamekasan Fisheries Service, whom CO Management assists in forming a village-level rule so that crabs in Pagagan Waters can be sustainable. On November 10, 2020 at the Pagagan Village Office Hall, together with the village government and representatives of fishermen and also attended by the Village Fisheries Service, they stipulated PERDES Rule Number 10 of 2020 [12] concerning Management of Crab Fisheries in Pagagan Village, Pademawu District, Pamekasan Regency, if the EBF crabs accidentally caught can also be done by placing in the crab box apartment that has been provided, so fishermen can manage it until the eggs are released naturally. Fishermen have started to apply this rule since regulations were enacted, whereby fishermen who get EBF crabs are put in the crab box, then recorded in the Logbook so that data on the number of crabs and the colour of the crab eggs are obtained that are put in the crab box apartment. There are 4 types of egg colour of the EBF crabs (Figure 2), namely yellow, orange, brown and grey.



**Figure 2.** Four types of colour egg berried females in the crab box apartment.

The number of EBF crabs put into the Crab Box Appartement from August to December 2021 was quite diverse, with the highest number in September and the least in December. The sample results obtained in August 2021 were 21 ind EBF crabs with different egg colours, respectively 8 grey, 12 brown, and 1 yellow. The catch of EBF crabs obtained in September 2021 was 24 ind which was 7 orange, 3 grey, 9 brown, and 5 yellow. The data in October showed 4 greys, 6 browns, 7 yellow and 1 orange. While in November there are only 2 grey, 1 brown, and 3 yellow. The number of EBF crabs in August and November is dominated by brown eggs. Meanwhile, October and November are dominated by yellow eggs. The data in Figure 3 below shows the grey egg has a hatching period of only 1 day, the brown 3 days, the orange 5 days, and the yellow 7 days. EBF crabs incubate brown and dark grey eggs, dominated by mature gonads, while immature gonads dominate yellow and orange colours. The development of EBF crabs can be seen from changes in egg colour level from yellow to dark grey [13].

The results of the data or samples obtained from fishermen, the number of EBF crabs that are placed into the Crab Box Apartment is quite varied. In January, it was found that the EBF crab was dominated by brown colour, which was as many as 5 ind, while the orange and grey were only 1. In February, the results obtained were 4 kinds of egg colours, namely 6 grey, 8 brown, 3 orange and 3 yellow. In March, the data obtained were dominated by brown eggs, namely 14 ind, followed by 13 in grey, 4 in yellow and 3 in orange (Figure 4).

The results of the data obtained in April 2022 amounted to 25 ind, which were 6 greys, 12 brown, 2 yellow, and 5 orange. While the data obtained in May decreased as many as 14 ind was only 1 in grey, 6 in brown, 2 in yellow and 5 in orange (Figure 5).

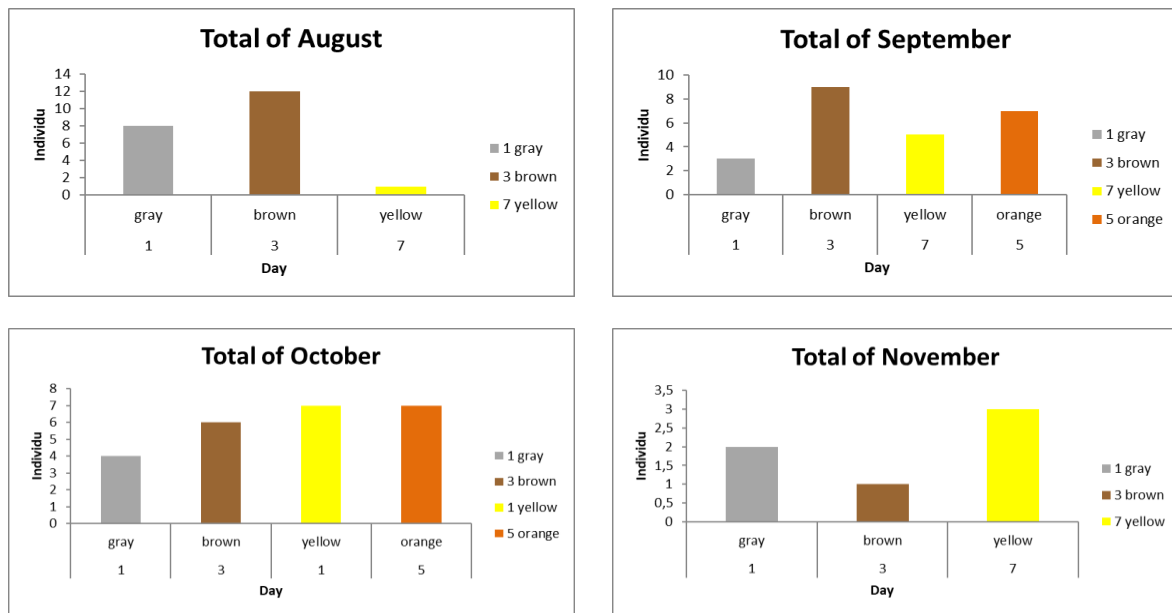


Figure 3. Data of crab spawn in August-November 2021.

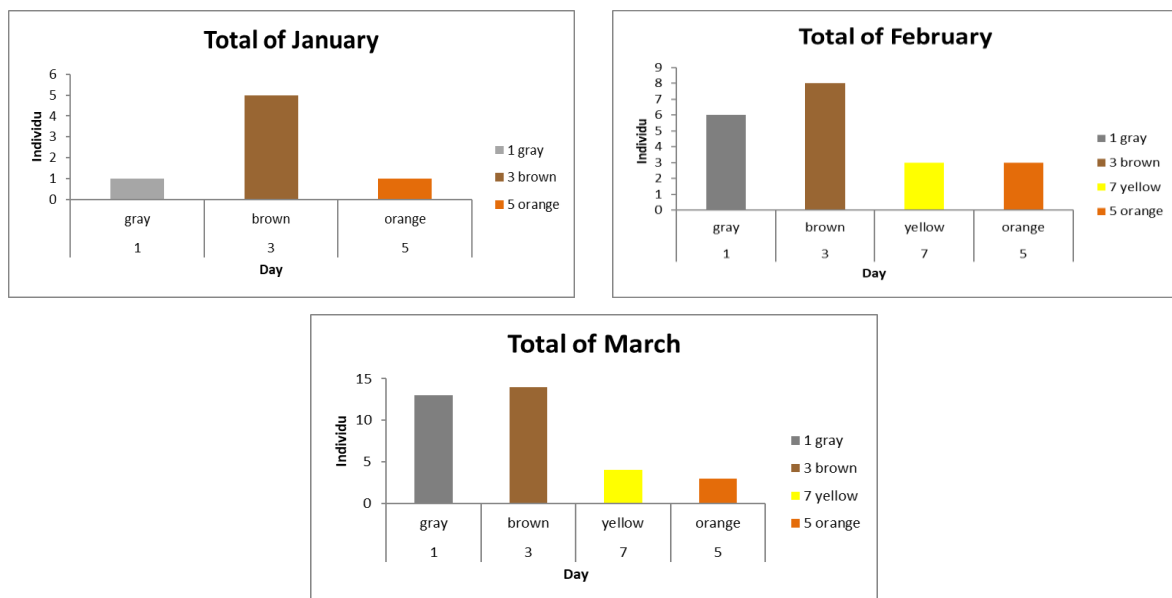


Figure 4. Data of EBF crabs in January, February and March 2022.

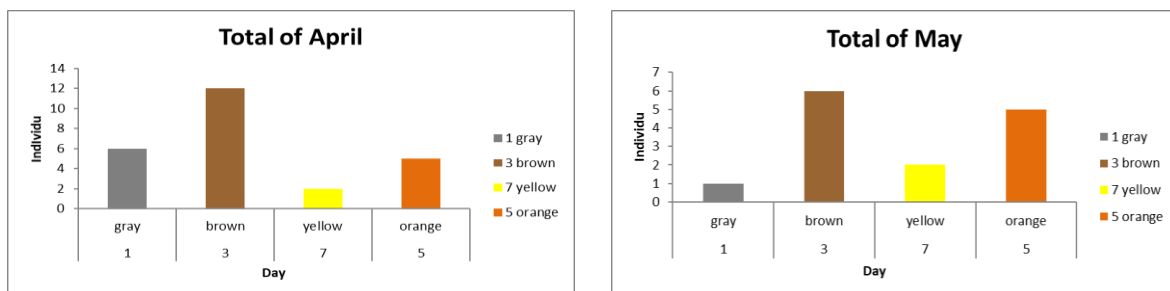


Figure 5. Data of crab spawn in April and May 2022.

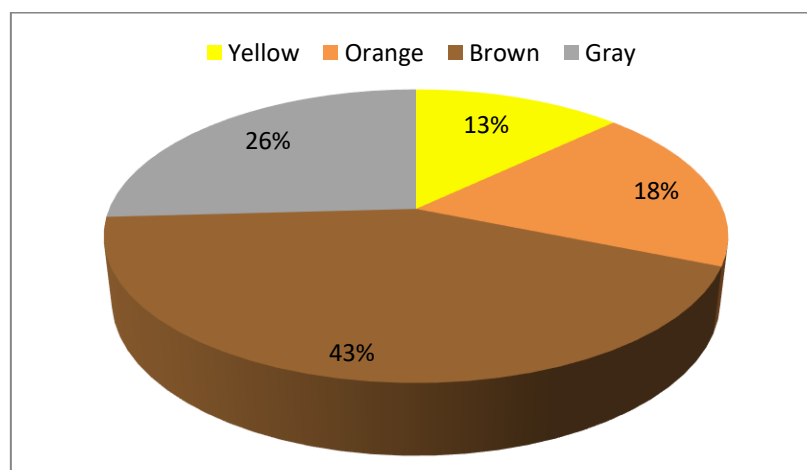
The results show that differences in egg colour affect the hatching duration because each colour difference in the level of gonad maturity, as the data obtained above states that the grey EBF crab only requires a hatching duration for 1 day from the day of release. The brown egg takes 3 days to hatch, while the orange takes 5 days to hatch, but it is different from the yellow, which takes longer than three colours that time takes 7 days from the time of releasing the crab sample, and some even exceed 7 days according to the development of the egg crab's. This is in accordance with the research of [14] that gonad maturity can be seen from the colour pigments sequentially starting from yellow, orange, brown, grey or black pigments, as well as based on the size of the diameter of the egg. The level of gonad development, when the egg is in the mother's abdomen (*ovigerous*), can also be determined based on the colour changes that occur in the egg and the appearance of the eye on the egg.

The EBF crabs that are stored or quarantined in the Crab Box Apartment aim to release the eggs so that they grow bigger. After the crabs hatch, the fishermen will take the crabs to sell to collectors (Figure 6).



**Figure 6.** Fishermen who will store the egg berried female crabs in the Crab Box Appartement.

This is one of the efforts to keep the crabs sustainable. The data on the total number of EBF crabs stored in the Crab Box from August 2021 to May 2022 can be seen in (Figure 7). EBF crabs from the waters of Pagagan Village are generally found with 4 colour compositions, namely yellow, orange, brown and blackish grey. The colours of the eggs indicate the level of maturity, where the first crab eggs out on the abdomen are yellow, then mature and turn into orange, brown and blackish grey [15].



**Figure 7.** Proportion of total EBF crab in the crab box appartement.

The results of the TKG data from 170 crabs stored in the Crab Box obtained data on 13% (22 ind) EBF crabs with yellow eggs, 18% (31 ind) crabs that lay orange eggs, 43% of those that lay brown eggs (73 ind) and 26% of the blue crabs (44 ind) that lay grey eggs. So from the data above, it can be seen that the EBF crabs that are put into the Crab Box Apartment are dominated by brown EBF crabs, which take only 3 days to incubate their eggs, while the least number is yellow EBF crab, which takes 7 days. Research that has been done shows that the gonads have differences in each development. This is in accordance with the opinion of [16], namely the yellow gonad colour indicates the egg has shown cell division, the brown egg colour indicates the eyes are starting to form, and the abdominal pigment strips appear, the black gonad colour (grey) indicates the pulse is getting stronger and starting to come out of the skin egg.

Based on the results of microscopic observations showed differences in the development of the egg. At the beginning of egg development, the EBF crabs have not yet formed eggs, and the egg still accumulates like lumps. In the development of TKG III gonads (yellow colour of the gonads), the crab eggs have formed granules on the crab's abdomen. The development of TKG III gonads (brown colour) of eggs is more developed, and it is seen that there is cell division in the crab gonads. While at TKG III (black gonad colour) visible black spots on the crab gonads. This development will form larvae ready to develop into larvae [13].

#### 4. Conclusion

The Crab Box Apartment is one of the efforts made by the fishermen of Pagagan Village so that the crabs remain sustainable because releasing the young crabs in the coastal area, it can increase the number of crab stocks around the waters. The results of the observations showed that the grey EBF crabs only needed 1 day to hatch, the brown took 3 days, and the orange took 5 days, while the yellow ones took longer. i.e. it takes 7 days.

#### Recommendation

It is necessary to develop the application of the Crab Box Apartment in other areas as an effort to keep the crabs alive and well because releasing the crabs in coastal areas, can increase the number of crab stocks around these waters.

#### References

- [1] [FAO] Food and Agriculture Organization of The United Nations 2020 *Species Gact Sheets Portunus pelagicus* (Linnaeus, 1758).
- [2] Dinas Perikanan dan Kelautan Jatim. Surabaya 2016 Profil Desa Pesisir Kepulauan Madura
- [3] Kementerian Kelautan dan Perikanan 2016 Rencana Pengelolaan Perikanan Rajungan di Wilayah Pengelolaan Perikanan Negara Republik Indonesia
- [4] Prasetyo D, Fitri A D P and Yulianto T 2014 *Fisheries Resources Utilization Management and Technology* **3**(3) 257-266
- [5] Kembaren D D T, Ernawati and Suprpto 2012 *J. lit Perikan. Ind.* **18**(4) 273-281
- [6] Peraturan Kementerian Kelautan dan Perikanan 2021 *Peraturan Kementerian Kelautan dan Perikanan Nomor 17 Tahun 2021 tentang Penangkapan Lobster (Panulirus spp.), Kepiting (Scylla spp.) dan Rajungan (Portunus spp)* Jakarta
- [7] Safaie M, Pazooki J, Kiabi B and Shorki M R 2013 *Journal of Fisheries Sciences* **12**(2) 430-444
- [8] Sumpton W D M, Potter G S and Smith 1994 *Asian Fisheries Science* **7** 103-113
- [9] Ernawati T and Kembaren D D 2016 Standard Operating Procedures (SOP) kegiatan penelitian Udang dan Crustacea lainnya (p.23). *Pusat Penelitian Pengelolaan Perikanan dan Konservasi Sumberdaya Ikan. Badan Penelitian dan Pengembangan Kelautan dan Perikanan.* Kementerian Kelautan dan Perikanan.
- [10] Efrizal, Arshad A, Kamarudin M S and Saad C R 2015 *Journal Fisheries and Aquatic Science* **10**(2) 77-91
- [11] Asosiasi Pengelolaan Rajungan Indonesia 2017 *Modul Pendataan Enumerator Rajungan Portunus pelagicus* Bogor
- [12] Peraturan Desa Pagagan 2020 Peraturan Desa Pagagan Nomor 10 Tahun 2020 tentang

Pengelolaan Perikanan Rajungan di Desa Pagagan Kecamatan Pademawu Kabupaten Pamekasan. Pamekasan p 13 [in Indonesia]

- [13] Arshad A, Efrizal M S, Kamarudin and Saad C R 2006 *Res. J. Fish & Hydrobiol.* **1**(1) 35-44
- [14] Tharieq M A, Sunaryo S and Santoso A 2020 *Journal of Marine Research* **9**(1) 25-34
- [15] Ikhwanuddin M, Azra M, Aimuni H S and Abol Munafi A B 2012 *Pakistan Journal of Biological Sciences* **15** (15) 720-728