

PAPER • OPEN ACCESS

## Distribution and Catch Characteristics of *Portunus Pelagicus* in North Madura Waters

To cite this article: M R T Laksani *et al* 2024 *IOP Conf. Ser.: Earth Environ. Sci.* **1329** 012004

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

You may also like

- [Reproductive performance of female blue swimming crab \(\*Portunus pelagicus\*\) from some waters in South Sulawesi](#)  
Andi Aliah Hidayani, Yushinta Fujaya, Muh. Tauhid Umar et al.
- [Flood Hazard Assessment Based on Analysis of Geomorphic Flood Index and History of Flood Events \(Case Study in Kemuning Watershed, Sampang\)](#)  
P C Nugroho, D Sutjningsih and L Kurniawan
- [Estimating the Economic Losses Value Caused by Flood Disaster in Sampang Regency Using Tangible Damage Assessment](#)  
Campina Illa Prihantini



**ECS**  
The  
Electrochemical  
Society  
Advancing solid state &  
electrochemical science & technology

**DISCOVER**  
how sustainability  
intersects with  
electrochemistry & solid  
state science research

# Distribution and Catch Characteristics of *Portunus Pelagicus* in North Madura Waters

M R T Laksani<sup>1</sup>, A F Syah<sup>2</sup>, A P R Cahyani<sup>1</sup> and Rosalinda<sup>2</sup>

<sup>1</sup> Program Study of Aquatic Resources Management, Department of Marine and Fisheries, Faculty of Agriculture, Trunojoyo University of Madura, Indonesia

<sup>2</sup> Program Study of Marine Science, Department of Marine and Fisheries, Faculty of Agriculture, Trunojoyo University of Madura, Indonesia

\*Corresponding author: [mertiara.laksani@trunojoyo.ac.id](mailto:mertiara.laksani@trunojoyo.ac.id)

**Abstract.** *Portunus pelagicus* is one of fishery commodity with high economic value and great demand in domestic and foreign markets. *P. pelagicus* is commonly found in Madura Sea waters. This study aimed to know the catch characteristics of *P. pelagicus* in North Madura. The locations of this study are Masaran, Sampang Regency, and Pasean, Pamekasan Regency. In this study, census sampling was done using the census method, which involved gathering samples of all the *P. pelagicus* that fishermen caught on each trip. The catch method in North Madura is using folding traps. In Masaran, the location of the sampling is <2 miles near the coast, and the location of Pasean is around 2- 4 miles from the coast. Based on *in situ* data the water quality in Masaran, Sampang, and Pasean of Pamekasan Regency had various conditions that were able to influence the existence of *P. pelagicus*. The total weight amount catches in Masaran, Sampang reach 13297 grams (99 individuals), and Pasean, Pamekasan reach 13967 grams (63 individuals). The sex ratio in Masaran, Sampang is 1:3 greater than in Pasean, Pamekasan that is 1:1. Carapace width was divided into small (<10 cm), medium (>10), and large (>12 cm) size classes. In Masaran, *P. pelagicus* is dominated by large and medium, the amount of large is 56 individuals of crabs, the medium is 32 individuals and 12 individuals are small and do not follow the rule of legal catch. Meanwhile, in Pasean 35 individuals are size large, 22 individuals are medium and 6 individuals are small. These results can be used as the basis for the management of *P. pelagicus* in North Madura.

## 1. Introduction

In Indonesia, blue swimming crab (*Portunus pelagicus*) is one of the export commodities with high economic value. The demand for it rises annually, as seen by the 4.83% increase in the *P. Pelagicus* export value between 2016 and 2020 approximately 367,519,713 USD by the end of 2020 [1]. The condition of high demand for *P. pelagicus* is not matched by efforts to meet market needs, *P. pelagicus* fishing activities are very dependent on wild catches. The existence of *P. pelagicus* needs attention or conservation efforts, one of which is monitoring the *P. pelagicus* population. One of the ways to monitor the *P. pelagicus* population is to know the characteristics of their catch area.

The *P. pelagicus* is a crustacean that lives in coastal and deep sea waters. Factors that influence the living environment of *P. pelagicus* need to be taken into consideration so that appropriate management efforts can be made. The optimal *P. pelagicus* to catch based on crab biomass is at a distance of 3.5 nautical miles to 8.5 nautical miles. Although at longer distances, the size and weight of the *P. pelagicus* are still profitable for fishermen, the *P. pelagicus* at that distance is thought to be in spawning condition [2]. The relationship between coastal ecology is an important factor in the growth of *P. pelagicus*. This is because coastal waters, including estuaries or coasts that resemble bays, are nursery grounds that support the increase in crab stocks [4]. Conditions of the aquatic environment which are influenced by different environmental factors and oceanographic factors influence the presence of *P. pelagicus* in a body of water.

The condition of the aquatic environment is also influenced by water quality. Water quality in coastal and marine waters is strongly influenced by oceanographic factors. This factor is also a factor that influences the carrying capacity of the *P. pelagicus* area. A decrease in the carrying capacity of *P.*



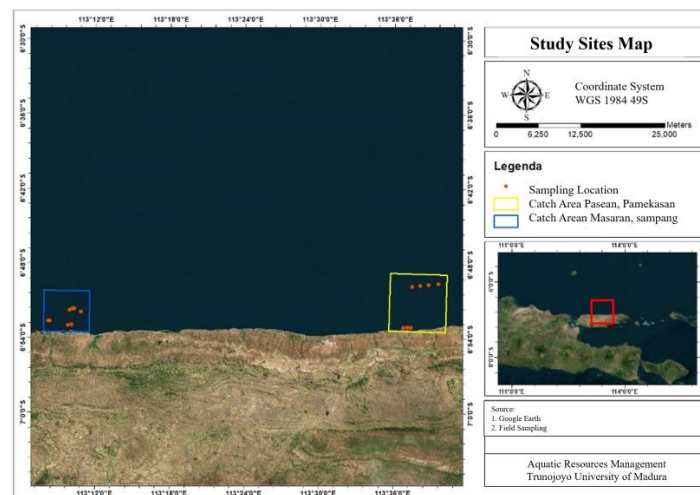
*pelagicus* habitat can be caused by natural factors in the form of oceanographic dynamics which cause sedimentation in waters as well as fishing activities for other fish resources that are less environmentally friendly [4]. This condition affects the sustainability of the existence of *P. pelagicus* in a water area. Oceanographic dynamics that directly influence water quality conditions include salinity, temperature, and depth.

East Java is one of the provinces that had water areas with potential fishing areas for *P. pelagicus*. One of the areas in East Java that has *P. pelagicus* fishing activities is in the Madura waters. Madura Island has quite potential *P. pelagicus* resources. The activity of *P. pelagicus* fishermen on the island of Madura is considered quite high, with *P. pelagicus* fishing carried out every day. The high *P. pelagicus* fishing activity and lack of selectivity in the catch create a threat to resource stocks which will continue to decline and the ecosystem will be stressed. Fishermen's determination of *P. pelagicus* fishing locations is still based on instinct and habit, so there is potential for suboptimal catches. Like other marine biota, chopped fish will choose suitable conditions as a place to migrate [5]. Therefore, information about catch characteristics is necessary to be able to understand and help future management models. Efforts to preserve *P. pelagicus* in Madura waters are very necessary, therefore information is needed that supports the sustainable management of *P. pelagicus*.

## 2. Methods

### 2.1. Time and Location

The research was conducted from August – November 2023 in 2 locations in Masaran, Sampang Regency, and Pasean, Pamekasan Regency. This location is based on the massive catch of *P. pelagicus* in those 2 areas. The data source in this study is the area and distribution of *P. pelagicus* fishing grounds which were collected from catch trips by fishermen (Figure 1). In Masaran, the location of the sampling is <2 mil near the coast, and meanwhile location of Pasean is around 2- 4 miles from the coast.



**Figure 1.** Study Site Location in North Madura Indonesia

### 2.2. Methods of Analysis of Area Assessment Criteria

The measurements of the physical and biological parameters of the *P. pelagicus* were carried out in situ. Temperature, salinity, pH, and dissolved oxygen (DO) were measured using water quality meters. The coordinates of the fishing stations were determined from Garmin's Global Positioning System (GPS) data. Information relating to the carapace width (CW) was obtained using a vernier caliper to measure the distance between the 9th anterolateral spines and recorded to the nearest 0.1 cm [5]. The carapace width (Figure 2) was measured during sampling to determine whether the catch was suitable for the regulation of *P. pelagicus* catch.



**Figure 2.** Measurement of carapace length of *P. pelagicus*. Source: Regulation of the Minister of Maritime Affairs and Fisheries of Indonesia Number 12 of 2020

The biological aspects of *P. pelagicus* catches are observed, including gender, weight, and carapace width (CW) [3]. The analysis of this study is a descriptive analysis of the water quality characteristics, distribution, and catch characteristics in North Madura waters.

### 3. Results and Discussion

#### 3.1. Water Quality

The results of observations of water quality parameters in this study are shown in Table 1, we can see that the water quality conditions of North Madura waters have different conditions because the catching time was done in three different seasons that were from the dry season (August), transition (September), and rainy season (November). Water quality parameters that comply with quality standards are temperature, salinity, pH, and DO. Temperature is one of the important abiotic factors that influences appetite activity, oxygen consumption, and metabolic rate of crustaceans [7].

Based on the results of observations of temperature parameters in this study, an average range of 21-30°C was obtained. The highest temperature existed in Pasean, Pamekasan during the second and third catch around 30°C. This condition is influenced by the season condition when the catch is obtained in November already in the rainy season. The temperature obtained during this research was optimal enough to support the life cycle and growth of *P. pelagicus* [5]. Salinity values during the study ranged from 34-36 ppt. *P. pelagicus* like warm waters because they move very actively compared to cold conditions preference and for salinity levels in the range of 30-40 ppt [5, 6]. The salinity value in Masaran and Pasean waters is still included in the optimal range for *P. pelagicus*. The pH value obtained from the research results ranges on average from 7.75 to 8.07. The results of the DO values in this study averaged 6.12-6.73 mg/L. The DO content at this research location still meets the criteria for the survival of *P. pelagicus*. These parameters show that *P. pelagicus* was able to live in various water quality in north Madura.

**Table 1** Waters Quality of *p. Pelagicus* catch area North Madura waters

Location	Catch	Water Quality Parameters			
		Temperature (°C)	Salinity (ppt)	pH	DO (mg/L)
Masaran, Sampang	First	27	33	7.36	6.28
	Second	21	36	7.20	8
	Third	28	34	7.5	10.6
Pasean, Pamekasan	First	28	35	7.9	6.5
	Second	30	34	8.3	7.6
	Third	30	33	8.07	10.5

### 3.2. Catch characteristics of *P. Pelagicus*

The *P. pelagicus* catch in both Masaran and Pasean using folding traps. Based on information from fishermen, the specifications of the folding traps include the framework made of iron, as presented in Figure 3. Therefore, it required the main rope to have a length of 180 m (Masaran) and 300 m (Pasean) and also brach rope and 1.5 m (both Masaran and Pasean, respectively). The ropes were fabricated with polyethylene multifilament material. 60 traps (Masaran) and 100 traps (Pasean) were used with a distance of 3 m between them. The operating mechanism of the traps is applied to the longline system. The form of a basic gill net (crab net) and the operation of this fishing gear uses simple technology and the business is done with people's scale and the habitat condition of *P. pelagicus* [9]. This condition of the traps is similar to the common catch method in another place. This catch method is continuously done by the fisherman and to improve their catchment they will increase the amount of traps and more wide catchment areas. *P. pelagicus* are usually caught by set bottom gillnets, collapsible traps (bubu lipat), mini bottom trawls (jaring arad), lift nets, guiding barriers (sero), and dredge nets (garuk). In the Java Sea, *P. pelagicus* is caught predominantly in collapsible traps and set bottom gillnets. Collapsible traps (Figure 3) are operated in waters at depths of 20–40 m. [10].



**Figure 3.** Folding traps of *P. Pelagicus*

The amount of catch of *P. pelagicus* can be affected by the method of the catch in the fishing ground. The amount of the catch of *P. Pelagicus* is shown in Table 2. *P. Pelagicus* caught during August–November was not in the best catchment period, which makes the amount of the *P. pelagicus* trend decrease. The highest amount of catchment in Table 2 is the first catchment in Pasean, Pamekasan which reach approximately 8 kg. The total amount of catchment both in Masaran and Pasean have almost the same value 13 kg. This condition shows that North Madura has a potential *P. pelagicus* catchment. The different amounts of bubu in Masaran and Pasean do not bring the different amounts of catchment. The difference amount of catchment is influenced by other factors such as eating habits, growth, lifespan, reproduction, and migration of *P. pelagicus*. More abundance occurs in the rainy season, and *P. pelagicus* is higher in the warmer season compared to the decreasing temperature season [5,9].

**Table 2** *P. pelagicus* catch amount in North Madura

Location	Catch	Location			Total (gram)
		Station 1 (gram)	Station 2 (gram)	Station 3 (gram)	
Masaran, Sampang	First	1587	2227	-	3814
	Second	1097	1313	1182	3454
	Third	2576	1726	1727	6029
<b>Total</b>					<b>13297</b>
Pasean, Pamekasan	First	2699	2129	2032	8196
	Second	820	1219	905	3442
	Third	1012	423	662	2329
<b>Total</b>					<b>13967</b>



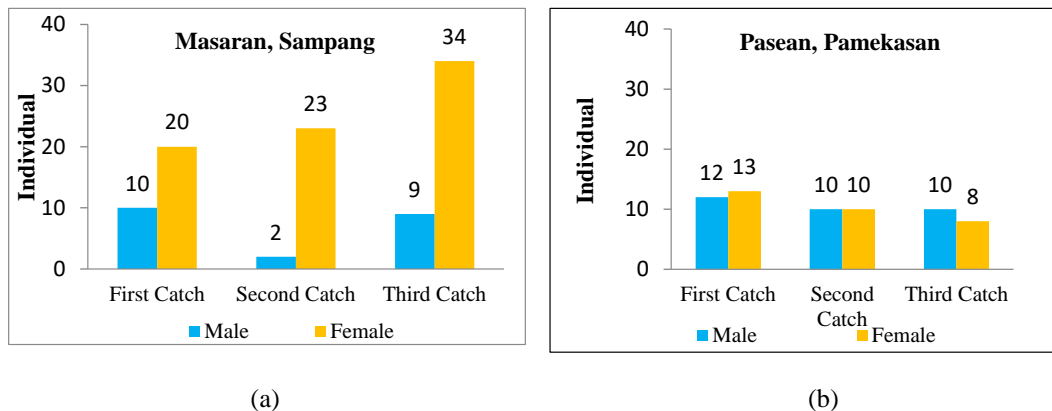


Figure 4. Sex Ratio of *P. pelagicus* in Sampang and Pamekasan

The total catchment of *P. pelagicus* in August-November is dominated by female individuals both in Sampang and Pamekasan Regencies. The number of females is twice more than the number of males. *P. pelagicus* males usually move more to look for food while *P. pelagicus* females tend to stay in some places during the spawning period, so there is a greater chance of females being caught compared to males whose movements are more extensive. Other factors are *P. pelagicus* males like waters with low salinity so it spreads around coastal waters-shallow ones. Meanwhile, *P. pelagicus* females prefer waters with higher salinity, especially for spawning, so they spread to deeper waters than males. Water temperature conditions can determine the size of the *P. pelagicus* sex ratio [3,7,8]. Figure 4 shows that in Masaran, the sex ratio between males and females is approximately 1: 3 in the third catch, and the average ratio in Masaran is 1:3. The sex ratio in Pasean is a little different it is 1:1 and almost the same for all catches. *P. pelagicus* females have a higher ratio than males, occurring in October and the spatial distribution of females is greater in locations offshore [9].

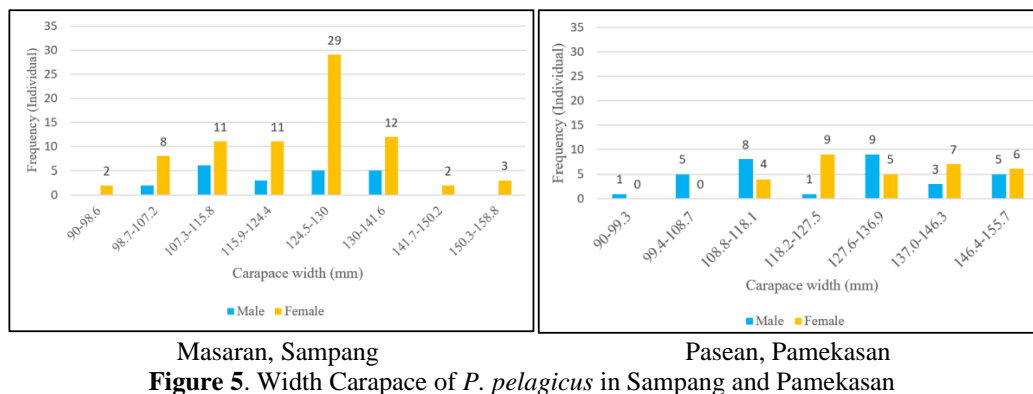


Figure 5. Width Carapace of *P. pelagicus* in Sampang and Pamekasan

The carapace width of *P. pelagicus* used to know that the catch followed the rules of the legal catch of *P. pelagicus*. The width is used to determine whether the catch has the authorized size of 100 mm, as approved by the Minister of Maritime Affairs and Fisheries Number 12 of 2020. The results from three times trips obtained found 99 individual crabs in Sampang and 63 individuals in Pamekasan. Figure 5 shows the classification of carapace width divided into small (<10 cm), medium (>10), and large (>12 cm) size classes. In Masaran, *P. pelagicus* is dominated by large and medium, the amount of large is 56 individuals of crabs, the medium is 32 individuals and 12 individuals is a small class and does not follow the rule of legal catch. Meanwhile, in Pasean, 35 individuals are large-size, 22 individuals are medium-size and 6 individuals are small-size. The activities of *P. pelagicus* catchment

that do not follow the rules of the legal catch still can be found in Two locations of North Madura. Carapace width was used to estimate the ratio of small crabs with carapace width (CW) less than the minimum legal size (100 mm) to crabs with CW greater than 100 mm is important to monitor and prevent the over-exploitation of *P. pelagicus* [10]. This condition needs to be given attention to keep the sustainability of *P. pelagicus*, especially in North Madura.

#### 4. Conclusion

The study of the catch characteristics of *P. pelagicus* on the coast of North Madura was carried out. Based on the result, the water quality of the coastal areas of Masaran (Sampang Regency) and Pasean (Pamekasan Regency) had various conditions that were able to influence the existence of *P. pelagicus*. However, it cannot be concluded the relationship between water quality and the amount of catchment of *P. pelagicus* because the time and the amount of sampling are too small and limited. Therefore, it was recommended to increase the time and the amount of sampling for future studies. From the total catchment of *P. pelagicus* in both coastal, the number of females is greater than the number of males based on sex ratio analysis which means, oceanography influences the total catchment. Therefore, oceanography was suggested to be studied in more detail for further studies to get knowledge about the relationship between oceanography and the existence of *P. Pelagicus* on the coast of North Madura. Moreover, monitoring and preventing the over-exploitation of *P. pelagicus* must be carried out to keep the sustainability. The results of this study were suggested to be used as the basis for the management of *P. pelagicus* and for improving the effectiveness of implementing fishing regulations on the coast of North Madura.

#### Acknowledgment

Thank you to the LPPM of Trunojoyo Madura University for providing the Hibah Penelitian Mandiri UTM 2023 local grant scheme. We also thank the Masaran, Sampang local fishermen, and Pasean, Pamekasan local fishermen for their assistance in this study.

#### References

- [1] KKP. 2021. Statistik Eksport Hasil Perikanan Tahun 2016-2020. Sekretariat Direktorat Jenderal Penguatan Daya Saing Produk Kelautan dan Perikanan
- [2] Putri, E W., Setyawati, R T., Rousdy, Diah W. 2021. Kepadatan Dan Pola Sebaran Rajungan *Portunus Pelagicus* (Linnaeus, 1758) Di Perairan Pesisir Kecamatan Batu Ampar, KabupatenKubu Raya. Indonesian Journal of Fisheries Community Empowerment, **1**(3), 210-224. <https://doi.org/10.29303/jppi.v1i3.343>
- [3] Anam, A., Redjeki, Sri., Hartati, Retno.2018. Sebaran Ukuran Lebar Carapas dan Berat Rajungan (*Portunus Pelagicus*)di Perairan Betah Lawang, Demak. *Jurnal of Marine Research* ,**7**(4), 239-247. <https://doi.org/10.14710/jmr.v7i4.25922>
- [4] Kurnia, R., Boer M., Zairion. 2014. Biologi Populasi Rajungan (*Portunus Pelagicus*) dan Karakteristik Lingkungan Habitat Esensialnya Sebagai Upaya Awal Perlindungan di Lampung Timur. *Jurnal Ilmu Pertanian Indonesia*, **19**(1), 22-28. Retrieved from <https://journal.ipb.ac.id/index.php/JIPI/article/view/8402>
- [5] Syah, A F., Fitriyah, Lailatul, N., Yakin, A., Ramadana, A Y., Putri, F C., Laksmi, P N.2022. Indeks Kelimpahan dan Karakteristik Daerah Penangkapan Rajungan (*Portunus Pelagicus*) di Perairan Madura. *BAWAL*. **14** (3), 135-148 <http://dx.doi.org/10.15578/bawal.14.3.2022.135-148>
- [6] Radifa, M., Wardiatno, Y., Simanjuntak, C.P.H. & Zairion, Z. (2020). Preferensi Habitat dan Distribusi Spasial Yuwana Rajungan (*Portunus pelagicus*) di Perairan Pesisir Lampung Timur, Provinsi Lampung. *J Pengelolaan Sumberd Alam dan Lingkung*. The Journal of Natural Resources and Environment Management, **10**(2), 183–197. <http://dx.doi.org/10.29244/jpsl.10.2.183-1972>
- [7] Muzammil, W., Apriadi, T., Melani W.R. & Damora, A. 2021. Bioinformation of Blue Swimming Crab (*Portunus Pelagicus*) during Covid-19 Pandemic in Bintan District, Riau

- Islands Province. *Journal of Tropical Fisheries Management*, **5**(2), 65-72.  
<https://doi.org/10.29244/jpft.v5i2.34442>
- [8] Wiradinata, H., Susiana, & Muzammil, W. 2021. Fecundity and Egg Diameter of Blue Swimming Crab (*Portunus pelagicus*) in Kawal Waters, Riau Islands Province-Indonesia. *Agrikan: Jurnal Agribisnis Perikanan*, **14**(2):347-352. DOI: 10.29239/j.agrikan.14.2.343-352
- [9] Wagiyono, K., Tirtadanu & Ernawati, Tri. 2019. Fishery And Population Dynamics Of Blue Swimmer Crabs (*Portunus pelagicus* Linnaeus, 1758) In Jakarta Bay. *Agrikan: Jurnal Penelitian Perikanan Indonesia*. **25** (2). p-ISSN: 0853-588
- [10] Ernawati, T., Budiarti, W.T, Yuniarta, S, 2020. *FAO-SEAFDEC Project - Book*, ed Loneragan, Neil, R., Wiryawan, B., Hordyk, A., Halim, A., Proctor, C., Satria, F., Yulianto, I (Bogor: IPB University, Indonesia; Murdoch University) p 29-50