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# THE EFFECT OF MOON PHASES ON CRAB (*Portunus pelagicus*) CATCHES IN MUNDU DISTRICT, CIREBON REGENCY, WEST JAVA

## Pengaruh Fase Bulan Terhadap Hasil Tangkapan Rajungan (*Portunus pelagicus*) di Kecamatan Mundu Kabupaten Cirebon Jawa Barat

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**ABSTRACT**

Crab is a marine commodity with a relatively expensive price, but the catch is often uncertain. Crab like crustaceans in general are positively phototactic, which naturally in the sea the activity of crabs at night is influenced by the moon phase. This study aims to determine the effect of the moon phase on the catch of fishermen in Mundu District, Cirebon Regency, West Java. The study used the Completely Randomized Design (CRD) method with 4 treatments, namely the time of capture on the 5th, 15th, 21st and 29th of Hijriah, crab catch data were collected from 5 fishing boats in each treatment/moon phase. The same boat was used in each moon phase. In addition, a study was conducted on the effect of fishing costs on catches. The results showed that the crab catch on the 15th of Hijriah (full moon) was the highest at 9.6 kg, followed by the 5th of Hijriah 8.6 kg, the 30th of Hijriah 6.8 and the lowest catch on the 21st of Hijriah 6.6 kg. The results of the regression analysis show that the variable of fishing costs does not have a significant effect on crab catches. The results of this study can be used by fishermen in planning crab catching activities.

Keywords: Full Moon, Hijri, Moon Phase

**ABSTRAK**

Rajungan merupakan komoditas laut dengan harga yang relatif mahal, namun hasil tangkapan sering tidak menentu. Rajungan seperti pada krustase pada umumnya bersifat fototaksis positif, yang secara alami di laut keaktifan rajungan pada malam hari pengaruhi oleh fase bulan. Penelitian ini bertujuan untuk mengetahui pengaruh fase bulan terhadap hasil tangkapan nelayan di Kecamatan Mundu Kabupaten Cirebon Jawa Barat. Penelitian dengan metode Rancangan Acak Lengkap (RAL) dengan 4 perlakuan yaitu waktu penangkapan tanggal 5, 15, 21 dan 29 hijriah, data hasil tangkapan rajungan dikumpulkan dari 5 perahu nelayan pada setiap setiap perlakuan/fase bulan. Perahu yang sama digunakan pada setiap fase bulan. Selain itu dilakukan penelitian pengaruh biaya menangkap ikan terhadap hasil tangkapan. Hasil penelitian menunjukkan tangkapan rajungan pada tanggal 15 Hijriah (bulan purnama) terbanyak 9,6 kg, diikuti pada tanggal 5 hijriah 8,6 kg, tanggal 30 hijriah 6,8 dan hasil

tangkapan terendah pada tanggal 21 hijriah 6,6 kg. Hasil analisis regresi menunjukan bahwa variabel biaya menangkap ikan tidak berpengaruh nyata terhadap hasil tangkapan rajungan. Hasil penelitian ini dapat dimanfaatkan nelayan dalam perencanaan kegiatan menangkap rajungan.

Kata Kunci: Bulan Purnama, Hijriah, Fase Bulan

## INTRODUCTION

Crab is one of the high-value fishery commodities and is exported to various countries. The main markets for crab are the United States, various European countries, Japan, China, Malaysia and Singapore (Agustina et al., 2014). Crab seeding has been successful and crab enlargement is carried out in ponds, but production from cultivation activities is still very small, therefore more than 95% of the crab exported comes from catches at sea. The ratio of crab catches is 74.27%, the remaining 25.73% is by-products, while the ratio of males to females is 1:0.7 (Endrawati et al., 2023). The northern coast of Java tends to be overfished, one indicator of which is the small-sized crabs that are caught a lot Muawanah et al. (2017) found that in the Demak area of Central Java, the catch of crab fishermen was dominated by carapace widths <8 cm. The decrease in the size of the crabs caught is an indication of overfishing (Budiarto et al., 2015).

Cirebon Regency is one of the potential fishing areas in West Java with a coastline of 54 $km^2$ (Wahyuni et al., 2021; Putri & Ilpah, 2019). Mundu District is a land area of 30.62 $km^2$, has 12 villages including Citemu Village, Bandengan, Mundu Pesisir, and Waruduwur, these villages are coastal areas of Mundu District with the main livelihood of fishing. In addition to fishing activities, there are also fish processing and cultivation activities.

The catch of fishermen in Mundu District is dominated by crabs, using gill nets. The catch of crabs is influenced by natural factors such as the phase of the moon, in general the crustacean group including crabs is classified as positive phototaxis, which tends to come to light. According to Irawan (2015), the influence of the moon phase affects the eating patterns, migration, and reproduction of crabs. This condition can cause differences in crab catches in each change in the phase of the moon.

Based on the description, a study was conducted on crab catching in various different moon phases, such as full moon and dark moon, with the aim of determining the effect of the moon phase on crab catches. The results of the study are expected to provide information to fishermen on the potential catches of certain moon phases.

## METHODS

The study was conducted in 2023 in Mundu District, Cirebon Regency, West Java Province. This study used a Completely Randomized Design (CRD) with 4 treatments including; Treatment one time going to sea on the 5th of Hijriah, Treatment two times going to sea on the 15th of Hijriah, Treatment three times going to sea on the 21st of Hijriah and Treatment four times going to sea on the 30th of Hijriah, each treatment with 5 replications (5 fishing boats). The tools used were 5 boats with 1 PK engines each equipped with crab catching nets. The research materials were in the form of fuel for going to sea and the needs of fishermen while at sea. In addition, it was also in the form of a list of questions mainly containing the types and catches. Data on crab catches were collected from 5 fishermen in each phase of the moon. In addition, a study was also conducted on the effect of fishing costs on crab catches. The effect of fishing costs on crab catches follows the following equation model:

$$Y = \alpha + \beta_1 X_1 + \ldots + £$$

Information:
Y = Crab catch (kg)
X1 = Cost of going to sea (Rp)
£ = Error term

Sampling using purposive sampling method, samples were selected intentionally based on predetermined criteria. These criteria include boat size, gillnet fishing gear and adjacent fishing areas. The number of boats observed at each time of fishing was 5 units as a replication.

Data on crab catches were collected from 5 previously determined boats. The time of data collection was on the 5th of Hijriah, the 15th of Hijriah, the 21st of Hijriah and the 30th of Hijriah. Data obtained from the effect of time of fishing (moon phase) on crab catches were processed statistically using One Way ANOVA and continued with Duncan's test using SPSS version 22. The effect of fishing costs on crab catches was analyzed using linear regression.

## RESULTS

### Regional Conditions

Mundu District is part of Cirebon Regency which has an altitude of between one and five meters above sea level. The land area of Mundu District extends from Northwest to Southeast. The villages in Mundu District are Bandengan, Banjarwangunan, Citemu, Luwung, Mundu Mesigit, Mundu Pesisir, Pamengkang, Penpen, Setupatok, Sinarancang. And Suci. Cirebon waters with the type of open bay beach waters towards the Java Sea with shallow raltive bathymetry. The coast of Cirebon waters is in the form of alluvial deposits, and there is shallowing around Cirebon waters covering a large area. The characteristics of the beach are divided into sandy beaches and muddy beaches. Mangrove trees grow in sandy waters and muddy waters. Mangrove beaches function to withstand the abrasion process around the beach. The maximum speed of tidal currents ranges from 0.04 - 0.35 m/s with an average of 0.19 m/s. The current pattern during high tide towards ebb is dominated by currents heading southeast, while the current pattern during low tide towards high tide is dominated by currents heading northwest. The dominance of bottom sediment in Cirebon harbor is silty sand, sediment transport is influenced by fluctuating currents that are able to sort fine sizes and mixed tidal types tend to be double daily (Dwianti et al., 2017).

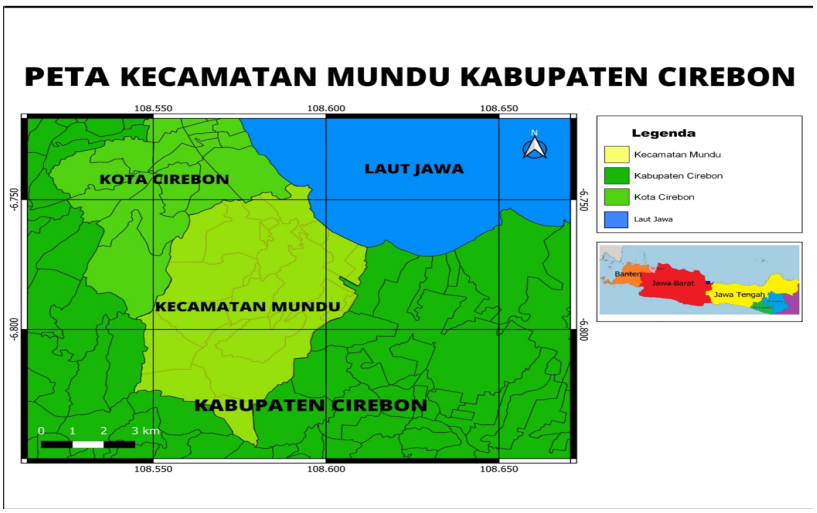


Figure 1. Map of Mundu District, Cirebon Regency

The condition of fisheries business in Mundu District is generally in the marine fisheries sector because Mundu District is a fairly large coastal area, namely 30.62 km$^2$, so the fisheries potential in Mundu District is quite large. The fisheries sector with the highest potential in

Mundu District is in four villages out of 12 villages in Mundu District, these villages include Citemu Village, Bandengan Village, Mundu Pesisir Village, and Waruduwur Village. These villages are part of the coastal area of Mundu District, coastal communities automatically make the sea their main source of livelihood.

**Crab Catch**

The main catch of gill nets is crab (*Portunus* sp.). Some other types of fish caught include ronggeng shrimp (*Harpiosquilla raphidae*), flathead fish (*Psettodes* spp.), mudcrab (*Scylla serrata*), manyung fish (*Arius thalassinus*), mackerel (*Rastrelliger* sp.), cuttlefish (*Sepia* sp.) and others. The results of crab catches during the dark moon and bright moon (full moon) can be seen in Figure 2.

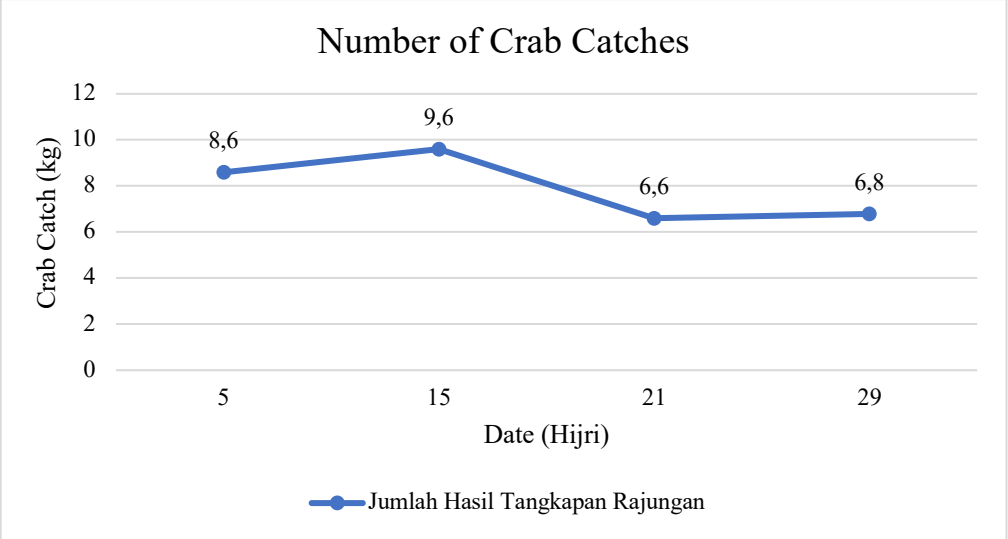


Figure 2. Crab Catch Graph

Based on the data in Figure 2, it can be seen that the average catch of crabs from the five fishing boats used as research samples was the highest on the 15th of Hijriah, the full moon, at 9.6 kg, while on the 5th, 21st, and 29th of Hijriah, the average catch of crabs was 8.6 kg, 6.6 kg, and 6.8 kg, respectively (Table 1).

Table 1. Crab Catch Results on Moon Phases

| Treatment | Catch Results (kg) |
|---|---|
| Date 5 Hijri | $8.6 \pm 0.89^{ab}$ |
| Date 15 Hijri | $9.6 \pm 19.4^{a}$ |
| Date 21 Hijri | $6.6 \pm 0.89^{b}$ |
| Date 30 Hijri | $6.8 \pm 25.8^{b}$ |

Description: similar letter notation means no significant difference

The catch of crabs on the full moon of 15 Hijriah was higher and significantly different from the catch on 21 Hijriah and 30 Hijriah ($P < 0.05$).

The effect of seafaring costs on crab catches is as in the following equation.

$$Y = 4.800 + 1.583\ X \text{ (Steel \& Torrie, 1980)}$$

Based on the regression equation, the constant value of 1.583 means that every additional 1 X (seafaring cost unit) will increase 1.583 units of crab catch with a coefficient of

determination of $R^2$ = 39.90%. The $R^2$ value of 39.90% means that the effect of seafaring costs on crab catches is only 39.90%, while 60.10% is caused by other factors.

## DISCUSSION

Fishermen go to sea all month or almost every day. The catch varies depending on several external factors including season, weather and even the moon phase. According to Jatmiko (2015), the moon period indirectly affects the presence of fish, so fishermen need to know the changes in each moon period. The moon phase changes periodically and becomes a factor that affects the waters chemically, physically, and biologically (Putra et al., 2019). These conditions in the sea cause tidal phenomena that greatly affect the life of marine biota such as crabs.

On the full moon of 15 Hijriah, the catch of crabs is greater than on the dark moon (21 and 29 Hijriah), this is because crabs are positively phototactic which actively move towards light sources, according to research results Hasly et al. (2019) crabs are attracted to light (positive phototaxis) and become active in the waters. The influence of the moon phase is a factor that is closely related to the behavior of marine biota, such as attraction to light (Pangauan et al., 2020). In addition, Soliha & Rahayu (2018) said that in the bright moon phase, high sea tides occur, resulting in the spread of plankton, which is the main food for crabs, becoming more abundant in the waters. This condition makes crabs more active in looking for food. Crab fishing is carried out throughout the year, the peak crab fishing season is in September and the lowest in April (Ihsan et al., 2014). Factors that influence the catch include the age of the moon (Katiandagho et al., 2021). The catch of crabs on the full moon was 759, the new moon was 120, and the quarter moon was 285. Crab habitats are very diverse, namely beaches with sandy bottoms, sandy and muddy substrates and the open sea (Budiarto et al., 2015).

Meanwhile, the average lowest crab catch occurred in the dark moon phase (21st and 30th of Hijriah) 6.6 - 6.8 kg. In the dark moon phase, the activity of crabs in searching for food is relatively lower, the number and size of crabs in the fishing area are smaller (Mustafa & Abdullah, 2013). Pratiwi et al. (2021) stated that the influence of the moon phase affects the pattern of crab foraging, migration, and reproduction, which can cause differences in crab catches. The results of the analysis of crabs in West Java waters are at a low level of vulnerability and low productivity (Suhernalis et al., 2020). The catch of crabs with traps in April was 79 kg, May 78 kg, June 73 kg, July 55 kg (Dirja, 2019). The time of fishing does not affect the catch of crabs (Azkia et al., 2022). The further from the coast, the greater the catch (Mustamin et al, 2021). Crabs can be caught with various types of fishing gear. Mardhan et al. (2019) said gill net fishing gear is classified as low with a dominance index of 0.21 - 0.27. The further from the coast, the greater the catch (Tajuddin et al., 2021).

The cost of going to sea does not significantly affect the catch of crabs. The amount of cost of going to sea must be in accordance with the number of crew members (ABK) and the distance at sea. The more crew members (ABK) and the further the distance at sea, the greater the costs incurred while at sea. This means that the cost of going to sea used by fishermen does not guarantee the amount of catch obtained. According to Marthin et al. (2018), operational costs in capture fisheries businesses do not affect catches or income. The operational costs incurred, such as the price of fuel oil (diesel), are very high. When fishermen travel long distances, the price of fuel is very detrimental to fishermen because the condition of the catch is not always constant.

## CONCLUSION

The crab catch of fishermen in Mundu District, Cirebon Regency is greater during the full moon than during the dark moon.

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