Eco. Env. & Cons. 27 (August Suppl. Issue) : 2021; pp. (S125-S129)
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ISSN 0971–765X

Seasonal pattern of lobster fisheries *(Panulirus* spp.*)* in Cilacap, Central Java, Indonesia

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(Received 20 October, 2020; Accepted 19 April, 2021)

ABSTRACT

Lobster (*Panulirus* spp.) is a fishery commodity that has the potential and has important economic value for export. The high demand for lobster encourages Cilacap fishermen to catch as many lobsters as possible. This study aims to identification on the current status of lobster resource management in Cilacap coastal, Central Java. The research was conducted in February-March 2020 in Cilacap Waters, Central Java. The results of this study indicate that the types of lobsters caught in Cilacap waters are *Panulirus ornatus* (pearl lobster) and *Panulirus homarus* (sand lobster). Based on the fishing season index chart, the highest peak season for lobster fishing in Cilacap waters was in November with an index value of 383%, while the lowest season was in April with an index of 23%. The type of lobster fishing gear used by Cilacap fishermen was gill net which is operated using a longboat with a size of 1-2 Gross tonnes. The results of the interview of fishing efforts that in 2019 there were 98 Cilacap fishing boats. The number of existing fishermen has increased wherein in 2014 there were only 20 units. The CPUE value obtained from interview data shows very fluctuated results where there were a decrease and increase in different years.

Key word : *Panulirus spp, Fishery commodity, Fishing gear, Catch per unit efforts, Water quality.*

Introduction

Lobster (*Panulirus spp*.) is a potential fishery commodity and has an important economic value to increase the number of exports of national fishery products (Setyanto *et al.,* 2019; Andriyono *et al.,* 2019; Yusgita *et al.,* 2019) Lobster ranks fourth for export commodities from the Crustacean nation after the *Penaeus, Metapeaneus,* and *Macrobrachium* according to Indonesian Statistics (BPS) records in 2005. Lobster experiences massive exploitation and their existence is threatened, this can be caused by market demand and high selling prices. This condition can certainly threaten the sustainability of lobster resources, considering that most of the lobster commodity is caught from nature. The threat to the sustainability of lobster resources is also exacerbated by the demand for lobster seed exports (Suman *et al*., 2014; Amali and Sari, 2020)

As a result of the high market demand and the trend of increasing lobster prices, fishermen continue to try to increase their efforts to catch lobsters from the wild. In 2006, there has been a decline in population marked by a decrease in the number of catches and size of lobsters caught in the wild (Kadafi *et al*., 2006). Based on this information, it is necessary to conduct a study or research on the current management status of lobster resources in Cilacap waters.

Naturally, fisheries management cannot be sepa-

rated from three dimensions that are inseparable from one another, namely (1) dimensions of fishery resources and their ecosystems; (2) dimensions of utilization of fishery resources for the social and economic interests of the community; and (3) the dimensions of fisheries policy itself (Charles, 2001). In relation to these three dimensions, current fisheries management has not considered the balance of the three, in which the importance of utilization for the socio-economic welfare of the community is felt to be greater than the health of the ecosystem. In other words, the approach taken is still partially integrated in an ecosystem boundary that becomes a container for fish resources as management targets. In this context, an integrated approach through an ecosystem approach to fisheries management is very important (Budiarto *et al*., 2015).

The management and utilization of a resource can be managed properly if information related to its potential and condition can be known and can be mapped regarding current conditions so that management can run properly (Dewi *et al.,* 2019). In the case of lobster resource utilization, things that need to be known are the state of the lobster resource itself in nature (Saleh *et al.,* 2018; Suryandari *et al.,* 2018). This can be seen from the trend of lobster catches and the diversity of catches obtained by fishermen. Then the condition of the habitat and the large number of fishermen or stakeholders with an interest in the use of lobster resources can also be related to the ecological conditions of lobster fishery. Another condition that needs to be known is the economic level of fishermen who utilize lobster resources, whether they meet the criteria or not, so that by knowing these basic things, the management strategy can be formulated through factors that have a higher priority level.

This study is aimed to determine the status of lobster fishery in the waters of Cilacap Regency. In where, the main factors that are the subject of this research, such as (1) lobster resource factors in nature, (2) habitat conditions, (3) technical resource utilization, (4) socio-economics, and (5) stakeholders who influence the utilization and management of lobster resources in Cilacap waters.

Materials and Methods

Research period and location

The research was conducted in February-March 2020 in Cilacap Waters, Central Java (Fig. 1).

Data collection

The data required was in the form of primary data which consists of data from field observations and secondary data consisting of literature studies. Primary data were obtained by conducting direct observations in the field and following all fishermen activities including catching lobsters in the sea as seen in Figure 1. The location was in a fishing ground which is a common fishing ground for lobster by Cilacap lobster fishermen.

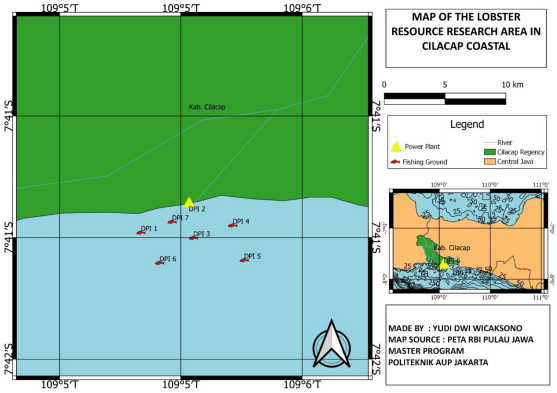

Fig. 1. Map of the research area (spot shows the lobster fishing area)

Results and Discussion

Types of Lobster (*Panulirus* spp.)

Based on the results of research conducted in Cilacap Coast, it was found that several types of lobsters were most often caught by fishermen. Two types of lobsters were identified, namely *Panulirus ornatus* (pearl lobster) and *Panulirus homarus* (sand lobster). This is different from the results of research conducted by Mahdiana and Laurensia (2011), which stated that there are three types of lobsters that can be identified in Cilacap waters, namely *Panulirus ornatus* (pearl lobster), *Panulirus homarus* (green sand lobster), and *Panulirus polyphagus* (bamboo lobster).

Season pattern

The fishing season pattern could be determined by the Seasonal Fishing Index which was obtained through the moving average method (random average) by looking for the average monthly production data and the fishing rate for several years, which was then graphed. The highest point is assumed to be the peak of the fishing season and the lowest

point is not the fish season (low season). The graph of the fishing season index to determine the season pattern can be seen in Figure 2.

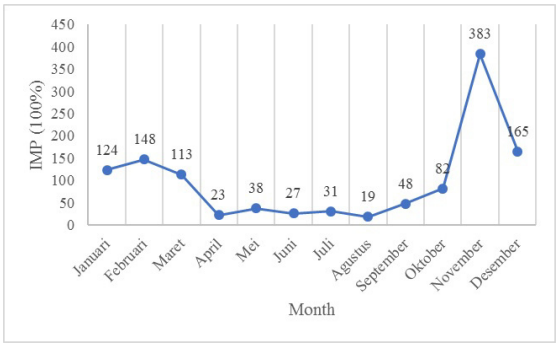

Fig. 2. Lobster Seasonal Fishing Index Pattern in Cilacap Waters, Central Java

The effective time for conducting the fishing operation is when the Seasonal Fishing Index value was above 100%. Based on the fishing season index chart, it can be seen that the highest peak season for lobster fishing in Cilacap waters was in November with an index value of 383%, while the lowest season was in April with an index of 23%. This is reinforced by information obtained from fishermen stating that the fishing season occurs from September to December.

Fishing vessels and fishing gear

Fishing gear commonly used by fishermen to catch lobsters in the southern coastal waters of Java include ampar nets, sirang nets, bottom gillnets, trammel nets, krakat (Beach Seine net), dogol, spear, and traps or traps (Permana, 2017), while the type of lobster fishing gear used by Cilacap fishermen was gill net which is operated using a long boat with a size of 1-2 Gross tonnes. The number of lobster fishermen varies from time to time, this is because not all Cilacap fishermen focus on one type of fishing gear.

Gill net is one of the environmentally friendly crustacean or fish fishing gear with minimal impact on the environment. This fishing gear is quite effective and can be operated by small-scale fishermen with lower capital based on the Regulation of the Minister of Marine Affairs and Fisheries Number 02 of 2011 concerning Fishing Routes and Placement of Fishing Tools in the Fisheries Management Area of the Republic of Indonesia, at Article 28, paragraph 7, Gill Net is a fishing gear that is static and passive, operated using a >1.5 inches sized mesh, P rope ris <500 m, using boats without motor, and with motor boats measuring <10 GT (WWF-Indonesia Fisheries Team, 2015).

Fishing efforts

Cilacap lobster fishermen begin to carry out fishing operations on each trip, namely at 03.30 in the morning and return to the land or fish landing base at 11.00 in the afternoon or commonly known as one day fishing fishermen. Each year, fishermen can operate their fishing gear for an average of 312 days. The results of the interview show that in 2019 there were 98 Cilacap fishing boats. The number of existing fishermen has increased where in 2014 there were only 20 units.

Table 1. Lobster Fishing Efforts 2014-2019

No	Year	Effort (*trip*)
1	2014	5,472
2	2015	7,980
3	2016	14,820
4	2017	12,768
5	2018	19,608
6	2019	17,784

Fishing result

Based on the data in Table 1, it can be seen that the fishing effort, in this case effort is meant by the number of lobster fishermen trips, which tends to increase every year. This is due to the increasing number of lobster catchers.

Based on data collected from various sources such as data from fishing cooperatives, it shows that the fishing results for the two types of lobster is quite fluctuated. The highest amount of production occurred in 2019 at 60,000 Kg and the lowest in 11,375 Kg. More detailed fishing result data is shown in Table 2.

Catch Per Unit Efforts (CPUE)

Catch Per Unit Effort (CPUE) is the division between caught fisheries production and fishing ef-

Table 2. Lobster Fishing Production in 2014-2019

No.	Year	Number of production (Kg)
1	2014	11,375
2	2015	19,200
3	2016	34,575
4	2017	46,000
5	2018	36,300
6	2019	60,000

forts made by fishermen in a certain water (Triharyuni *et al.,* 2012). The CPUE value obtained from interview data shows very fluctuated results where there weere decrease and increase in different years. Changes in the value of CPUE each year can also be affected by the addition and reduction of effort (effort). The effort value is inversely proportional to the CPUE value when viewed from the formula. This means, if there is additional effort, it will reduce the value of the CPUE. Any increase in business will reduce fish stocks.

Table 3. CPUE of lobster fisheries in Cilacap

No.	Year	Number of production (Kg)	Effort	CPUE kg/trip
1	2014	11,375	5472	2.08
2	2015	19,200	7980	2.41
3	2016	34,575	14,820	2.33
4	2017	46,000	12,768	3.60
5	2018	36,300	19,608	1.85
6	2019	60,000	17,784	3.37

Source: Cooperation and Interview Data

In the Table 3 also shows the catch per effort (CPUE) data which tends to fluctuate. The CPUE value is obtained from the division between the amount of catch obtained in one year with the number of lobster fishing trips in Cilacap within one year as well. The results showed that during 2014 to early 2019, the highest CPUE value was 3.60 kg/trip which occurred in 2017 while the lowest CPUE value occurred in 2018, namely 1.85 kg/trip.

In 2014 the CPUE value showed 2.08 kg/trip. Then in the following year, namely 2015 the CPUE value increased to 2.41 kg/trip. In 2016 the CPUE value decreased by 3% and in the following year the CPUE value increased significantly, namely to 3.6 kg/trip. The highest percentage decrease in CPUE value occurred in 2018 where the value of decline reached 49%, this could be due to the increase in the number of fishermen catching lobsters in that year. Based on the analyzed data, the CPUE indicator is given a criterion of 3 because the trend tends to be stable.

The size of the lobster that is fit to catch refers to the Regulation of the Minister of Marine and Fisheries No. 1 of 2015 is more than 200 grams. Based on the research results, it was found that lobsters were caught below the catch size. The possible cause is the non-selective fishing gear used for fishing. The types of fishing gear used to catch lobsters were nets and traps. The principle of operation of nets and traps is to leave the nets and traps in a state that has been given bait in them so that lobsters will be trapped and entangled in the traps and nets. Lobster that has been caught in fishing gear (nets and traps) will find it difficult to get back out. According to the morphology of lobsters, lobsters have many small spines and segments on their body, so it will be difficult for the lobster to move out of the fishing gear. The results showed that more *Panulirus homarus* were caught in the size below 200 g. The other four types of lobster were inversely proportional to the result of *Panulirus homarus*, in which, above 200 g sized lobsters were more caught than the smaller lobsters.

The role of stakeholders in fisheries management is very important, in this case that is meant by lobster fisheries. Stake-holders referred to in the management of lobster fisheries include the Regency Marine and Fisheries Service, Local Fishery Port and the central government. The level of stakeholder activity will affect the success of fisheries management, where the more active stakeholder participation included, the higher the success rate of lobster fisheries management will be gained (Adrianto, 2012). Stakeholder participation starts from the initial stipulation or policy-making after which successively implementation, monitoring and evaluation. In the case of Cilacap, stakeholder participation in lobster fisheries management is still relatively weak due to the lack of data collection and supervision of lobsters. Lobster data is very important because it will become a reference in policy making. On the other hand, in the Cilacap lobster fishery, data is not directly collected. Data collection is done indirectly, namely by collecting data from collectors, not fishermen. In addition, there are still many lobsters that are below catch size, which is a sign that there is a lack of control over the catch of lobster activities.

Acknowledgement

The author would like to thank all the stakeholders and fishermen of Pelabuhan Ratu who have provided information through personal interviews and written data and permission to carry out this research. The author is also grateful to Study Program of Fishery Resource Utilization, Politeknik Ahli

Usaha Perikanan (AUP-STP), South Jakarta, DKI Jakarta which supports the progress of this research.

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