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Ecosystem Approach for Fisheries Management for Small-Scale Fisheries in Java, Indonesia - A review

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Abstract

Fishers who are classified as small-scale according to Law No. 7 of 2016 are fishermen who carry out fishing business to meet their daily needs, whether done with the help of fishing vessels or not. This gives a view that small-scale fishers are dependent on fish resources. Therefore, a breakthrough in resource management is needed for small-scale fishing communities in Indonesia, especially on the island of Java. This is also supported by a decrease in production in several water areas on the island of Java which is fishing grounds. Fishery management with an ecosystem approach was found to be better because a comprehensive measurement was carried out on three main subsystems in the fisheries system, namely the natural subsystem, human subsystem, and management subsystem, where these three subsystems are included in several reference indicators which are summarized in an analysis of the ecosystem approach.

Keywords: EAFM, Indonesia, Java Island, Small Scale Fisheries

Introduction

Capture fisheries in Indonesia are one of the business sectors that has an important influence on the economy of much of the population, especially those in coastal areas (Nababan et al., 2008). The length of the Indonesian coastline is around 81,000 km (Roziqin & Gustin, 2017). This means that people living in coastal areas along 81,000 km are directly affected by capture fisheries activities. The utilization of fish resources in the sea through fishing activities has been carried out for a long time by the people of Indonesia. 90% of the world's capture fisheries are dominated by small-scale fisheries and involve as many as 120 million workers working in them (World Bank, 2012). Likewise, in Indonesia, approximately 90% is dominated by small-scale fisheries (Vatria, 2020).

Limitations regarding small-scale fisheries have been set through Law Number 7 of 2016, namely fishermen who operate vessels with a size of <10 Gross Tons. This law is the result of a revision of Law

No. 45 of 2009, which stipulates those small-scale fishers are fishermen who operate vessels with a size of <5 Gross tons. This certainly further expands the scope of small-scale fisheries itself.

The island of Java, as the island that has the most densely populated population in Indonesia, also has many small-scale fishermen, both on the north coast and south coast. The number of small-scale fishing fleets operated throughout Java is in the range of more than 84,000, while for fleets above 10 GT, which are not included in the small-scale category, there are around 21,000 (Ministry of Marine and Fisheries, 2021).

Fishers who are classified as small-scale according to Law No. 7 of 2016 are fishermen who carry out fishing business to meet their daily needs, whether carried out with the help of fishing vessels or not. This provides a view that small-scale fishers are dependent on fish resources (Akbarsyah et al., 2017). Findings from Arkham et al. (2018), who have conducted an assessment of small-scale fisheries in Madura, East Java province on crustacean resources. The dependency index of small-scale fishers reaches 21.74, which is included in the medium category (Barnes-Mauthe et al., 2013). Another study conducted by Robin et al. (2019) on small-scale fishers in Jakarta Bay found that the level of dependence on fish resources was more than 60%. The high level of community dependence on fish resources can be a significant threat to capture fisheries because it will have an impact such as damage to aquatic ecosystems (Romadhon, 2014).

Several factors that cause dependence on fish resources for fishers include (1) the mindset of people who are still consumptive, (2) low income, (3) there is no place of sale other than the skipper (Rahayu et al., 2020). Therefore, a breakthrough in resource management is needed for small-scale fishing communities in Indonesia, especially on the island of Java. This is also supported by a decrease in production in several water areas on the island of Java which is fishing grounds. Fisheries management in Indonesia uses several methods. There are three approaches that have been used throughout the decade, namely ecosystem-based management, rights-based management, and management for resilience. These three approaches in practice complement each other with the theories that have been studied previously (Pomeroy & Andrew, 2011).

Recent studies suggest that management based on togetherness with the community can provide ecological and social benefits, including increasing the abundance and habitat of species, fish catches, stakeholder participation, and adaptive capacity of fisheries, as well as encouraging social learning processes. Furthermore, co-management is more effective when smallholder fishers and diverse stakeholders are involved through an adaptive institutional framework. However, the review also suggests that more research is needed to discern when co-management initiatives can transform pre-existing conflicts, challenge power asymmetry, and distribute benefits more equitably (d'Armengol et al., 2018).

Small-scale fishery in Java

a. Total population

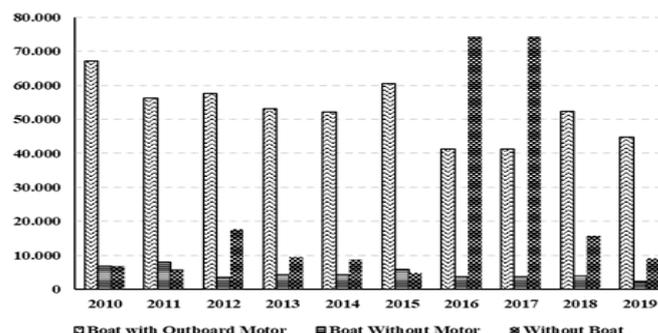


Figure 1. Total population of small-scale fishing households in Java The

The total population of small-scale fishing households using outboard motorboats is the highest in the last ten years. Fishers who do not use motorbikes in their fishing activities are much smaller than the number of households using outboard motorboats. However, this number increased very sharply in 2016 and 2017. Then it experienced a very drastic decline in 2018 and 2019.

b. The fishing fleet used (number per species)

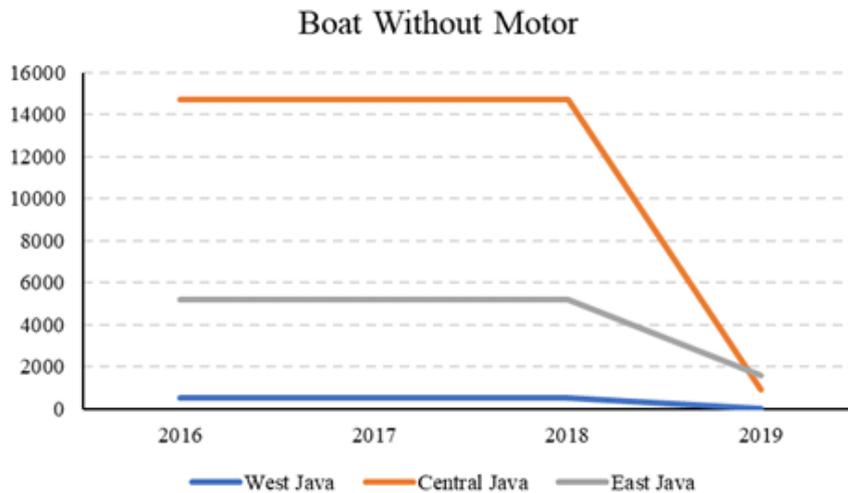


Figure 2. Number of boats without motors used by fishermen in their fishing business

The highest number of used boats without motors are in the province of Central Java, then in East Java, and the lowest in West Java. This number decreased simultaneously in 2019 (Figure 2), unlike the case with outboard motorboats. From 2016 to 2018, the number operated tended to be at a low number, namely below 10000 units, whereas in 2019, it increased up to 5 times (Figure 3).

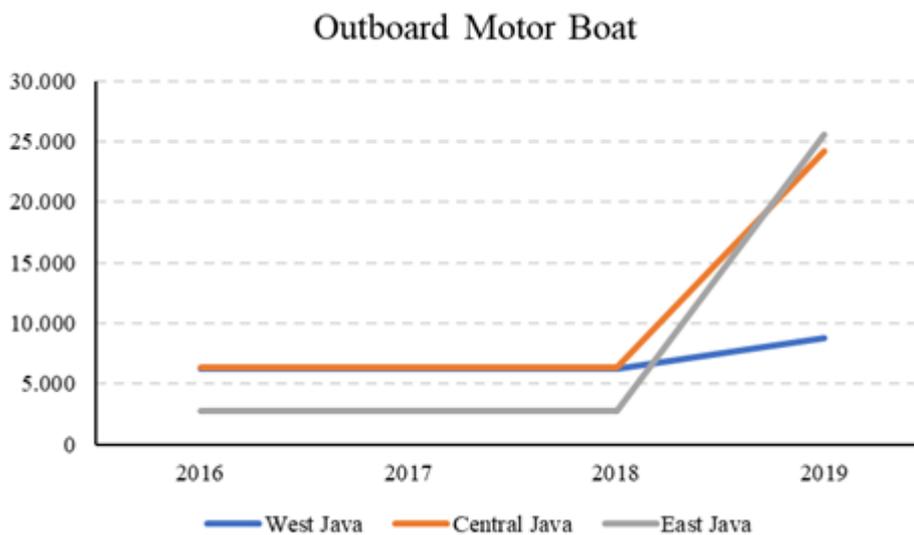


Figure 3. Number of outboard motorboats used by fishermen in their fishing business

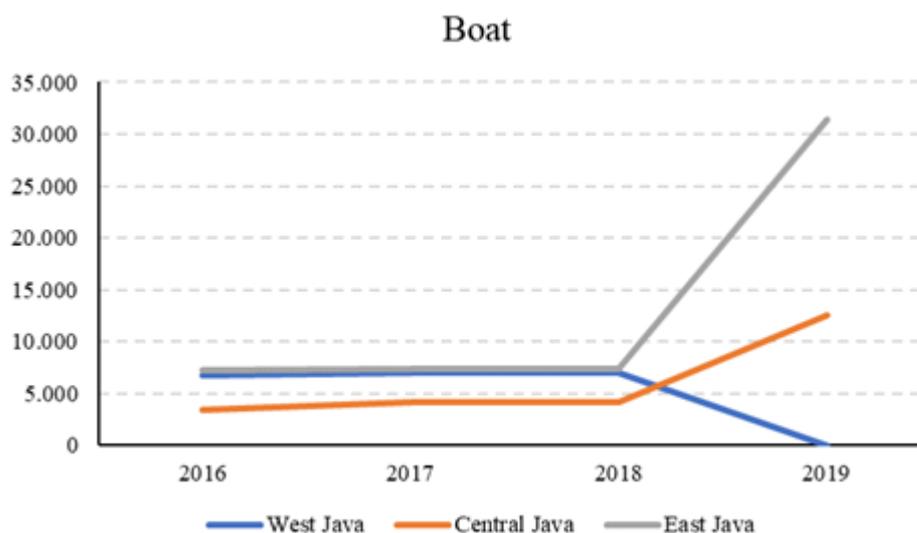


Figure 4. Number of motorized boats used by fishermen in their fishing business The

The number of boats equipped with motors operated on the island of Java is between 5000 - 10000 in two provinces, namely West Java and East Java. In the Central Java area, the number of motorized boats is less, which is below 5000 units, and has increased in 2019 so that the number is between 10000-15000 units (Figure 4).

Level of Dependence on Resources

High dependence on fish resources has been widely studied by marine fisheries experts, especially those working in Indonesia. One of them is the research in Indramayu, West Java Province by Solikhin et al. (2017), which has analyzed gillnet fishers with vessel sizes of 0-20 GT and gillnet vessels more than 20 GT. This study concludes that fishers who operate vessels less than 20 GT have a higher dependence than fishers with a size of more than 20 GT. This opinion is corroborated by Setiawan et al. (2007) that Indramayu district has a higher dependence than other regions due to a high ratio of fishers even higher than the surrounding area, a higher catch ratio, and the contribution of local revenue and income. the ratio of the number of workers becomes an important point. In addition, the dependence of fishers on fishing work and the absence of other skills that can be done is a problem to be solved. Not only in Indonesia, but the dependence of fishers on fish resources is also experienced by other countries, including also in Moorea, French Polynesia. The research conducted shows that fishing effort is predicted to be high not only on the coast but evenly throughout the waters (Thiault et al., 2017).

The risks and impacts that will occur if small-scale fisheries are not managed properly

The prominent geographical features revealed by research on the degree of dependence on fishing indicate that regional peculiarities, related to ecosystem heterogeneity, must be carefully considered in the management process (Tzanatos et al., 2006).

Governments with authority in developing countries have limited capacity in managing small-scale capture fisheries (Kusdiantoro et al., 2019). The use of conventional fisheries management methods is not very suitable for small-scale fisheries in Indonesia. This condition causes a new management method to be needed for better small-scale fisheries in Indonesia. The development of sustainable small-scale fisheries, it can be done by improving fisheries management. The same thing was experienced by Indonesia when it directed forward fisheries management based on fisheries management areas (WPP) (Kusdiantoro et al., 2019).

Indonesia seeks to encourage small-scale fisheries to apply the principles of sustainable and responsible fishing. This sustainability principle is focused on small-scale fishers who are directly involved in fishing practices as well as trade governance. Based on the ecological aspect, the ecological sustainability of fisheries can be seen from the condition of the stock of capture fisheries resources itself.

In general, fishermen's income from fishing can meet their basic needs and even more than that. In comparison, fishermen's income is higher than the national average UMR so that it becomes one of the indicators of livelihoods from capture fisheries activities that have a chance of sustainability. Based on the Circular Letter of the Minister of Manpower of the Republic of Indonesia No. SE-07/MEN/1990, it is stated that the UMR component has considered a reasonable cost of living so that it can be concluded that fishermen's income is able to meet their living needs. However, the payment or income of fishermen's businesses has high uncertainty or is not fixed, especially when there is a famine season, so that training or provision of business skills is needed in other fields, such as fish processing and others according to resource conditions.

The condition of open access fishery resources causes everyone to compete to extract as many fish resources as possible, causing resource scarcity. On the other hand, fishing units tend to increase so that the productivity of fishers decreases. The parties involved in the conflict are generally traditional fishermen fighting over the same fishing grounds. Fisherman conflict is a phenomenon that has occurred long ago, even before the era of regional autonomy. The freedom to exploit fishery resources is a consequence of the characteristics of open access.

Ecosystem-Based Management for small-scale fisheries in Java, Indonesia

In 2011, the concept of community-based resource management and co-management still had limitations in terms of managing coral reef habitats and conservation areas. This occurs due to the gap between knowledge and interests of various parties who should be involved in resource management activities. Likewise, the gap in needs that causes fishing activities is a necessity that must be done. This will require management. Controlling fishing efforts and understanding the dynamics of capture fisheries as well as the art of managing fishers are essential points in fisheries resource management which can later become the benefits of small-scale fishing communities in Indonesia (Atmaja & Nugroho, 2017).

To manage fish resources, there are three critical components that run in a balanced condition, namely: ecological, social, and economic. Empirically it is a tug-of-war between the three interests. The strategic policy of small-scale fisheries management has 10 (ten) key sub-elements, namely: (a) fishermen; (b) Fisheries Service; (c) excess fishing capacity; (d) decrease in the catch; (e) fishing that is not environmentally friendly; (f) ineffective regulations; (g) conservation of fish resources; (h) increasing fishermen's income; (i) restrictions on fishing gear that are not environmentally friendly (Malik et al., 2021).

Several ways in fisheries management as the basis of fish resource management in Indonesia are contained in the laws and various regulations that have been stipulated. Fishery management techniques according to the Fisheries Law (Article 7 of Law 31 of 2004 and Law 45 of 2009 concerning amendments to Law 31 of 2004 concerning fisheries), namely: 1) Input control includes the type, number, size of fishing gear; type, number, size, and placement of fishing aids; area, path, and time or season of fishing; requirements or standard operating procedures for fishing; fishing vessel monitoring system. Output control includes controlling the size or minimum weight of fish species that can be caught. Previously, government efforts in managing fisheries have been shown from various management techniques for regulation, which include zoning of fishing areas (SK No. 54 cm) (SK No. 123/Kpts/Um/3/1975 and ring trawl fishing routes (Kepmentan No. 392/1999), up to a complete ban on

tiger trawl fishing gear (Keppres no 39/1980) and control through levies fishery products (PHP) according to PP No 54/2002 and fishery levies (UU 31/2004), Article 48 point 1 and Article 49.

The concept of an ecosystem approach to fisheries management introduced by FAO in 2003 is a fisheries management approach that pays attention to the balance between ecological sustainability, economic and social benefits through good governance (Gianelli et al., 2015). The implementation of EAF/CO-M is a beneficial strategy that enables sustainable exploitation of resources. This can be seen in the research conducted by Gianelli et al. (2015) by providing additional indicators of commercial shellfish fishing, with a specific minimum size that allows for an impact on the sustainable exploitation of fish resources. The following way is to take advantage of the time when the weather is not friendly. The preparation of strategic action steps for fisheries management is made according to SMART rules (Doran, 1981). SMART stands for Specific, Measurable, Assignable, Realistic, and Time-Related. Management using this rule is expected to fulfill the initial objectives of the activity. Small-scale fisheries management strategies can be implemented with two recommended approaches. The first is the social development strategy for the short term (5 years) and the existing maintenance strategy for the medium term (10 years) and long term (15 years). The activities in the fisheries management process include:

- a. Maintaining and controlling the status of fish resources
- b. , improving, maintaining and regulating, and improving the status of habitats and ecosystems in order to reach the reference range of indicators,
- c. regulating and minimizing the use of fishing technology that has an impact on fish resources,
- d. increasing the participation of relevant stakeholders involved in the management process
- e. expands the use of local wisdom,
- f. increases ownership of production assets and the saving rate so that fishermen's income remains above the minimum salary,
- g. increases the capacity of related institutions that have an effect on

Conclusion

Fisheries management with an ecosystem approach is found to be better because a comprehensive measurement is carried out on the three the main subsystems in the fisheries system, namely the natural subsystem, human subsystem, and management subsystem, where these three subsystems are included in several reference indicators that summarized in one analysis of the ecosystem approach.

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