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# Lobster *(Panulirus* spp.) management policy strategy in Cilacap Coast, Central Java, Indonesia

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**ABSTRACT**

This study aims to formulate policies based on SWOT and AHP analysis to determine the most appropriate policies to accelerate the improvement of the sustainability status of lobster fishery resource utilization on the Cilacap coast. The data source used is the result of the EAFM and RAPFISH analysis to formulate alternative strategies and management policy priorities. At the SWOT group level, data on the threat group as the "top priority" is obtained with a value of 35.6%. This shows that the threat factor is more dominant. Based on the priority of the A-SWOT analysis policy strategy, the strategy that must be implemented in priority is Strategy 4 (Weakness-Threat) with a weight of 32.4% with more stringent enforcement efforts regarding Regulation of the Minister of Marine and Fisheries (PERMEN KP) Number 12 of 2020. Strategy 1 (strength-opportunity) with a weight of 25.7%, Strategy 3 (strength-opportunity) with a weight of 25.7%, and Strategy 2 (strength-weakness) with a weight of 18.5%. Strategies in the form of tightening minimum lobster size rules and fishing gear selectivity, exploring local knowledge, and efforts to improve water quality.

***Key words :*** *Panulirus spp, Sustainable development, Fisheries sector, Coastal ecosystem, Cilacap, Indonesia*

## Introduction

Cilacap coastal waters are included in the Fisheries Management Area (WPP-NRI) 573. One of the bases for capture fisheries on the south coast in Central Java Province is the Cilacap Ocean Fishing Port (PPSC). PPSC as one of the places to land fishery products in Cilacap has the function of handling catches as well as distributing them.

Based on several studies on the potential and production of lobster fisheries, there has been a decrease in lobster production due to uncontrolled fishing pressure. In 2019, lobster production from Cilacap fishermen reached 60 tons and lobster is an important fishery commodity even though its contribution is only 0.27% of the total fishery product at

PPSC with a production value of IDR 1.8 billion. As much as 80% of the catch is for export purposes, while 20% is for local consumption. Lobster fishermen catch seasonally using gillnets.

The occurrence of various environmental damages and the scarcity of natural resources and energy due to uncontrolled exploitation forces every country to implement sustainable development in the management of natural resources.

SWOT (Strength, Weakness, Opportunities, Threats*)* analysis is known as a form of analysis that compares internal factors with external factors. Strengths and weaknesses mostly occur in the internal environment (internal), while opportunities and threats occur outside the environment (external). This method of analysis is based on the logic that aims to maximize potential and opportunities but simultaneously minimizes constraints and threats to achieve the goals (Abdillah, 2016).

The Analytical Hierarchy Process (AHP) is a basic approach to decision making. In this process, the decision-maker uses pairwise comparison which is used to form all priorities to determine the ranking of alternatives (Qashlim, 2015).

This study aims to formulate policies based on SWOT and AHP analysis to determine the most appropriate policies to accelerate the improvement of the sustainable status of lobster fishery resource utilization in the coastal district of Cilacap, Central Java. The data source used is the result of the Ecosystem Approach to Fisheries Management (EAFM) and Rapid Appraisal for Fisheries (RAPFISH) analysis from previous studies (Adrianto *et al.,* 2014) to formulate several alternative strategies and policy priorities for Lobster fishery management in Cilacap waters.

## Materials and Methods

### Research Period and Location

The research was conducted in February-March 2020 in Cilacap Waters, Central Java, Indonesia.
SWOT Matrix

The tool used to compile strategic factors is the SWOT matrix. This matrix can clearly describe how the external opportunities and threats faced by the company or institution can be adjusted according to their strengths and weaknesses (Table 1).

### AHP

AHP analysis was carried out utilizing pairwise comparisons between various criteria, with two important stages, namely: (i) determining which of the two was considered (important/preferred/possible) and; (ii) determine the number of times more (important/liked/likely to occur).

**Table 1.** SWOT matrix

| **FAS** / **IFASE** | **Strength (S)** Determine 5-10 factors for internal weakness | **Weakness (W)** Determine 5-10 factors for internal weakness |
|---|---|---|
| **Opportunity (O)** Determine 5-10 factors of external opportunity | **Strategy S-O** Create a strategy that uses your strengths to take advantage of opportunities | **Strategy W-O** Create a strategy minimize weaknesses to take advantage of opportunities |
| **Threat (T)** Determine 5-10 factors for external threats | **Strategy S-T** Create a strategy use force to overcome threats | **Strategy W-T** Create a strategy minimize weaknesses and avoid threats |

Source: Mudana (2014)

### AHP-SWOT (A-SWOT)

Schmoldt *et al*. (2001) applied A-SWOT (AHP-SWOT integration). The combination of methods and SWOT is done to formulate alternative policies in the SWOT analysis and AHP analysis is carried out to determine the priority order of policies that must be carried out.

## Results and Discussion

### SWOT Strategy Analysis

Based on the SWOT analysis in Table 1 can be seen the position of each EAFM indicator in each quadrant, then a strategy can be formulated for quadrant combinations in the form of Strength-Opportunity, Weakness-Opportunity, Strength-Opportunity, and Weakness-Threat.

For the Strength-Opportunity group, the formulation of alternative policies from the strength and opportunity quadrants in the form of three policies, namely livelihood welfare extension and fishery product diversification, fisheries refugia approach

for unique habitats specifically for estuaries, and increasing sustainable use training for the main players in lobster fisheries. Fisheries refugia can be defined as a marine or coastal area where measurable management is specifically implemented for the sustainability of important species (fishery resources) during a critical phase of the species life cycle for sustainable use (Hakim *et al.*, 2019). The concept of fisheries refugia is formed through identification and design with priority areas to integrate fisheries and habitat management (Paterson *et al.*, 2013).

**Table 2.** Strategy priority outputs

| Strategy | Output |
|---|---|
| Strategy 1 (Strength-Opportunity) | 0.257 |
| Strategy 2 (Weakness-Opportunity) | 0.185 |
| Strategy 3 (Strength-Threat) | 0.234 |
| Strategy 4 (Weakness - Threat) | 0.324 |

The alternative policy group Weakness-Opportunity resulted in policy alternatives in the form of tightening the rules for the minimum size of lobsters that can be caught and the selectivity of fishing gear, exploring local knowledge related to sustainable fisheries management and efforts to improve water quality. The Strength-Opportunity quadrant has alternative policies in the form of regulation of lobster catching efforts through government regulations, determination of conservation areas and mangrove replanting efforts, full implementation of RPP, and decision-making mechanisms. Weakness-Threat has a quadrant with alternative policies in the form of strict enforcement of lobster resource use regulations and taking action against violations in resource use. From the four quadrants of these policies, AHP analysis is carried out to determine the strategic quadrants that become policy priorities to accelerate efforts to manage lobster resources on the Cilacap coast.

The next analysis is AHP analysis using Expert Choice 11 software, based on the output of the analysis it can be seen the local and global priorities of each SWOT quadrant group, the factors, and the size of the relationship to the SWOT strategy quadrant group. This can strengthen the basis for determining alternative priority policies for lobster fisheries resource management in the Cilacap coast (Figure 1).

At the level of the SWOT group, the threat group is found as the main priority with a value of 35.6%, this indicates that threat factors dominate more than each management indicator. The results of the

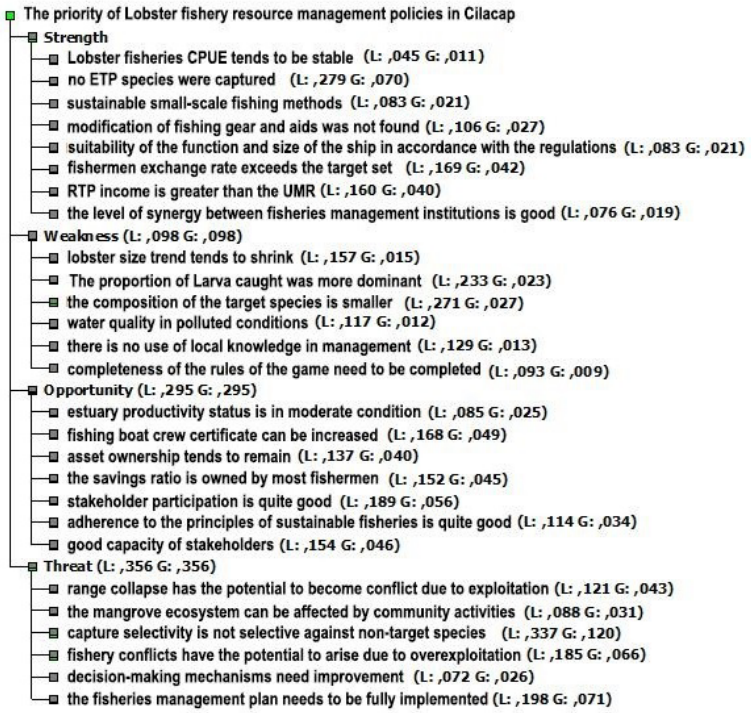


**Fig. 1.** Expert Choice Hierarchy Output 11

EAFM and RAPFISH analysis show that the status of less sustainable management is related to more dominant threat factors for the sustainable use of lobster resources.

In the threat group, the dominant factor locally is catch selectivity (33.7%), this is a threat because of the non-selective lobster catching efforts carried out on non-target species, the second factor is the fisheries management plan (19.8%) which has not been fully implemented in the area Cilacap fishery. Fishery conflict factor (18.5%) can also be a threat due to unsustainable fishing efforts. These three factors are the main factors in the threat group so that they will have an important role in determining policy priorities.

The opportunity quadrant group is in the second priority with a weight value of 29.5%. Indicators in the EAFM domain with moderate or good values are a factor in this quadrant. These factors are considered to have an opportunity to improve the current sustainability status to accelerate the improvement of lobster resource management on the Cilacap coast.

The factor that has local priority dominates in the opportunity quadrant is the fairly good participation of stakeholders (18.9%), this factor is an opportunity in determining policies to increase efforts for sustainable management. The factor of crew certification that can be improved (16.8%) is the second local priority factor in this quadrant group, this is related to the first factor, sufficiently good participation can be an opportunity to increase the certification of expertise for ship crews or the main players in the lobster fishery business in coastal Cilacap. The third factor that has high local priority is stakeholder capacity (15.4%) and savings ratio (15.2%), both factors are considered as opportunities to create alternatives for lobster fishermen to emphasize more efficient and sustainable fishing efforts of target species.

The Strength Quadrant (25.1%) SWOT ranks third as the focus of management, this quadrant has factors that are considered the strengths of existing management efforts and can be improved or maintained in accelerating the improvement of the sustainability of management efforts.

The factor with high priority in this quadrant is the ETP species which is not threatened in management efforts with a weight value of 27.9%, the exchange rate of fishermen that exceeds the target set by the government with a weight of 16.9% has the potential as a strength in existing management because it can support the sustainability of the economic dimension. The income of the FHW which is higher than the UMR with a weight of 16% can also be a strength factor to maintain sustainability from the economic dimension.

Weaknesses the quadrant (9.8%) is a quadrant with the last priority as a priority, in this quadrant there are factors that have low scores in existing

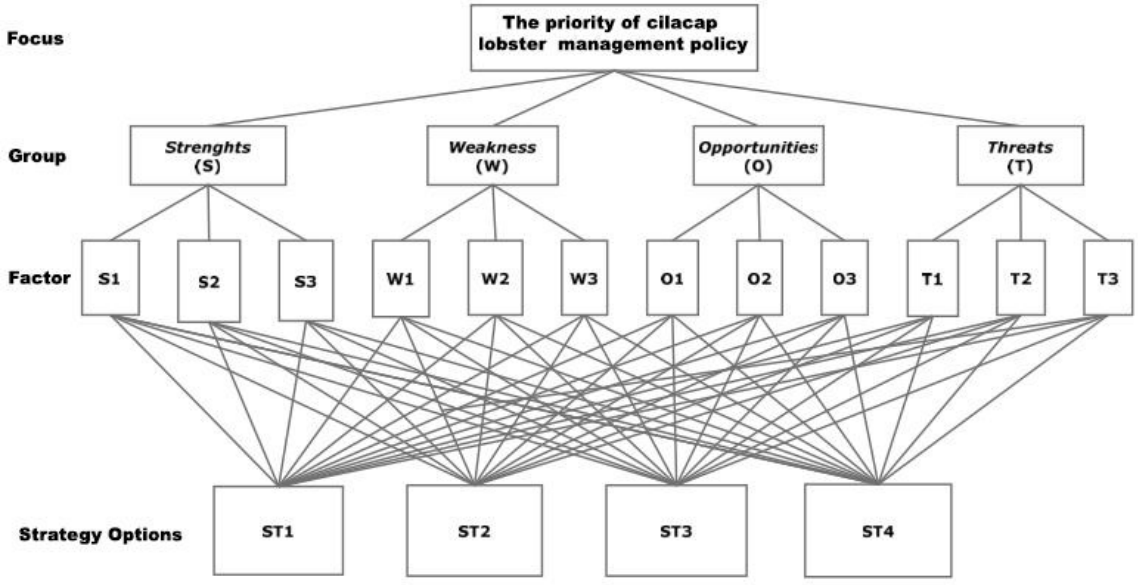


**Fig. 2.** A-SWOT Hierarchy of Lobster Fishery Management Strategy

management so that it needs to be a focus in further management. The weakness of the quadrant, the three dominant factors, is the composition of the target species which is smaller than the catch and the non-target with a weight value of 27.1%, this is related to the catch selectivity factor in the threat quadrant. The next factor is the proportion of young lobster with a weight of 23.3%, this factor is included in the weakness quadrant because the large number of young lobsters caught during field observations can worsen management conditions. The last factor that dominates in this quadrant is the trend of catching lobster size which is getting smaller with a weight of 15.7%. This factor needs to be a focus in policy formulation so that the sustainability of lobsters is not threatened.

**A-SWOT**

In Tabel 2 the final output results of the A-SWOT analysis are displayed with the help of Expert choice 11 software. The schematic analysis carried out in the SWOT and AHP methods is depicted in Figure 2. to clarify the flow of analysis Based on the results of the A-SWOT analysis, the policy strategy priority, Strategy 4 (Weakness-Threat) with a weight of 32.4% as a priority in management efforts. Strategy 4 has the following policy alternatives: 1) Strict Enforcement of Lobster Resource Utilization Regulations; 2) Action Against Violations in Resource Utilization.

These priorities need to be prioritized to accelerate the improvement of the sustainable management of lobster fishery resources on the Cilacap coast. This is in accordance with conditions in the field at the time of observation, the need for firmer enforcement of regulations concerning the Minister of Marine Affairs and Fisheries Regulation (PERMEN KP) Number 12 of 2020 and firm action against these regulations.

The second policy priority obtained is strategy 1 (strength-opportunity) with a weight of 25.7%, strategy 1 focuses on strengths and opportunities in sustainable management efforts. Strategies that can be implemented are: 1) Livelihood welfare extension and fishery product diversification; 2) Fisheries Refugia Approach for Estuary Special Unique Habitats; 3) Increasing Training on Sustainable Use for Main Lobster Fisheries.

Based on the strengths and opportunities that are actually owned in real conditions in the field, policies on welfare improvement education and special areas for the sustainability of lobster resources as well as training on the sustainable use and management of lobster fisheries can be carried out.

The third policy priority obtained is strategy 3 *(strength-opportunity)* with a weight of 25.7%. The strengths and opportunities that are still considered sufficient to be the basis for the current status of sustainability have resulted in a policy strategy that focuses on maintaining the EAFM indicator which has a moderate to good score. Policies in this strategy quadrant are in the form of: 1) Arrangement of Lobster Catching Efforts through Government Regulation; 2) Determination of Conservation Areas and Mangrove Replanting Efforts; 3) Full Implementation of RPP and Decision Making Mechanism.

The regulation of lobster catching efforts in accordance with government regulations related to Minister of Marine Affairs and Fisheries Regulation (PERMEN KP) Number 12 of 2020 should be considered to encourage sustainable use efforts for related factors in the power and opportunity quadrant. Efforts to determine a mangrove habitat conservation area can also be an alternative solution to the problem of lobster resource sustainability, considering that the mangrove area on the Cilacap coast is a nursery ground habitat for lobster resources. The not yet fully implemented RPP requires a solution to implement the RPP as a whole to increase the sustainability status of lobster resource management efforts.

The last priority of the strategy that can be carried out in an effort to improve the sustainability status of lobster resources on the Cilacap coast is strategy 2 (strength-weakness) with a weight of 18.5%. Strategies that can be implemented include:

1) Tightening the rules for the minimum size of lobsters that can be caught and the selectivity of fishing gear.
2) Digging Local Knowledge Regarding Sustainable Fisheries Management.
3) Efforts to Improve Water Quality.

## Conclusion

Based on the strategy above, the implementation of the first policy regarding the tightening of lobster size that can be caught needs to be done considering that even though the CPUE is still in a stable condition every year, it is necessary to tighten regulations regarding minimum size, non-selective fishing efforts will threaten the sustainability of resources in

the long term. Local knowledge can be more accepted by the community so that it is necessary to explore local knowledge about the sustainability of lobster fishery resources to complement the rules in managing these resources. Poor water quality can have an impact on lobster resources considering that aquatic biota is very dependent on water quality as a medium of life.

## References


Abdillah, D. 2016. Pengembangan Wisata Bahari Di Pesisir Pantai Teluk Lampung. *Jurnal Destinasi Kepariwisataan Indonesia.* 1(1) : 45–65.

Adrianto, L., Habibi, A., Fahrudin, A., Azizy, A., Susanto, H. A., Musthofa, I. and Budiarto, A. 2014. Penilaian Indikator untuk Pengelolaan Perikanan dengan Pendekatan Ekosistem. Jakarta: Direktorat Jendral Perikanan Tangkap Kementerian Kelautan and Perikanan.

Hakim, A. A., Kamal, M. M., Butet, N. A. and Affandi, R. 2019. Determination of Fisheries Refugia Area for Freshwater Eels (*Anguilla* Spp.) In Palabuhanratu Bay, West Java, Indonesia. *Iop Conference Series: Earth and Environmental Science.* 404(1). Https://Doi.Org/10.1088/1755-1315/404/1/012014

Hareen, Z. T. G. 2016. Analisis Potensi Pengembangan Pariwisata (Pendekatan Ahp (Analitycal Hierarchy Process ) Pada Jenis Obyek Wisata Alam, Wisata Budaya Dan Wisata Alternatif Di Kabupaten Bojonegoro). *Swara Bhumi.* 01(02) : 32–39.

Mudana, I. K. 2014. Untuk Peningkatan Keselamatan Alur Laut Kepulauan Indonesia Ii Safety Equipment Support in Lembar Ferry Port for Improved Safety in Indonesia Sea Lane Ii. *Warta Penelitian Perhubungan.* 26(4) : 227–240.

Paterson, C. J., Pernetta, J. C., Siraraksophon, S., Kato, Y., Barut, N. C., Saikliang, P. and Armada, N. B. 2013. Fisheries Refugia: A Novel Approach to Integrating Fisheries and Habitat Management in the Context of Small-Scale Fishing Pressure. *Ocean and Coastal Management.* 85 : 214–229. Https://Doi.Org/10.1016/J.Ocecoaman.2012.12.001

Qashlim, A. 2015. Penerapan Metode *Analytic Hierarchy Process* (AHP ) Untuk Sistem Pedukung Keputusan (Studi Kasus/: Penentuan Kawasan Hutan Konservasi ), 1, 8–14.

Satria, D. 2009. Strategi Pengembangan Ekowisata Berbasis Ekonomi Lokal Dalam Rangka Program Pengentasan Kemiskinan Di Wilayah Kabupaten Malang. *Journal of Indonesian Applied Economics.* 3(Mei), 37 47.

Satrio, A. W. and Yoswaty, D. 2018. Strategi Pengembangan Ekowisata Bahari Di Pantai Pelawan Kabupaten Karimun Provinsi Kepulauan Riau. Fakultas Perikanan Dan Kelautan Universitas Riau, 1–12.

Schmoldt D.L, Kangas J, Mendoza G.A. Basic Principles of Decision Making in Natural Resources and the Environment. In 2001. p. 1–13.