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The strategy of Small-scale fisheries management in Cilacap Regency Waters

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ABSTRACT

Management of small-scale fisheries resources is more likely to be oriented towards economic growth by overexploiting fishery resources without paying attention to sustainability aspects. The number of small-scale fishing fleets tends to increase, resulting in over-exploitation in coastal areas. The purpose of this study is to develop alternative strategies for small-scale capture fisheries management in Cilacap Regency. Collecting data using survey methods and interviews with key informants. Sampling was done by purposive sampling technique. Data were analyzed using the AWOT method, namely the SWOT method combined with AHP. The results showed that the IFAS matrix value is 3.17 (strength = 2.211 and weakness is 0.715) the total value of EFAS is 2.926 (opportunity = 2.211 and threat = 0.715). The choice of strategy is in quadrant IV (growth and constructive conditions). Strategic priorities that can be taken include, increase productivity with environmentally friendly fishing gear, optimize fishing facilities and infrastructure assistance, strengthen the role of fishermen's organizations or groups, increase human resource capacity through training and empowerment programs for fishermen and capital assistance for fishing business development.

Key words : *Artisanal fisheries, SWOT, AHP, Cilacap waters*

Introduction

Small-scale fishing is a fishing activity that is operated using equipment that is still simple and has local knowledge that is passed down from generation to generation (Apine *et al.*, 2019). The contribution of small-scale fisheries, especially in developing countries, is to supply nutritional needs, food security, provide employment, and as a solution to poverty alleviation (Lloret *et al.*, 2018). In addition, small-scale fisheries also contributes to the national economy (De la Cruz-González *et al*., 2018). The main characteristic of small-scale capture fisheries is the operating area that is not far from the coast (<4 miles) and still uses simple technology (Mardyani *et al.*, 2020). Currently, the number of small fishermen in Indonesia is around 85% of the total fishermen (Vatria *et al.*, 2019).

Currently, small-scale fisheries management activities tend to be oriented towards economic growth by overexploiting fishery resources without paying attention to the sustainability aspect, which results in a drastic reduction in the stock of fish biomass. In addition, the absence of regulations governing the limitation of the number of small-scale fishing fleets has resulted in the number of fleets tend-

ing to increase. According to Picaulima *et al.,* (2021) explaining that limited fish resources make fishermen always try to improve the ship's ability through increasing production inputs to optimize catches. The dynamics of small-scale fisheries operating in narrow fishing areas (0 – 4 miles) or coastal areas and small islands have an impact on competition between fleets, whether they have the same fishing gear, or the same fishing area.

The problem that occurs in small-scale fisheries, especially in developing countries such as Indonesia, is overcapacity. In addition, small-scale capture fisheries are very vulnerable to conflict and competence among fishermen. Competition occurs due to of the interaction of techniques between fishing gear in fighting over the fishing ground. According to (Asrial *et al.*, 2021), explains that two or more different types of fishing gear can cause competition when operating fishing gear.

The dominance of small-scale fisheries in Cilacap Regency often results in competition between fishermen in operating fishing gear. Competition between fishermen can be due to the similarity of fishing gear, fishing areas (DPI) and catch targets (Hakim *et al.,* 2018). Fishing activities in coastal areas have an impact on environmental degradation (Alam *et al.*, 2021). In addition, the high activity of small-scale fishermen has an impact on the availability of fishery stocks in the sea which ultimately leads to over fishing (Nakayama *et al.*, 2018) .

This study aims to determine alternative strategies for small-scale fisheries management in the waters of Cilacap Regency. Determination of strategy is done with the AWOT approach. Awot is a SWOT (Strength, Weaknesses, Opportunity, Threats) analysis that is integrated with AHP (analytical Hierarchy Process) analysis.

Methods of Research

The research was conducted in the area of South Cilacap Regency, which is the center of fisheries activities in Cilacap Regency. Data collection was carried out in June – July 2022. The methods used were surveys and interviews as research instruments

The data collected are primary data and secondary data. The primary data collected are internal factors (Strengths and Weaknesses) and external factors (opportunities and threats) in the management of small-scale capture fisheries in Cilacap Regency. Primary data was collected through interviews with competent key informants to determine SWOT criteria and alternatives and priorities for implementing strategies. The secondary data collected were production data for each type of fish and trip data for fishing gear. Secondary data collection came from several agencies, including the Cilacap Regency Fisheries Service (Disperkab Cilacap), Marine and Fishery Resources Supervision Center (PSDKP), and KUD Minosaroyo.

Determination of respondents was selected by purposive sampling based on the role and expertise of the respondent . The following are the details of the group of respondents in the study (Table 1).

Data analysis uses the AWOT approach, which is a data analysis method by combining a hierarchical structure with SWOT strategic planning, so as to determine the best strategic priorities for the available alternative strategies. AHP is a decision-making model that is carried out by compiling multi-criteria problems into a hierarchical arrangement (Imelda *et al.*, 2019). The AHP principle is the simplification of an unstructured, strategic and dynamic complex problem into its parts, and organizes it in a hierarchy (Henríquez-Antipa and Cárcamo, 2019).

The SWOT matrix can clearly describe the various external opportunities and threats faced by the agency that can be adjusted according to their strengths and weaknesses. This matrix can be various opportunities, various threats, internal weak-

Table 1. The group of respondents

No.	Respondent Group	Number of Respondents (persons)
1	Fisherman	
	a) arad net	15 people
	b) gill net	15 people
	c) trammel net	15 people
	d) *scoop* net	10 people
2	Indonesian Fishermen Association (HSNI) Cilacap Regency	1 person
3	Department of Marine Affairs and Fisheries	5 people
4	Supervision of Marine and Fishery Resources (PSDKP)	1 person
5	KUD Minosaroyo	

nesses, and internal strengths that produce four sets of possible alternative strategies. One of four a set of possible strategic alternatives that are expected from a SWOT analysis to be used in the strategy of a management strategy. The four sets of strategic alternatives generated from the SWOT matrix are as follows (Table 2).

The stages of data processing using SWOT-AHP analysis are as follows:
Level 1: formulation of goals to be achieved (goals)
Level 2: determining the criteria, namely the SWOT variable (Strengths, Weaknesses, Opportunities, Threats)
Level 3: determining sub-criteria, namely strategic factors in each SWOT group and determining priorities for each SWOT variable
Level 4: determining alternative strategies and selecting strategic priorities using the AHP technique

The selection of alternative strategies is based on the combination of each variable Strength, Weaknesses, Opportunity and Threats by maximizing the S and O variables to overcome or minimize the W and T variables in capture-scale fisheries management in Cilacap Waters. Data analysis was carried out using Expert Choice 11 software.

Results and Discussion

Identification and determination of IFAS and EFAS factors

The identification and priority of the SWOT variable was obtained through in-depth interviews with key informants and the results of field observations. The results of the analysis show that the strength factor is the main priority that needs to be improved, then by taking advantage of opportunities and overcoming threats and weaknesses. The calculation of the SWOT component matrix is in Table 3.

The results of the calculation of the IFAS matrix (Table 4) show that the main factor influencing internal decision making is Most small fishermen use environmentally friendly fishing gear with a value of (0.305). Next is government support program in fisheries management (0.169). The government's role in supporting the management of small-scale capture fisheries is carried out by holding outreach programs, counseling, empowerment and technical guidance to small fishermen, especially regarding the operation of environmentally friendly fishing gear. Next is the factor of the existence of fisherman institutions as a forum for channeling government programs (0.13). Some of the fishermen's institutions include the fishermen's association and the joint business group (KUB). The existence of fishing institutions can help fishermen to get access to assistance to the government, both district, provincial and central governments. The fourth factor is The diversity of types of capture fisheries production that has economic value (0.06). The main commodities caught by small fishermen are anchovies (*Stolephorus sp*), Fringescale sardine (*Sardinella fimbriata*), Hair tail (*Trichiurus lepturus*), Silver pomfret (*Pampus argenteus*), Jerbung (*Penaeus merguiensis*), and Rebon (*Actes indicus).*

Table 3. The score of the SWOT variable

Variable	Score	Priority
Strength	2,506	P1
Weakness	0.665	P4
Opportunity	2,212	P2
Threats	0.715	P3

The lowest strength factor is Cilacap Regency has a long coastline (0.047). Cilacap Regency has the longest line in Central Java reaching 103 Km which stretches from Nusawungu sub-district in the eastern hemisphere bordering Kebumen Regency and Kampung Laut District in the west bordering Pangandaran Regency, West Java.

The most dominating weakness factor is that the supervision of small-scale capture fisheries manage-

Table 2. Matrix SWOT Strategy

Strategi SO Strategy	**WO Strategy**
This strategy is made by utilizing all strengths to seize and take advantage of opportunities as much as possible	This strategy is utilized based on the utilization of existing opportunities by minimizing existing weaknesses
ST Strategy	**WT Strategy**
This strategy is a uses the strengths possessed to overcome threats.	This strategy is based on activities that are defensive in nature and seek to minimize existing weaknesses and avoid threats

ment activities is still minimal (0.095). Fisheries management supervision activities in Cilacap Regency are carried out by the Cilacap Regency Regional Government, Cilacap Regency PSDKP, Naval Base (LANAL) and Air and Water Police (Polairud). Fishing surveillance activities for small vessels are still lacking. This is because when referring to PERDIRJEN PSDKP NO. 12 YEAR 2017 the Technical Guidelines for Supervision of Fishing Vessels are calm, small fishermen are not obliged to report departures to supervisory officers. The second weakness factor is the conflict between fishermen, especially arad fishermen (0.055). Conflicts with arad fishermen occur because arad nets are considered less environmentally friendly. The third weakness factor is the less than optimal management of the Fish Auction Place (0.055). The number of TPI in Cilacap is 10 TPI, but only a few still have auction activities, including: TPI Kemiren, TPI Lengkong, TPI Tegal Katilayu, TPI and Rawa Jarit. The fourth weakness factor is that some fishermen do not sell their catch at Fish Auction Place (0.043). The reason fishermen do not conduct auctions at TPI is because there is an "agreement" relationship with baskets. The basket provides capital to go to sea on the condition that the catch obtained is sold in the basket. The catch obtained is influenced by the fishing season (0.038). Based on the results of interviews with fishermen, the fishing season is an obstacle faced by fishermen, the unpredictable fishing season has an impact on decreasing the production of fish catches.

IFAS factor priority is obtained by using AHP analysis. The results of the analysis are presented in Figure 1.

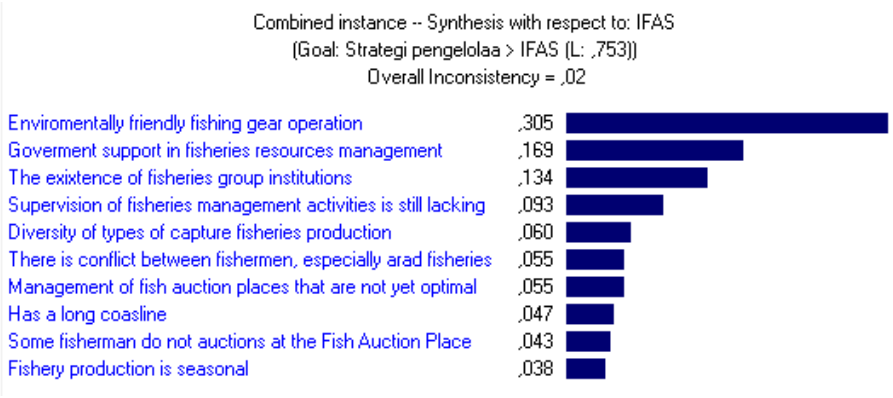

Fig. 1. Matrix calculation of IFAS

Table 4. IFAS calculation matrix

No.	Criteria	Weight	Rating	Score
	Strengths			
1	Has the longest coastline in Central Java	0.047	4	0.1645
2	Most small fishermen use environmentally friendly fishing gear	0.305	4	1.105625
3	Government support program in fisheries management	0.169	4	0.612625
4	The diversity of types of capture fisheries production that has economic value	0.060	3	0.1875
5	The existence of fisherman institutions as a forum for channeling government programs	0.134	3	0.4355
	Sub-Total	0.715		2.50575
	Weaknesses			
6	The catch obtained is influenced by the fishing season	0.038	2	0.08075
7	There is conflict between fishermen, especially arad fishermen	0.055	3	0.15125
8	Supervision of small -scale capture fisheries management activities is still minimal	0.094	2	0.19975
9	Some fishermen do not sell their catch at Fish Auction Place	0.043	2	0.102125
10	The less than optimal management of the Fish Auction Place	0.055	2	0.130625
	Sub-Total	0.285		0.6645
	Total	1,000		1.84

Table 5. EFAS Calculation. matrix

No	Opportunities	Weight	Rating	Score
11	Huge potential of fishery resources	0.121	3	0.39325
12	Training program for human resource capacity building	0.160	3	0.48
13	Capital support by the government, private sector and banks	0.132	3	0.396
14	The existence of a joint business group (KUB) for fishermen	0.086	3	0.24725
15	Programs for supporting facilities and infrastructure for fishing activities	0.206	3	0.69525
	Sub-Total	0.705		2.21175
	Threats			
16	Extreme Weather Changes	0.046	2	0.092
17	The existence of pollution and damage to marine ecosystems	0.067	3	0.21775
18	over fishing	0.078	2	0.16575
19	Competition for immigrant fishermen (andon)	0.044	2	0.1045
20	Information on fishery sector data is still lacking	0.060	2	0.135
	Sub-Total	0.295		0.715
	Total	1,000		1.49675

The results of the calculation of the EFAS matrix (Table 5) show that the main factor of opportunity is the fishing activity facilities and infrastructure assistance program (0.206). Assistance programs by the government include boats, fishing gear, machines and fishing aids. The second opportunity factor is the training program for human resource capacity building (0.160). The government in this case the Fisheries Service provides training to improve the skills of fishermen, among others; training in making fishing gear, machining services in Maju Fisherman Village (KALAJU) and Fisherman Field School Program (SLN). The third opportunity factor is capital support by the government, private sector and banks (0.132). The Fisheries Service of Cilacap Regency held a socialization and counseling program for Fishermen Insurance (ASNEL). The function of insurance is as an identity and protection for fishermen. In addition , there is an Intermediation Bazaar program. This program is to provide access to capital for fishermen with funding from banks. The fishing gear assistance program by PT JASINDO (Insurance Jasa Indonesia). The fourth buoyant factor is the potential for large fishery resources (0.121). The lowest opportunity factor is the existence of financial institutions for fishermen (0.086). There is KUD Minosuroyo, which is a financial institution that manages fishermen's finances in Cilacap Regency. KUD Minosaroyo oversees 8 fish auctions in Cilacap. The existence of the Minosaroyo KUD can help fishermen when there is a famine season, namely famine funds to help their capital to go to sea.

The highest threat factor is overfishing (0.078). Overfishing can be caused by the high activity of small-scale fishermen, so that the amount of catch production exceeds the sustainable limit (Maximum Sustainable Yield) of fish resources (Nakayama *et al.*, 2018). The second threat factor is pollution and damage to the marine environment (0.067). The occurrence of environmental pollution can be caused by PLTU activities in the coastal area of Cilacap. In addition, it is caused by the activity of fishing gear that does not damage the marine ecosystem, because it dredges the bottom of the waters and hits coral reefs. The third threat factor is fishery data information is still lacking (0.060). The lack of information on fisheries data, especially fishery production data, especially production data for small-scale fishermen in Cilacap, is caused by not all fishermen landing their catch at the Fish Auction Place (TPI), so that trip and fishing trip data are not recorded. The fourth threat factor is extreme weather changes (0.046). Extreme weather changes greatly affect the activities of fishermen in catching fish in the sea. The fifth threat factor is the competence of the fishermen (andon) (0.044). The presence of migrant fishermen who enter the waters of Cilacap often creates horizontal conflicts between fishermen. Thus, to resolve the conflict, the Cilacap District Fisheries Office held outreach activities and fostering a network of border fishermen's associations.

EFAS factor priority is obtained by using AHP analysis. The results of the analysis are presented in Figure 2.

Alternative Strategy

The selection of alternative strategies is obtained by

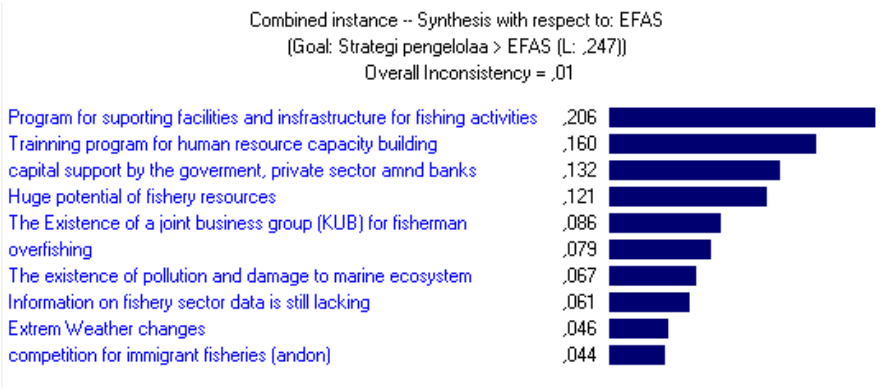

Fig. 2. Matrix calculation of EFAS

adding up each criterion on the IFAS and EFAS factors. The calculation results are obtained to determine the quadrant point of the IFAS and EFAS matrices. The IFAS value is 3.17 with a strength value of 2.505 and a weakness of 0.664, the difference value is 1.841. The EFAS value is 2,926 with an opportunity value of 2.211 and a threat value of 0.715, the difference value is 1.496. Based on these calculations, the IFAS and EFAS values are in quadrant IV (Figure 3). Quadrant IV is a growing and constructive condition.

Total IFAS Weighted

Score	Strong (3.0 - 4.0)	Average (2.0 - 2.99)	Weaknesses (1.0 - 1.99)
High (3.0 - 4.0)	I	II	III
Medium (2.0 - 2.99)	**IV**	V	VI
Low (1.0 - 1.99)	VII	VIII	IX

Fig. 3. SWOT Analysis Schematic

Based on the SWOT matrix analysis there are four types of strategies, namely as follows.

1. SO (Strength – Opportunity)

SO 1 = Increased fishery productivity with environmentally friendly fishing gear
SO 2 = Capital assistance for fishing business development
SO 3 = Optimization of fishing facilities and infrastructure assistance
SO 4 = Diversification of fishery products to increase the selling price of fishery products
SO 5 = Strengthening the role of fishermen organizations or groups

2. The S – T (Strengt – Threats)

ST 1 = Restriction on the number of fishing fleets
ST 2 = Increased supervision of fishing activities
ST 3 = Increase capture fisheries data collection for small-scale fishermen
ST 4 = Establishing coordination and cooperation between regions in fisheries management
ST 5 = Assessment of Fish Production Stock

3. W – O (Weaknesses – Opportunity)

WO 1= Capacity building of human resources through training and empowerment programs for fishermen
WO 2= Optimization of extension and socialization programs on fisheries management
WO 3 = Improvement of facilities and infrastructure in TPI
WO 4= Increasing the participation of fishermen in capture fisheries management
WO 5= Access to information for fishermen about fishing grounds

4. W – T (Weakness – Threats)

WT 1 = Increasing public awareness in fair and responsible fisheries management
WT 2 = Strict sanction action for arresting business actors who violate the law
WT 3 = Establishing cooperative relationships between fishery business actors
WT 4 = Increase fisher participation in capture fisheries management
WT 5 = Access to information for fishermen about fishing areas

Determination of strategic priorities from several alternatives, namely by referring to the calculation of the weighted values of each factor using AHP analysis. So that the priority strategies are obtained, including: **The first strategy** is to increase productivity with environmentally friendly fishing gear. One of the programs of the Cilacap Regency Fisheries Service is to hold a socialization program for the

operation of environmentally friendly fishing gear. The aim of the program is to increase fishermen's awareness about the importance of environmentally friendly fishing gear, so that they can realize sustainable capture fisheries.

The second strategy is optimizing the aid of fishing facilities and infrastructure. The forms of assistance provided to fishermen are in the form of fishing fleets, fishing gear and machines. Assistance programs can be submitted through the Joint Business Group (KUB).

The third strategy is to strengthen the role of fishermen's organizations or groups. Several programs have been carried out by the Fisheries Service of Cilacap Regency in increasing the role of the organization, namely socializing and fostering a network of fishermen's associations, especially with border fishermen. The purpose of implementing the program is to help solve fishermen's problems by means of deliberation so that sustainable and responsible fisheries development can be realized.

The fourth strategy is to increase the capacity of human resources through training and empowerment programs for fishermen. Programs that have been held by the Cilacap Regency Fisheries Service to increase the capacity of human resources include; Technical guidance and socialization on archiving and administration, technical guidance for capacity building for small fishermen and the Fisherman Field School (SLN) program organized by the Cilacap Meteorological Station with the Meteorology, Climatology and Geophysics Agency (BMKG).

The fifth strategy is Capital assistance for the development of fishing business. One of the programs organized by the government is the Intermediation Bazaar, which is a program for fostering and facilitating access to capital for SEHAT recipients (Certification of Fishermen's Land Rights) in Cilacap Regency. The purpose of the intermediation bazaar program is to increase the accessibility of fishermen to capital resources or the use of schemes owned by other financial institutions and institutions.

Conclusion

Based on the calculation of the IFAS and EFAS matrix values, it is obtained that the dominating factor is the power factor (2.506). Meanwhile, the lowest factor is Weakness (0.665). The results of the sum of each criterion on the IFAS and EFAS criteria obtained the intersection point (3.17; 2.926), which is in quadrant IV. Quadrant IV shows growing and constructive conditions. Alternative priority strategies obtained by referring to the AWOT analysis, obtained strategies, among others: Strategy 1 is to increase productivity with environmentally friendly fishing gear. Strategy 2 is optimizing the aid of fishing facilities and infrastructure. Strategy 3 is to strengthen the role of fishermen's organizations or groups. Strategy 4 is to increase the capacity of human resources through training and empowerment programs for fishermen. Strategy 5 is capital assistance for the development of fishing business.

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Conflict of Interest

Authors states that there is no conflict of interest in the research

References

Alam, S., Rahman, M. and Al Arif, A. 2021. Challenges and opportunities in artisanal fisheries (Sonadia Island, Bangladesh): The role of legislative, policy and institutional frameworks. *Ocean and Coastal Management.* 201(October 2020), 105424. https://doi.org/10.1016/j.ocecoaman.2020.105424

Apine, E., Turner, L.M., Rodwell, L.D. and Bhatta, R. 2019. The application of the sustainable livelihood approach to small scale-fisheries: The case of mud crab *Scylla serrata* in South west India. *Ocean and Coastal Management*. 170(December 2018): 17–28. https://doi.org/10.1016/j.ocecoaman.2018.12.024

Asrial, E., Marzuki, M. and Hamid Khasanah, R.I. 2021. Sustainability analysis of tomato jellyfish (*Crambione mastigophora*) fisheries resources management in saleh bay waters, sumbawa island, indonesia. *Biodiversitas.* 22(2): 512–520. https://doi.org/10.13057/biodiv/d220202

De la Cruz-González, F.J., Patiño-Valencia, J.L., Luna-Raya, M.C. and Cisneros-Montemayor, A. M. 2018. Self-empowerment and successful co-management in an artisanal fishing community: Santa Cruz de

Miramar, Mexico. *Ocean and Coastal Management*. 154(January): 96–102. https://doi.org/10.1016/j.ocecoaman.2018.01.008

Hakim, L., Wiyono, S.E. and Wahju, R.I. 2018. Kompetisi alat tangkap ikan skala kecil di Pelabuhan Perikanan Pantai Tegalsari. *Jurnal Marine Fisheries*. 9(1): 107–116.

Henríquez-Antipa, L.A. and Cárcamo, F. 2019. Stakeholder's multidimensional perceptions on policy implementation gaps regarding the current status of Chilean small-scale seaweed aquaculture. *Marine Policy*. 103(96): 138–147. https://doi.org/10.1016/j.marpol.2019.02.042

Hue, H.T.T., Pradit, S., Lim, A., Goncalo, C. and Nitiratsuwan, T. 2018. Shrimp and fish catch landing trends in songkhla lagoon, Thailand during 2003-2016. *Applied Ecology and Environmental Research*. 16(3): 3061–3078. https://doi.org/10.15666/aeer/1603_30613078

Imelda, Kusrini, N. and Hidayat, R. 2019. Strategi Pengelolaan Perikanan Tangkap Berkelanjutan Di Wilayah Pesisir Kabupaten Kubu Raya. *Marine Fisheries: Journal of Marine Fisheries Technology and Management*. 10(1): 59–69. https://doi.org/10.29244/jmf.10.1.

Lloret, J., Cowx, I.G., Cabral, H., Castro, M., Font, T., Gonçalves, J.M.S., Gordoa, A., Hoefnagel, E., Matiæ-Skoko, S., Mikkelsen, E., Morales-Nin, B., Moutopoulos, D. K., Muñoz, M., dos Santos, M. N., Pintassilgo, P., Pita, C., Stergiou, K. I., Ünal, V., Veiga, P. and Erzini, K. 2018. Small-scale coastal fisheries in European Seas are not what they were: Ecological, social and economic changes. *Marine Policy*. 98(November 2016): 176–186. https://doi.org/10.1016/j.marpol.2016.11.007

Mardyani, Y., Kurnia, T. and Adrianto, L. 2020. Pengelolaan Perikanan Skala Kecil Di Perairan Pesisir Kabupaten Bangka Dengan Pendekatan Bioekonomi. *Jurnal Kebijakan Sosial Ekonomi Kelautan Dan Perikanan*. 10(2): 91. https://doi.org/10.15578/jksekp.v10i2.9305

Martinez-escauriaza, R., Pita, P., Maria, L., Manuel, N., Gouveia, A., Teixeira, E., Freitas, M. De and Hermida, M. 2021. *Analysis of Big Game Fishing Catches of Blue Marlin (Makaira nigricans) in the Madeira Archipelago (Eastern Atlantic) and Factors that Affect Its Presence*.

Nakayama, S.I., Takasuka, A., Ichinokawa, M. and Okamura, H. 2018. Climate change and interspecific interactions drive species alternations between anchovy and sardine in the western North Pacific: Detection of causality by convergent cross mapping. *Fisheries Oceanography*. 27(4): 312–322. https://doi.org/10.1111/fog.12254

Picaulima, S.M., Wiyono, E.S., Baskoro, M.S. and Riyanto, M. 2021. Analysis of Factors Affecting Catches in Small-Scale Fleet Fisheries in Eastern Kei Kecil Island, Kei Islands. *Jurnal Sumberdaya Akuatik Indopasifik*. 5(4): 415. https://doi.org/10.46252/jsaifpik-unipa.2021.vol.5.no.4.189

Vatria, B., Wiryawan, B., Wiyono, E.S. and Baskoro, M.S. 2019. Cluster Analysis of Small-scale Capture Fisheries Characteristics in Kayong Utara Regency. *Marine Fisheries/: Journal of Marine Fisheries Technology and Management*. 10(1): 95–106. https://doi.org/10.29244/jmf.10.1.