



Rapfish: A Rapid Appraisal Technique to Evaluate the Sustainability Status of Pelagic Fisheries in North Aceh Waters

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Abstract: Rapfish is used as an indicator to assess pelagic fisheries' sustainability in Aceh's northern waters. This study aims to determine the sustainability of pelagic fishing and the factors that mostly influence the sustainability of pelagic fisheries. Surveys and interviews with questionnaires were conducted in collecting data, then analyzed by RAPFISH analysis with five dimensions. The results show that the ecological and economic dimensions are in a quite sustainable category, the social dimension is in a less sustainable category, the technological dimension is in the very sustainable category and the institutional dimension is in the less sustainable category. In addition, there are several indicators that most influence the sustainability of pelagic fisheries with purse seine on the ecological dimensions; (1) the location of fishing grounds; (2) the Fishing season. The economic dimension is influenced by (1) assistance from the government; (2) dependence on subsidies. Meanwhile, the social dimension is influenced by (1) The development of the number of fishermen; (2) The level of conflict. Lastly, the technological dimensions which influenced by (1) fishing vessel size; (2) Mechanical power, and institutional dimensions (1) The role of customary leadership, and (2) Fishermen's involvement in the process of preparing management regulations.

Keywords: Aceh; Kutaraja; Pelagic Fisheries; Rapfish; Sustainability

Introduction

Fish resources in Indonesia's fisheries management area are very abundant and are one of the natural resources which are the basic capital for development because they have the potential economic strength, to become a great economic power for the prosperity of the people (Marasabessy, 2017). Law Number 31 of 2004 Fisheries are all activities related to managing and utilising fish resources and their environment, from pre-production, production, and processing to marketing in the fishery business. Utilization of fish resources does not rely on increasing the production of one party alone but guarantees sustainable fisheries from these fishery potentials (Zulfikar, 2012). the fisheries and marine sectors, which will become the foundation of the

economy in the future, need to be managed properly (Yonvitner et al. 2020). Therefore, opportunities and challenges must be realized and implemented in real terms for optimal and sustainable development of the marine and fisheries sector.

Based on FAO (2014), in 2012 Indonesia was ranked 2nd for capture fisheries production and 4th for aquaculture production in the world and based on FAO (2020) Indonesia was ranked 3rd after Peru and China. This fact can illustrate that Indonesia's fishery potential is very large, so if managed properly and responsibly it will be sustainable, and it can become one of the main sources of capital for development in the present in the future. This has also been mandated in the Law of the Republic of Indonesia Number 45 of 2009 article 6 paragraph 1 which emphasizes that fisheries

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management is aimed at achieving optimal and sustainable benefits, as well as ensuring the preservation of fish resources. One of the fishing gears mostly used by fishermen in Aceh is the purse seine. Purse seine or commonly also called purse seine is one of the special fishing gears used to catch pelagic fish.

A purse seine is a fishing gear that is multi-species, that is, it catches more than one type of fish. In many cases it is often found that the mesh size of the purse seine fishing gear is very small, this can affect the catches obtained. The problem that occurs is the Kutaraja Fishing Port (Rambun et al., 2016), which is included in the WPP 572 fisheries management area with a status that is already over-exploited for pelagic fish and fully exploited for demersal fish (Kurnia et al. 2019). One way to overcome this problem is to use RAPFISH (Rapid Appraisal for Fisheries) as an indicator for assessing the sustainability of pelagic fisheries in the northern waters of Aceh.

The RAPFSIH method is a multi-dimensional rapid assessment technique for evaluating the sustainability of fisheries (Pitcher, 1999); (Pitcher and Preikshot, 2001); (RAPFISH, 2006). The RAPFISH has been developed using six evaluation areas (economic, ecological, technological, social and ethical) but, bearing in mind that not only the current sustainability status of the fishery but also its evolution over time, the analysis has focused on these areas of evaluation (Murrillas et al., 2008). The development of the RAPFISH method was introduced by the Fisheries Center, at the University of Colombia in 1999. The basic technique of the RAPFISH method uses simple and easily assessed attributes to provide a fast, cost-effective, and multidisciplinary assessment of fisheries status, in terms of comparative levels of sustainability (Murrillas et al., 2008). Placing a value (score) on a measurable attribute using Multi-Dimensional Scaling (MDS) involving dimensions in this study using 5 dimensions as the source of data collected, namely social dimensions, ecological, economic, technological and institutional dimensions.

Method

The method used in this research is descriptive method with survey, observation and interview techniques. the descriptive method is a method of researching the status of a group of people, an object, a condition, a system of thought, a class of events in the present or a form of data collection that aims to describe, describe a situation or a problem in which data the conditions taken were analyzed according to the approach used in the study (Nazir, 2014). The data collected is in the form of primary data and secondary data. Primary data consists of the results of structured interviews with the help of questionnaires to

respondents. Respondents were purse seiner owners and managers who were selected based on certain considerations, namely 25% of the 294 population of purse seiners in Kutaraja Fishing Port the number of respondents used was 73 fishermen.

The data analysis method was carried out using RAPFISH (Rapid Appraisal for Fisheries), an analytical method for evaluating the sustainability of fisheries in a multidisciplinary manner which is based on ordination techniques or placing something in a sequence of measurable attributes. with Multi-Dimensional Scaling (Suryana et al. 2012). Rapfish analysis includes rapid valuation analysis (RAP-analysis), leverage analysis (leverage analysis) and Monte-Carlo analysis. Kite diagrams are used to describe the status of sustainability in a multi-dimensional way by comparing the performance of each dimension. For the basis for determining the sustainability index (Allahyari, 2010), see Table 1.

Table 1. The category of a sustainability index for each dimension

Index Value	criteria assessment	Sustainability category
0-25	Poor	Not sustainable
25-50	Less	Less sustainable
50-75	Enough	Fairly sustainable
75-100	Good	Highly sustainable

Result and Discussion

RAPFISH As an indicator for assessing pelagic fisheries sustainability in Aceh's northern waters, it is a 5-dimensional study that aims to determine the sustainability status of fisheries in the northern waters of Aceh. The steps taken to determine the sustainability of each dimension and attribute need to be carried out Rapfish analysis, Leverage and monte-Carlo analysis on each dimension in the Rapfish method. The sustainability of fisheries is described quantitatively in numerical analysis using limited multidimensional scaling techniques, uncertainties expressed through simulation Monte-Carlo and sensitivity with Leverage analysis (Jimenez et. al 2020) and the results are as follows:

Ecological Dimensions. The ecological dimension is a good or bad picture of the quality of the environment and resources for fishing activities that may or may not have an impact on supporting fisheries sustainability. The sustainability status of pelagic fisheries on the ecological dimension has 10 attributes based on the code of conduct for responsible fisheries (CCRF) and adapted to the needs of the research location. The ten attributes on the ecological dimension include having high

highest value of 11.68 for the attribute of assistance from the government and the lowest attribute value of 1.92 for the profit attribute of the fishing business. This analysis is basically intended to see the sensitivity of reducing attributes to the sustainability score. Leverage analysis results for all attributes on the economic dimension are presented in Figure 4.

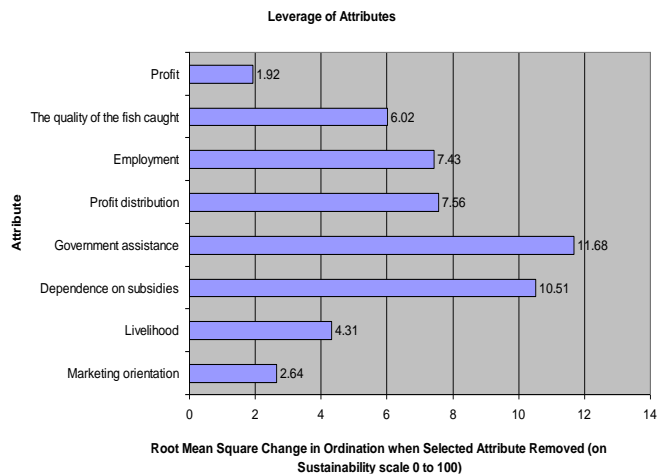


Figure 4. Analysis of Economical Dimensions and Sensitive Factors Affecting Economical Sustainability.

Social Dimension. The sustainability status of pelagic fisheries on the social dimension shows the role of fishermen, communities and communities in management that impacts the sustainability of pelagic fisheries activities. The social dimension uses 7 assessment attributes. The seven attributes in question are the level of education, environmental knowledge, level of conflict, development of the number of fishermen, community's role in conservation, participation of family members, and level of business outreach. The results of the Rapfish analysis on the social dimension get an index value of 46.24 meaning it is less sustainable (Figure 5). This implies that the social system in fishing communities needs to be improved to gain support for the sustainability of sustainable capture fisheries development. Analysis of the results of ordination on the social dimension produces a correlation squared value (R²) of 94.44% and a stress value (S) of 14%. Thus, the results of this research analysis show the condition of the goodness of fit by obtaining a stress value of less than 25%.

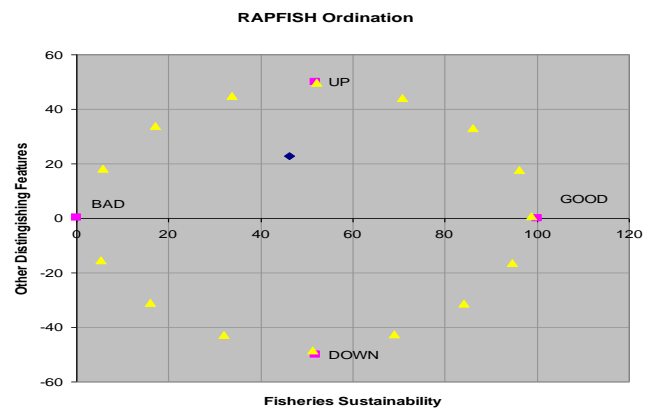


Figure 5. Rap results of ordination analysis for social dimensions

The results of the Leverage analysis of all the attributes used in the social dimension show the highest score of 10.13 for the attribute of the development of the number of fishermen and the lowest score of 0.86 for the attribute of environmental knowledge. This analysis is basically intended to see the sensitivity of reducing attributes to the sustainability score. Leverage analysis results for all attributes on the social dimension are presented in Figure 6.

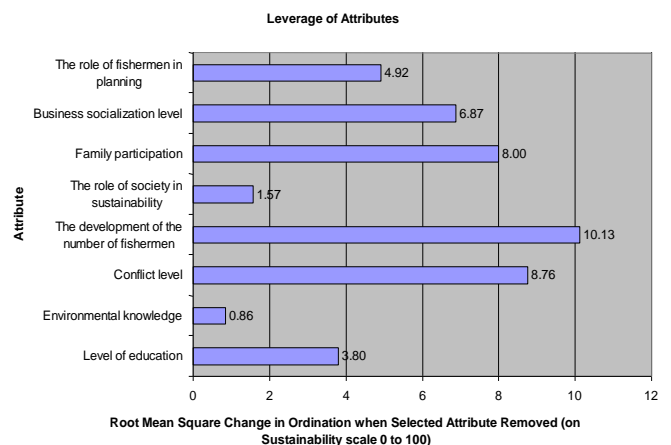


Figure 6. Analysis of Social Dimensions and Sensitive Factors Affecting Social Sustainability.

The Rapfish analysis results for the status of sustainability in the social dimension show a sustainability index value of 46.24 which is included in the less sustainable category. namely realizing the potential for sustainable development of this sector requires the involvement of coastal communities in benefit-sharing and decision-making (Kadagi et al. 2021). Based on the results of the Leverage analysis, there are 2 of the 8 most influential attributes, namely the development of the number of fishermen with a value of 10.13 and the level of conflict with a value of 8.76. However, this can be corrected by increasing the capacity to absorb knowledge and playing a positive

role in communication, that is, the higher the capacity to absorb knowledge, the faster the movement and the earlier the peak of prosperity will come. Therefore, scientific and technological innovation needs to be strengthened to increase the utilization rate of domestic fishery resources (Zhou et al. 2021).

Technological Dimensions. The technological dimension reflects fishermen's expertise and use of technology in fishing activities. Sustainability analysis on the technological dimension uses 7 assessment attributes, namely handling fish on board, vessel size, use of fishing aids, engine power, safety for fishermen, threatening protected fish, and fish landing sites.

The results of the Rapfish analysis on the technology dimension get an index value of 82.77, which means it is very sustainable (Figure 7). This shows that the sustainability of pelagic fisheries is getting good results in terms of technology. The ordinate analysis on the technological dimension produces a squared correlation value (R²) of 95% and a stress value (S) of 14% the results of the analysis show the goodness of fit by obtaining a stress value of less than 25%. To see the level of stability of the results of the ordination analysis on Rapfish.

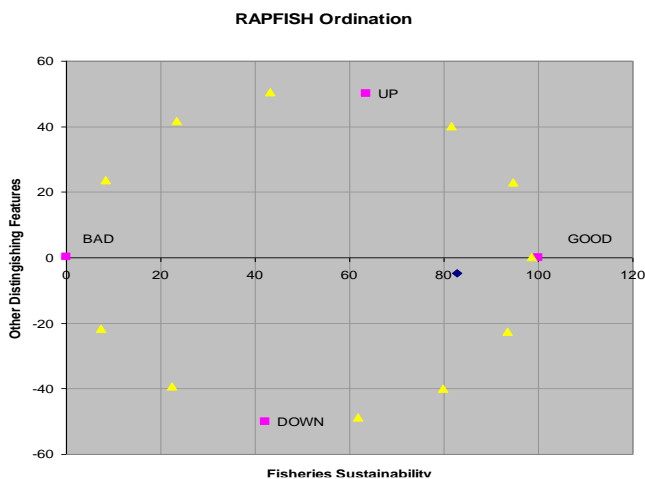


Figure 7. Rap results of Ordination Analysis for Technological Dimensions

The results of the Leverage analysis of all the attributes used in the technology dimension, get the highest score of 10.13 on the attribute of the development of the number of fishermen and the lowest score of 1.42 on the attribute of fish landing sites. This analysis is basically intended to see the sensitivity of reducing attributes to the sustainability score. Leverage analysis results for all attributes on the technology dimension are presented in Figure 8.

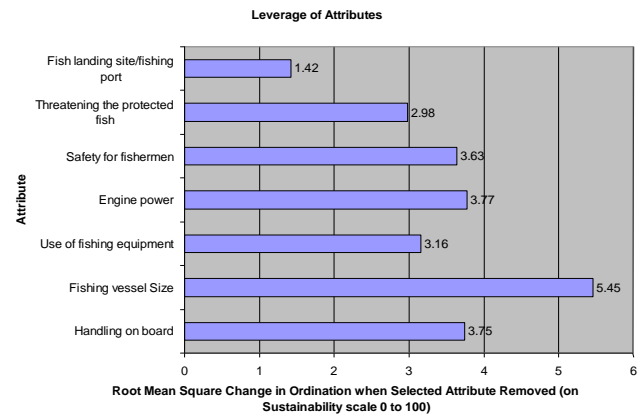


Figure 8. Analysis of Technological dimensions and sensitive factors affecting technological sustainability.

Institutional Dimension. The institutional dimension of pelagic fisheries sustainability status reflects the direct and indirect influence and linkages to the sustainability of pelagic fisheries in the northern waters of Aceh. Analysis of the sustainability status of fisheries on the institutional dimension uses 7 assessment attributes. The seven attributes used are group coaching, training and outreach, compliance with CCRF rules, frequency of counselling and training, fishermen's involvement in preparing fisheries management regulations, the role of customary leadership, and the level of adherence of fishermen to customary law. The results of the sustainability analysis on the institutional dimension get a value of 35.17 (Figure 9) which means that it is included in the less sustainable category. This implies that these circumstances or conditions need to be improved again to ensure the sustainability of pelagic fisheries. The ordinate analysis on the institutional dimension produces a correlation squared value (R²) of 95% and a stress value (S) of 14%. This shows the condition of the goodness of fit, by obtaining a stress value of less than 25%. To see the level of stability of the results of the ordination analysis on Rapfish.

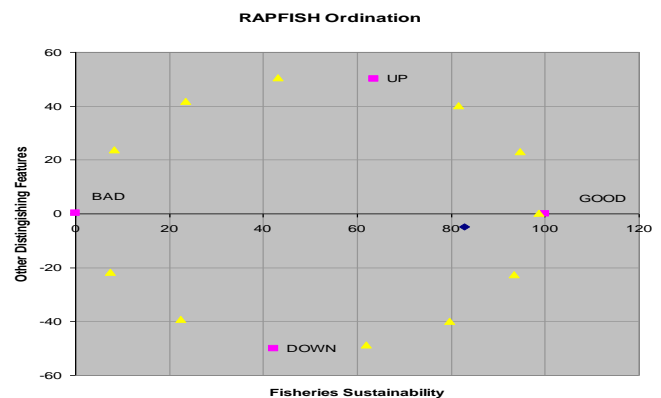


Figure 9. Rap results of Ordination Analysis for Institutional Dimensions

The results of the Leverage analysis of all the attributes used in the institutional dimension show the highest value of 11.70 for the attribute of customary leadership roles and the lowest score of 7.06 for the attributes of training and outreach. This analysis is intended to see the sensitivity of reducing attributes to the sustainability score. Leverage analysis results for all attributes on the social dimension are presented in Figure 10.

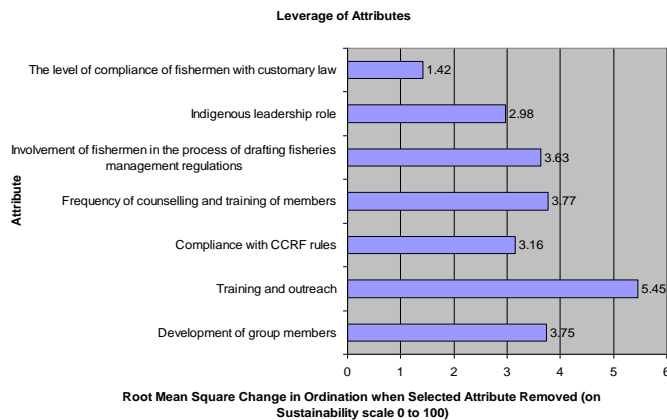


Figure 10. Analysis of Institutional Dimensions and Sensitive Factors Affecting Institutional Sustainability.

Sustainability Index in Kite Diagram. There are five dimensions analyzed by the Rapfish method of the five dimensions, the highest being the technological dimension which is 82.77, then the economic dimension is 64.42, the ecological dimension is 62.47, the social dimension is 46.24 and the last is the institutional dimension is 35.17 (Fig. 11).

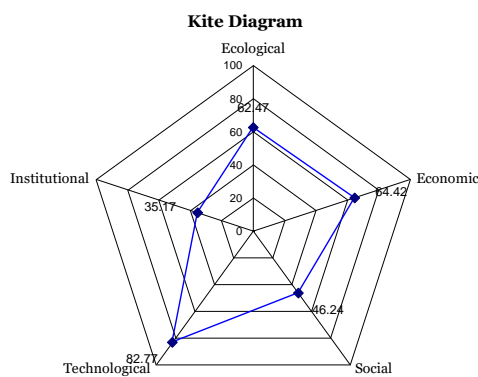


Figure 11. Fly chart Analysis of Index and Sustainability Status of Pelagic Fisheries in Northern Aceh Waters

The Rapfish analysis results for the sustainability status of pelagic fisheries in northern Aceh waters based on the Kutaraja fishing port on the technological dimension found a value of 82.77 which is included in the good or very sustainable category. The emergence of these two attributes in the sustainability of pelagic

fisheries in the northern waters of Aceh based on the Kutaraja fishing port can be explained that the first is the size of the vessels that rely on the Kutaraja fishing port have an average vessel size of 30-60 GT and the second is the engine power on purse seine fishing gear vessels. have a ship size of more than 120PK. The results of the sustainability index on the technological dimension are the same as that of a sustainable good category with a value of 75.89 (Riza et al. 2019). In his research, 2 influential attributes are the type of fishing gear with a value of 10.30 and fishing aids with a value of 5.04.

The results of the Rapfish analysis for the sustainability status of fisheries on the institutional dimension show an index value of 35.17 which is included in the less sustainable category. This explains that the government's role needs to be increased again in supporting capture fisheries activities. One of the concepts explicitly stated in Article 6 of the Fisheries Law is the need to consider customary law or local wisdom and pay attention to community participation, but local wisdom must not conflict with national law (Rizqi et al. 2017). Based on the analysis of the Leverage results, there are 2 of the 7 most influential attributes, the first is the role of customary leadership with a value of 11.70 and the involvement of fishermen in the process of preparing management regulations with a value of 9.67. The effectiveness of policies made by the government, however, depends on the responsiveness of support from the community where support for government policies emerges from below, namely the fishermen themselves.

Conclusion

The sustainability of pelagic fisheries using Rapfish analysis as an indicator for assessing the sustainability of pelagic fisheries in northern Aceh waters based on Kutaraja fishing port, Lampulo on the ecological dimension is in the quite sustainable category with a value of 62.47 the economic dimension is in the fairly sustainable category with a value of 64.42 dimensions The social dimension is in the less sustainable category with a value of 46.24, the technological dimension is in the very sustainable good category with a value of 82.77 and the institutional dimension is in the less sustainable category with a value of 35.17.

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Author Contributions

Makwiyah A. Chaliluddin conceptualization, which includes research ideas, design with methodology, and data analysis.

Siti Sundari, Thaib Rizwan, Ilham Zulfahmi, Ichsan Setiawan, Sayyid Afdhal El Rahimi, and Roesa Nellyana conceptualization has been carried out by reviewing investigation research, literature review, and provided feedback on the manuscript.

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Conflicts of Interest

The author declares no conflict of interest.

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