



Analysis of the Sustainability Status of Butini Fishing in Towuti Lake

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| Article History | Abstract |
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| Received: 02 June 2023 Revised: 10 August 2023 Accepted: 13 August 2023 | <i>Butini fish (Glossogobius matanensis) is an endemic fish from Towuti Lake which needs to be managed sustainably by considering the various interactions that occur in aquatic ecosystems. The purpose of this study was to analyze the sustainability status of butini fish (Glossogobius matanensis) resources based on ecological, fishing technology, social institutional and economic dimensions in Towuti Lake. The data analysis used is Rapid Appraisal for Fisheries Sustainability (Rapfish). The results of the analysis of the sustainability of the butini fishery in Lake Towuti show that it is quite sustainable on the ecological dimension with an index value of 57.22, a social-institutional index value of 73.36, and an economic index value of 67.74. However, there is also absence of a fishery management plan in Towuti Lake. Sustainable management of butini fisheries is recommended to optimize the benefits derived from butini fish resources.</i> |
| CC License CC-BY-NC-SA 4.0 | Keywords: Butini fish, Towuti Lake, Sustainability Status, Rapfish |

1. Introduction

Lake Towuti is the largest lake in the Malili Complex which is located in South Sulawesi, Indonesia. This lake has an area of 560 km² and a depth of 203 m (Mamangkey, et al., 2012). Butini (*Glossogobius matanensis*) (Kottelat & Whitten, 1996) is an endemic fish species found in Lake Towuti (Mamangkey, 2010).

Butini fish is used as consumption fish in various processed forms such as dried fish, smoked fish, and shredded fish (Personal Obs, 2023). The price for this butini fish can also be said to be quite high, ranging from Rp. 25,000–Rp. 50,000 per kilogram. A high demand encourages an increase in catch (Personal Obs, 2023).

Higher market demand is inversely proportional to the availability of very limited information, and only revolves around the biological aspects of growth and mortality of endemic butini fish (Mamangkey, 2014). Without information, fishing activities for butini fish are ongoing according to

consumer demand. This can cause no sustainability in butini fish. The high exploitation of butini fish indicates that its utilization has not been managed properly and sustainably.

One of the tools that can be used to evaluate the sustainability of the multidimensional butini fishery is the Rapid Appraisal for Fisheries (RAPFISH). Rapid Appraisal for Fisheries (RAPFISH) is a fishery sustainability assessment method based on a multidimensional scaling approach. This research attempts to apply the RAPFISH method in evaluating the sustainability of the butini fishery in Lake Towuti.

2. Materials And Methods

Location and Time of Research

The research started from December 2022 to May 2023 at Lake Towuti, East Luwu Regency, South Sulawesi Province (Figure 1).

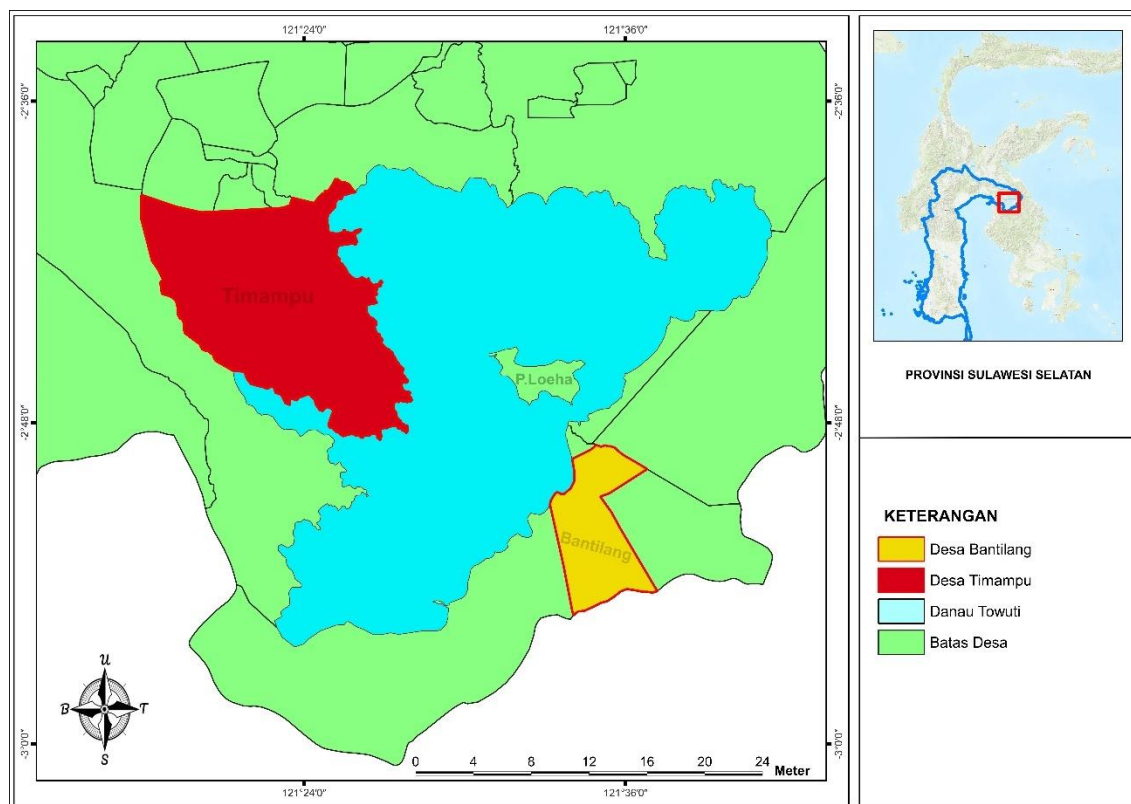


Figure 3. Map of butini fish research sites in Lake Towuti

Population and Sample

The population of the research activity is Lake Towuti fishermen. Fishermen of Lake Towuti are the beneficiaries of butini fish resources. The determination of respondents was carried out using the non-probability sampling method used if the population parameters were not known or it was not possible to identify them individually (Riduwan 2011). The sampling technique applied is snowball sampling, namely stakeholders who have information recommend other stakeholders as respondents (Wildemuth 2009). The number of fisherman respondents is 30 people apart from experts, 5 experts (experts) are also determined as respondents. Apart from the respondents, as additional information, unstructured interviews were also conducted with an unlimited number of informants.

Data Collection

The data required are primary and secondary data related to the attributes of the dimensions of sustainable management, namely: ecological, economic and social institutional dimensions. Primary data were obtained from measurements and direct observation at the research location in the form of observations and interviews with selected respondents and experts, while secondary data was obtained from library sources and documents from several related agencies. In-depth discussions were held

with experts including academics, non-governmental organizations, government officials and community leaders.

Data Analysis

Analysis of sustainable management of butini fish resources in Lake Towuti, South Sulawesi Province. Multi-dimensionally using the RAP-FLYING FISH (Rapid Appraisal for Fisheries Sustainability) method developed by the University of British Columbia's Fisheries Center (Kavanagh, 2001) which has been used by Fauzi et al., 2002; Nur, 2011; Nababan et al., 2007; Nadiarti 2012., Paramata, 2014.

Compilation of the index and status of sustainable management of butini fish for each dimension and good and bad criteria refers to the concept used by Pitcher et al., 2001), Rapfish Group (2006), and Allahyari (2010) as well as opinions from experts and relevant stakeholders with the system under study. Each attribute is determined by a score, namely a score of 3 for good conditions (good), 1 means bad (bad) and between 1 - 3 for moderate conditions. The definitive score is the mode value, which is analyzed to determine the points that reflect the position of sustainability relative to the good and bad points with the MDS statistical ordination technique.

Stages of Rapfish analysis: First, analysis of data on butini fish resource management and environmental conditions. Second, scoring aspects of sustainable management of butini fish resources in Lake Towuti. Third, perform a Multi-Dimensional Scaling (MDS) analysis with an excel template to determine the ordinate and stress values through the ALSCAL Algorithm. Fourth, carry out rotations to determine the position of fisheries in bad and good ordination. Fifth, carry out a sensitivity analysis (Leverage analysis) and Monte Carlo analysis to take into account aspects of uncertainty.

The index scale for the sustainability of the management of butini fish resources has an interval of 0 - 100. The status of the sustainability of the management of butini fish resources is divided into several categories, which can then be seen in Table 1:

Table 1. Butini fish sustainability index

| Index Value | Category |
|-------------|-------------------|
| 0-25 | Unsustainable |
| 26-50 | Less Sustainable |
| 51-75 | Quite Sustainable |
| 76-100 | Sustainable |

Source: Budianto, 2012

3. Results and Discussion

Sustainability of Butini Fisheries Management at Lake Towuti

The sustainability of the management of the butini fisheries ecosystem in Lake Towuti was assessed using the Multi-Dimensional Scaling (MDS) technique through a modification of the Rapfish approach (Rapid Assessment Technique for Fisheries) for butini fisheries. Sustainability status in this study uses 2 dimensions, namely, ecological, social-institutional and economic dimensions. This dimension consists of 18 attributes including ecological dimensions 6 attributes, 6 institutional social dimensions and 6 economic attributes which will describe the sustainability status of butini fisheries management in Towuti Lake. The results of Rapfish's coordination of the management dimensions are as follows:

Ecological Dimension Sustainability Status

The ecological dimension in the management of butini fisheries consists of 6 indicators, namely (1) sources of pollution, (2) endemic fish, (3) siltation and reduction of land area, (4) length and weight, (5) range collapse (6) Invasive fish. The results of Rapfish's coordination of the ecological dimension obtained a sustainability index value of 57.22 which indicates that the sustainability status for the ecological dimension is categorized as quite sustainable. The results of the coordination of the sustainability of the ecological dimension can be seen in Figure 1.

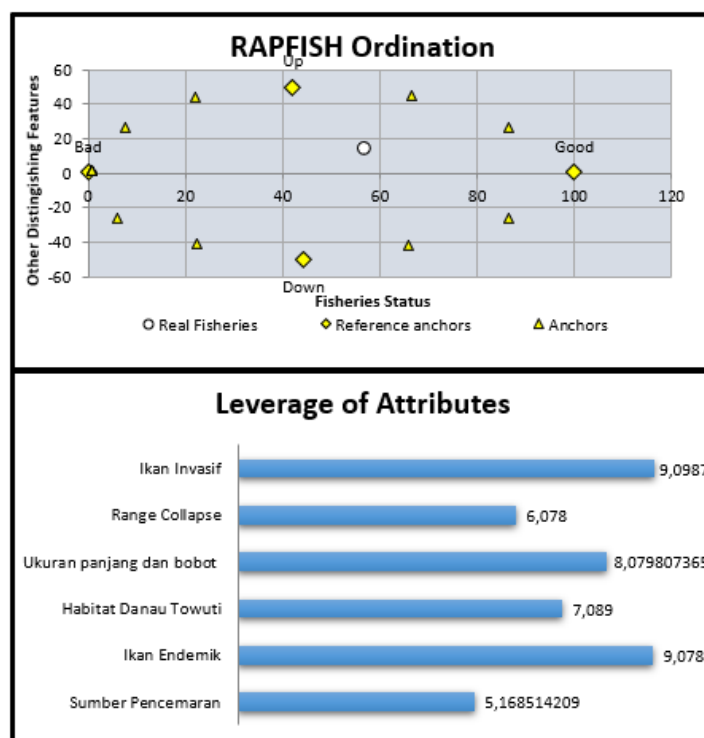


Figure 1. Results of rapfish ordination and leverage analysis

Based on the results of interviews with fishermen from Lake Towuti, invasive foreign fish currently have the opportunity to dominate fresh waters and become predators of native fish and interfere with the reproduction of native fish, thereby changing the composition and structure of fish communities, dominating and eliminating endemic fish. this is in accordance with Sentosa & Hedianto's research, 2018; Hedianto & Satria, 2017; Herder et al., 2012 stated that the louhan fish has the status of a foreign fish.

One of the endemic fish in the waters of Lake Towuti is the butini fish (*Glossogobius matanensis*) (Mamangkay & Nasution, 2012). High exploitation of butini fish is thought to have disturbed its spawning grounds by invasive fish (Yanuarita, et al. 2020). Based on the results of a study by Herder, et al, (2012), the invasive flowerhorn fish eat butini fish eggs, and this can interfere with the productivity of butini fish. Likewise, the results of Mamangkey's research (2010) report that the use of butini fish is carried out continuously without any time limit for fishing.

Social and Institutional Dimensions of Sustainability Status

Sustainability of the social and institutional dimensions means that development should be able to create equitable development, social mobility, community participation, and relations between stakeholders. Social and institutional aspects are the main aspects that must be balanced in sustainable development. Analysis of the six attributes that influence the social dimension, namely (1) level of education, (2) stakeholder participation, (3) utilization of local knowledge, (4) fisheries conflicts, (5) fisheries management plans, and (6) Fishermen's institutions. The value of the social dimension sustainability index was obtained, namely 73.35 which was classified as quite sustainable. Sustainability index values and leverage attributes of the social and institutional dimensions are presented in Figure 2.

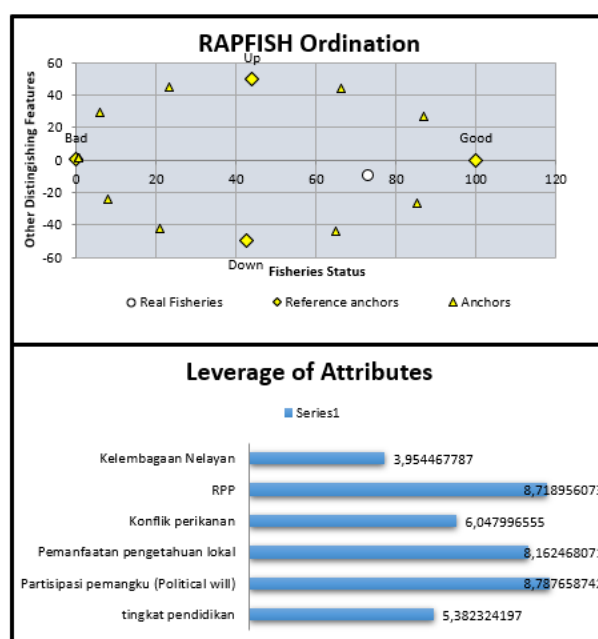


Figure 2. Results of institutional social coordination and leverage analysis

Based on the results in Figure 2. Shows that the attributes of the fisheries management plan (RPP) should receive more attention to create sustainable fisheries management. Based on the results of interviews with fishermen and the relevant government explaining that there is no fishery management plan in Lake Towuti, DKP East Luwu said that the inland fisheries management plan cannot apply to Lake Towuti because Lake Towuti is a Nature Tourism Park (TWA) issued in Decree No. 274/Kpts/Um/4/1979 dated 24 April 1979. The importance of a fisheries management plan is absolute in sustainable fisheries, especially capture fisheries. This is because unwise exploitation of fisheries can have a significant negative impact on fishery resources, especially in the case of butini fish.

Sustainability status of the economic dimension

The management of butini fisheries is capable of providing economic benefits without neglecting environmental aspects in the economic dimension of sustainability. Based on the results of the Rapfish analysis of butini fishing activities in Lake Towuti on six attributes on the economic dimension, namely (1) fishing household income; (2) natural resource economic value (butini); (3) business feasibility; (4) access to markets; (5) demand level; (6) the added value of butini fish products, the sustainability index value of the economic dimension is 67.74 which is classified as quite sustainable. Sustainability index values and leverage attributes of the economic dimension are presented in Figure 3.

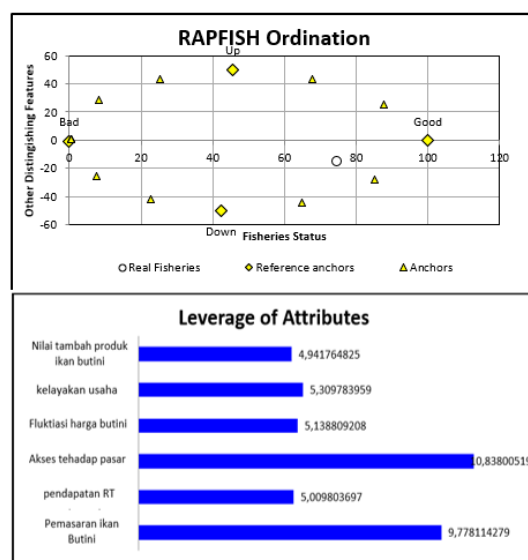


Figure 3. Results of ordination and analysis Leverage economic dimension

The results of the Rapfish coordination that the economic dimension has the status of less sustainable fisheries management. This shows that it is important to pay attention to this dimension for the sustainability of fisheries management in Lake Towuti. Based on the leverage analysis as shown in Figure 3. Based on the attribute access to markets, it is an attribute that influences the sustainability of the economic dimension because it has the highest RMS value of the other attributes presented in Figure 11. Changes to this attribute will easily affect the increase or decrease in the value of the economic sustainability index. Access to markets is still inefficient due to low income or profits earned by fishermen. According to Putri, et. al 2019 states that market access can increase fishermen's economic income. The second sensitive attribute related to the marketing of butini fish has not been able to reach a wider market so consumers are still limited to the local Towuti Lake community. This is in line with the opinion of Sudayana, et. al., (2011) state that marketing is an important activity in increasing income.

4. Conclusion

Based on the results of the study, it can be concluded that the sustainability status of the butini fishery in Towuti Lake is considerably acceptable. However, based on an assessment of the three dimensions, namely the ecological dimension in the waters of Towuti Lake, has the lowest index, 57.22. The important and most sensitive attributes in the analysis of rapfish from the ecological dimension, namely invasive fish and butini fish catch, showed a considerable decrease. On the social/institutional dimension, community participation in the utilization of fishery resources is absent, and there is also absence of a fishery management plan in Towuti Lake. While on the economic dimension, the feasibility of the fishing business and household income is inadequate.

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