JURNAL PERIKANAN DAN KELAUTAN
Volume 28 No. 3, October 2023: 316-323

e-issn : 2721-8902
p-issn : 0853-7607

Sustainability Status of Four-Finger Threadfin (*Eleutheronema tetradactylum*) Management in Sinaboi Sub-District Rokan Hilir District, Riau Province

Status Keberlanjutan Pengelolaan Ikan Senangin (Eleutheronema tetradactylum) di Kecamatan Sinaboi Kabupaten Rokan Hilir Provinsi Riau

Efvin Kridayanti Gea[1], Trisla Warningsih[1*], Hazmi Arief[1]
[1]*Department of Fishery Socio-Economics, Faculty of Fisheries and Marine, Universitas Riau, Pekanbaru 28293 Indonesia*
**email: trisla.t.warningsih@lecturer.unri.ac.id*

Received
15 August 2023

Accepted
18 October 2023

Abstract

This research was conducted in July 2022 in Sinaboi District, Rokan Hilir Regency. This study aimed to analyze the sustainability status and attributes strongly influencing the sustainable management of four-finger threadfin (*Eleutheronema tetradactylum*) in Sinaboi District, Rokan Hilir Regency. The method used in this research is the survey method. Data sources were collected from primary data and secondary data. The purposive sampling technique selected nine respondents who met specific criteria. The data obtained were analyzed with RAPFISH to explain the ecological, economic, social, technological, and institutional dimensions that include sustainability attributes through several analyses, including Multidimensional Scaling (MDS) and sensitivity analysis (leverage analysis). The results of the Multidimensional Scaling (MDS) analysis showed that the sustainability index in the ecological dimension with a value of 61.71 and the economic size with a value of 52.12, which has a reasonably sustainable status, as well as in the social dimension with a value of 50.94, the technological extent with a value of 48.81 and the institutional size with a value of 50.40 has a less sustainable status. 9 leverage attributes are sensitive and affect the value of sustainability in the results of sensitivity analysis (leverage analysis) for each dimension. Influential details need to be considered to increase the sustainability value of four-finger threadfin in Sinaboi District.

Keywords: Sustainability Status, Level Attributes, RAPFISH, Sinaboi

Abstrak

Penelitian ini dilaksanakan pada Juli 2022 di Kecamatan Sinaboi Kabupaten Rokan Hilir. Tujuan dari penelitian ini adalah untuk menganalisis status keberlanjutan serta atribut sangat mempengaruhi dalam mendukung pengelolaan berkelanjutan Ikan Senangin (*Eleutheronema tetradactylum*) di Kecamatan Sinaboi Kabupaten Rokan Hilir. Metode yang digunakan pada penelitian ini adalah metode survei. Pengumpulan sumber data diperoleh dari data primer dan data sekunder. Teknik *purposive sampling* digunakan untuk memilih 9 responden yang memenuhi kriteria tertentu. Data yang diperoleh dianalisis dengan RAPFISH untuk menjelaskan dimensi ekologi, ekonomi, sosial, teknologi serta kelembagaan yang termasuk atribut keberlanjutan melalui beberapa analisis antara lain: analisis *Multidimensional Scaling* (MDS) dan analisis sensitivitas (*Leverage Analysis*). Hasil dari analisis *Multidimensional Scaling* (MDS) diketahui bahwa indeks keberlanjutan pada dimensi ekologi dengan nilai 61,71 dan dimensi ekonomi

dengan nilai 52,12 yang memiliki status cukup berkelanjutan juga pada dimensi sosial dengan nilai 50,94, dimensi teknologi dengan nilai 48,81 dan dimensi kelembagaan dengan nilai 50,40 memiliki status yang kurang berkelanjutan. Terdapat 9 atribut pengungkit yang sensitif dan berpengaruh terhadap nilai keberlanjutan pada hasil analisis sensitivitas (*Leverage Analysis*) untuk masing-masing dimensi. Untuk meningkatkan nilai keberlanjutan Ikan Senangin di Kecamatan Sinaboi, atribut yang berpengaruh perlu diperhatikan.

Kata kunci: Status keberlanjutan, Atribut Pengungkit, RAPFISH, Sinaboi

1. Introduction

Sinaboi District is one of the sub-districts in Rokan Hilir Regency that produces a lot of four-finger threadfin (*Eleutheronema tetradactylum*). According to information from the Rokan Hilir Regency Fisheries Service, four-finger threadfin production in Sinaboi District has increased yearly from 2017 to 2020. Based on research by Mohamad et al. (2017), It is feared that if the utilization of four-finger threadfin resources does not pay attention to the carrying capacity of these fish resources so that, the resulting increase in catch production can be a source of new problems in the future.

The term "sustainability" refers to a particular way of doing things based on the assumption that the goods or services provided by a specific group will not be diminished in the future. Multiple ecological, economic, social, technological, and institutional dimensions make sustainability complex. Sustainability assessments that only focus on one of the dimensions eventually lead to gaps or adverse effects on all sizes (Nurdinsyah et al., 2020). According to Muhsoni et al. (2021), appropriate management efforts can balance the level of utilization between dimensions in each region, and sustainable utilization of fishery resources can be achieved. Reasonable management efforts must include various sizes. Four-finger threadfin in Sinaboi District is assessed from each dimension, namely ecological, economic, social, technological, and institutional dimensions. All measurements are expected to provide information on the conditions and optimal efforts needed to preserve the four-finger threadfin in Sinaboi District.

The development of the RAPFISH technique approach by the Fisheries Center, University of British Colombia, using the Multidimensional Scaling (MDS) method, can analyze the sustainability status of fishery resources. Based on the characteristics studied, the stages of analysis of the sustainability of fisheries resources can vary in determining the attributes of the fisheries resources (Erwina et al., 2015). Therefore, to analyze the sustainability status of four-finger threadfin and features that affect sustainable management in Sinaboi District, this study used RAPFISH.

2. Material and Method

2.1. Time and Place

This research was conducted in July 2022 in Sinaboi District, Rokan Hilir Regency, Riau Province. The research location was chosen purposively by considering that Sinaboi District is an area with a large production of four-finger threadfin

2.2. Methods

The survey method is the method used in conducting this research. This method aims to collect data and information from several variables from a group of people by conducting interviews and literature studies (Gea, 2020). The purposive sampling technique is used in this study and is a sampling based on specific considerations (Sugiyono, 2016). Determination of respondents based on the desired conditions and the existence of good communication skills when filling out the questionnaire (Cikitha et al., 2018). The selected respondent criteria comprised nine people: two from the Fisheries Service, one community leader, two Panglao owners, and four fishermen. The sources and types of data used are primary and secondary. Data from interviews with respondents at the research location is preliminary data (Alfaniatur et al., 2019). Meanwhile, data obtained from existing sources is called secondary data (Lantang et al., 2021). Secondary data was obtained from the Regency Fisheries Service in Rokan Hilir, the Regency Marine and Fisheries Statistics Center in Rokan Hilir, and information from related agencies needed for this research.

To achieve the desired objectives in this study, the data obtained were analyzed using RAPFISH through Multidimensional Scaling Analysis (MDS) and sensitivity analysis (leverage analysis). According to Halim (2013), four (4) categories of sustainable status are based on the large scale. The groupings are index intervals 0-25 (poor), 26-50 (poor), 51-75 (fair), and 76-100 (good).

3. Result and Discussion

Sinaboi District is one of the sub-districts in Rokan Hilir Regency with six administrative areas consisting of 1 Kelurahan and 5 Kepenghuluan. Geographically, Sinaboi District is located at the coordinates 020 16.690'LU and 1010 00.459' East, with a land area of 33,548 km^2 and borders with: North: Malacca Strait, South: Bangko Sub-district, West: Bangko Sub-district, and East: Dumai City

3.1. Sustainability Status of Four-Finger Threadfin in Sinaboi

Good management is needed to ensure the long-term sustainability of fisheries resources because fisheries products are the needs of current and future generations. If handled correctly, it can succeed in resource utilization, either because the amount or capacity of utilization is exceeded or because fishing only prioritizes one dimension and ignores other existing dimensions. Therefore, an overall analysis of the ecological, economic, technological, social, and institutional dimensions of the sustainability status of fisheries catches is necessary (Piliana, 2015).

Sinaboi sub-district is a producer of four-finger threadfin. In catching four-finger threadfin, fishermen use gill nets. Small-scale capture fishermen carry out four-finger threadfin catching in Sinaboi Subdistrict with a one-day fishing system, where the catch time ranges from 6-10 hours. Four-finger threadfin also has a price of IDR40,000/kg, which is a type C fish sold locally. The difference in fish prices depends on the size of the fish; type A and B four-finger threadfin are sold for export, such as to Malaysia and Singapore through the port of Dumai.

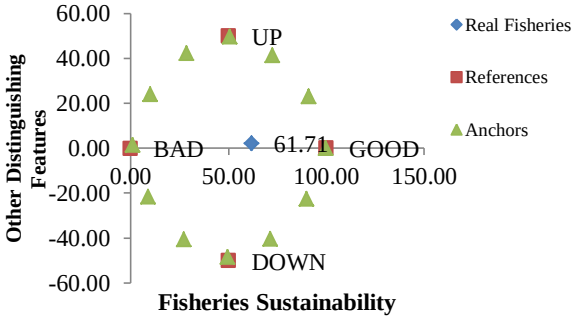

Figure 1. Sustainability status of the ecological dimension

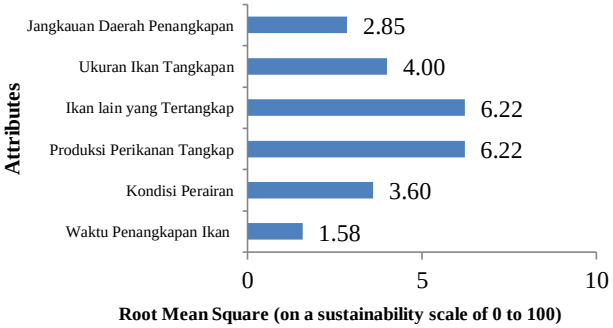

Figure 2. Level attributes in the ecological dimension

Multidimensional Scaling (MDS) analysis with RAPFISH resulted in sustainability index value of the ecological dimension of four-finger threadfin in Sinaboi District of 61.71, as shown in Figure 1. Based on these results, the sustainability status of four-finger threadfin in the ecological dimension in Sinaboi District is included in the moderately sustainable category. Several ecological dimension attributes influence the sustainability of four-finger threadfin fishing in the Sinaboi District. The figure below shows the results of the environmental dimension's sensitivity analysis (leverage analysis).

Two sensitive attributes are generated, as shown in Figure 2: other fish caught and capture fisheries production with the same RMS of 6.22. According to the results of interviews with fishermen, gill nets are the fishing gear used by fishermen when going to sea to catch four-finger threadfin. The use of this gill net has high selectivity, and this is because this net catches fish of fewer than three types of species with the same fish size, and other fish that are not the main catch (bycatch) are still also sold (Chaliluddin et al., 2019). Gulama and shrimp are different fish species caught, but they do not affect the number of main target fish caught. As shown in Figure 1, four-finger threadfin production tends to increase, requiring good management to ensure resource sustainability

3.2. Economic Dimension Sustainability Status

The capacity of an activity to utilize capture fisheries resources to achieve sustainable long-term economic results is the economic dimension. To develop fisheries resource management policies this economic dimension can also be used as a source of reference in developing existing fisheries resource management policies (Marzuki et al., 2017).

The economic dimension sustainability index value obtained from the Multidimensional Scaling (MDS) analysis using RAPFISH is 52.12, as shown in Figure 3. Based on these results, the sustainability status of four-finger threadfin in the economic dimension of Sinaboi District is included in the moderately sustainable category. Different attributes in the financial size have other influences on the magnitude of the four-finger threadfin sustainability index. The figure below shows the results of the sensitivity analysis (leverage analysis) on the economic dimension.

Figure 3. Sustainability status of economic dimension

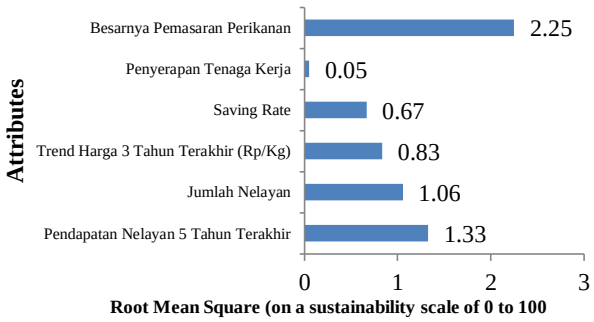

Figure 4. Leverage attributes in the economic dimension

The fisheries marketing magnitude of 2.25 is one of the leverage attributes that significantly affects the sustainability index value in the economic dimension. Of course, the international marketing of four-finger threadfin exported to Malaysia and Singapore will positively impact the region's local economy. Parera et al. (2021) stated that the short-term impact of international marketing on exporting countries is an increase in the trade balance of fishery products, an increase in the volume of capture fisheries production, an increase in demand for fish products, and an increase in effort. However, if carried out with an open access policy in the long term, it will eventually result in a decrease in fish resource stocks, a decrease in fisheries production, and a loss of significant business opportunities in the future. Therefore, four-finger threadfin marketing needs to receive more attention from the local government and fishermen if it is to maintain and increase its contribution to the national economy, including improving the welfare of fishermen.

3.3. Social Dimension Sustainability Status

The social dimension reflects how community activities in fishing activities generally support the long-term and sustainable improvement of capture fisheries areas (Setiofano et al., 2018). The sustainability index value of four-finger threadfin in the social dimension in Sinaboi District is 50.94, obtained from the results of Multidimensional Scaling (MDS) analysis using RAPFISH, as in Figure 5. These results indicate that the sustainability status of four-finger threadfin is less sustainable. The sustainability index of the four-finger threadfin is influenced differently by attributes in the social dimension. The figure below shows the results of the sensitivity analysis (leverage analysis) of the social size

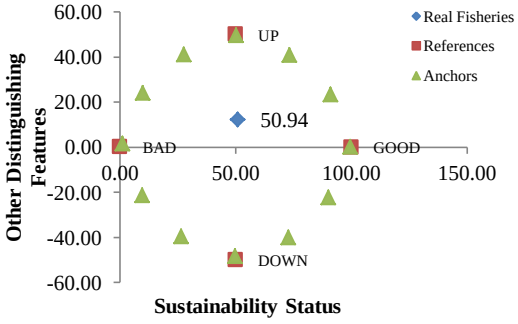

Figure 5. Social dimension sustainability status

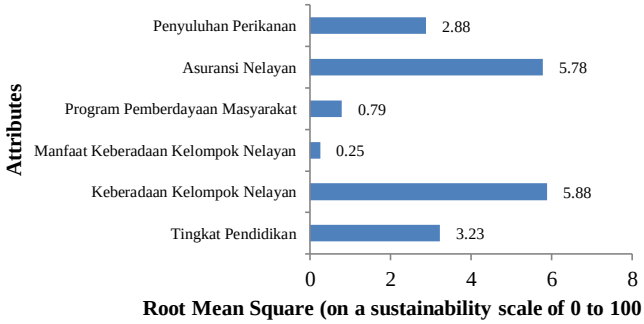

Figure 6. Leverage attributes in the social dimension

Figure 6 shows that there are 2 (two) sensitive attributes, namely the existence of a fishermen group with an RMS of 5.88 and fishermen insurance of 5.78. Fishermen groups benefit social life because they work together to make it easier for fishermen to deal with problems (Hidayah et al., 2020). The four-finger threadfin fishermen group aims to make proposals addressed to the government or fisheries department to catch four-finger threadfin. The following sensitive attribute is fishermen's insurance because fishermen need this insurance to deal with natural risks in the fishing area, such as high sea waves and unpredictable lousy weather that can be a risk for fishermen when catching. To handle the dangers fishermen face, the government must ensure protection for each fisherman by issuing a fisherman insurance program by existing regulations (Astuti, 2017). This attribute is sensitive because the fishing community needs to learn about fishermen's insurance well and correctly. Therefore, the government must conduct particular socialization with fishermen regarding this insurance.

3.4. Sustainability Status of Technology Dimension

The extent to which a particular fishing technique utilizes capture fisheries resources is indicated by the technological dimension. Technology that can certainly support production activities in the capture fisheries

sector in a sustainable manner over a long period of time is considered a good technology (Ratnasari et al., 2021).

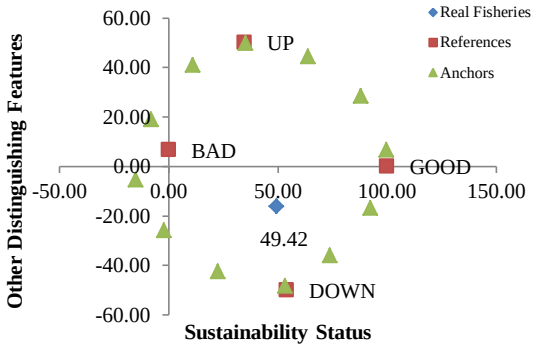

Figure 7. Sustainability status of technology dimension

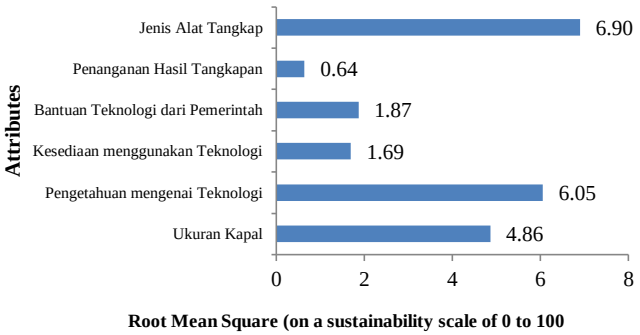

Figure 8. Leverage attributes in the technology dimension

Figure 8 shows 3 (three) sensitive attributes, namely the type of fishing gear, with an RMS of 6.90; knowledge of technology, with an RMS of 6.05; and vessel size, with an RMS of 4.86. The gill net fishing gear used by fishermen is a fishing gear with the principle of catching several schools of fish on the move. The gill net will entangle the fish in the operculum (Subehi et al., 2017). The type of fishing gear is a sensitive attribute because gill net gear reduces adverse impacts on aquatic ecosystems, which has a good effect.

The ability of fishermen to accept marine technology and information is knowledge of technology. Fishermen who have a more open mind to technological advances can help fishermen themselves with the technical implementation of the four-finger threadfin fishing method (Mahmud, 2021). Knowledge of technology is sensitive due to the lack of understanding of fishermen, so the government must consider this to guide fishermen. The boat size attribute is exposed because the boat size needs to be adjusted to the amount of catch production.

3.5. Institutional Dimension Sustainability Status

The condition of the institutional dimension attribute is that all fisheries-related institutions can effectively and sustainably make decisions on resource management based on the principle of favoritism towards fishing communities (Moo et al., 2013).

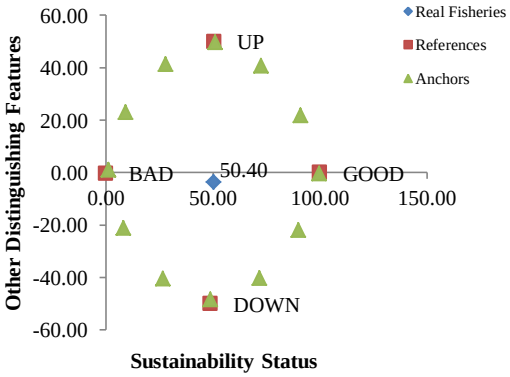

Figure 9. Sustainability status of institutional dimension

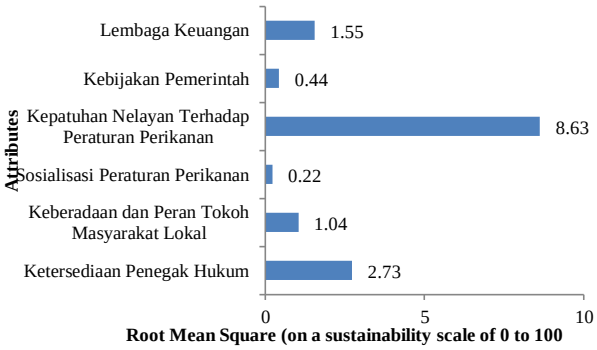

Figure 10. Leverage attributes in the institutional dimension

The sustainability index value of four-finger threadfin in Sinaboi District of 50.40 was obtained through Multidimensional Scaling (MDS) analysis conducted with RAPFISH on the institutional dimension, as shown in Figure 9. Based on these results, the sustainability status of four-finger threadfin in the institutional size of Sinaboi District is less sustainable. Attributes in the institutional dimension have different influences on the sustainability index of four-finger threadfin. The figure below shows the results of the sensitivity analysis (leverage analysis) on the institutional extent.

In Figure 10, the influential leverage attribute in the institutional dimension is supported by fishermen's compliance with fishing regulations, particularly the use of permitted fishing gear. A good understanding of the rules that have been set can play a role in directing fishers to determine the type of fishing gear for fishing activities (Nababan et al., 2017). Therefore, learning the criteria for environmentally friendly fishing gear as outlined in the Code of Conduct for Responsible Fisheries (CCRF) is essential

Table 1. Differences in Monte Carlo sustainability index values based on RAPFISH analysis

Dimensions of Sustainability	Sustainability Index Value		Difference
	RAPFISH	Monte Carlo	
Ecology	61,71	61,03	0,68
Economy	52,12	51,47	0,65
Social	50,94	50,52	0,42
Technology	48,81	48,36	0,45
Institutional	50,40	50,16	0,24
Multidimensional	52,99	52,75	0,24

Warningsih et al. (2020) stated that the sustainability index values obtained showed little difference, indicating that: 1) The judgment error for each attribute will be relatively small, 2) there is a relatively slight variation in scores due to differences of opinion, 3) the analysis process is stably repeatable, and 4) can avoid data entry errors or data loss that occurs.

3.6. Goodness of Fit Assessment

The proportion of variance that can explain the model is indicated by the stress value. A stress value of less than 0.25 in RAPFISH suggests that the results obtained are promising. In contrast, a stress value greater than 0.25 indicates that the results of Multidimensional Scaling (MDS) are inaccurate. So, the smaller the stress value obtained from the analysis results, the better the results' quality. In contrast to the value of R^2 (coefficient of determination), the quality of the analysis results becomes better if the value of R^2 (coefficient of determination) is getting bigger or closer to 1 or >90% (Khairunnisa, 2017). The following table displays the stress and R^2 values of the ecological, economic, technological, social, and institutional dimensions.

Table 2. Results of stress and R^2 value analysis

No.	Dimensions	Stress	R^2
1	Ecology	0.1549414	0.9384442
2	Economy	0.1632793	0.9354524
3	Social	0.1542366	0.9394440
4	Technology	0.1598205	0.9139690
5	Institutional	0.1483567	0.9353622

Based on Table 2, the stress values generated from all dimensions studied, namely ecological, economic, social, technological, and institutional, obtained results that were less than 0.25, which means they are in the excellent and suitable category (perfect). The value of R^2 obtained in each dimension studied is close to one or 90%. By the provisions of the coefficient of determination, this value indicates that the attributes in the size can explain and suggest improvements to the system under study.

4. Conclusions

The following conclusions can be obtained from the analysis of the sustainability index of four-finger threadfin in Sinaboi District, Rokan Hilir Regency: the results of the Multidimensional Scaling (MDS) analysis show that the ecological dimension has a sustainability index of 61.71, and the economic size of 52.12 has a reasonably sustainable status. The social dimension has a sustainability index value of 50.94, the technological extent with a value of 48.81, and the institutional size with a value of 50.40 has a less sustainable status. The results of the sensitivity analysis (Leverage Analysis) of each dimension of sensitive leverage attributes consist of other fish caught, capture fisheries production, the amount of fisheries marketing, the existence of fishermen groups, fishermen insurance, types of fishing gear, knowledge of technology, vessel size and fishermen's compliance with fisheries regulations.

5. Suggestion

The government can make policies for managing the sustainability of four-finger threadfin resources in Sinaboi District, which should focus more on attributes that have high leverage in each dimension without ignoring other details. This is so that efforts are made to sustain the sustainability of four-finger threadfin resources.

6. References

Alfaniatur., Rokhmah, S., Suprapti, Y., Munir, M. (2019). Karakteristik Istri Nelayan dalam Upaya Meningkatkan Pendapatan Keluarga Pesisir Pantura di Desa King-King Kecamatan Tuban Kabupaten Tuban. *Jurnal Ilmiah Perikanan dan Kelautan*, 11(1): 70.

Astuti, F.F. (2017). *Jaminan Keselamatan Kerja Bagi Nelayan Tradisional Melalui Asuransi Perikanan (Studi Di Kota Sibolga)*. Universitas Muhammadiyah Sumatera Utara.

Chaliluddin, M.A., Ikram, M., Rianjuanda, D. (2019). Identifikasi Alat Penangkapan Ikan Ramah Lingkungan Berbasis CCRF di Kabupaten Pidie, Aceh. *Jurnal Galung Tropika*, 8(3): 197–208.

Cikitha, P., Suryana, A.A.H., Anna, Z., Nurhayati, A. (2018). Analisis Peran Sektor Perikanan Terhadap Pembangunan Wilayah Kabupaten Kuningan Jawa Barat. *Jurnal Perikanan dan Kelautan*, 9(1): 1–8.

Cocon, C., Anggoro, S., Yusuf, M. (2016). *Analisis Multidimensi Status Keberlanjutan dan Strategi Pengelolaan Kawasan Pengembangan Budidaya Laut Berkelanjutan (Studi Kasus di Perairan Teluk Ekas Kabupaten Lombok Timur Provinsi Nusa Tenggara Barat)*. Universitas Diponegoro

Erwina, Y., Kurnia, R., Yonvitner, Y. (2015). Status Keberlanjutan Sumber Daya Perikanan di Perairan Bengkulu. *Jurnal Sosial Ekonomi Kelautan dan Perikanan*, 10(1): 21.

Gea, T.N. (2020). *Analisis Ekonomi Pengelolaan Sumberdaya Ikan Layur (Trichiurus spp.) di Perairan Kabupaten Cilacap Jawa Tengah.* Institutt Pertanian Bogor. Bogor

Halim, A.A.C. (2013). *Status Keberlanjutan Pengelolaan Sumberdaya Ikan Terbang (Hirundicthys oxycephalus) Berdasarkan Dimensi Ekologi, Biologi, dan Teknologi Penangkapan di Selat Makasar*. Universitas Hasanuddin

Hidayah, Z., Nuzula, N.I., Wiyanto, D.B. (2020). Analisa Keberlanjutan Pengelolaan Sumber Daya Perikanan di Perairan Selat Madura Jawa Timur. *Jurnal Perikanan Universitas Gadjah Mada*, 22(2): 101.

Khairunnisa. (2017). *Analisis Potensi, Tingkat Pemanfaatan dan Status Keberlanjutan Sumberdaya Ikan Tembang (Sardinella gibbosa) di Pelabuhan Perikanan Samudera Belawan Provinsi Sumatera Utara*. Universitas Sumatera Utara.

Lantang, S.A., Andaki, J.A., Pangemanan, J.F., Suhaeni, S., Wasak, M.P., Rompas, R.M. (2021). Keadaan Perusahaan Perikanan Tangkap Pada Masa Pandemi Covid-19 dan Era New Normal (Studi Kasus PT. Virgo Internusa di Kelurahan Kadoodan Kecamatan Madidir Kota Bitung). *Jurnal Ilmiah Agrobisnis Perikanan*, 9(1), 16–22.

Mahmud, A. (2021). *Analisis Indeks Keberlanjutan Ekonomi, Sosial, Ekologi dan Teknologi Komoditas Lobster di Pesisir Pantai Dampar, Kabupaten Lumajang, Jawa Timur.* UIN Sunan Ampel. Surabaya

Marzuki, M., Nurjaya, I.W., Purbayanto, A., Budiharso, S., Supriyono, E. (2017). Tinjauan Dimensi Ekonomi Keberlanjutan Pengelolaan Budidaya Laut Di Teluk Saleh Kabupaten Sumbawa. *Jurnal Sosial Ekonomi Kelautan dan Perikanan*, 8(2): 157.

Mohamad, M., Hasim., Salam, A. (2017). Analsis Keberlanjutan Perikanan Tangkap Ikan Cakalang (*Katsuwonus pelamis*) di Kabupaten Gorontalo. *Jurnal Riset dan Pengembangan Ilmu Pengetahuan*, *02*(1): 236–243.

Moo, Z. A., Pascasarjana, P., & Hasanuddin, U. (2013). *Status Keberlanjutan Perikanan Tuna Madidihang (Thunnus albacares) di Teluk Tomini Kabupaten Boalemo*. Universitas Hasanuddin.

Muhsoni, F.F., Zainuri, M., Abida, W. (2021). Menggunakan Pemodelan RAPFISH Evaluasi Pemanfaatan Pelabuhan Kamal Untuk Wisata Bahari Pasca Pembangunan Jembatan Suramadu, *Jurnal Kebikanan Sosial Ekonomi Kelutan dan* Perikanan, *11*(1), 63–73.

Nababan, B., Wiyono, E.S., Mustaruddin. (2017). Fishermen's Perception and Compliance to Support Sustainable Capture Fisheries in Tanjungbalai Asahan, North Sumatra. *Marine Fisheries : Journal of Marine Fisheries Technology and Management*, 8(2): 163–174.

Nurdinsyah, M.A., Rosmiati, M., Suantika, G. (2020). Analisis Keberlanjutan dan Strategi Pengelolaan Tambak Udang Putih Sistem Intensif di Pesisir Selatan Jawa Barat. *Jurnal Sosioteknologi*, 19(3): 426–441.

Parera, N.Y.O., Bhokaleba, B.P.P.W., Ramadona, T. (2021). Keberlanjutan Perikanan Cakalang di Kabupaten Sikka: Sebuah Analisis Dimensi Ekonomi. *Jurnal Perikanan Terubuk*, 49(2).

Piliana, W.O. (2015). *Pengelolaan Ekonomi Sumberdaya Ikan Layang (Decapterus spp.) yang Berkelanjutan di Perairan Kabupaten Muna Sulawesi Tenggara*. Institut Pertanian Bogor

Ratnasari, A., Putra., Lastini. (2021). Kelayakan Usaha Budidaya Ikan Nila di Desa Cibunar Kabupaten Sumedang: Sebuah Analisis Keberlanjutan. *Jurnal Sosial Ekonomi Pertanian* (*Journal of Social and Agricultural Economics*). 14: 281–298.

Setiofano, F.W., Herpandi, H., Widiastuti, I. (2018). Analisis Keberlanjutan Pengolahan Kerupuk Ikan di Kabupaten Ogan Ilir, Sumatera Selatan. *Jurnal Fishtech*, 6(2): 153–162.

Subehi, S., Boesono, H., Nnd, D.A. (2017). Analisis Alat Penangkap Ikan Ramah Lingkungan Berbasis *Code of Conduct for Responsible Fisheries* (CCRF) di tPI Kedung Malang Jepara. *Journal of Fisheries Resources Utilization Management and Technology*, 6(4): 1–10.

Sugiyono. (2016). *Metode Penelitian Kuantitatif Kualitatif dan R&D*. Bandung : PT Alfabet.

Warningsih, T., Hendrik, H., Suaseh, Y. (2020). The Status of Sustainability of Anchovy Resources in the Labuhanbatu Territorial Waters, North Sumatra Province. *IOP Conference Series: Earth and Environmental Science*, 430(1).