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Rapfish Analysis (Rapid Appraisal for Fisheries) for Sustainability of Lobster (*Panulirus* Sp.) in Coastal Cilacap With a Blue Economy Approach to Maritime Security

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Abstract

Based on the results of the sustainability analysis of the EAFM domain for the management of lobster fisheries on the coast of Cilacap, it is necessary to carry out a comparative analysis to describe the sustainability status of each domain and the interrelationships between each indicator used. In addition, it is necessary to measure the indicators that are the main factors in determining the status of the domain. Four security concepts, namely sea power, marine safety, blue economy, and human security. All of this information is expected to be used as material for a stronger analysis in determining policy priorities in the next chapter. RAPFISH (Rapid Appraisal for Fisheries) is an analytical method to evaluate the sustainability of fisheries in a multidisciplinary manner based on the technique of ordination (putting something in the order of measurable attributes) with Multi-Dimensional Scaling (MDS). Monte Carlo analysis is used to determine the stability of the RAPFISH ordinance results, Laverage analysis is carried out to find out what attributes are sensitive from all dimensions used. The results obtained from the testing of this chapter are the sustainability status of each management dimension in general is in moderately sustainable status with an average score of 54.56. The dimension with the lowest level of sustainability is the dimension of fish resources and the highest dimension is the dimension of fishing techniques.

Keywords: RAPFISH; lobster; EAFM; sustainability.

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1. Introduction

Fisheries development is carried out through efforts to increase productivity and business efficiency, which in turn is expected to increase fishery production which is directed at increasing consumption, foreign exchange earnings and the supply of domestic industrial raw materials. The increase in production is aimed at increasing the income of fishing farmers, job opportunities, business opportunities and encouraging the growth of domestic industry and regional growth. All things are done while still paying attention to the preservation of natural resources and the environment in realizing sustainable and environmentally friendly fisheries development [1].

Based on the results of the sustainability analysis of the EAFM domain in the previous chapter, it is necessary to conduct a comparative analysis to describe the sustainability status of each domain and the interrelationships between each indicator used. In addition, it is necessary to measure the indicators that are the main factors in determining the status of the domain. All of this information is expected to be used as material for a stronger analysis in determining policy priorities in the next chapter.

The many linkages in the fisheries sector require a comprehensive assessment or represent each dimension of interest involved in management efforts. The limited data and information on fisheries in conducting research using the EAFM method causes the assessment of management status to not represent all existing indicators, some management domain indicators cannot be fulfilled to provide a complete Figure of the status of lobster fisheries in Cilacap Regency.

Method development *Rapid Appraisal for Fisheries* (RAPFISH), which was introduced by the Fisheries Center, University of Columbia in 1999, is now widely practiced in various countries. However, RAPFISH as a method to measure and describe the sustainable condition of marine and fishery resources in a place or region is still actual to be carried out in Indonesia. The use of RAPFISH analysis is still relevant in Indonesia because the actual data describing the condition of water management areas in Indonesia is still very minimal. On the other hand, the need for sustainable management of the area is increasingly pressing [2].

RAPFISH is an open source license software created to determine the sustainability status of a fishery that is analyzed in a multi-dimensional manner. However, this software can be developed to determine the sustainability status of other sectors such as agriculture, plantations, animal husbandry, and so on. Until now, the RAPFISH technique is still very relevant to be used as an instrument to quickly and accurately assess the sustainability status of fisheries development in an area [3].

RAPFISH is a multi-disciplinary technique to determine sustainability quickly in order to evaluate the sustainability of a fishery activity based on a number of attributes that are easily scored. Ordination of a number of attributes is done using multi-dimensional scaling (MDS) followed by scaling and rotation [4].

The thing that needs to be considered in the RAPFISH theory is the aspect of uncertainty. This is the impact of scoring errors due to lack of information, the impact of diversity in scoring due to differences in assessment, errors in data entry and the high stress value obtained from the ALSCAL algorithm. To see the problem of uncertainty, the Monte Carlo analysis technique is used, which is a simulation method to examine the effect of

calculation errors and misjudgments on attributes by the informant and evaluate the impact of random errors on all aspects. If the difference between the Monte Carlo sustainability index and the MDS sustainability index is less than 1, it indicates that the effect of error in the analysis is small [5].

Dimension reduction analysis on Rapfish uses the ALSCAL algorithm with the MDS (Multi-Dimensional Scaling) method where the position of objects in multidimensional space is plotted in two-dimensional space [6]. It aims to facilitate multi-dimensional analysis so that it can be viewed in a two-dimensional perspective.

Blue economy In partnership, APEC members define blue economy as an economic model that encourages the implementation of sustainable development, for example, developing marine and fishery industrialization that emphasizes growth, job creation, and encourages environmentally friendly technological innovation. Marine development that is less than optimal and tends to be unsustainable is due to a development pattern that is not based on science and technology, does not implement an integrated supply chain system, and is less inclusive. Utilization of natural resources is carried out with a blue economy model so that the environment is maintained.

Christian Bueger stated that maritime security contains four security concepts, namely sea power, marine safety blue economy, and human security. The concept of sea power explains the role of the navy, namely protecting the sustainability of the country, protecting sea transportation routes for trade and improving the economy. It can be concluded that Indonesia's maritime security should be able to protect Indonesia's national interests in the maritime sector. Based on the influential elements in building sea power, Indonesia has some of these prerequisites. With the vast territory of the country, and the sea in Indonesia, the Indonesian people actually have a great opportunity to take advantage of natural resources. With Indonesia's position between two continents and a large ocean, then become the world's main shipping lane. With a very large population, Indonesia has great potential to dominate the regional and global maritime sector.

According to the US DoD Dictionary Military Terms, national interest is defined as the basis or foundation of the development of national goals that establish goals and objectives. National interests are also the needs and desires set by a sovereign state in dealing with other sovereign states, non-state actors, and opportunities and situations in a developing strategic environment that are presented as targets to be achieved. This understanding explains the dynamics of a strategic environment in which various actors, opportunities, and interactions play a role, both internal and external components.

2. Research Method

To determine the sustainability status of efforts to utilize Lobster (Panulirus Spp.) resources in Cilacap, a sustainability analysis was carried out on six dimensions of EAFM which include: (1) fish resources; (2) habitat and ecosystem; (3) fishing techniques; (4) economy; (5) social and (6) institutional using RAPFISH software (developed by Kavananagh P and Pitcher, 2004), then strengthened by the Monte Carlo test and then to determine the most influential attribute as leverage, Leverage analysis was carried out.

RAPFISH (Rapid Appraisal for Fisheries) is an analytical method to evaluate the sustainability of fisheries in a multidisciplinary manner based on the technique of ordination (putting something in the order of the measured

attributes) with Multi-Dimensional Scaling (MDS). MDS itself is basically a statistical technique that tries to transform multidimensional into a lower dimension [7]. Each dimension has something to do with sustainability, with assessment criteria in accordance with the EAFM indicator assessment guidelines. The Likert scale score obtained in the previous chapter is used as input in the RAPFISH analysis.

The score value is determined based on the determination of the EAFM Likert score for each indicator, analyzed with the help of the RAPFISH program, the results of the analysis are then interpreted into 4 groups that describe the condition of sustainability, namely: 0-25 means bad, 26-50 means less, 51-75 means enough and 76 -100 means good.

According to Sri Fitrianti and his colleagues [8], briefly the RAPFISH method is described in several stages as follows:

1) Determination of Sustainability Attributes

Determination of Sustainability Attributes. This study uses 27 attributes from six dimensions according to the sustainability status according to EAFM in chapter 3.

2) Determination of the Value of Each Attribute

The assessment used uses the results of the assessment of each indicator from chapter 3. Referring to the RAPFISH method, explains that a bad score is a reflection of the most unfavorable conditions in a management, while a good value is a value that reflects the most favorable conditions in resource management, and among bad and good values, there is one value called the intermediate value or the middle value [9].

3) ALSCAL Algorithm Development

Compilation of the ALSCAL algorithm on the RAPFISH application to perform analysis.

4) RAPFISH (Multidimensional Scaling) Ordination

The RAPFISH ordinance with the MDS (Multidimensional Scaling) method was used to determine a point (value) that reflects the relative position of the lobster fishery. A good analysis result shows that the stress value is smaller than 0.25 ($S < 0.25$) and the RSQ or R2 is close to 1.

5) Determination of Sustainability Status

Determination of the sustainability status of lobster fisheries management is based on the fisheries sustainability index. The fishery sustainability index has an interval between 0 – 100. The value of the sustainability index refers to Suryana and his colleagues [7], which divides the sustainability status into 4 categories: Unsustainable with a score of 0-25, Less Sustainable between a value of 26-50, Fairly Sustainable between a value of 51-75 and Sustainable between a value of 76-100.

6) Monte Carlo Analysis

Monte Carlo analysis is used to determine the stability of the RAPFISH ordinance results. The Monte Carlo analysis on the RAPFISH method was carried out 25 times with the scatter plot technique. The stability of the resulting sustainability index is reflected by the clustered plot, whereas if the results show a spread plot, it means that there are disturbances or aspects of uncertainty in the analysis results. The average of the 25 repetition points on the X-axis scatter plot is averaged and then subtracted by the y-point on the sustainability value (MDS), the result of the difference between Monte Carlo and MDS reflects the sustainability status. The difference value < 1 indicates that the value of the sustainability index status at the confidence interval according to the RSQ value obtained results that did not experience much difference.

7) Laverage Analysis

Laverage analysis was carried out to find out what attributes were sensitive from all the dimensions used. The most sensitive attribute will contribute to sustainability in the form of changes in the Root Mean Square (RMS) on the X axis (sustainability scale).

3. Results and Discussion

Results

1) Fish Resource Dimension

The results of the MDS test are shown in the output graph in Figure 4.1. To show the position of the level of sustainability in a multi-dimensional manner.

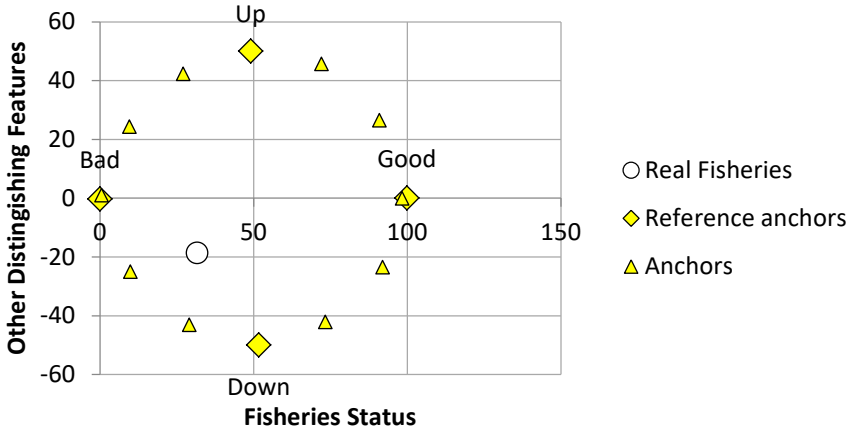

Figure Error! No text of specified style in document.**.1:** Multi-dimensional Scaling Dimensions of Fish Resources

Based on the value of the test RAPFISH obtained a value for the dimension of fish resources of 31.60, based on this value, this dimension obtains the criteria of being less sustainable in management efforts. The value of S

(stress) obtained is 0.14 and the RSQ (Root Square correlation) is 0.92, this shows that the results of the multi-dimensional testing carried out on each indicator are good because S < 0.25 and RSQ is close to 1.

To find out the consistency of the MDS test, a test was carried out *Monte Carlo* with 25 repetitions. The graph of the Monte Carlo test for the dimensions of fish resources can be seen in Figure 4.2.

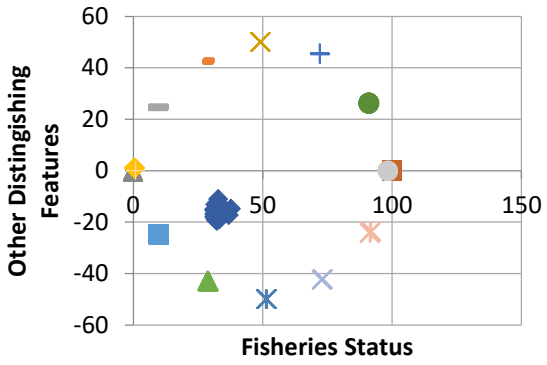

Figure Error! No text of specified style in document.**..2:** *Monte Carlo* Fish Resource Dimension

Based on *scatter plot* The results of the MDS assessment for the dimensions of fish resources are quite consistent, seen from the 25 plots that tend to converge at one point. The average result of 25 repetitions of the Monte Carlo scatter plot analysis on the X axis is 32.93. If we look at the difference between the MDS value and the average scatter plot, the value is 1.33. The value is more than 1 which means that the repetition results show that the test results have differences that can still be tolerated in terms of the RSQ value which is close to 1. This can be caused by the different scores of each attribute on this dimension.

To see test results *leverage* shown in Figure 4.3. In this test, the attributes of levers on the dimensions of fish resources will be known.

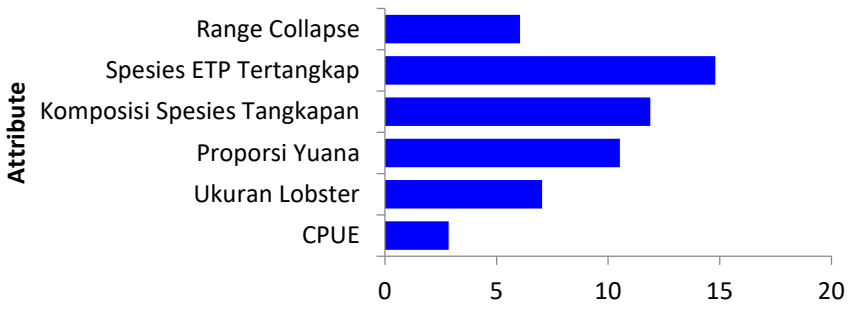

Figure Error! No text of specified style in document.**..3:** Fish Resource Dimension Leverage

Based on the graph above, it can be seen that the lever attribute or the main factor that can affect the sustainability level of the fish resource dimension is the caught ETP species. This is because this attribute has a score of*likert* 3 or in good condition so that it has an important role in the sustainability of this dimension and

the level of management must be maintained. The lever attribute with the second priority is the composition of the catch, this is because the score of this attribute is low, management efforts for this attribute to improve the sustainability status are by making regulations on fishing gear that are more selective in catching target species. The attribute that becomes the next leveraging factor is the proportion of yuan, according to the fact in the field that the lobster caught has a size below the standard set by Minister of Forestry Regulation No. 12 of 2020. From this case, it is necessary to implement appropriate policies for the sustainability of lobster fisheries resources and businesses in Indonesia. Cilacap coast.

2) Habitat and Ecosystem Dimensions

In this dimension, three attributes are used to adjust the indicators used in the EAFM analysis which have been adapted to conditions in the field. To see the sustainability condition of the results from the RAPFISH analysis, the sustainability graph for the habitat and ecosystem dimensions is shown in Figure 4.4.

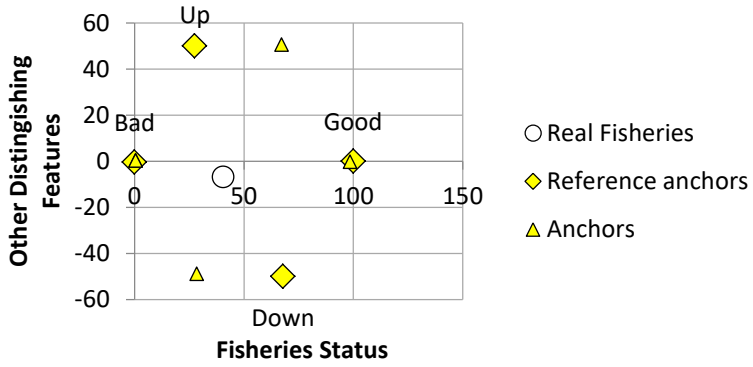

Figure Error! No text of specified style in document..**4:** Multi-dimensional Scaling Habitat & Ecosystem Dimensions

Based on sustainability analyst RAPFISH for the habitat and ecosystem dimensions, it gets a score of 40.23 or is in the less sustainable criteria. To determine the level of confidence from this test, it can be seen from the value of S (Stress) and RSQ (Root Square Correlation), the value of S is 0.14 smaller than 0.25 and RSQ is 0.92. This shows that the MDS testing that was carried out was good and represented the problem. To find out the consistency of the test, it can be assessed from the test *monte carlo*,the author repeated 25 times to see the consistency of the MDS testing algorithm repetition on the habitat and ecosystem dimensions. The graph of the results of the Monte Carlo test for habitat and ecosystem dimensions can be seen in Figure 4.5.

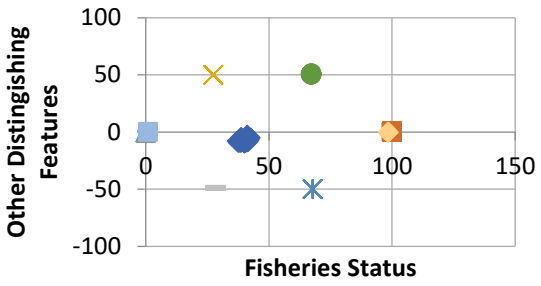

Figure Error! No text of specified style in document.**.5:** Monte Carlo Habitat & Ecosystem Dimension

Based on test results *Monte Carlo* it can be concluded that the MDS test model on the habitat and ecosystem dimensions is consistent in terms of the scatter plot graph that gathers at one point with the difference between the MDS and Monte Carlo tests on the X axis of 0.27. This supports the stress value and Root Square Correlation which shows that the test model for this dimension is good and represents the existing problems.To find out the main levers of the attributes used, a test is carried out *Leverage*, the graph of the test results is shown in Figure 4.6.

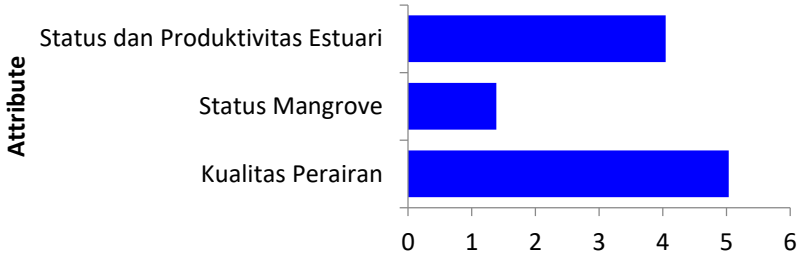

Figure Error! No text of specified style in document.**.6:** Habitat & Ecosystem Dimension Leverage

The results of the Leverage analysis can be seen that the main lever in the habitat and ecosystem dimensions of lobster fisheries management on the coast of Cilacap is water quality, this factor is the main factor because based on the results of the assessment on the Likert domain EAFM scale, this dimension has a low score due to information on water pollution in the area. around Cilacap waters. To improve the status of sustainability in this dimension, it is necessary to prioritize the improvement of water quality. While the levers on the second priority are the status and productivity of the estuary, the productivity of the estuary is important considering that the estuary area is a nursery area for various juveniles and is important for the sustainability of each aquatic species.

3) Dimensions of Fishing Techniques

MDS testing on the fishing technique dimension uses five attributes to determine the sustainability status on this dimension, the sustainability graph is shown in Figure 4.7. The graph is an interpretation of a multi-dimensional assessment that is displayed in the form of a two-dimensional graph to facilitate the analysis.

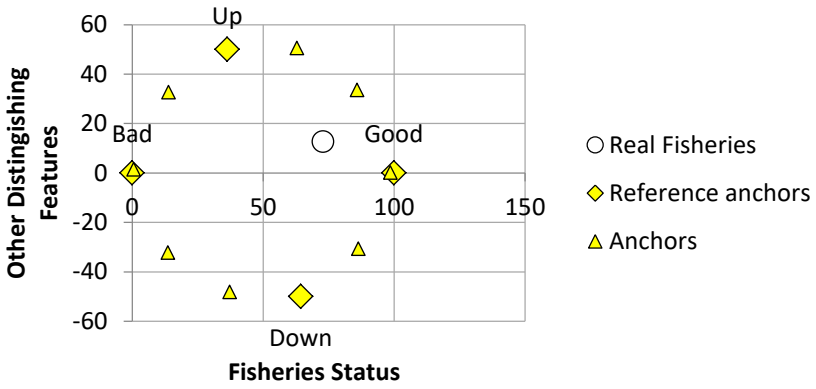

Figure Error! No text of specified style in document.**.7:** Multi-dimensional Scaling Dimensional Fishing Technique

Based on the test, it can be determined that the sustainability value on the fishing technique dimension is 72.77 or has a fairly sustainable status. Mark *stress* from this test, 0.15 is smaller than 0.25 and the RSQ value is 0.94, this value means the test results are good and represent sustainability problems in the dimensions of fishing techniques.

To find out the consistency of the test, a test is carried out *Monte Carlo*, the results of this test can be seen in Figure 4.8. The test output is in the form of a scatter plot with blue dots as an interpretation of the repetition of the test on the dimension assessment algorithm 25 times.

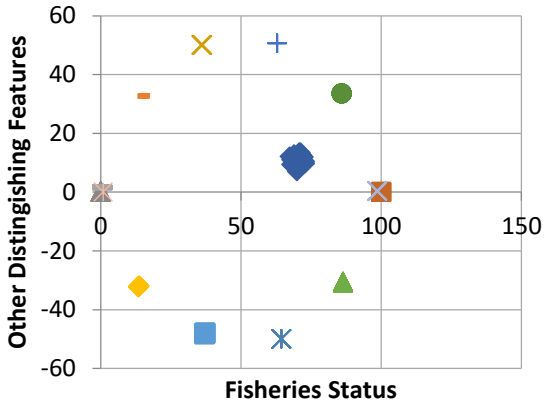

Figure Error! No text of specified style in document.**.8:** Monte Carlo Fishing Technique Dimensions

Based on test results *Monte Carlo* the output coordinates are at a point that is adjacent or overlaps with an average value of 70.50. The difference between the results of the RAPFISH MDS test and the Monte Carlo test is 2.26, this value is quite far from 1.00 but if you look at the RSQ test which shows a value of 0.94, it can be concluded that the test results are still considered reliable. The large difference between the MDS and Monte Carlo tests can be caused by the manual preparation of the ALSCAL algorithm which has a bias so that the coordinates that appear have an average difference of 2.26 points on the X-axis rotation results (bad – good

axis). However, this value is not too large when viewed on a scale of 100, where the difference is 2.26% between the two test models.

Test *Leverage* carried out to assess the attribute that has the greatest factor in the level of sustainability on the dimensions of fishing techniques. The comparison of the five indicators in this dimension is shown in the graph in Figure 4.9.

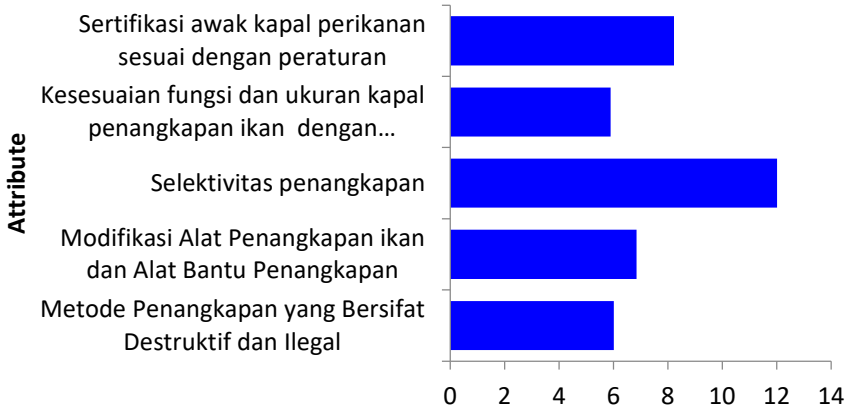

Figure Error! No text of specified style in document.**.9:** Fishing Technique Dimensional Leverage

Based on the results of the analysis *Leverage* it can be seen that the attribute that becomes the main lever is the selectivity of the catch, the Likert value on this attribute is 2 because the effort to catch lobster is less selective in terms of the proportion of catch and the size of the lobster caught. This can be taken into consideration in determining priorities for policy making to improve the sustainability status of lobster fisheries on the coast of Cilacap. The second lever attribute is crew certification, this can be improved by providing increased training on environmentally sound fishing efforts for lobster fishery business actors.

4) Economic Dimension

In the economic dimension, four attributes are used to assess sustainability. The results of the analysis of the four attributes are shown in Figure 4.10. The discussion of the results of the analysis refers to the EAFM Likert score and the real condition of the lobster fishery on the coast of Cilacap.

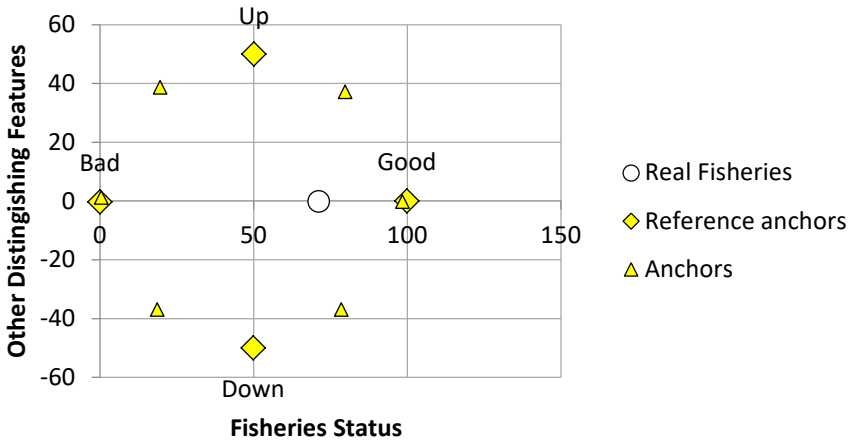

Figure Error! No text of specified style in document.**.10:** Multi-dimensional Scaling Economic Dimension

Sustainability scores obtained on the economic dimension using analysis RAPFISH indicates a fairly sustainable status with a value of 71.20. The stress value obtained in this test is 0.16, which is smaller than 0.25, which means this test is good. Meanwhile, if it is seen from the RSQ value of this test, it is at a value of 0.94 so it can be concluded that this test is good and can be trusted to describe problems on each attribute used in the economic dimension.

To see the consistency of the test results, a test was carried out *Monte Carlo* so that it can be seen the consistency of the test with 25 repetitions. The test results are shown in Figure 4.11.

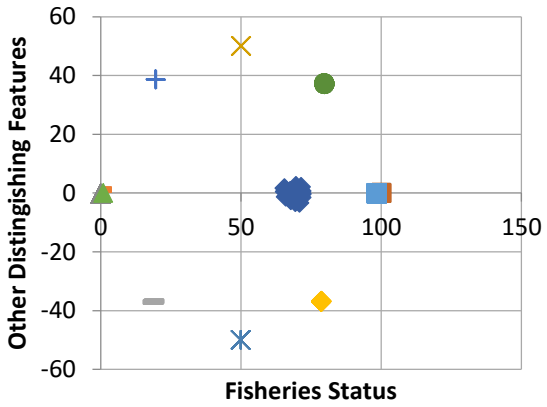

Figure Error! No text of specified style in document.**.11:** Monte Carlo Economic Dimension

Based on test results *Monte Carlo* it can be seen that the scatter plot coincides at one point, at a glance this test shows that the repetition of the MDS test is consistent. If you look at the comparison of the MDS value with an average of 25 repetitions of Monte Carlo, the difference in value is 2.13. This value is high enough compared to the criterion of 1 to be considered a good test, but the Stress and RSQ values in this dimension test can be concluded that this multi-dimensional attribute assessment model is quite good. This is because in the economic dimension there are two attributes that have a good Likert score and two attributes that have a moderate score so

that the repetition of the ALSCAL algorithm shows the possibility of data input errors seen from the comparison with RSQ.

The next test to see the attributes of leverage in the economic dimension is the test *Leverage*. As for making it easier to carry out this analysis, a graph of the test results is shown in Figure 4.12.

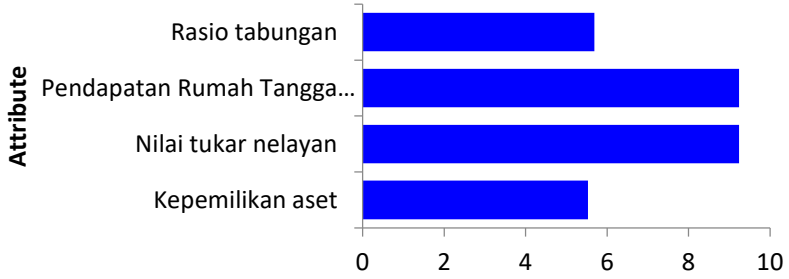

Figure Error! No text of specified style in document.**.12:** Leverage Economic Dimension

Based on the results of the analysis *Leverage* The main levers are found in the income attribute of the household household and the fisherman's exchange rate and the next lever is the ratio of savings and asset ownership. This is due to the similarity of the Likert score assessment on this dimension. Based on these results, the recommendation that can be made to maintain the sustainability of this dimension is to increase the income of FHH and the fisherman's exchange rate. To improve the sustainability of this dimension, it is necessary to increase the attributes of the ratio of savings and ownership of fishermen's assets to achieve the sustainability of the economic dimension at a better level.

5) Social Dimension

In the social dimension, three attributes that determine sustainability are used to determine the level of sustainability in this dimension. To determine the effect of these three attributes on the sustainability status, the sustainability graph is shown in Figure 4.13.

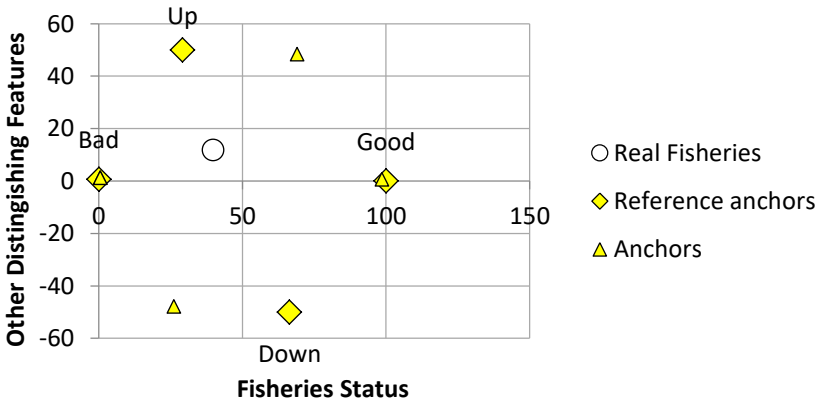

Figure Error! No text of specified style in document.**.13:** Multi-dimensional Scaling Social Dimension

Based on the sustainability analysis on the social dimension, a sustainability score of 39.72 was obtained. This shows that sustainability in this social dimension is in a less sustainable condition. To determine the level of accuracy of testing with the MDS method, it is seen from the value of *stress* of 0.18 and the RSQ value of 0.92. Based on value *Stress* and the RSQ of this test is classified as good and represents the existing problems because the S value is less than 0.25 and the RSQ is close to 1.

The results of the assessment model are tested for consistency using the method *Monte Carlo* 25 repetitions. To see the test results, the graph is shown in Figure 4.14.

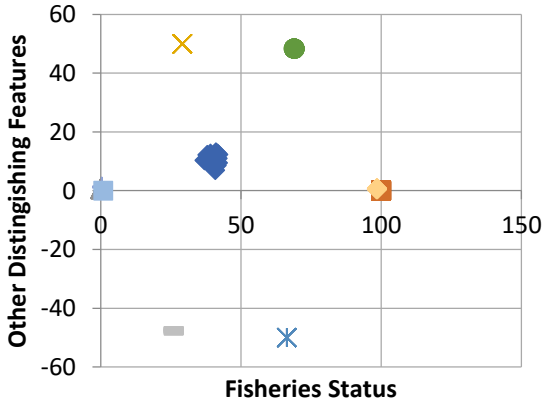

Figure Error! No text of specified style in document.**.14:** Monte Carlo Social Dimension

According to the test results *Monte Carlo* it appears that the scatter plots gather at one point and coincide with each other. To find out whether there is a significant difference between the results of the MDS and Monte Carlo tests, the average point on the x-axis of the Monte Carlo graph is seen for the difference with the results of the MDS test, the results obtained are 0.17 so this test is considered consistent because the value of the difference is smaller. of 1. This corresponds to the value of Stress and RSQ.

To find out the attributes that are levers in the assessment of the sustainability of the social dimension, an analysis is carried out *leverage*, the results of the analysis are displayed in the form of a bar graph in Figure 4.15.

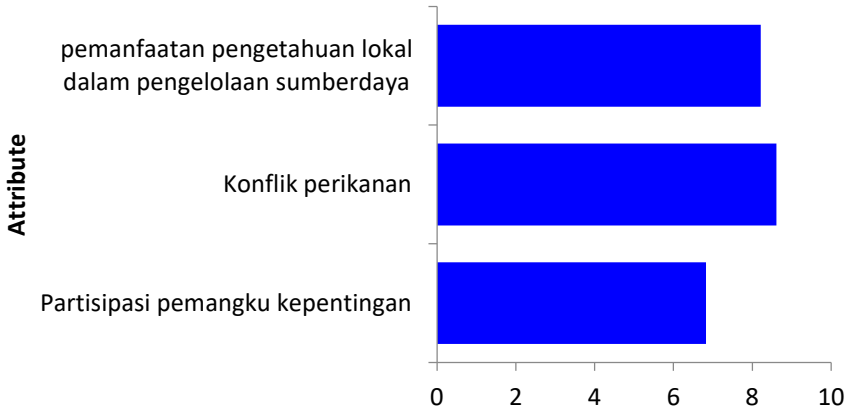

Figure Error! No text of specified style in document.**.15:** social dimension leverage

Based on test results *leverage* it can be seen that the attributes of levers in the social domain are fisheries conflicts and the use of local knowledge. The fisheries conflict that still occurs is in the form of catching lobster seeds which indirectly causes contra for lobster fishermen because it has the potential to reduce fishermen's catches. The attribute of local use as leverage because this attribute has a low Likert score, it is necessary to explore local wisdom related to efforts to use sustainable lobster fisheries resources because currently there is no local wisdom that can support efforts to manage lobster resources in Cilacap.

6) Institutional Dimension

In the institutional dimension, management efforts use six attributes to assess the sustainability status of management. The results of the RAPFISH MDS analysis can be seen in Figure 4.16.

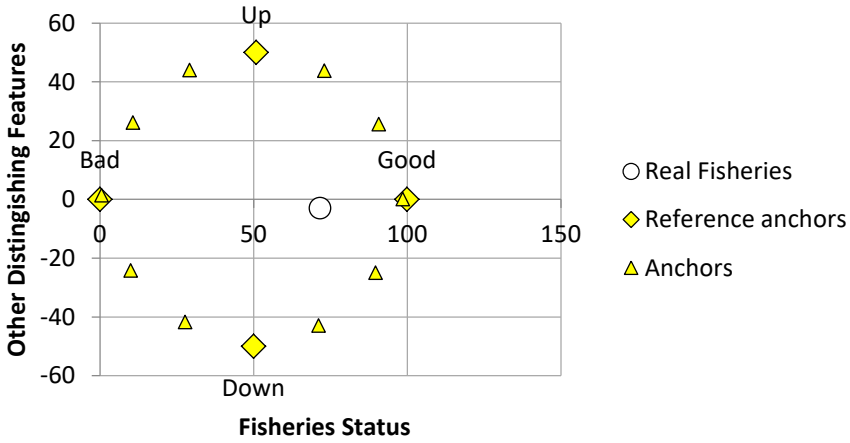

Figure Error! No text of specified style in document.**.16:** Multi-dimensional Scaling Institutional Dimension

According to the results of the MDS assessment, it can be seen that the sustainability status of the Institutional dimension is in good criteria with a score of 71.58. To find out whether the test results are a good model, it is necessary to review the Stress and RSQ values. The stress value of 0.14 indicates that the test uses a good model

because the stress value is less than 0.25. The RSQ value is 0.95, indicating that this test model represents sustainability problems that exist in the institutional dimension.

To determine the consistency of the test, a Monte Carlo test was carried out with 25 repetitions of the MDS model to determine the level of uncertainty in the test. To see the results of the Monte Carlo test, it can be seen in Figure 4.17.

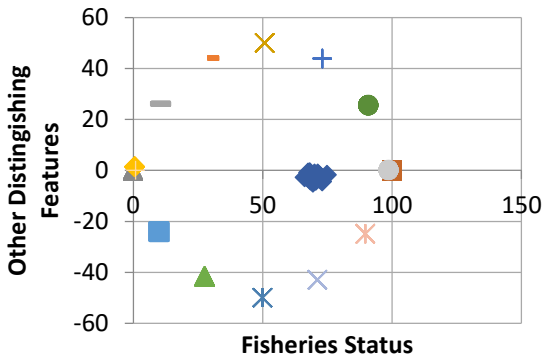

Figure Error! No text of specified style in document.**.17:** *Monte Carlo Institutional Dimension*

Based on test results *Monte Carlo* it can be seen that the scatter plots are located at points that are close to each other, this means that the repetition model of 25 times shows good results and low uncertainty values from the dimensional testing process. When viewed from the comparison value between the average scatter plot and the MDS value on the institutional dimension, there is a difference of 1.14. This value is not too far from the limit value of 1 so that this test model can be said to be good, especially when viewed from the stress and RSQ values.

To find out the lever factors in the sustainability of the institutional dimension, it can be seen in the graph *leverage* in Figure 4.18. In the form of a bar chart.

Figure Error! No text of specified style in document.**.18:** *Leverage* Institutional Dimension

Based on the leverage test, the main lever factor in the institutional dimension is obtained. The management plan attribute as the main lever attribute is because in this dimension this attribute has the lowest Likert score, so it is necessary to improve the implementation of RPP to improve the sustainability status of lobster fisheries resource management in Cilacap. The second lever attribute is the level of policy synergy, this attribute is in good criteria so that it needs to be maintained or improved in management efforts.

4. Discussion

1) Fish Resource Dimension

In this dimension the current condition is considered unsustainable so that it is necessary to improve and improve management as for the lever attributes that can accelerate the improvement of the sustainability status of the resource, namely selectivity of capture, the need for improvement of selectivity in catching lobster both in terms of size or proportion of catch. The solution that can be done is through enforcement of rules or a moratorium on lobster catching.

The second lever is the certification of fishing boat crews, the need for improvement in training for fishermen so that fishing efforts can be more sustainable both in terms of the ecosystem and the lobster fishery business itself.

The third lever is the modification of fishing gear and fishing aids for lobster, the absence of modification of fishing gear and fishing aids on the coast of Cilacap is a good indication for the sustainability of lobster resources. Regulation and development of lobster fishing gear should lead to the selectivity and effectiveness of the fishing gear.

2) Habitat and Ecosystem Dimensions

The habitat and ecosystem dimension has criteria that are less sustainable, habitat and ecosystem are very important dimensions in management efforts because this dimension is very much related to other dimensions, considering that capture fisheries business is a business that utilizes natural resources.

The main lever factor in this dimension is the quality of the waters, based on the information obtained as material for this study, the quality of the waters on the coast of Cilacap is polluted by various human activities. Lobster as an aquatic species is very dependent on water quality, so it is necessary to prioritize policies regarding improving water quality related to efforts to manage lobster and other fisheries resources, especially to the preservation of the ecosystem itself.

The second lever is the status and productivity of the estuary, the coast of Cilacap is the estuary of several major rivers. In this study, the information used about the productivity of the estuary is the condition of the Segara Anakan estuary. These waters are the estuary of three major rivers, namely Citanduy, Cibeureum, and Cimeneng [10]. This estuary area is also related to the mangrove ecosystem in Segara Anakan where the area is a nursery area for various aquatic biota so that productivity and sustainability need to be maintained.

3) Dimensions of Fishing Techniques

On the fishing technique dimension, the sustainability status is moderately sustainable, this dimension is more related to the human factor in fishing. The right effort to improve this dimension is to increase the capacity and ability of the main lobster fishery players to make more sustainable fishing efforts.

The lever factor that exists in this dimension is the selectivity of the catch attribute, the need to prioritize increasing the selectivity of the catch even though the lobster fishing gear used is quite environmentally friendly. The large number of juveniles caught and non-target species make this attribute a leveraging factor.

The next lever attribute that is the focus of management efforts is the certification of fishing boat crews. Lobster fishery is a coastal fishery that uses small boats of 1 -2 GT, however it is necessary to standardize the lobster fishery business to encourage the sustainability of lobster resources. Certification can also increase the capacity of business actors to carry out sustainable lobster fishing efforts.

4) Economic Dimension

Resource management efforts not only see ecosystems as a priority but also consider the sustainability factor for human use. Efforts to manage fisheries living natural resources are expected to provide economic benefits and added value to humans living around the ecosystem in a sustainable manner. The condition of this dimension is currently in a fairly sustainable status.

Leveraging factors that are the focus in the economic dimension are the income of the FHH and the fisherman's exchange rate. These two attributes are in good status so they need to be improved and maintained. If the income factor decreases, it can result in increased exploitation efforts of lobster resources, thereby reducing the sustainability status of these resources. When viewed from the fisherman's exchange rate, the related factor is the stability of the selling price of the catch with the capital costs that must be incurred by fishermen to go to sea, so it is necessary to regulate the selling price of lobster and the availability of fishermen's fishing needs.

5) Social Dimension

The social dimension is related to fisheries resource conservation efforts, when viewed from the lever factor, there are two attributes as levers out of a total of three attributes. The attributes that become levers in this dimension are the attributes of fisheries conflicts and the use of local knowledge in resource management.

There is no direct conflict in the utilization of lobster resources, but there are still violations in the form of smuggling lobster seeds from the coast of Cilacap which has the potential to cause conflict between fry fishermen and lobster fishermen because catching lobster seeds can reduce the number of adult lobsters in the wild so that lobster fishermen experience a decrease in catches. This has the potential to cause conflict.

The absence of local wisdom that can be applied directly in an effort to manage lobster resources causes this attribute to become a lever in the social dimension. The need for excavation of local wisdom owned by the

fishing community in Cilacap to support the sustainability of lobster resource management efforts.

6) Institutional Dimension

The institutional dimension uses six sustainability attributes and according to the MDS analysis this dimension is in a fairly sustainable status, there are three levers that can accelerate the improvement of sustainability status,

The first lever is the attribute of the fishery management plan, the incomplete implementation of the fishery management plan causes this attribute to have a rudimentary score. To increase the sustainability of this dimension, it is necessary to emphasize the implementation of the management plan.

The next factor is the attribute of the level of synergy between institutions, in the case of lobster management in Cilacap, the synergy between institutions is going well. So this attribute needs to be maintained to maintain the sustainability status of the existing lobster management,

The last factor is the capacity of stakeholders, the capacity of stakeholders must continue to increase in line with the times and issues of global conservation trends. So that continuous improvement can accelerate efforts to manage lobster resources in Cilacap.

In general, the condition of the sustainability level of each dimension of lobster resource management can be seen in Table 4.1. The aggregate score is the average of the scores for each management dimension. In general, the overall sustainability status is at a moderately sustainable level and can be upgraded to sustainable status.

Table Error! No text of specified style in document.**.1:** Status of Sustainability Dimensions of RAPFISH Analysis

Dimension	**Dimensional Sustainability Status**	**Sustainability Status**
Fish Resources	31.60	Less Sustainable
Habitat and Ecosystem	40.51	Less Sustainable
Fishing Techniques	72.77	Sustainable Enough
Economy	71.16	Sustainable Enough
Social	39.72	Less Sustainable
Institutional	71.58	Sustainable Enough
Aggregate	54.56	Sustainable Enough

To find out the relationship between the dimensions that exist visually, it can be seen in the flyover diagram in Fig **Figure 4.19.**

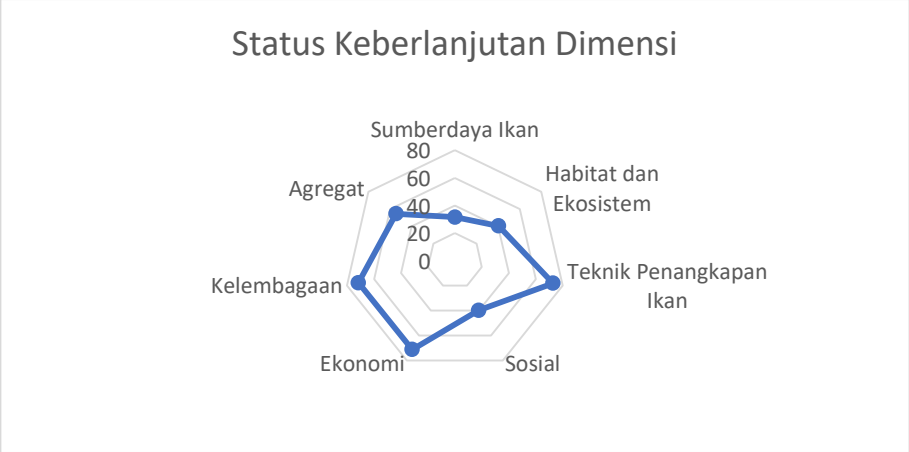

Figure Error! No text of specified style in document.**.19:** RAPFISH Dimensional Sustainability Kite Chart

5. Conclusion

1. The sustainability status of each management dimension is generally in moderately sustainable status with an average score of 54.56
2. The dimension with the lowest level of sustainability is the dimension of fish resources and the highest dimension is the dimension of fishing techniques
3. The main lever attributes of each dimension are ETP Species Caught, Water Quality, Capture Selectivity, RTP Opinion & Fisherman's Exchange Rate, Fishery Conflict and Fishery Management Plan
4. The implementation of the blue economy has also helped reduce the risk of high sea threats from both natural and human resources.

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