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STATUS, EXPLORATION POTENTIAL AND RESOURCE MANAGEMENT OF KURAU (*Eleutheronema tetradactylum*) FISH IN OVERFISHING AREA (CASE STUDY IN BENGKALIS DISTRICT, RIAU PROVINCE)

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ABSTRACT

The research was conducted in Bengkalis District which is a strategic area in Riau Province. The coastal waters of this area is located in the Strait of Malacca and known as WPP 571. Its strategic position of the area is faced with the problem of overfishing, including the fishery resources of Kurau (Eleutheronema tetradactylum). This research was conducted by using case study method. The purpose of the research was to get the Kurau fishery resources management strategy formulation by knowing; 1) exploration potency of Kurau fish resources; 2) management strategy and sustainable utilization of Kurau fish. The bioeconomic and tiered process (AHP) analysis were used in the present study. The results showed that Kurau fish has experienced overfishing by 33.42%, the natural growth rate of Kurau fish was 0.614, capture power coefficient was 0.00000020 whilst the carrying capacity coefficient was 28 820. Fishery management potency of Kurau according to MEY regime was 15,321.34 tons with catches of 4,407.72 tons and total fishing effort as much as 141,949 trips. The formulation of management strategy of Kurau fishery resources is by giving greater attention to the process of policy formulation. This alternative strategy mean that the local government policies both that devoted exclusively to the management of Kurau fish or other fishery resources should be in favour with the sustainable factor.

Keywords: Bioeconomic, Kurau, overfishing, strategy

INTRODUCTION

Bengkalis is located on the East Coast of Sumatra, Riau Province and considered as strategic area in the Strait of Malacca because it is directly adjacent to Malaysia. This district has a coastal region with a diversity of natural resources and marine fisheries. Based on research conducted by The Fisheries and Marine Department of Bengkalis (2008) concerning the analysis of Bengkalis coastal water and the Malacca Strait potency, as also reported by Nontji (2005), The Strait of Malacca has already been in the overfishing condition where its fishery potency of 276,030 tonnes has been exploited for 389,280 tonnes. The Straits of Malacca area is 162,000 km^2, while the area of Bengkalis waters (including EEZ) is 10497.3 km^2.

Overfishing could be interpreted as overexploited so that the potency of fish populations progressively reduced and CPUE will continue to decrease and hence will negatively impacted the fishermen's income. A review on capture fishery potency of Bengkalis indicated that coastal and marine waters of Bengkalis is part of the waterway that connects the Indonesian inland waters (waters between Sumatra and Kalimantan) with the Andaman Sea and the Indian Ocean as a whole has been exploited exceeded its potency of 257.5 %, or has exceeded 2.5 times its sustainable potency.

Based on the type of commodity, only a small pelagic fish, such as mullet, prickly, pomfret, trevally, which are already closer to their potency exploitation rate of 99%, while others, such as large pelagic fishes (eg, mackerel, Parang-parang) has far exceeded their potency (383.8%), demersal fish (Kurau, debuk, siakap) with 414.9% exploitation rate (Department of Fisheries and Marine of Bengkalis, 2008).

Fishing activities with a variety of developed fishing methods in conjunction with

the capture fisheries resources such as Gill Net in Bengkalis waters has lead to overfishing condition. To achieve sustainable fisheries management in Bengkalis waters, a study in order to identify and evaluate the exploration potency on fisheries resources in Bengkalis is needed. Referring to the problems, available data and the condition of Bengkalis fishery resources this research is necessary and very important to be conducted.

Based on the problems identification, it can be concluded that the formulation of the problem as follows: (1) How does the Kurau fish exploration potency and (2) How does the management strategy and sustainable utilization of Kurau fish?. This study is basically an analysis of fishery management to obtain a comprehensive overview about the necessary fisheries in developing policies to achieve sustainable fisheries. The purpose of this study was to identify the potency of fishery resources in Bengkalis and determine its management strategies and sustainable utilization of Kurau fish in Bengkalis.

RESEARCH METHODS

The research was conducted from July 2013 to February 2014. Samples of fish were collected from Tanjung Medang North Rupat representing Station 1, Meskom Bengkalis as Station 2, Selat Baru Bantan as Station 3 and Pambang as station 4. These four stations represented the Kurau fishing grounds in Bengkalis Riau Province.

Data collection in this study was done by direct observation in the field and conduct interviews and questionnaires to the respondents. Other supporting method used were interviews and literature studies. Stratified random and purposive sampling were used to determine the fishermen and experts/specialists respondents respectively.

RESULTS AND DISCUSSION

1. Potency of Fisheries Resources

In order to understand the potency of Kurau fisheries in Bengkalis, it is necessary to study the actual value of each fishery management regime that has a high economic value so as to contribute to the local economy. Thus the bioeconomic analysis is needed to answer the study of the fishery resources potency.

Bioeconomic analysis of fisheries resources in this study was applied for Kurau fish. This is the type of fishery resources with a substantial contribution in Bengkalis. Secondary data as reference was obtained from the Department of Fisheries and Marine and the Central Bureau Statisitk of Bengkalis. Types of fishing gear which is the object of research is Kurau nets and longlines. Data of production and effort in the field was obtained for 8 years from 2005 to 2012. This data were then analyzed by a bioeconomic analysis.

The catch per fishing effort (CPUE) of Kurau which landed in Bengkalis fluctuated and tend to decline from time to time. According to Sparre and Venema (1998), CPUE is an index of fish stocks abundance in the waters. Therefore, through the value generated from this analysis can be interpreted that there is possibility for additional production as there are still available fish stocks at the capture site. Efforts to increase production should also considered the sustainable resource. Government policies and regulations related to the management of fish resources, especially Parang-parang fish in the waters of Bengkalis and WPP 571 becomes a necessity in order to achieve optimization and sustainability. THE development OF Catch Per Unit Effort (CPUE) is shown in Figure 1.

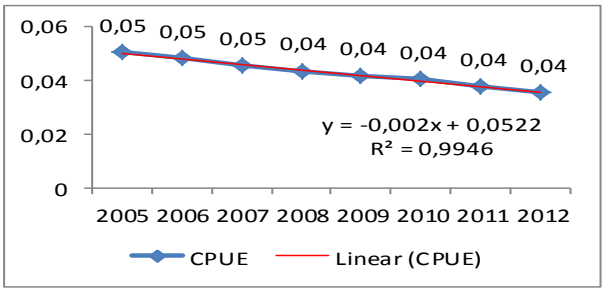

Figure 1. CPUE trend of Kurau Fish Resources

MSY or maximum sustainable yield is the largest catch of fish that can be produced within the limits of sustainability. MSY in this case is calculated using logistic growth function. Before estimating MSY, biological parameter should be estimated first. The results of this estimation is used to estimate the level of effort (effort) at MSY conditions. The value of effort, the actual production and sustainable production of Kurau fish in Bengkalis are presented in Table 1.

Tabel 1. Effort, actual production and sustainable production of Kurau fish in Bengkalis

No.	Year	*Effort* (Et)	Actual Production (ton)	Sustainable Production (ton)
1	2005	43.062	2.172,48	2.157,85
2	2006	54.586	2.637,59	2.614,08
3	2007	68.714	3.134,05	3.103,56
4	2008	73.664	3.221,31	3.256,84
5	2009	77.335	3.250,37	3.364,42
6	2010	92.535	3.762,47	3.754,62
7	2011	108.541	4.122,40	4.069,24
8	2012	118.495	4.235,02	4.215,09

At equilibrium, the growth rate is zero and the rate of population equal to K (carrying capacity). Carrying capacity is influenced by intrinsic growth rate (r), the higher the value of r, the faster achievement of carrying capacity. The maximum rate of growth will occur in the condition of half of the carrying capacity or K / 2. This level is also known as Maximum Sustainable Yield or MSY.

Table 2. Results of bioeconomic analysis in a variety of Kurau Fish Resources Management Regime

No.	Control Variable	*Sole Owner* / MEY	*Open Access*/ OAY	MSY
1	x (ton)	15.321,34	1.822,26	14.410,21
2	h (ton)	4.407,72	1.048,47	4.425,41
3	E (trip)	141.949	283.898	151.530
4	π (million Rp)	214.938,80	(0,00)	213.959,61

On MEY condition (Sole Owner), the number of Kura stock is as much as 15321.34 tons with catches of 4407.72 tons and the amount of effort as much as 141 949 fishing trip, so the value of the rents obtained is Rp 214,938.80 million. Management of Open Access produce standing stock as much as 1822.26 tons with catches of 1048.47 tons and the amount of fishing effort as much as 283 898 trips. At MSY conditions, fish stocks are much 14410.21 tons with catches of 4425.41 tons and the amount of fishing effort as much as 151 530 trips, so as to obtain rents Rp 213,959.61 million.

The value of the Kurau fish resource rents on open access condition is zero. This means that if the Kurau fish resources in Bengkalis left open, the competition in this condition becomes uncontrollable, resulting in the value of its profits to zero. Based on the amount of the the rents value of the sole owner or MEY management regime, fishery Resources Management Regime of Kurau is shown in Figure 2.

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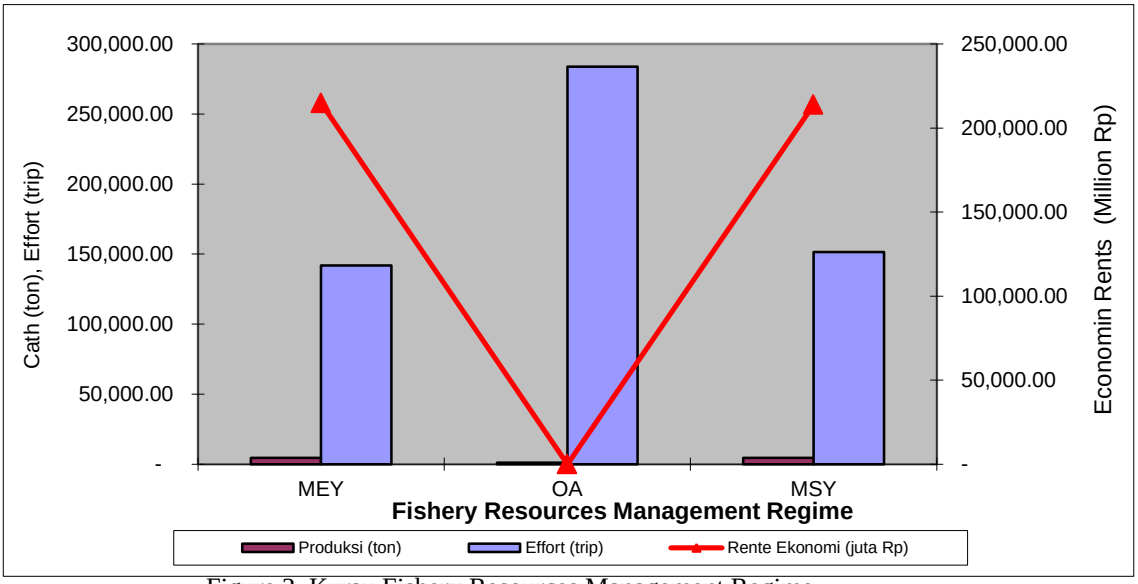

Figure 2. Kurau Fishery Resources Management Regime

Based on the amount of the rents value earned on the sole owner or MEY management regime, rents value obtained is the highest value when compared to other conditions. In addition, the number of fish stocks in MEY generate the most abundant amount. Therefore, the management of static fisheries resources in Bengkalis should be managed with the MEY or Sole Owner management regime.

2. Fisheries Management Strategy

Fisheries development in Bengkalis require simultaneously and directed intervention strategies and policies to the problems that exist with reference to the various rules and guidelines that have been established at various levels. In addition it is necessary to give priority to the management aspects of the sustainability index value which is the lowest category, as Charles *et al*. (2002) stated that the management will be a lot to deal with compromises in making choices and prioritizing of the available alternatives to establish the use of the allocation of limited resources.

Determination of dimensions and priority attributes performed by AHP analysis based on the results of the calculation of the dimension index, the value of the root mean square (RMS) attributes, as well as the weight of each attribute value (needs assessment). AHP hierarchy is shown in Figure 3.

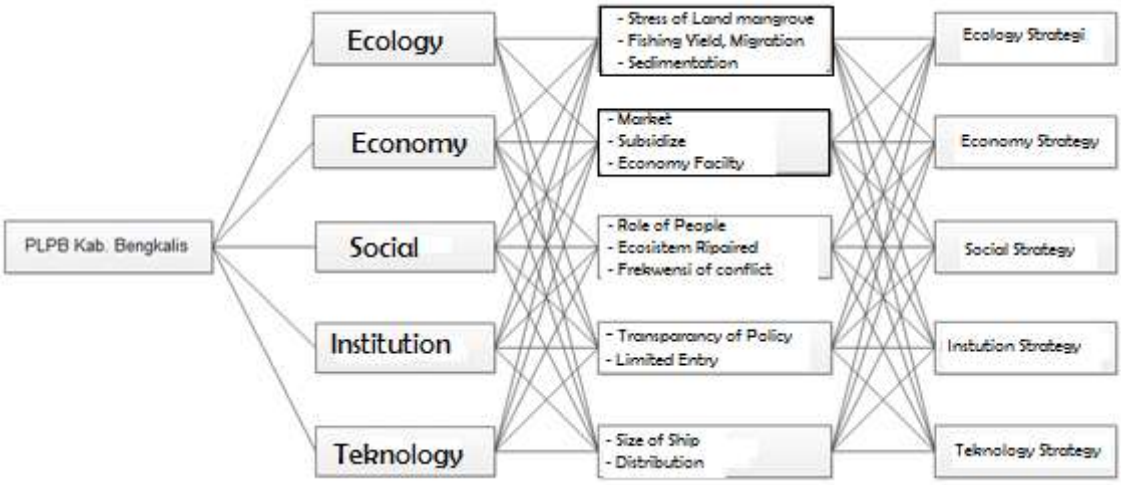

Figure 3. Hierarchy Priority of Environmental Fisheries Sustainability

AHP analysis results through Criterium Decision Plus V.30 software, on a score scale of decision-making 1.0 as shown in Figure 5 shows that the main priority is the policy on

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ecological strategy with a score of 0.912 then the economic strategy with a score of 0.706, and the social strategy with a score of 0.588. The contribution of each dimension in the prioritization strategy is shown in Figure 4.

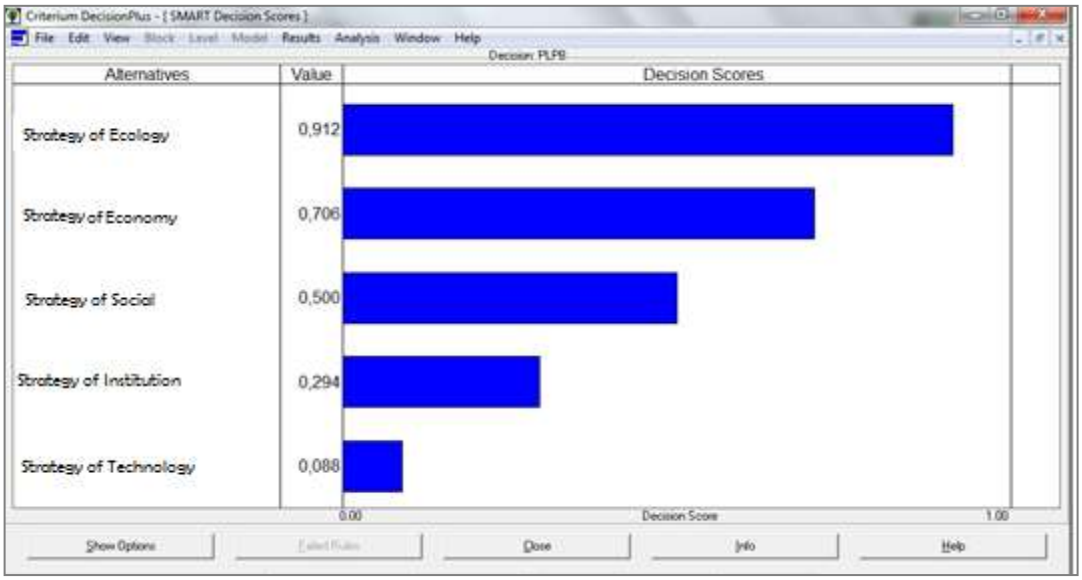

Figure 4. Hierarchy Strategy of Environmental Fisheries Sustainability Priority

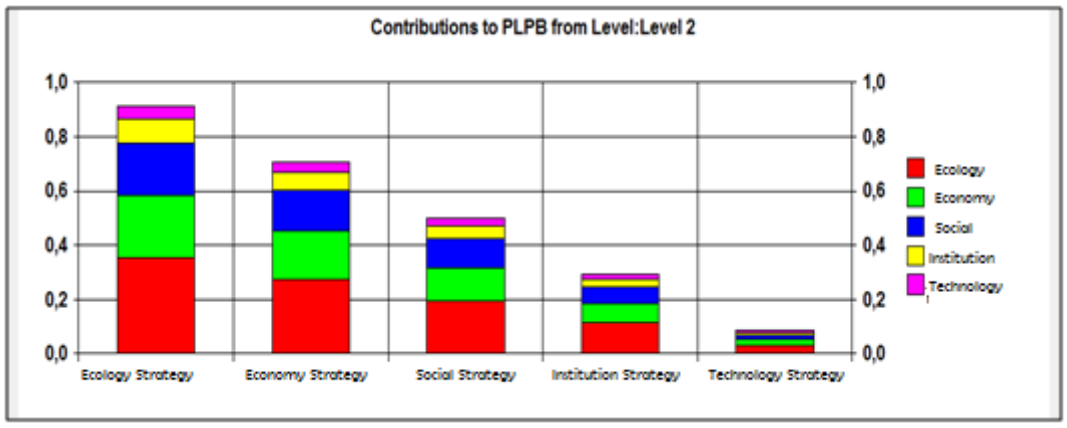

Figure 5. Contributions of Each Dimension in Environmental Fisheries Sustainability Strategy

Based on the priority order of the dimensions and attributes in a dimension resulted from the AHP analysis, strategic direction of environmental capture fisheries sustainability for Bengkalis district for each priority dimension can be structured as follows:

1. Dimensions of Ecological Sustainability Strategy
   a. Determination of fish conservation zone area
   b. Restrictions on the number of fishing gear
   c. Restrictions on fishing area / establishment of fishing ground
   d. Restrictions on operating time of fishing activities
2. Dimension of Economic Sustainability Strategy
   a. Policies in *limited entry* through the input-output
   b. Restrictions in fishing subsidy
   c. Enhancing the role of fishing cooperatives in terms of capitalization or the fishermen needs
   d. Increased fishery trade system
3. Dimensions of Social Sustainability Strategy
   a. Dissemination and outreach to the local community about the function of mangroves on the environment
   b. Dissemination and outreach to the local community about the sustainability of the

functions of biological resources, especially Kurau fish

c. Socialization and counseling to fishermen in order to direct the use of fishing gear that is equal to the same goal (Kurau net-longline)

4. Dimensions of Institutional Sustainability Strategy
   a. Increasing the role of cooperatives and fisheries department
   b. Increasing the role *pokwasmas* (Community Group Supervisor) in order to preserve the ecosystem and avoid conflict
   c. Integrated monitoring by investigators through the relevant agencies (joint patrols)
   d. Increasing the role of local wisdom / customs in the environmental management of fisheries
   e. Transparency policy by policy makers both recipient and donor policies / policy makers
   f. The existence of limited entry
   g. Develop sinergism among relevant stakeholders in the management of environmentally sustainable fisheries (PU-LH-Perindag-UKM and others)

5. Dimensions of Sustainability Technology Strategy
   a. The development of post-harvest handling technology on board
   b. The policy of selectivity of fishing gear
   c. Types of materials / vessel construction
   d. Minapolitan Policy (port and harbormaster availability)

CONCLUSION

The bioeconomy results showed that Kurau fish experiencing overfishing by 33.42%. The level of optimal utilization of parang-parang fishery resources with effort of 141 949 trips per year, optimal biomasss 15321.34 tons and optimal catches 4407.72 tons. From the known optimal utilization, optimal rents amounted to 214,938.80 million rupiah. This study also obtained carrying capacity coefficient of 28820 tonnes per year. The main priority is the policy on ecological strategy with a score of 0.912, then the economic strategy with a score of 0.706, and the social strategy with a score of 0.588, institutional strategy of 0.294 and technology strategy with a score of 0.088.

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