

THE CONDITION OF DEVELOPMENT COASTAL FISHERIES AND FISHERMAN INCOME IN BENGKALIS REGENCY, RIAU PROVINCE, INDONESIA

AMRIZAL*, SJAFRIZAL**, MAHDI**, JUNAIIDI**

Email: amrizal9715@gmail.com

* PhD Student in Post Graduate Programe, Andalas University, Padang Indonesia; Lecturer socio-economic of Fisheries, Faculty of Fisheries and Marine Science, University of Riau, Indonesia

** Lecturer in in Post Graduate Programe, Andalas University, Padang Indonesia

ABSTRACT

Bengkalis Regency is one of level II region in Province of Riau that has fairly broad waters are waters of the Strait of Malaka already experienced over fishing (DPK Prov. Riau, 2011). Focus of the research is conducted in two districts that is Bantan's district and North Rupa's district which is an area of sea fishery. The research objectives are; (1) analyze the potential and the level of exploitation fisheries in Kabupaten Bengkalis, (2) analyze the potential and level of exploitation coastal fisheries in Bengkalis Regency, 3. Knowing the income of fisherman coastal fisheries in Kabupaten Bengkalis

The results showed that: the fishing conditions in Regency of Bengkalis has experienced over fishing. The potential for sustainability was 7249.56 tons / year, with the rate of exploitation in 2013 was 115.51% and the highest rate of exploitation in 2008 amounted to 139.10%, if you see each of the three zones of arrest are: (a) the condition of the fishery in Bengkalis Regency the potential for sustainability 7.249.56 tons / year. The rate of exploitation in 2013 amounted to 115.51% and the highest rate of exploitation in 2008 amounted to 139,10%, (b) the condition of coastal fishery, the potential for sustainability 1.287,09 tons / year. The rate of exploitation in 2013 amounted to 148.86% and the highest rate of exploitation in 2008 amounted to 113.44%, BCR = 1,98, the average income of fisherman RP 2.054.500,-/month

Keywords : *Sustainable potential, income and business development*

INTRODUCTION

Agricultural development policies in many developing countries, including Indonesia generally focused, substantive fulfillment with an effort to increase the amount of production in a decade was an increase in the production of various commodities of agriculture to national income receipts. But is not accompanied by an increase in the welfare of farmers and rural communities in general. Poverty of farmers and rural communities will lead to heavy pressure on natural resources, which means a negative impact on the preservation of natural resources and environmental quality. This situation will be exacerbated by the poor. To simply maintain the life, the poor are often forced to exploit natural resources, both in their

control and common property (common property, common resources) that lead to the degradation of natural resources and the environment.

Availability of fish in the waterway, including the territorial waters of Bengkalis, is estimated to have thinned due to excessive fishing effort. The fish that should not be arrested because there is still too small, follow tertangkap. Jumlah fish continue to decline and endangered due to overfishing sudahmelebihi limits on the sustainable potential. The high number of fishermen in Bengkalis this in utilizing this fish resources, has led the region into a conflict-prone region. Strait of Malacca has occurred fishing intensively, so there has been a surplus catch is equal to 100.08% (DPK Riau Province, 2011).

This study aims to: 1. Analyze potential and level of exploitation of fisheries Bengkalis and the average income of the fishermen Bengkalis, 2.

Analyzing the potential and the level of exploitation of coastal fisheries as well as the average income of fishermen.

RESEARCH METHODOLOGY

Place and time

This research was conducted in the Bengkalis Regency. Penelitian this done by the end of 2013 until the end

of 2014. The focus of the research conducted at the location of the two Sub-District, District and Sub-District Bantan North Rupert which is a regional marine fisheries.

Equipment and Materials Research

Tools and materials used in this study was a questionnaire as a data collection guidelines, stationery, tape recorder as a recorder during interviews with the respondents, a digital camera for documentation of research

Research Methods

In this study, the method used is survey method, the collected data derived from primary data and secondary data. And collected primary data obtained through interviews with the respondents individually and as a group. Respondents in this study of 100 people, while the data for the secondary collected from various sources.

Population and Sample

The population in this study was all fishermen fishing in marine waters contained in the study site, penelitian dilakukan in two districts, the District and the District of North Rupert Bantan.

Table 1. The samples were taken from each village and sub-district.

No	District	Total population	Sample
1	Bantan	859	60
2	Rupat Utara	613	40
	TOTAL	1.472	100

Analisis Data

Analysis of Potential sustainable

1. Effort (fishing effort)

With a wide variety of fishing gear by fishermen in the Regency. Bengkalis, it is necessary to determine the standardization of fishing gear. To determine the value Fishing Effort, then the non-standard gear must be in conference to standard fishing gear by the formula:

$$\text{Fishing Effort} = \frac{n \cdot FPI}{FPS}$$

n = number of fishing gear

FPI = power factor capture fishing gear ari i (non-standard tool)

Fps = power factor standard fishing gear

d. BCR = GI / TC e. IRR = NI / I x 100% f. NPV (Net Present Value): $Bt - Ct / (1 + i)$

Analysis Potentials

- Optimal effort : $a / 2b$
- Potential sustainable (MSY): $\hat{A}^2 / 4b$
- Level Exploitation (T.Eks): $(T.prod/MSY) \times 100\%$

Business analysis

Business Analysis and fishing income

To calculate the feasibility, financial tested every effort in the third zone of catching up with the following formula:

a. To calculate the investment: $I = MT + TC$

b. Total cost (cost): $TC = FC + VC$

c. Gross income (gross income): $GI = \text{production} \times \text{price}$

RESULTS AND DISCUSSION

Bengkalis also consists of islands that are home and move society in general. Almost every sub-district in the Bengkalis Regency island economically have the potential for economic activities. Bengkalis district have great fishing

potential, the potential is stated in the data Department of Marine and Fisheries Bengkalis for 9 years (2005-2013). Marine fisheries production, fleet and fishing gear in Bengkalis are presented in Table 2

Table 2. fishing gear, fleet and marine fisheries production in Bengkalis Year 2005-2013

Year	Fishing gear (unit)	Boat (unit)	Ratio gear and boat	Production (ton)
2005	3.811	3.140	1,21	8.285,3
2006	4.447	4.215	1,06	8.468,8
2007	5.810	4.205	1,36	9.103,5
2008	5.670	4.882	1,16	10.083,9
2009	5.059	3.953	1,28	9.443,8
2010	5.132	2.997	1,71	9.291,9
2011	5.232	3.475	1,51	8.530,0
2012	5.364	3.453	1,55	8.735,0
2013	5.584	3.519	1,59	8.373,9

Source: Department of Marine and Fisheries Bengkalis, 2013

Fishing fleet fishing in Bengkalis in 2013 as many as 3,519 units with a composition of Boats Without Motors (PTM) 1,308 units (37%), Motor

Tempel 369 units (1%) and the Motor Vessel 1,842 units (52%). The number and type of fishing fleet Bengkalis District are presented in Table 3

Table 3. Number of marine fishing fleet in Bengkalis Year 2005-2013

Years	PTM (unit)	MT (unit)	KM			Amount (unit)
			0-5 GT	5-10 GT	>10 GT	
2005	1.039	315	1.595	191	-	3.140
2006	1.375	302	2.316	222	-	4.215
2007	1.363	304	2.308	230	-	4.205
2008	1.325	343	2.930	284	-	4.882
2009	1.334	388	1.978	253	-	3.953
2010	1.073	298	1.349	257	-	2.977
2011	1.159	311	1.742	263	-	3.475
2012	1.182	318	1.685	266	2	3.453
2013	1.308	369	1.560	277	2	3.519

Source: Department of Marine and Fisheries Bengkalis

Potential sustainable Bengkalis

Bengkalis fishery conditions in the district can be predicted number of fleets and fishing gear

for coastal fisheries and offshore pantaidapat seen in Tabel 4

Table 4. Predicted fleets and fishing gear in Bengkalis for inshore and offshore in 2005-2013

Year	Armada			Gear		
	Coast	Offshore	Total	Coast	Offshore	Total
2005	1.880	1.260	3.140	2.287	1.524	3.811
2006	2.770	1.445	4.215	2.668	1.779	4.447
2007	2.797	1.408	4.205	2.895	1.915	4.810
2008	2.927	1.955	4.882	3.402	2.268	5.670
2009	2.368	1.585	3.953	3.055	2.024	5.059
2010	1.777	1.200	2.977	3.079	2.053	5.132
2011	2.089	1.386	3.475	3.139	2.093	5.232
2012	2.070	1.383	3.453	3.218	2.144	5.364
2013	2.115	1.404	3.519	3.351	2.233	5.584

Source: The results of data analysis DKP Bengkalis 2005-2013

Production, amount of equipment, fleet, fishing effort (effort) and average catch per-unit apparatus (CPUE) marine fisheries Bengkalis, for 9 years presented in Table 5

Table 5. Production of fish, Total Gear, Fleet, Effort and CPUE in the waters Bengkalis district, years 2005-2013

Year	Production (ton)	Gear (unit)	Indeks confertion	Effort (unit)	CPUE	Level Eksploitation
2005	8.285,3	3.811	1,7	2.242	3,70	114,29
2006	8.468,8	4.447	1,7	2.616	3,24	116,82
2007	9.103,5	5.810	1,7	2.829	3,22	125,57
2008	10.083,9	5.670	1,7	3.335	3,19	139,10
2009	9.443,8	5.059	1,7	2.976	3,17	130,27
2010	9.291,9	5.132	1,7	3.019	3,08	128,17
2011	8.530,0	5.232	1,7	3.078	2,77	117,66
2012	8.735,0	5.364	1,7	3.155	2,77	123,67
2013	8.373,9	5.584	1,7	3.284	2,55	115,51

Source: The result of data analysis DKP Bengkalis 2005-2013

Fishery production and an increase of 0.32% per year, while the number of fishing gear an increase of 5.24% per year. The magnitude of the increase in the number of instruments from year to year is not followed by an increase in production increase is only 0.32% per year.

In Table 5 fishing effort (effort) increased by 5.24% per year, while the CPUE decline in average 4.40% per year. That is the fishing require greater cost to menangkapikan same. From the years 2005-2013 the addition of fishing gear / fishing effort that would require additional costs as well.

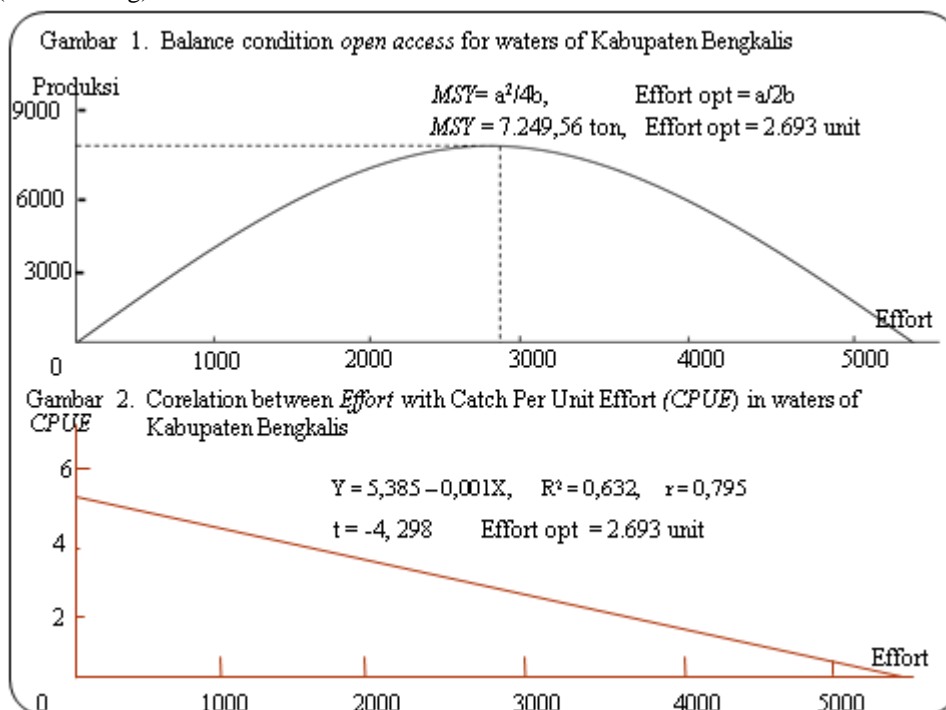
The fishing conditions Bengkalis

The relationship between fishing effort (effort) with the catch-per-unit effort (CPUE) can be described by a linear regression equation: $Y = 5.385 - 0,001X$ with correlation coefficients (R^2) of 0.632 and the value of $t = -4.298$. This means that the catch per unit effort is equal to 5.385 tons / year. If the fishing effort is zero, and there will be a decrease in the catch of 0,001 tons / year by increasing each of the business units.

The state of fish stocks at the beginning (No.) amounted to 1,292,400.00 tons of fish stock in 2013 (Nt) amounting to 1,284,021.10 tons. Maximum Sustainable Yield (MSY) of 7249.56 tons / year, meaning that the number of fish that may be caught in the waters Bengkalis each year is as much as 7249.56 tons. While the number of fish

that were captured in 2013 amounted to 8373.9 tons, meaning that the level of exploitation of fishery resources in the waters of Bengkalis has reached 115%. Means already experiencing excess fishing (over fishing). It can also be seen from

Effort optimal for Bengkalis waters is 2,693 units, while the number of fishing effort (effort) in 2013 has reached 3,284



Conditions Coastal Fisheries Bengkalis

Without Motor (PTM), Motor Boats Motor 3 Paste and small-sized GT 6-24 PK presented in Table 6

Conditions coastal fisheries are dominated by small fishing boats using a fishing fleet that is

Table 6. Production (cachth), catching effort (Effort) and catch per-unit effort (CPUE) for coastal waters, years 2005-2013

Year	Production	Gear	Index conversion	Effort	CPUE	Level Exploitation
2005	1.657,0	2.287	1,84	1.243	1,33	128,74
2006	1.693,8	2.668	1,84	1.450	1,17	131,60
2007	1.775,2	2.895	1,84	1.573	1,13	137,92
2008	1.915,9	3.402	1,84	1.849	1,04	148,86
2009	1.747,0	3.035	1,84	1.649	1,06	135,73
2010	1.772,5	3.079	1,84	1.673	1,06	137,71
2011	1.492,7	3.139	1,84	1.706	0,87	115,97
2012	1.489,9	3.218	1,84	1.749	0,85	115,37
2013	1.454,9	3.351	1,84	1.821	0,80	113,04

Source: The results of the data analysis DKP district. Bengkalis years 2005-2013

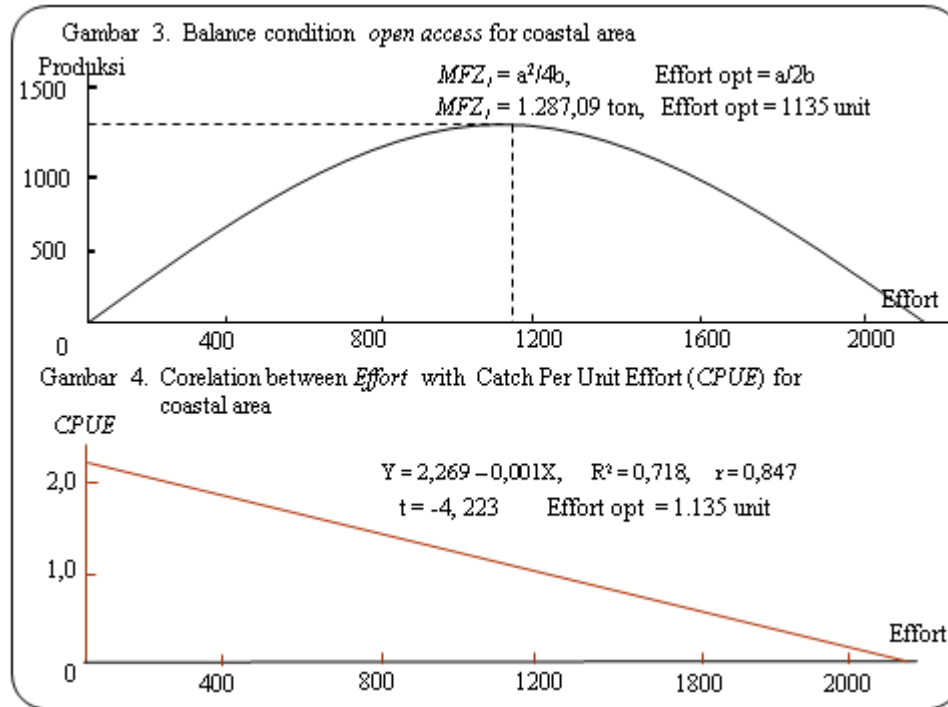
The relationship between fishing effort (effort) with the catch-per-unit effort (CPUE)

coastal fisheries, can be described by a linear regression equation: $Y = 2,269 - 0,001X$ with

correlation coefficients (R^2) of 0.718. This means that the catch per unit effort is equal to 2,269 tons / year. If the fishing effort is zero, and there will be a decrease in the catch of 0,001 tons / year by increasing each of the business units.

The state of fish stocks in coastal waters at the beginning (No.) amounted to 567,250.00 tons of fish stocks in tahun2013 (Nt) amounting to 565,795.10 tons. Maximum Sustainable Yield

(MSY) of 1287.09 tons / year. The amount of fish caught in coastal waters were highest in 2008 amounted to 1915.9 tonnes (148.86%). If viewed from the optimal value of fishing effort (effort opt) for the coastal waters are as many as 1,135 units, but without control effort in 2008 has reached 1,850 units, so the following year effort seen to decline by 11%.



Business analysis Bengkalis Coastal fisheries

Capital for business

The initial capital is often called the main capital. The initial capital costs are issued / invested by fishermen to build one unit of fishing effort and the costs incurred was not changed despite the change of production. The initial capital is

comprised of: 1) the purchase of a boat / ship, 2) the purchase of machinery, 3) the purchase of fishing gear, 4) the purchase of equipment. The initial capital (MA), which is issued to businesses sea fishing to coastal waters (Zone I) in Bengkalis presented in Table 7

Table 7. Capital of each type of fishing gear in coastal waters in Bengkalis

No	Type of tool	Type & amount off expenditures (Rp 000)				Other
		Armada	Gear	Boat engines	Roller Machine	
1.	Gill net (PTM)	1.000	1.000	-	-	50
2.	Gill net (MT)	15.000	20.000	15.000	-	300
3.	Trammel net (MT)	15.000	15.000	15.000	-	300
4.	Long line (MT)	10.000	10.000	10.000	-	300
5.	Gombang (MT)	10.000	15.000	10.000	-	300
6.	Ambai (MT)	4000	7.000	5.000	-	300

Source : The result of data analysis

Index values feasibility

The value of the index BCR, IRR and Income is strongly influenced by the amount of capital

invested and costs issued in fishing effort. The index value of fishing effort in pderairan beach is presented in Table 8

Table 8. Value index of marine fisheries in coastal waters Bengkalis

No	Gear	Boat	BCR	IRR	Income	Busines Condition
1	Gill net	PTM	2,08	45,26	6.500.000	Worthy
2	Gill net	MT (2 GT)	1,73	28,40	44.500.000	Worthy
3	Trammel Net	MT (2 GT)	1,92	38,24	33.000.000	Worthy
4	Long line	MT (2 GT)	1,78	29,20	24.000.000	Worthy
5	Gombang	MT (2 GT)	1,39	17,37	11.000.000	Worthy
6	Ambai	MT (2 GT)	1,80	29,85	8.000.000	Worthy

Source : The result of data analysis

Respondent data, fishing gear used fishing fleet Boats Without Motors (PTM), and Motor Paste (MT), Strength machines, cost of use, the

catch, gross income, net income, the index value Benefit cost of Ratio (BCR) and Internal Rate of Return (IRR) are presented in Table 9.

Table 9. respondent data capture tool, fleet, average costs, catches, BCR and IRR income every month

Water	Respondent Total (Person)	Gear	Boat	PK	Cost (000) Rp	Outcome (kg)	Gross Income (000) Rp	Net Income (000) Rp	BCR	IRR
Coastal Fisheries	37	Gill net	PTM		600	50	1.250	650	2,08	45,25
	20	Gill net	MT(2GT)	15	5.200	360	9.000	3.800	1.73	28,40
	18	T. Net	MT(2GT)	10	3.600	150	6.900	3.300	1,92	38,24
	7	Long line	MT(2GT)	8	2.700	160	4.800	2.100	1,78	29,20
	6	Gombang	MT(2GT)	8	2.800	130	3.900	1.100	1,39	17,37
	12	Ambai	MT(2GT)	6	1.000	60	1.800	800	1,80	29,85

Source: Results of the data analysis

The criteria of the condition of coastal waters Bengkalis based on the value and

sustainable potential to presented on regression in Table 10

Table 10. Output regression for coastal waters Bengkalis

Parameter Regression	Coefficient	q	Standart Error	t	F	R ²	r
$\beta_0(a)$	2,269		0,294	7,716			
$\beta_1(b)$	-0,001	0,001	0,003	-4,223	17,837	0,718	0,847

Y = 2,269 – 0,001X	
Production / C (2013)	= 1.454,90 ton
No = (a/q) x 250 (operating days per years)	= 567.250,00 ton
Nt = No-C	= 565.795,10 ton
MSY= a ² /4b	= 1.287,09 ton/year
Optimal effort = a/2q	= 1.135 unit
% Exploitation level = C/MSY(2008)	= 148,86%
Average of exploitation level Coastal	= 129,44%
BCR	= 1,98
Average net income	= Rp 2.054.500,-/month

Source: Results of the data analysis

CONCLUSIONS AND RECOMMENDATIONS

Fishery conditions in Bengkalis already indicated excess fishing (over fishing) with the sustainable potential of 7249.56 tons / year, with the rate of exploitation in 2013 amounted to 115.51%, and the highest in 2008 at 139.10, with fishing effort (effort) in 2013 already exceed the optimal limit is 122%. Business is still profitable with BCR value = 1.98, because the catch of shrimp and fish species of high economic value. As for inshore waters Bengkalis more severe condition where the level of exploitation in 2008 has already reached 148.86% with fishing effort (effort) amounted to 1,850 units or 163%. While the effort which ideally is 1,135 units this means that already in excess of 63%.

For the development of fisheries Bengkalis, the necessary arrangements with the restriction of fishing effort, namely the addition of fishing gear, especially for coastal waters Bengkalis. Similarly to exploit offshore waters by using high-tech fishing fleet.

REFERENCES

1. Amiadji and Santoso. H. 2008. Optimization of fishing on boats tuna Longliner with the support of satellite systems. Surabaya Institute of Technology, Surabaya.
2. Badruddin, NN Wiadnyana, B.Wibowo, 2005. Deep water exploratory bottom long lining In the waters of the Arafura Sea. *Indonesian Fisheries Research Journal*, 11 (1): pp 41-46.
3. Badruddin, Wudianto, N.N. Wiadnyana, and S. Nurhakim, 2006. Deep sea fish resources Diversity and potential in the waters of western Sumatra of the Eastern Indian Ocean. *Indonesian Fisheries Research journal*. 12 (2): pp113-12.
4. Bailey and Brorsen (1989). Price asymmetry in Spatial Fee Cattle Markets. *Western Journal of Agriculture Economics*, Vol. 14. pp 246-252.
5. Brill, R.W. et al, 1999. Horizontal Movements and depth adult Yellow fin Distribution of large tuna (Thunnus albacores) near the Hawaiian Islands, recorded Using Ultrasonic telemetry: Implications for the physiological ecology of pelagic fishes. *Marine Biology* (133) pp 395-408
6. Charles, A.T., 2001. Sustainable Fishery Systems. Blackwell Science Ltd., London
7. Chodriyah, U., W.A. Pralampita, 2010. Study Mini Purse Seine fishing in the Great Lakes Fish Landing Sites Rembang, Central Java. *Indonesian Fisheries Policy Journal*, Vol. 2(2): 91-99
8. Dahuri, R., 2001. The potential and problems of development of coastal regions of Indonesia, and oceans kajiansumberdayapesisir Center IPB, Bogor.
9. Fauzi, A. and S. Anna, 2005. Modelling of fisheries and marine resources for Policy analysis, Scholastic main library, Jakarta.

10. _____, 2005. Approach to Fisheries and Marine Resources Policy Analysis. Gramedia Pustaka Utama, Jakarta.
11. Gulland, J.A., 1983. Fish Stock Assessment. Food and Agriculture Organization of the United Nations, Rome.
12. Hadiyanto, Supriandi, S. John, and L.I. Amin, 2009. Analysis of the sustainability of Plantation People in Border Regions Nunukan Kalimantan Sebatik Island East district, *Agro Economic Journal*. 25(2): 218-229
13. Hermawan, M., 2006. Small-Scale Fishing Sustainability (*case coastal fisheries in Serang and Tegal*). Dissertation Program S-3 Graduate School of IPB, Bogor.