ISBN 978-979-792-546-8

Bioeconomic Analysis of Capture Fisheries in Bengkalis Regency

Pareng Rengi*, Usman M. Tang and Yusni Ikhwan Siregar

Faculty of Fisheries and Marine Science, University of Riau, Pekanbaru 28 293
Email: parengrengi@ymail.com

ABSTRACT

Bengkalis coastal and offshore seas are well known for high fishing productivity. Fisheries sector had a significant contribution to regional economy, thus the development of fisheries become important for local government policy to increase fishermen welfare. However, it was indicated that the Bengkalis fishing production showed a decreasing trend which suggested an overfishing status. The present research aimed to analyze the fisheries resources state in Bengkalis Regency, and performed a Shift Share (SS) Analysis as well as Location Quotient (LQ) Analysis, to determine the trend of fisheries sector to Bengkalis economy. Furthermore, Bioeconomic Analysis and Institutional Analysis were also carried out to describe the institutional aspect. Apparently, Parang-parang (*Chirocentrus dorab*) have been over exploited. Bioeconomic analysis revealed that exploitation rate of Parang-parang reached 263%. Natural growth level of Parang-parang was calculated of 1,142, capture capacity coefficient was 0,0000002721 and carrying capacity coefficient was 168.882,96. Bioeconomic analysis result of Kurau (*Eleutheronema tetradactylum*) was overfishing 33,42%. Natural growth level of Kurau was 0,614, capture capacity coefficient was 0,00000020 and carrying capacity coefficient was 28.820. Fisheries management policy of this economic resources had better used MEY regime. Based on LQ and SS analysis, it appeared that fisheries sector had high effects to regional economic so that fisheries development provide significantly contribution to public welfare opportunity. The degradation of marine ecosystem and high exploitation (overfishing) become a serious problem. The role of social culture (local wisdom) should be revitalized. Stakeholders involved in fisheries development policy were fiseheries office, Bengkalis Parliament, Forestry Departement and Bengkalis Environmental Agency.

Keywords: *Policy analysis, Fishery resources, Bioeconomic, Bengkalis*

INTRODUCTION

Adjacent to Malacca straits, Bengkalis marine fisheries sector was strategic in term regional economy and out-border of Indonesian territory. This regency had coastal area with high biodiversity of marine and high fisheries nature resources. According Nontji (2005), Fisheries Office 2008, Bengkalis with ocean area 10.497,3 km^2, calculated a potency of 276.030 ton and have exploited 389.280 ton. Analysis on capture fisheries in Bengkalis showed that Bengkalis's waters was exploited 257,5% or over of 2,5 times from MSY. According to partial fish, only a little of pelagic fish like *Belanak, Bawal, Selar* that have exploitation level of 99 %. On the other hand, big pelagic (*Tenggiri, Parang-parang)* was exploited 383,8 %, demersal fish *(kurau, debuk, siakap)* was exploited 414,9 % (DKP Bengkalis, 2008). For sustainable fisheries management purpose, a series of study consisting of ecology, economy, social as well as bionomic analysis including Shift Share analysis, LQ analysis, and institutional analysis, were carried out.

Aimed of this research was identified characteristic of fisheries resources in Bengkalis and determined potention of fisheries resources in Bengkalis.

MATERIALS AND METHODS

Data collection on oceanography (physical, chemical) were dane by field observation which has been done 7 month (July 2013- February 2014). Fish biology sample were collected from four stations or fish landing of TPI Tanjung Medang (ST 1), Meskom Village (ST 2), Selat Baru Village (ST 3) and Pambang Village Bantan District (ST 4). Social data were obtained by interview, and quistionaire's distribution to respondent of stakeholder. Respondent were determined by stratified random sampling method and expert respondent were established purposively.

Data analysis of Shift Share analysis, LQ analysis, and institutional analysis were performed to determine economy bases of the Bengkalis.

ISBN 978-979-792-546-8

RESULTS AND DISCUSSIONS

Characteristic of Fisheries Resources. Characteristics of Bengkalis coastal seas dealing with physical and chemical oceanoraph were shown in Table 1.

Table 1. Physialc and Chemical properties of Seawaters of Bengkalis.

No	Parameter	Average Value Measured	Water Quality Standard (KLH/ and PP No. 82/2001)
1	Stream Velocity (Cm/s)	11.06 cm/s	
2	Temperature ('C)	30.33 'C	28-32 'C
3	Turbidity (NTU)	0-66.4 NTU	
4	Salinity (psu)	22.8-29.8 psu	6-29 psu
5	pH	7.13-7.34	06-Sep
6	Dissolved Oxygen (mg/L)	3.65–8.29 mg/L	0-6
7	Total Dissolved Solid (mg/L)	22–28 mg/L	10.001- 100.000 mg/L
8	Total Suspended Solid	8-260 mg/l	70 mg/l
9	Nitrate (mg/L)	0.004-0.112 mg/L	Oligotrofik
10	Phosphate (mg/L)	0.003- 0.01 mg/L	Oligotrofik
11	High Lead Metal (ppm)	0.215-0.382 ppm	0.03-1
12	High Cadmium Metal (mg/I)	0.012-0.023 mg/l	0.01
13	High Zinc Metal (mg/L)	0.024	0.05-2

Source : Primary Data (2013)

Table 1 showed that some waters condition (physical and chemical parameter) in Bengkalis in normal condition, but there somes condition have degradation and out of water quality standard. Potention of Mangrove's ecosystem size in Bengkalis according to density criteria by hose tightly density, medium, wide appart, very wide appart showed in Table 2.

Table 2. Mangrove's Ecosystem Size According Density Level in Bengkalis Regency

District	Size (ha)			
	Remote	Medium	Tight	Total
North Rupat	3.192	9.591		12.783
Rupat	5.806			5.806
Bantan		5.584		5.584
Bengkalis	77	4.181		4.258
Total	11.660	33.000	1.410	46.070

Source : Image Satelite Analysis, 2013

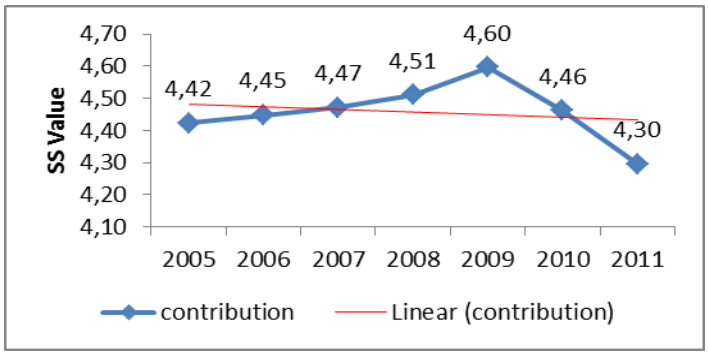

Figure 1. Trend of Fisheries Sector Contribution in Bengkalis

ISBN 978-979-792-546-8

Fisheries was one of agriculture sub-sector in Bengkalis that had high economic potention. Series of contribution value to regional economic acccording Regional Gross Domestic Product (RGDP) of Bengkalis (2005-2011) indicated by shift share analysis. Contribution trend of fisheries sub sector showed in Figure 1.

Figure 1 showed a decreased of contribution for 2010-2011 which presumably due to decreased of fisheries of production and revenue. Such decreasing trend of contribution were of main concern local government and by stakeholder in relation to proper policy and regulation. According LQ analysis, fisheries sub-sector was basic sector in the period of 2005-2010 (7 years) (Fig 2). This fisheries sector according Syafrizal (2008) had high competitive advantage and was sector exogenous that can increased regional economic growth.

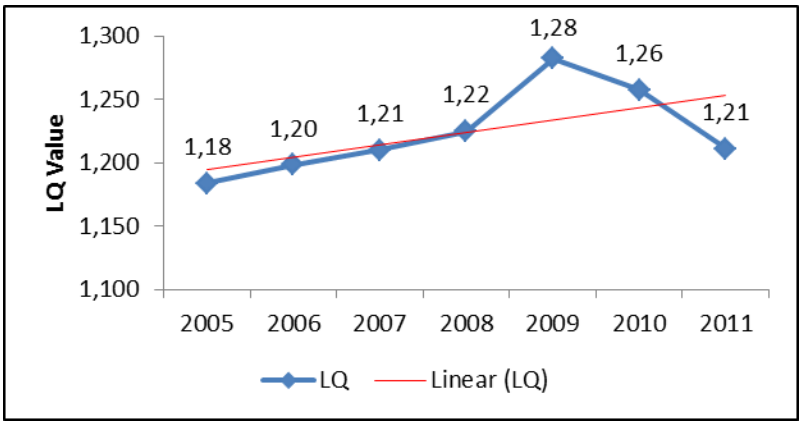

Figure 2. Trend of LQ Value of Fisheries Subsector in Bengkalis

Bengkalis's fisherman consist of local ethnics and imigrants (chinenes). Local ethnic usually had role as small-scale fisherman, whereas imigrant had capitall intensive fishing bussiness. Share result system between fisherman and businessman was marketing channel or direct share result system in field. In order to reach balanced all of system, it need integrated management by all stakeholder. According Aldon et all (2011), strong and organized partnership between society, fisherman, and policy maker need to be managed.

Stakeholder analysis (Schmeer 2007) define as systematic process to collected and analyzed information qualitatively in determining, main interest in policy formulation. Stakeholder list and their strong and influenced as shown in Figure 4.

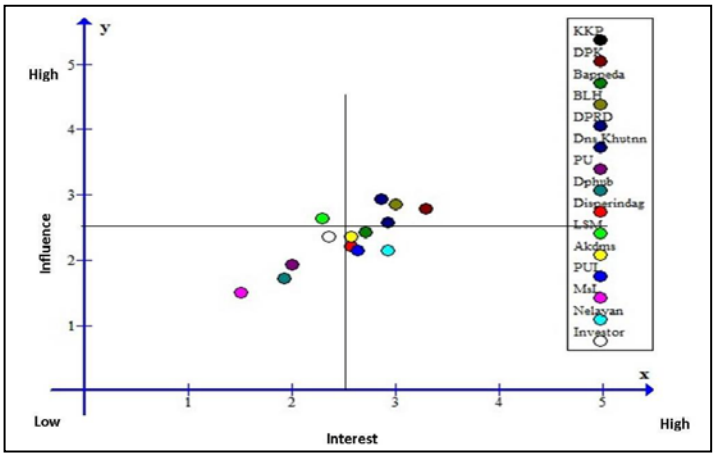

Figure 4. Matriks of Stakeholder's Interest and Influenced

ISBN 978-979-792-546-8

According stakeholder analysis result, primary stakeholder as policy makers of sustainability fisheries was DKP Bengkalis (Department of Marine and Fisheries), DPRD Bengkalis (Parliament), Forestry Departement and BLH (Environmental Agency).

Fisheries Resources Potency. In order to show potention of Bengkalis's fisheries, it need bioeconomic analysis to provide the actual value every fisheries management regime. Bioeconomic analysis of fisheries resources in this research was cariied out for Parang-parang and Kurau. This type was fisheries resources apparently show a high contribution in Bengkalis Regency. Secondary data got from DKP and BPS (Statistics). Type of fishing gear for bionomic modelling was drift gillnet, longline. Production and effort data was collected of a series 8 years. This data have analyzed by bioeconomic analysis from 2005 to 2012.

CPUE Parang-parang and Kurau had a fluctuative value. According to Spare and Venema (1998), CPUE w as as overfishing indexs in waters. So that value showed opportunity to production increased because avaiable of fish stock in catch location. Effort of production increased must be concerned sustainability factors. Policy and regulation about Parang-parang and Kurau resources in Bengkalis waters and WPP (Fishery Management Area 571) are important to reach optimalization and sustainability CPUE showed in Figure 5 and 6.

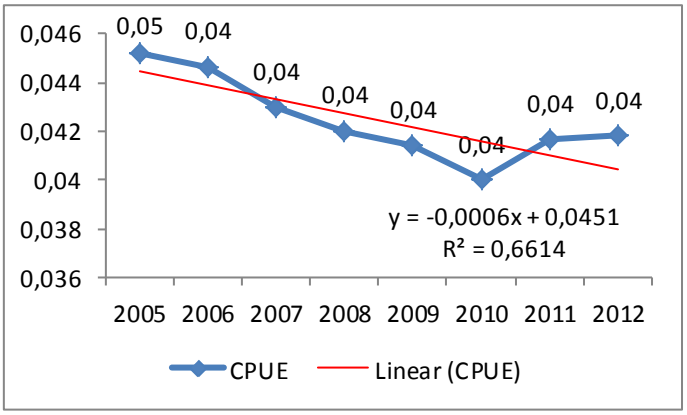

Figure 5. Trend of CPUE value of Parang-parang (*Chirocentrus dorab*)

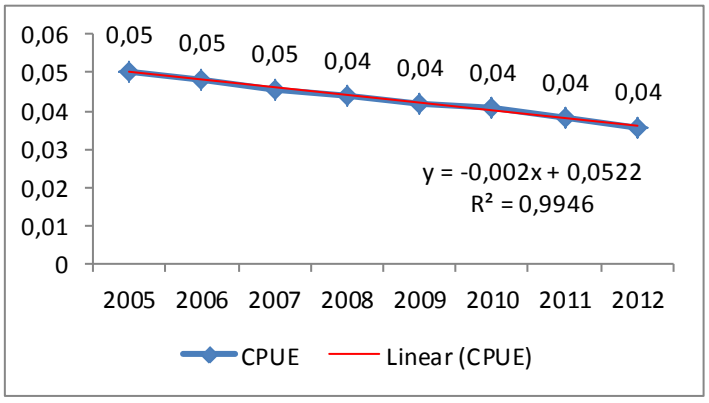

Figure 6. Trend of CPUE value ofKurau (*Eleutheronema tetradactylum*)

MSY was estimated by a logistic growth functionmodel. Effort value, actual production and sustainable production of Parang-parang in Bengkalis showed in Table 3.

Table 3. *Effort*, Actual Production and Sustainable Production of Parang-parang in Bengkalis Regency

No.	Years	*Effort* (Et)	Actual Production (ton)	Sustainable Production (ton)
1	2005	106.962	4.835,77	4.789,66
2	2006	99.485	4.442,00	4.462,97
3	2007	219.095	9.416,71	9.541,77
4	2008	408.235	17.154,03	16.933,28
5	2009	410.638	17.012,74	17.022,16
6	2010	465.083	18.603,31	19.001,73
7	2011	416.515	17.356,17	17.238,96
8	2012	416.202	17.397,23	17.227,42

Source : Data Analysis Result, 2013

Table 3 showed that most of Parang-parang's actual production was over of sustainable potention. It suggest a dangerous for Parang-parang's sustainability. MSY function was influenced by effort with biology r, q, K quadratic parameter. Effort value have influenced by sustainable production and effort of captured fisheries resources in Bengkalis.

Table 4. Effort, Actual Production and Sustainable Production of Kurau in Bengkalis

No.	Years	*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

Source : Data Analysis, 2013

Carrying capacity was influenced by intrinsik growth (r). Maximal growth was a half from carrying capacity or k/2. This level named MSY. Bioeconomic analysis of Parang-parang and Kurau were presented in Tabel 5 and 6.

Table 5. Bioeconomic Analysis Result of Parang-parang

No.	Variable	*Sole Owner* / MEY	*Open Access*	MSY
1	x (ton)	87.862,45	6.841,94	84.441,48
2	h (ton)	48.116,93	7.493,83	48.196,03
3	E (trip)	2.012.756	4.025.512	2.097.741
4	π (million Rp)	656.114,24	-	654.944,50

Table 6. Bioeconomic Analysis Result of Kurau's Resources

No.	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 (juta Rp)	214.938,80	(0,00)	213.959,61

Source : Data Analysis, 2013

Rent value of parang-parang's resources in open access condition was zero, suggesting that Parang-parang's resources in Bengkalis was open to competition, accordingly the rent value was

ISBN 978-979-792-546-8

zero. Rent value in MEY was highest value among the other value. Fish stock in MEY was the most. It implied that management of Parang-parang's resources in Bengkalis staticly were better managed by MEY regime (Figure 7).

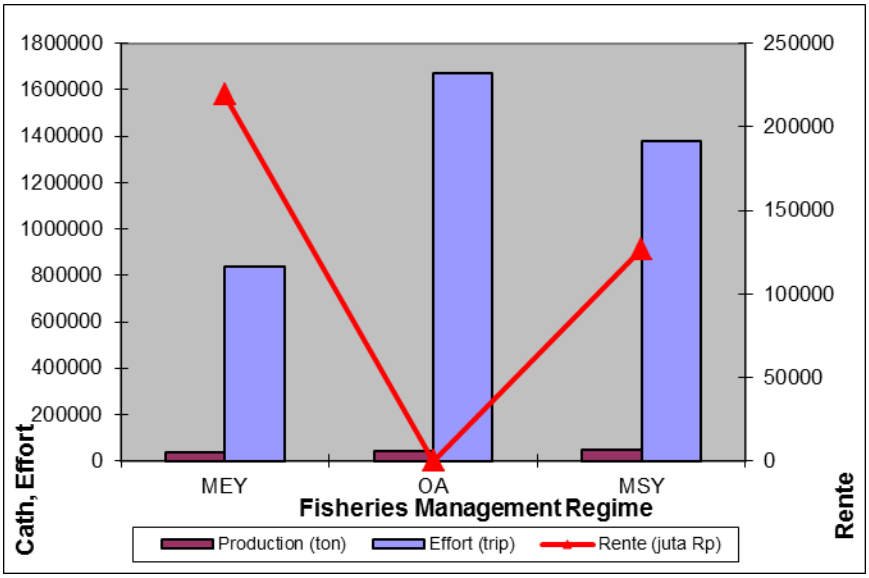

Figure 7. Regim of Parang-parang's Resources Management

Rent value of Kurau's resources in open access was zero. MEY was the best management regime that showed in Figure 8. Rent value in MEY was the highest value also had influenced by fish stock.

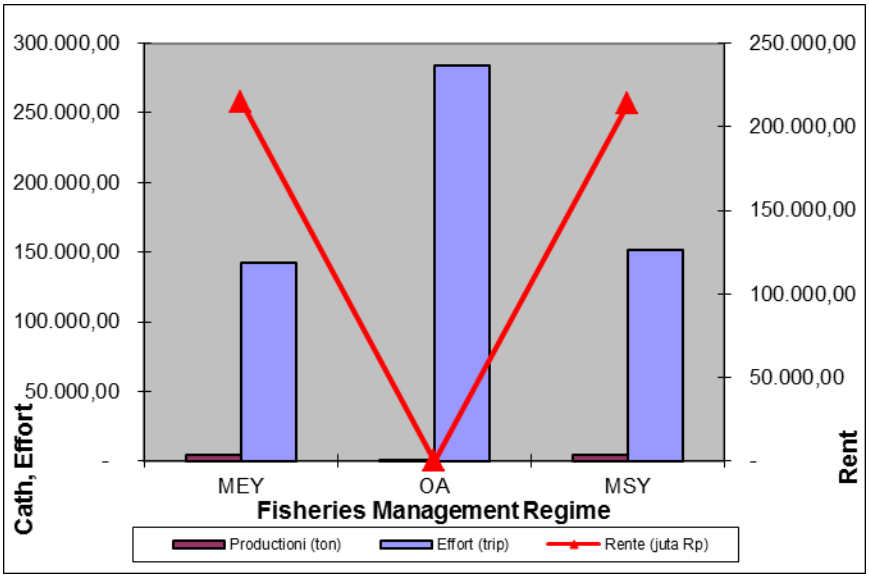

Figure 8. Regime of Kurau's Resources Management

CONCLUTIONS

Parang-parang (*Chirocentrus dorab*) fish landing have been over exploited with exploitation rate of 263%. Natural growth level of Parang-parang was calculated of 1,142, capture capacity coefficient was 0,0000002721 and carrying capacity coefficient was 168.882,96. Bioeconomic analysis result of Kurau (*Eleutheronema tetradactylum*) was overfishing 33,42%. Natural growth level of Kurau was 0,614, capture capacity coefficient was 0,00000020 and carrying capacity

coefficient was 28.820. Fisheries management policy of this economic resources had better used MEY regime. Based on LQ and SS analysis, it appeared that fisheries sector had high effects to regional economic so that fisheries development provide significantly contribution to public welfare opportunity. The role of social culture (local wisdom) should be revitalized. Stakeholders involved in fisheries development policy were fiseheries office, Bengkalis Parliament, Forestry Departement and Bengkalis Environmental Agency.

REFERENCES

Aldon MET, AC Fermin, RF Agbayani. 2011. Socio-cultural Context of Fishers' Participation in Coastal Resources Management in Anini-y, Antique in West Central Philippines. *J Fisheries Research. Elsevier.* 107:112-121.

Department of Marine and Fisheries, 2008. Perhitungan Potensi Perikanan Laut Kabupaten Bengkalis. DKP Bengkalis Research.

Nontji, A. 2005. Laut Indonesia. Djambatan. Jakarta.

Schmeer K. 2007. Stakeholder Analysis Guidelines. In: Schribner ES and Brinherhoff D (editor). Policy Toolkit for Strengthening Health Sektor Reform 2: 1-43. Bethesda MD. Abt Associates Inc.

Sjafrizal, 2008. Ekonomi Regional Teori dan Aplikasi. Padang. 329 hal.

Sparre P, Venema SC. 1998. Introduction to tropical tuna assessment Part I. Manual Fish.Tech.Paper. Food and Agricultural Organization (FAO).