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Linking indicators for ecosystem approach to fisheries management and management of marine protected area effectiveness in Anambas Island, Indonesia

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Abstract. Marine Protected Area (MPA) Anambas is a conservation area under the governance of LOKA KKPN Pekanbaru, Riau Province with potential types of ecosystems and abundant fish resources. The existence and sustainability of fish resources is one of the keys to successful fisheries management in the Anambas MPA as newly defined conservation area. Therefore the evaluation needs evaluation for fisheries condition and status of marine protected area performance management. This study aims to evaluate and compare the assessment of fisheries management status using Ecosystem Approach for Fisheries Management (EAFM) indicator and Effectiveness status using Management effectiveness of Aquatic, coastal and small Island Conservation Area (E-KKP3K) in MPA Anambas. Assessment of EAFM indicators result aggregate value is equal to 211. It means, the condition of Anambas Marine Protected Area included in good category. While the results of performance evaluation using E-KKP3K are on green rankings because all questions are answered in the green ranks. It means, Anambas Marine Protected Area has managed with minimum as newly established MPA. The Management strategy carried out on indicators of fish resources, habitats and ecosystems, fisheries technology, economic, social and institutional are in bad and medium category.
Key Words: Marine Protected Area, EAFM, E-KKP3K, Anambas Island.

Introduction. Marine Protective Area (MPA) is a protected area, managed base on the zoning system, to realize the sustainable fisheries resources and environment management. Protected area on this definition includes not only the sea waters but also public waters, including rivers and lakes. MPA has three main pillars, namely protection, preservation, and utilization. In addition to protecting biodiversity, effectively MPA management will support sustainable fisheries management and economic improvement through marine ecotourism activity (PISCO 2002; Gell & Roberts 2003). Zoning activities did to support the formulation of effective and sustainable MPA management. This formulation involves biophysical, socio-economic-cultural, governance aspects (Bengen et al 2003; White et al 2006) and funding aspect (Susanto 2005). Therefore determination of the MPA must meet the following criteria:

a) Ecology or biophysical, including biodiversity, naturalness, ecological relevance, representativeness, uniqueness, productivity, migration area, rare fish habitat, fish spawning ground, and nursery ground;
b) Social and cultural, including the level of community support, potential conflicts of interest, potential threats, local wisdom and customs; and
c) Economy, including the importance of fisheries, recreation and tourism potential, esthetics, and reaching the region.

Based on the Convention on Biodiversity (CBD 2010) 10th in Nagoya, Japan in 2010, which mandates every state to allocate 10% of its territorial sea area as Marine

Protective Area, so that CBD require Indonesia to set aside about 31 million hectares of marine waters as MPA. MPA's in Indonesia is growing rapidly since 2003, which reached from 5.4 million hectares to 15.78 million hectares in 2012 (Ruchimat et al 2012).

One of the MPA's are established by the Government of Indonesia is Anambas waters based on Marine and Fisheries Decree No. 35 of 2013. Based on aspect of governance, Anambas under the authority of Pekanbaru National Water Conservation Workshop (NWCW). This management is not only under directly central government authority but also under local government. For implantations, existence of the MPA need to pay attention to the rules of utilization and management that assures the availability and continuity while maintaining and improving the quality of the value and diversity of existing resources. Sustainable fisheries management can be achieved through the ecosystem approach to fisheries management (Ecosystem Approach to Fisheries Management [EAFM]). EAFM is a concept that balance between socio-economic objectives, in the management of fisheries (fishermen's welfare, justice utilization of fish resources) taking into account the knowledge, information and uncertainty about biotic components, abiotic and human interaction in the aquatic ecosystem through an integrated fisheries management, comprehensive and sustainable (MMAF 2012).

Table 1

Status of Sustainable Marine Protected Area/KKP Management

No	*Names of KKP*	*Existing total area (Ha)*	*Regulating decree*		*Status*	
			Proposal	*Enhancement*	*2012*	*2014*
1	KKPD Berau, East Kalimantan	285,266	Peraturan Bupati No. 516/2013 dated 2/09/2013	N/A	Red 100% Yellow 50%	Red 100% Yellow 91% Green 29%
2	TNP Sawu Sea, East Nusa Tenggara	3,355,353	KEP.38/MEN/2009	No.5/KEPMEN-KP/2014	Red 100% Yellow 75%	Red 100% Yellow 100% Green 86% Blue 39%
3	TWP Gili Matra, West Nusa Tenggara	2,954	SK Menhut No.99/Kpts-II/2001 tanggal 15 Maret 2001	KEP.67/MEN/2009	Red 100% Yellow 75%	Red 100% Yellow 100% Green 38%
4	TWP Anambas, Riau Kepulauan	1,262,686	KEP.35/MEN/2011	No. 37/ KEPMEN-KP/2014	N/A	Red 100% Yellow 100% Green 62% Blue 5%
5	KKPD Nusa Penida, Bali	20,057	SK Bupati Klungkung No 12/2010	No.24/KEPMEN-KP/2014	Red 100% Yellow 75%	Red 100% Yellow 100% Green 100% Blue 49 %
6	KKPD Kei Kecil Barat, Maluku	150,000	SK Bupati Maluku Tenggara No.162/2012.	N/A	Red 100% Yellow 25%	N/A

Source: LAKIP 2013 Ditjen [KKJI-MMAF] and Willoughby et al 2015; N/A = not available.

To measure effectiveness of the sustainable management, the Ministry of Marine and Fisheries Affairs through the Directorate General KP3K establish an evaluation system for existing MPA's performance as E-KKP3K (Management Effectiveness of Aquatic, Coast and Small Island Conservation Area). E-KKP3K is a standard evaluation tool, was approved under a Directorate General Degree of KP3K, KKP, (KEP 44/KP3K/2012) on the Technical Guidelines for Evaluating the Management Effectiveness of Aquatic, Coastal and

Small-Islands Conservation Areas. The E-KKP3K can be used as a basis for measuring the competence standards for MPA managers. Moreover, it is a good Decision Support System (DSS) which can be applied to any MPA in Indonesia (KP3K-KKP 2013).

Anambas MPA has been evaluated by the MMAF as the progressing MPA in Indonesia. Table 1 reported summary of MPA Performance result. From Table 1 it can be seen that there has been significant improvement of the conservation areas management status in some MPAs. The most significant achievement can be inferred from the case of TNP Savu Sea (number 2 in the Table) of which the management status has been improved from yellow level to blue level (39%) between 2012 and 2014.

Management status of MPA using E-KKP3K defined in to five rank, from first rank (KKP Initiated) to fifth rank (KKP Self-Reliant) (Kasasiah 2013) where result of assessment will show next strategy is needed to apply like technical guidelines procedure. Whereas EAFM describes in assessment of specific indicator from regional biophysical aspects, so it can identify indicators need to be improved from each domain. So, the purpose of this study is to evaluate and compare the assessment of fisheries management status using EAFM indicator and effectiveness status E-KKP3K in MPA Anambas.

Material and Method

Field sampling. The research was conducted in March 2015 to June 2015. The study was conducted at Anambas MPA (Figure 2). Data collected in this study consisted of primary data and secondary data. The primary data obtained through direct observation, interviews using interview in-depth interview. Information about governance and institutional aspects were collected using manual measuring instrument Conservation Area Management Effectiveness Evaluation of Coastal and Small Islands (E-KKP3K) built by the Ministry of Marine Affairs and Fisheries established by Decrees No. KP3K Kep.44/ KP3K/2012. Information about existing fisheries at research study was collected using EAFM indicators.

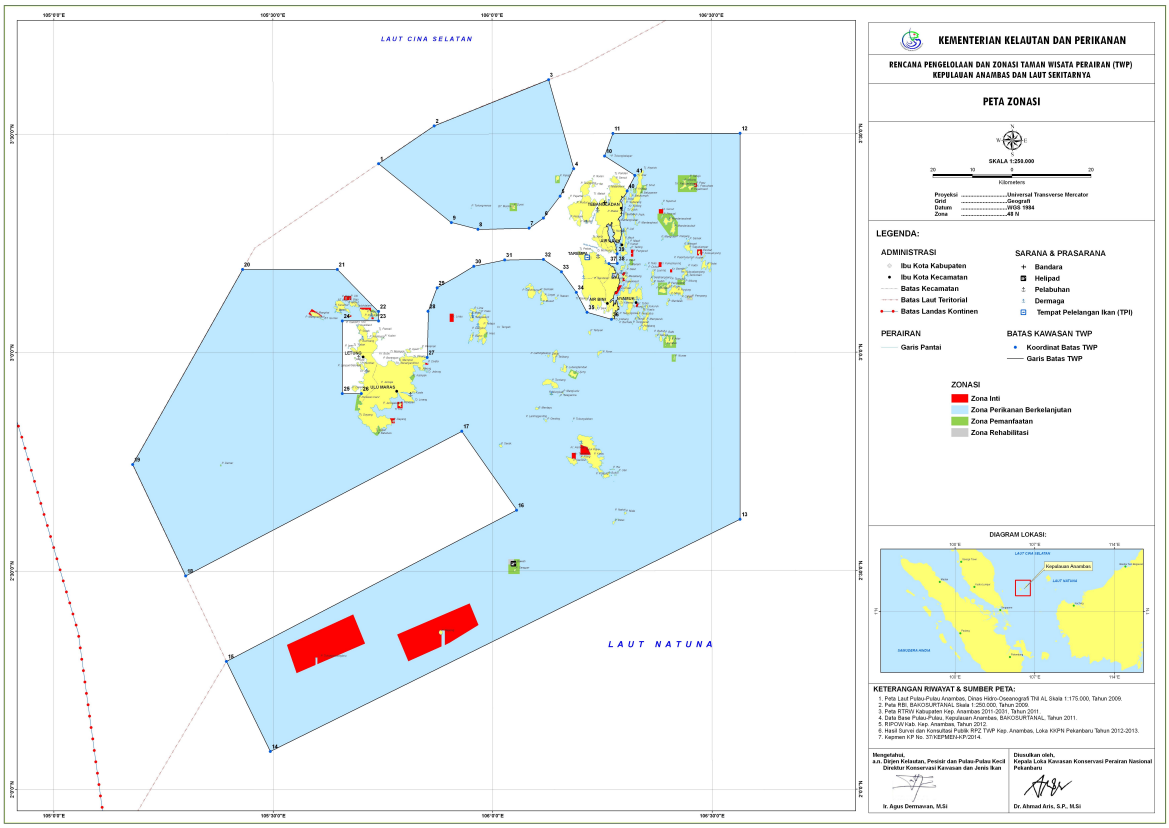

Figure 1. Map of Marine Protected Area in Anambas Island Region.

Analysis of marine protected area management performance status. Data Analysis to determine management status using the E-KKP3K, by answering 74 questions divided into 15 groups of questions. Status management is divided into five levels, namely the Water Conservation Initiated (ranked Red), established (rank Yellow), Managed Minimum (ranked Green), Managed Optimum (ranked Blue), and Independent (Gold rank) contained in Table 2.

Table 2

Question criteria in Area Management Status using E-KKP3K

Rank			*Criteria*	*Number of questions*
Red (1)	KKP/KKP3K Initiated	1	Initiatives proposal	8
		2	Area identification and inventory	
		3	Reservation and conservation area	
Yellow (2)	KKP/KKP3K Established	4	Management organizational unit and personnel	11
		5	Management and zoning plans	
		6	facilities and infrastructure to Supporting management	
		7	Management funding support	
Green (3)	KKP/KKP3K Managed minimally	8	Approval of management plan and zoning	20
		9	Management standard operating procedure (SOP)	
		10	Implementation of the management and zoning plan	
		11	Designation of water conservation area	
Blue (4)	KKP/KKP3K Managed pptimally	12	Setting the area boundary	28
		13	Institutionalization	
		14	Regional resource management	
		15	Socioeconomic and cultural management	
Gold (5)	KKP/KKP3K Self-reliant	16	Improving people's welfare	6
		17	sustainable financing	

To determine the outcomes in each rank, the following equation is used:

$$Achievement = \frac{Number\ of\ question\ that\ answer\ 'Yes'}{Number\ of\ question\ in\ rank\ evaluation} \times 100\%$$

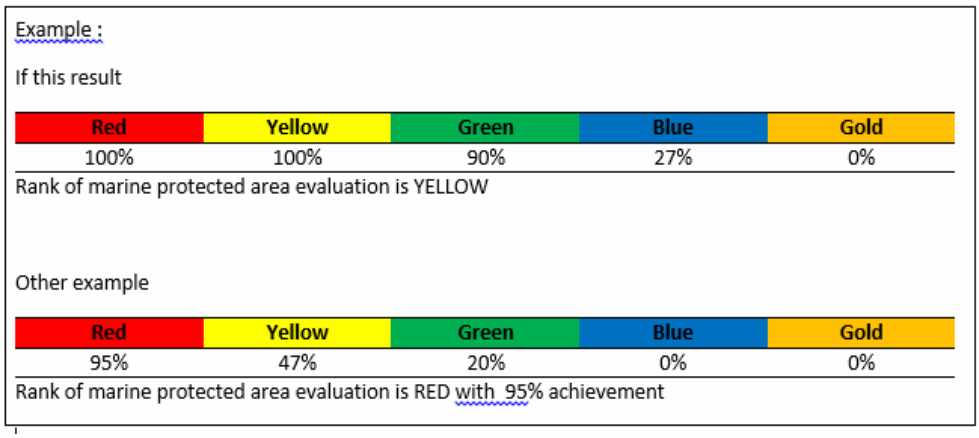

Figure 2. Example the ranking of marine protected areas management determination using E-KKP3K (MMAF 2012).

To determine the ranking of examined conservation areas using simple rules, where a region's rank indicated by the rank which has perfect score percentage (100%). E-KKP3K adopt the principle of "built building blocks heap" (building block) which required further rank could not be achieved if the activities in the previous rank have not been completed or achieved all (MMAF 2012). Some examples of ranking are presented in Figure 2.

Analysis of fisheries condition. EAFM is understood as a concept of balance between the socio-economic objectives in fisheries management (fishermen's welfare, justice utilization of fish resources) taking into account the knowledge, information and uncertainty about biotic components, abiotic and human interaction in the aquatic ecosystems through an integrated fisheries management, comprehensive and sustainable. EAFM Analysis is one of multi-attribute approach with tendency or performance indication about ecosystem conditions approaches generally (MMAF 2012).

In this context, some of the principles that must be considered in the implementation of the ecosystem approach in fisheries management (EAFM) include: (1) the fishery should be managed at the limits of an impact that can be tolerated by ecosystems; (2) ecological interactions between fish resources and ecosystems must be preserved; (3) management software should be compatible for all distribution of fish resources; (4) the precautionary principle in fisheries management decision-making process; (5) The governance of fisheries including the importance of ecological systems and human systems (FAO 2005).

This research using EAFM to fisheries condition assessment with 28 indicators divided into six domains. Every domain has different weight and criteria assessment by rank like explained in Table 3.

Table 3

Weight and criteria indicator assessment EAFM

Domain	*Indicator*	*Criteria*	*Weight*
Fish resource	Raw CPUE	1 = dropped sharply (average decrease > 25% per year) 2 = decreased slightly (average decrease < 25% per year) 3 = stable and increasing	42.33
	Fish size trend	1 = trend of average fish size caught is getting smaller 2 = size trend relative fixed 3 = size trend the bigger	22.33
	Proportion juvenile caught	1 = an awful lot of (> 60%) 2 = a lot (30 - 60%) 3 = few (<30%)	17.33
	"Range Collapse"	1 = fishing ground becomes too far, depend on target species 2 = fishing ground far, depend on target species 3 = fishing ground relative fixed, depend on target species	7.33
	Species of ETP	1 = there are species of ETP caught but not released 2 = caught but released 3 = no one species of ETP caught	10.33
Habitat & Ecosystem	Quality of waters	1 = > exceed the corresponding quality raw of KepMen LH 51/2004 2 = equal the corresponding quality raw of KepMen LH 51/2004	20

Domain	*Indicator*	*Criteria*	*Weight*
Habitat & Ecosystem	Quality of waters	3 = under the corresponding quality raw of KepMen LH 51/2004 1 = chlorophyll concentration a >10 mg/m3) 2 = chlorophyll concentration a 1-10 mg/m3 3 = chlorophyll concentration a <1 mg/m3	20
	Status of seagrass	1 = low cover, ≤30%; 2 = medium cover, ≥ 30 - < 60%; 3=high cover, ≥ 60% 1 = low diversity (H' < 3,2 atau H' < 1), the number of species < 3 2 = middle diversity (3,20<H'<9,97 or 1<H'<3), the number of species 3 - 5 3 = high diversity (H'>9,97 or H'>3), the number of species > 5	15
	Status of mangrove	1 = low cover, < 50% 2 = medium cover, ≥ 50 - < 75% 3 = high cover, ≥ 75 %	15
	Status of coral reefs ecosystem	1 = low cover, <25% 2 = medium cover, ≥ 25 - < 50% 3 = high cover, ≥ 50%	15
	Unique habitat	1=unknown habitat of unique 2 = there is habitat of unique but not managed unwell; 3 = there is habitat of unique but managed well	15
	Climate change on habitat and waters condition	> State of knowledge level: 1 = no study of the impact of climate 2 = Impact but not accompanied adaptation and mitigation 3 = Impact but not accompanied with strategy adaptation and mitigation	10
Fishing technology	Fishing technology is destructive	1 = frequency of violations > 10 cases per year 2 = frequency of violations 5-10 cases per year 3 = frequency of violations <5 cases per year	31
	Modification of fishing tools and FADs	1 = more than 50% size of target species< Lm 2 = 25-50% size of target species < Lm 3 = <25% size of target species < Lm	26
	Fishing capacity and effort	1 = Ratio of fishing capacity < 1 2 = Ratio of fishing capacity = 1 3 = Ratio of fishing capacity > 1	16
	Fishing selectivity	1 = low (> 75%); 2 = medium (50-75%) 3 = high (less than 50%)	16

Domain	*Indicator*	*Criteria*	*Weight*
Fishing technology	The compliance function and the size of vessel with legal documents	1 = low compliance (more than 50% sample not match with legal document) 2 = medium compliance (30-50% sample not match with legal document); 3 = high compliance (less than 30%) sample not match with legal document	11
Social	Stakeholder participate	1 = < 50% 2 = 50-100% 3 = 100 %	40
	Fisheries conflict	1 = more than 5 times/year 2 = 2-5 times/year 3 = less than 2 times/year	35
	Local knowledge utilization	1 = nothing 2 = exist but not effective 3 = exist and effective	25
Economy	Asset ownership	1 = decrease asset value (more than 50%) 2 = asset value constant (less than 50%) 3 = increase asset value (up to 50%)	45
	Household fishery	1 = more than take home pay regional 2 = equal take home pay regional 3 = > take home pay regional	30
	Saving ratio	1 = less than credit interest loan 2 = equal credit interest loan 3 = more than credit interest loan	25
Institutional	Pursuance to responsibility fisheries principle in formal or non formal fisheries management plan	1 = more than 5 times fisheries management violation 2 = 2-4 times fisheries management violation 3 = less than 2 times fisheries management violation 1 = no rules assembling 2 = rule assembling not effectively 3 = rule assembling effectively	25
		1 = no tools and person 2 = there are tools and person but no action 3 = tools, person and action available 1 = no warning or punishment 2 = warning or punishment available 3 = warning and punishment available	
	Decision rule mechanism	1 = no decision rule mechanism 2 = mechanism available but not effectively 3 = mechanism available and effective 1 = decision available but unapplied 2 = decision available not fully apply 3 = decision available and fully apply	18

Domain	Indicator	Criteria	Weight
Institutional	Fisheries management plan	1 = no Fisheries Management Plan 2 = Fisheries Management Plan available but not fully apply 3 = Fisheries Management Plan available and fully apply	15
	Fisheries management policy and institutional synergetic level	1 = conflict between institutional 2 = inter-institutional communication not effective 3 = well inter-institutional synergy 1 = contradiction policy 2 = not support policy 3 = support policy	11
	Stakeholder capacity	1 = no increasing 2 = increasing but not functional 3 = available and functional	5

Visualization assessment indicator flag EAFM using modeling techniques. Technical Flag Modeling done by a multi-criteria analysis (MCA) in which a set of criteria was built as a base for the performance analysis of the fishery management area seen from the ecosystem approach in fisheries management through the development of a composite index with the following stages (Adrianto et al 2005):

1. Determine the criteria for each indicator each aspect EAFM (habitat, fishery resources, fishing technical, social, economic and institutional);
2. Assess the performance of each WPP for each indicator tested;
3. Give a score for each of the performance indicators in each of WPP (Likert score based ordinal 1,2,3);
4. Determine the weighting for each indicator;
5. Develop a composite index of each aspect for each WPP with a model function: CAI = f (Cani ... .n = 1,2,3 ... ..m);
6. Develop a composite index for the entire EAFM government on each WPP with the model functions as follows: C-WPPI = f (CAiy 1,2,3 .... y = z; z = 11).

Indicators are assessed and then analyzed using a simple composite based on the arithmetic average is then displayed in the form of the flag model (KKP 2012) as shown in Table 4.

Table 4

Flag model

Score value	Flag model	Description
100-125		Bad
126-150		Not good
151-200		Medium
201-250		Good
251-300		Best

Result and Discussion

Assessment of fisheries in fisheries conservation area. The assessment of fisheries condition in KKP of Anambas using EAFM indicators i.e. includes an assessment of fish resource domain, habitat and ecosystem, fishing technology, economy, social, and institutional. Indicators are needed to support implementation of EAFM which give some

information about condition of ecosystem, catching intensity, mortality and development of management (Jennings 2005).

Domain of fish resources. The results of the assessment on the indicators of fish resources can be seen in Table 5 with total of 209 composite. Assessment on each indicator is resulted that the indicator raw CPUE and proportion of juvenile caught in good condition, indicator species of the ETP is under medium condition and indicator of size of fish and Range Collapse are in bad condition. Bad condition in the indicator Range Collapse because of based on the result of field observation by fishermen, the fish size is more getting smaller and fewer by years. So many more fishermen are getting far in fishing. This can happen because two matter i.e. because the pressure of catch to excessive fish resource in the KKP Anambas and ecosystem damage. Refers to Haruddin et al (2011), the percentage of coral cover was positively correlated with the fish abundance, when correlated with catch it is assumed that the higher coral reef ecosystem quality, the higher fish populations that make coral reefs as well habitat for feeding ground, nursery ground or spawning ground. Meanwhile, bad condition for fish size indicator can happen because the increasing capacity effort to fish resources.

Table 5

The results of the assessment of fish resource domain

SDI	*1*	*2*	*3*	*4*	*5*	*Total*
Score	3	1	3	1	2	-
Weights	40.33	20.33	15.33	5.33	8.33	-
Value	121	20	46	5	17	209

1 - Raw CPUE, 2 - Fish size, 3 - Proportion of juvenile caught, 4 - 'Range Collapse' SDI, 5 - Species of ETP.

Ecosystem and habitat domain. The results of assessment on ecosystem and habitat domain can be seen in Table 6 with the total composite value of 191. On the assessment of the only quality of waters that are in good condition and indicators of climate change on the condition of waters are in bad condition. In addition to both of indicators, other indicators are in medium category, indicator of seagrass, coral reef ecosystem, mangrove ecosystem, and unique habitat.

Vatria (2010) reported that generally, the reef damages are caused by the fishing activities that are destructive, i.e. the use of explosives, poisonous materials (cyanide), and coral mining activity also for building material, reclaimed beaches, tourism activities that are less responsible, and sedimentation due to increased erosion and land top. Whereas damage of seagrass is caused by reclamation for port and industrial estate (UNEP 2004) and though little is known about the exploitation level of fauna in the seagrass beds. Dense population in most of the islands of the archipelago who mostly depend on the subsistence and small scale fisheries (Pet-Soede et al 2001) and including the fisheries products from seagrass ecosystems (Priosambodo et al 2006). Meanwhile climate change indicator is on bad even though climate change is a big impact especially for people living in the coastal and who laid down his life in agriculture and fisheries which is sensitive about climate (Simbolon 2012).

Table 6

The results of assessment on ecosystem and habitat domain

Ecosystem	*1*	*2*	*3*	*4*	*5*	*6*	*Total*
Score	3	2.5	2	2	2	1	-
Weights	20	15	15	15	15	10	-
Value	53	38	30	30	30	10	191

1 - Quality of waters, 2 - Status of seagrass, 3 - Status of mangrove ecosystem, 4 - Status of coral reef ecosystem, 5 - Unique habitat, 6 - Climate change on the condition of waters and habitat.

Fishing technology domain. The results of the assessment on this domain can be seen in Table 7 with the total composite value of 269. On average across all indicators except indicator method of fishing that is destructive and illegal is in good condition. It is because there are still some activities of destructive fishing such as the use of potassium chlorate and trap. The use of trap in this case is the use of an inappropriate trap in place so that damage coral reefs. Mustaruddin (2011) stated that the marine conservation area is a marine protected area and avoided from the destructive fishing activities.

Table 7

The results of assessment on fishing technology

TPI	*1*	*2*	*3*	*4*	*5*	*Total*
Score	2	3	3	3	3	
Weights	31	26	16	16	11	
Value	62	78	48	48	33	269

1 - Fishing method which are destructive and illegal, 2 - modification of fishing tools and FADs, 3 - Fishing capacity and effort, 4 - fishing selectivity, 5 - the suitability of fishing vessel the appropriate legal documents regulations.

Social domain. The results of the assessment on the social domain are seen in Table 8 with a composite value of 185. Indicators that are in bad condition, the participation of stakeholders, it is because participation of stakeholders in Anambas is still below 50%. Many stakeholders do not do a real contribution to fisheries sustainable management of Anabas. Participation becomes essential due to the existence of MPA which should contribute to the welfare of local community economy, employment, community development and cultural values such as fisheries access and sustainability of community activity in addition to capture community feedback in order to achieve the goal of KKP (Pomeroy et al 2005) especially community participated. The fishing conflict indicators are in medium condition. The fishing conflict which often occur regarding restrictions on fishing areas between fishermen in areas of the South and Siantan Sub district Siantan Timur. According to Hilborn (2007) the objective of preserving marine ecosystems is broadly in conflict with all other objectives because the more you protect an ecosystem less resources is available for utilization in the form of yield. While the results showed that the indicators on the utilization of local knowledge is in good condition. This situation occurred because the existing of local wisdom in fishing communities Anambas applied properly and effectively in management of fish resources.

Table 8

The results of assessment social domain

Social	*1*	*2*	*3*	*Total*
Score	1	2	3	-
Weights	40	35	25	-
Value	40	70	75	185

1 - The participation of stakeholders, 2 - Fisheries conflicts, 3 - Local knowledge in the management of fish resource.

Economy domain. The assessment indicators in the economic domain generate a composite value of 205 (Table 9). Saving ratio indicators are in bad condition because the result of saving ratio is lower than the Bank Indonesia interest rates on hold 7.1 percent on 2015. It can be caused by the value of goods and services in Anambas Island and Siantan which are mostly high enough. Indicator of household income is in good condition, average income of fisherman is above average value for regional take home pay of regency and indicator of asset ownership is in medium condition.

Table 9

The results of assessment on economy domain

Economy	*1*	*2*	*3*	*Total*
Score	2	3	1	-
Weights	45	30	25	-
Value	90	90	50	205

1 - Asset ownership, 2 - Household income, 3 - Saving ratio.

Institutional domain. Assessment on this domain generates a composite value of 216 as listed in Table 10. The average of the indicators in this domain are in the medium condition, except level indicator synergy of policies and institutional management of fish resource that is in good condition and indicator compliance to sustainability fisheries management in bad condition Brinkerkoff & Goldsmitth (1992). Thus, institutions include rules or procedures that shape how people act, and roles or organizations that have attained special status or legitimacy. In general institutional participation in this domain have not well-ordered because there are still many enforcement rules that have not been translated in the form of clear rules, and so many violation and conflict occured in the event of fisheries management. Lack of resource ownership rights in the coastal areas and seas have encouraged the utilization conflicts between stakeholders and conflict of authority between authorized agencies (Satria 2006).

Table 10

The results of assessment on institutional domain

Institutional	*1*	*2*	*3*	*4*	*5*	*6*	*Total*
Score	1	2.2	2	2	3	2	-
Weights	25	26	18	15	11	5	-
Values	25	57	36	30	33	10	186

1 - Adherence to the principle of responsible fisheries, 2 - Completeness of rules, 3 - Institutional mechanisms, 4 - The fisheries management plan, 5 - The level of synergy of policies, 6 - Capacity of the stakeholders.

For the total result of assessment conducted using techniques of flag modeling, we can see the status and the category of assessment. Index analysis results indicators EAFM performed by summing the indicator on each domain (Table 11), so it can be concluded from the results of the calculations of the status of fisheries on the KKP Anambas by looking at the flag value category results. Based on the results of the assessment, domain of fish resources, fishing technology and economy are in the good category with the green flag, while domain of social, ecosystem and habitat and institutional are in the medium category with the yellow flag, so that the total average assessment are in the good category. The average value of the aggregate of an entire domain appraisal EAFM is 211. DJPT-MMAF (2011) stated that the composite value in Indonesia Regional Fisheries Management number 711 belongs in the good category of 218. For information, KKP Anambas is Marine protected area in Indonesia regional fisheries management number 711.

Table 11

The index of aggregate results indicators EAFM on each domain

Domain	*Value*	*Flag*	*Description*
Fish resource	209		Good
Ecosystem and habitat	191		Medium
Fishing technology	269		Good at all
Social	185		Medium
Economy	205		Good
Institutional	216		Medium
Aggregat	211		Good

Analysis of the management status. Analysis of management status in conservation area with the evaluation tools of the E-KKP3K generated by in-depth interviews information of key informants regarding the management status in the KKP Anambas. This analysis based on assessment question in E-KKP3K in accordance with information. A summary of result can be seen in Table 12.

Table 12

A summary of the results of analysis of effectiveness management status in KKP Anambas

Rank	*Number of yes answers*	*Number of questions*	*Percentage (%)*
Red	8	8	100
Yellow	11	11	100
Green	21	21	100
Blue	14	28	50
Gold	0	6	0

New Assessment results through E-KKP3K in Table 10 for the KKF Anambas are in the green category, where last assessment from Directorate Generale of KKJI-KKP through LAKIP (2013) show the result in red rank with details of it is red 100% and yellow 50%. KKP Anambas is in the category of green due to the value of 100% perfect only got the green category. At E-KKP3K scoring system adhered to the principle of building beams which required that rank next to impossible can be achieved when the activities not previously completed or accomplished entirely. The results of the assessment of the status of the management based on E-KKP3K explained that the status of the management of fisheries in the MPA Anabas already is in good condition with management still minimum (KP3K-KKP 2013). This condition because of completeness, infrastructure as well as fishery management plan (RPP) is assigned but not yet all running.

Fisheries management strategic. Assessment of fisheries in generate aggregate the total value of fisheries status in the MPA Anambas in good conditions. Result of this assessment will provide reinforcement to standard evaluation of effectiveness E-KKP3K by providing referral strategies and more detailed management programme based on EAFM domain to increase minimum marine protected area management. It is because, assessment of EAFM just using indicators to existing condition, whereas assessment using E-KKP3K only how do manager's work to manage marine protected area. A comparison between E-KKP3 analysis based on Kasasiah (2013) and EAFM analysis describe at Table 13.

Therefore management strategies to make condition of fishery in the KKP Anambas remains stable and sustainable which are combined from both E-KKP3K and EAFM assessment. Where not all domain on EAFM also analyzed in E-KKP3K criteria i.e. Domain of fisheries resource and Habitat and Ecosystem related with Criteria Implementation of management plan and zoning and Region resources management, Domain social and economic related with criteria of socio-economic and culture management and Raising Community prosperity, Domain of institutional related with almost cover all criteria in E-KKP3K. This strategy is done based on what should be done to meet the goals of the management of the strategy depends on understanding relationship that connect to reference pressure to attribute and other power dynamics (Pratiwi 2014). It like Gavaris (2009) statement that Strategic decisions must be able to facilitate the comparison of attributes generated by alternative references selected.

Table 13

Comparison between analysis using E-KKP3K and EAFM

EKKP3K	*EAFM*
Measure effectiveness and performance of marine protected area management	Measuring sustainability status of fisheries management in marine protected area
Is static and common to all of marine protected area in Indonesia	Are specific, based on existing condition in each marine protected area
Doesn't identify key attributes from each measured management aspects	Identify condition from each indicator to increase fisheries management status in marine protected area
Improving effectiveness status of management based on activities programme and strategies that have not been fulfilled from every management aspect are setting by default	Strategy of activities to improvement can be clearly defined based on condition of each indicator in every domain

Based on references to the management of fisheries with EAFM and E-KKP3K, should need a management strategy for indicators which are in medium and bad condition. While for a good indicator is proper to maintain the existing condition and continuing the arranged strategies. The strategy:

Fish resource management

- Monitoring and evaluating about population, size of fish and number and diversity of fish species in MPA
- Set the fishing area in order to make easier and relatively close
- Control so that no species of ETP caught

The management of habitat and ecosystems

- Set Standard Operational Procedure (SOP) in management plan i.e. SOP of education, research, tourism, marine fisheries and aquaculture
- Control ecosystem of mangrove, seagrass and coral reef in core zone, sustainable fisheries zone, utilization zone and or others zone so there are increasing ecosystem condition
- Set the unique habitat management with the proper handling
- Initiated a study about climate change impact as well as handling strategies

Setting technique of fishing

- Control and minimize destructive and illegal fishing and using negative impact fishing gear

Improvement socio-economic and cultural

- Increase the participation of stakeholders in order to the higher
- Minimize the occurrence of conflicts of fisheries
- Control the ownership of productive assets in order to increase
- Arrange for saving the fishing rate is greater than of bank interest rates

Institutional strengthening

- Minimize violations in fisheries management by set up effective rules
- Arrange for fisheries management plan to be able to well run fully
- Arrange of every institution policy can support and synergy well each other
- Increase capacity of stakeholders to increase expertise in accordance to its functions
- Maximize funding to MPA management activities.

Conclusions. Results of fisheries condition assessment using the EAFM indicators as ecosystem-based fisheries assessment method showed that the KKP Anambas in good categories. While effectiveness of management status by using E-KKP3K obtained that KKP Anambas status are in the green category, which means that the KKP Anambas have managed at minimum level. Results of the assessment it must be accompanied by a fisheries management strategy taking into account the reference point of each indicator

is considered. Management strategies that need to be done i.e., monitoring and evaluating about population, size of fish and number and diversity of fish species in MPA, set up fishing ground, create SOP management, maintain and increase coverage of seagrass, mangroves and coral reefs, set up unique habitat management, initiated a study on the climate change impact, keeping the from illegal and destructive fishing, increase capacity and participate of stakeholders, minimizing occurrences of conflicts, controlling ownership of asset productive and saving rate, minimizing the violations by setting rules, control management plan, manage policy synergy betweens stakeholders. Not at least maximize funding for management activities.

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