

A Study on Fishing and Fisheries Institutional of Skipjack Tuna (*Katsuwonus pelamis*) for Sustainable Fisheries Management in West Aceh, Aceh Province

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ABSTRACT

The West Aceh water has great potency of skipjack tuna, however, without sustainable management, the fish might be decreased. A study aims to understand the fishing technique and institutional domain of skipjack tuna fishery resources in West Aceh and to arrange tactical decision in fishery management with ecosystem approach, a study was conducted from April to May 2015. The method used in this research is a qualitative research, with purposive sampling method. Data were analyzed using a flag modeling with the approach Multi-Criteria Analysis. Results shown that the fisheries condition in West Aceh region were categorized as fair in two domain of EAFM. Management formulated a tactical step on indicators that have are surveillance and law enforcement to fishing gear unfriendly, license of fishing gear unit, regulate mesh size of fishing gears appropriated Lm size, input controlling, Increasing of surveillance and law enforcement to fishing gear, Increasing of surveillance and law enforcement to document accordance, training of fishing crew, monitoring and surveillance to border violation, monitoring, and promoting fisheries management planning, enhancing communication and cooperation between intra government and enhancing stakeholder capacity.

Keywords: *EAFM, fishing, institutional, skipjack, sustainability*

INTRODUCTION

West Aceh regency is one of the operational area of fisheries management that into territorial area of fisheries management 572, West Aceh water belong to recent water that utilized fish potential of small pelagis by traditional fisherman that derived from other provinces. Fisheries management is not sufficient only considered of population target sustainability. However, fisheries management also need considered the ecosystem and natural resources sustainability as habitat and fish population. Impact of ecosystem consequences the utilization of natural resources to be important for identified earlier in order to destructive of resources can be minimized and anticipated in order to emerged degradation of natural resources sustainability. The approach more envisaged in aspect of ecosystem sustainability more introduced with ecosystem approach to fisheries management (EAFM).

In several area, there uncontrolled fish exploitation. Even though this activity causing fish stock depleted, fishing rate is constanly increased. Limited access to resources sometimes emerged conflict of fisheries resources. Fishing control technically should be undertaken control of fishing effort, fishing management) and ecosystem controlling (Ardianto *et al.*, 2005). Ecosystem approach is one form of resources management that consider attitude, characteristic or attributes from natural that this present human aspect always ahead. Therefore, we need to undertake facing out to model of fisheries resources management based on ecosystem that called as ecosystem based on fisheries management, management of fisheries resources including overall ecosystem belong to stakeholder aspect and impact that occurred in each sector that related with fisheries.

The aim of this research is to understand the fisheries resources management that associated with fishing technique and fisheries institutional in West Aceh and to arrange strategy of fisheries management in West Aceh. There is a role of fisheries related institution in West Aceh in conducting efforts of fisheries resources management, including the the marine as well as the land natural

resources. The main problem in the fisheries resources management is there is less harmony between fisheries institutions. Almost institutional fisheries still less implemented fisheries management. Thus, it necessary to undertaken a study regarding fisheries management of skipjack (*Katsuwonus pelamis*) in West Aceh were still investigated.

MATERIALS AND METHODS

The research was undertaken in April to May 2015 in West Aceh (Figure 1). For collecting fisheries data in Fisheries Port of Ujong Baroh, Fisheries Port of Meureubo subdistrict and Fisheries Port of Samatiga. Three sites are the center fishing activity in West Aceh.

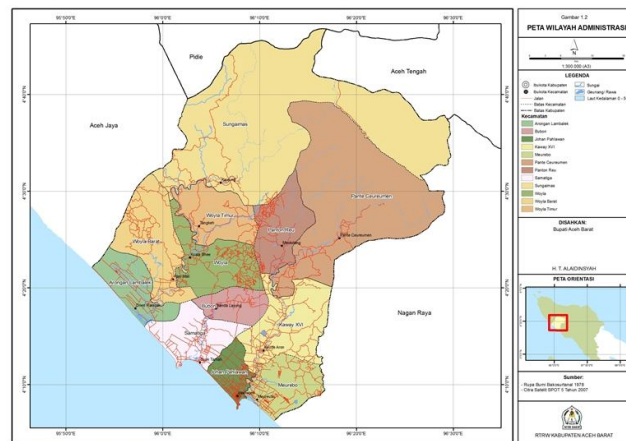


Figure 1. Site of research
(Source: West Aceh Statistical Office, 2015)

Methods. This research used qualitative approach and discussion descriptive. Qualitative approach is a research process and understanding based on methodology that search a social phenomenon and human problem. This approach, the researcher arranged a complex description, interview, report from responden overview and undertaken the study naturally (Creswell, 1998 in Afriani, 2009). Sampling method is purposive sampling. This method was used in limited amount of responden in site and was also used for research quickly (Afriani, 2009). The population that taken in this research is 120 responden are consist of stakeholder in West Aceh including Marine and Fisheries Affair of West Aceh, panglima laot, fishermen, academician, HNSI and Fisheries port.

Data Analysis. EAFM analysis was undertaken through indicator approach of fishing technique and fisheries institutional. The indicators simply defined as a tool for measuring, indicating or referring something more or less from measurement that they want (Adrianto *et al.*, 2011). This research was undertaken assessment to 6 indicators in domain of fishing technique and 6 indicators in domain institutional. Each indicator possess criteria and different grade assessment. Criteria and grade respective indicator can be presented in Table 1 (Adrianto *et al.*, 2011).

The visualization of indicator assessment result of EAFM is using a flag modelling technique. This flag modelling technique was undertaken with *Multi Criteria Analysis* (MCA) approach which a criteria set was established as basis for analysis of amount of fisheries management which seen from ecosystem approach in fisheries management through development of composite index with the following stage (Adrianto *et al.*, 2005):

Table 1. Method of measurement, criteria, and grades of indicator in fishing domain

Domain	Indicator	Measurement Method	Criteria	Grades
Fishing	Method of fishing destructive or illegal	Interview	1=frequency of fishing with fishing gear destructive and illegal > 10 cases/Year	30
			2 = frequency of fishing with fishing gear destructive and illegal 5- 10 cases/year	
	3 = frequency of fishing with fishing gear destructive and illegal < 5 cases/year			
	Modification of fishing gears and fishing attractor	Interview	1 = more than 50% of target species size < Lm	25
			2 = 25-50% of target species size < Lm	
			3 = < 25% of target species size < Lm	
	Fishing capacity	Interview	1 = Fishing capacity ratio < 1 2= Fishing capacity ratio = 1 3 = Fishing capacity ratio > 1	15
Fishing selectivity	Interview	1 = low (> 75%) 2 = fair (50-75%) 3 = high (less than 50%)	15	
Function accordance and size of fishing fleet with legal document	Interview	1 = low accordance (more than 50% of sample isn't appropriate with legal document 2 = fair suitability (30-50% of sample isn't appropriate with legal document 3 = high suitability (less than 30% of sample isn't appropriate with legal document	10	
The certification of ship crew according to regulation	Interview	1= Ownership certificate < 50%; 2= Ownership certificate 50-75% 3 = Ownership certificate > 75%	5	
Total				100

1. Determine criteria for EAFM indicator (Fishing technique and institutional)
2. Assess amount each indicator that tested
3. Determine grades for each indicator
4. Give score for each amount domain of indicator
5. Develop composite index respective aspect with function model $CA_i = f(CA_n, \dots, n=1,2,3, \dots, m)$
6. Develop composite index for overall EAFM with function model the following:

$C-WPPI = f(CA_1, \dots, y = 1,2,3, \dots, z; z = 11)$ indicators that assessed then analysed with analysis y simple composite based an average aritmatic then depicted in flag modelling (Adrianto *et al.*, 2011) (Tabel 3).

Table 2. Method of measurement, criteria, and grades of indicator in domain of institutional

Domain	Indicator	Method of measurement	Criteria	Grades
Institutional	The compliance level of stakeholder to game rule either formal or nonformal	Interview	1= more than 5 times occurred violation of law in fisheries management 2 = 2 – 4 times times occurred violation of law in fisheries management 3 = less than twice occurred violation of law in fisheries management	25
	The comprehensiveness of rule of the game in fisheries management	Interview	Non-formal 1 = more than 5 violation information 2 = more than 3 violation information 3 = no violation information 1 = No regulation in fisheries management 2 = provide regulation that including fisheries managing for 3 – 5 domain 3 = provide complete regulation to support fisheries management from 6 domain Elaboration for number 2 1 = Exist but the amount rule of the game were decreased 2 = Exist but the amount rule of the game were constant 3 = exist and the amount rule of the game were added	26
	Making decision mechanism	Interview	1 = no making decision mechanism 2 = there are mechanism But no effective 3 = there are mechanism and effective 1 = there are decision but it isn't undertaken 2 = there are decision but it isn't fully undertaken 3 = there are decision and fully undertaken	16
	Fisheries management planning	Interview	1 = has not yet fisheries management planning 2 = there is fisheries management planning but hasn't yet fully undertaken 3 = there is fisheries management planning and fully undertaken	15
	The level of policy synergty and fisheries institutional	Interview	1 = the conflict between different institutional 2 = communication between institutional has not yet effective 3 = synergy between institutional were fine	11
	Stakeholder capacity	Interview	1= no improvement 2 = there are improvement but has not yet functioned 3 = there are improvement and well functioned	5
Total				100

Table 3. Visualization of flag modelling for EAFM indicator

Composite score grades	Flag modelling	Description
100-125		Poor
126-150		Less Fair
151-200		Fair
201-250		Good
251-300		Excellent

RESULTS AND DISCUSSION

Domain of fishing technique. The result of composite analysis shown that composite value of fishing technique domain as much as 47 (Table 3). The indicators were categorised fair condition are fishing method destructive and illegal, modification of fishing gear, and fishing attractor, fishing capacity, fishing selectivity, and function accordance and size of fishing fleet with legal document. The assessment of The certification of ship crew according to regulation. This condition caused by many fishermen have no certification in West Aceh because mostly fishermen still used boat below 5 GT.

Table 3. The composite analysis of fishing technique domain

Fishing	1*	2*	3*	4*	5*	6*	Total	Grade
Result	5-10 cases/year	45%	10,6%	26,14%	33,3%	46,15%		
Score	2.4	2	2.3	2.4	1.9	1.4		
Grade	30	25	15	15	10	5		
Densitas score	16	22	19	19	17	10		
Grade	1152	1100	655.5	684	323	0.7	3915	47

Note: *1) fishing method destructive and illegal , 2) Modification of fishing gear, and fishing attractor, 3) fishing capacity, 4)fishing selectivity, 5) Function accordance and size of fishing fleet with legal document, 6) The certification of ship crew according to regulation. Source : (Primary Data, 2015)

Table 4. Indicators in Institutional domain

Institutional	1*	2*	3*	4*	5*	6*	Total	Grade
Result	Twice violations	Exist and added regulation	Isn't fully run	Hasn't yet exist fisheries management planning	Hasn't been yet effectively communication	Exist and isn't function well		
Score	3	3	2	1	2	2		
Grade	25	22	18	15	11	9		
Densitas Score	29	28	12	28	18	29		
Grades	2016	1811	359	1	485	480	5151	59

Note : *1) the compliance to fisheries principles responsible, 2) The comprehensiveness of rule of the game, 3) making decision mechanism, 4 fisheries management planning , 5) level of policy synergy and fisheries institutional, 6) stakeholder capacity Source : (Primary Data, 2015)

Table 5. The tactical steps for fisheries management in West Aceh

Atributes	Actual Value		Indicator Reference		Tactical Steps
	Score	Criteria	Score	Criteria	
fishing method destructive and illegal	2	Violation frequency occurred 5 -10 cases/year	3	Violation frequency occurred < 5 cases/year	Surveillance and law enforcement to fishing gear unfriendly
Modification of fishing gear, and fishing attractor	2	25%-50% species target size < Lm	3	Less than 25% species target size than < Lm	License of fishing gear unit, regulate mesh size of fishing gears appropriated Lm size
fishing capacity	2	Fishing capacity ratio = 1	3	Fishing capacity ratio > 1	Input controlling (Utilization of fish resources)
fishing selectivity	2	moderate (50-75%)	3	High (less than 50%)	
Function accordance and size of fishing fleet with legal document	2	moderate accordance (30 - 50% until isn't appropriate with legal document)	3	High accordance than 30% until isn't appropriate with legal document	Increasing of surveillance and law enforcement to fishing gear
The certification of ship crew according to regulation	2	Certification ownership < 50%	3	Certification ownership 50-75%	Increasing of surveillance and law enforcement to document accordance Training of fishing crew

Source : (Primary Data, 2015)

Atributes	Actual Value		Indicator Reference		Tactical Steps
	Score	Criteria	Score	Criteria	
making decision mecanism	2	isn't fully ran	3	Fully ran	Monitoring and surveillance to border violation
Fisheries management planning	2	has not yet fisheries management planning	3	Exist but not yet ran	Monitoring, and promoting fisheries management planning
Level of sinergency	2	Is not effectivelly communication	3	The sinergency intra institutional run well	Enhancing communication and cooperation between intra government
Stakeholder capacity	2	No exist and isn't functioned well	3	Exist and is not functioned well	

Source : (Primary Data, 2015)

Institutional domain. The indicators in Institutional domain was undertaken to six indicator (Table 4). The result of composite shown that composite value of Institutional domain namely 59. In Institutional domain only two indicators that categorised in good condition namely the compliance to fisheries principles responsible and the comprehensiveness of rule of the game. It's caused the role of indigenous knowledge that lead a Panglima Laot and formal regulation from local government to govern the fisheries and marine sector in West Aceh.

The indicators that categorised fair condition namely making decision mechanism, level of policy sinergy and fisheries institutional and stakeholder capacity. Meanwhile, the assessment of fisheries management planning were categorised poor condition. This condition caused by the local government in West Aceh hasn't arranged fisheries management planning. According to interview with marine and fisheries affair official staff that we have constraint to arrange fisheries management planning such as budget and human resources.

Tactical Steps. Tactical decision is how the ways that will undertaken for implementation the management strategy which was stipulated. Tactic is the steps of rule that give feedback and prevailed for achieving strategy (Gavaris, 2009). Tactical steps undertaken to indicator that isn't prevailed with reference point value or possess score 1 and 2 in fisheries research through EAFM approach. This tactical decision was undertaken to enhance the score or fisheries condition from less good categories to fair or from score 1 become score 2 and from fair categories become good or from score 2 become 3. The tactical steps can be undertaken for fisheries management in West Aceh fisheries can be presented in Table 5.

Tactical steps in ecosystem approach to fisheries management that were undertaken to 12 indicators namely 6 indicator in fishing technique domain and 6 indicators in institutional domain. These tactical steps need to undertaken in order to improve West Aceh fisheries status from fair to good.

CONCLUSION

The assessment of fisheries through EAFM indicators were obtained status or fisheries condition in West Aceh water belong to fair categories. The tactical steps were formulated that possess fair assessment and less good. These formula of tactical steps are surveillance and law enforcement to fishing gear unfriendly, license of fishing gear unit, regulate mesh size of fishing gears appropriated Lm size, input controlling (utilization of fish resources), Increasing of surveillance and law enforcement to fishing gear, Increasing of surveillance and law enforcement to document accordance, training of fishing crew, monitoring and surveillance to border violation, monitoring, and promoting fisheries management planning, enhancing communication and cooperation between intra government and enhancing stakeholder capacity.

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