Management of the Ribbon Fish (Trichiurus Lepturus Linnaeus, 1758) Resources Based On Ecosystem Approach At Pelabuhan Ratu Bay

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ABSTRACT

Ribbon fish has an important economic value and it spread to almost all regions in Indonesian water. Ribbon fish resource utilization activity has made a great contribution for fisheries sector in Indonesia. High market demand and needs for ribbon fish lead the increasing of ribbon fishing intensity. Pelabuhan ratu is one of the landing port for ribbon fish. The continuous absence of proper management for ribbon fish, will decline the fish stock. This study aims to analyze the sustainability of Ribbon fish species by analyzing the opportunities and challenges ribbon fish fisheries management by conducting an assessment based on indicators of ecosystem approach to fisheries management (EAFM). Evaluation EAFM indicator in Pelabuhan ratu bay for ribbon fish management has 68.1 of mean score. It means that the condition ribbon fish in Pelabuhan ratu bay is medium category. Management strategy for ribbon fish in Pelabuhan ratu bay consist of the strategy for fish resources, habitats and ecosystems, fishing technology, economic, social and institutional. Tactical decision was made in order to implement a strategy that has been set.

Keywords: EAFM, ecosystem, ribbon fish, Pelabuhan ratu, fisheries, sustainability,social, economy, institutional

1. Introduction

Ribbon fish is one of the important economical fishes that exist in Indonesian waters. This is due to high export demand especially from China and Korea market (Nurani et al, 2015). One ofthe production areas of Ribbon fishthat is able to export the high amount of fishes to other country is Pelabuhanratu Bay. Trichiurus lepturus Linnaeus, 1758 is a fish species mostly found in at Pelabuhanratu Bay.

In addition to the high demand of Ribbon fish, the increase in fishing effort is also due to the increasing number of vessels as well as the increasing number of sea trips. Under these conditions, most likely laying fishery will experience over fishing. At this time, fishery resources have dominated in economic overfishing (Astuti, 2008).

Ribbon fish fishery at Pelabuhanratu Bay is a complex system consisting of three interrelated dimensions and dynamic interdependence. The three dimensions are (1) dimension of fishery resources and theirecosystem, (2) dimension of fishery resource utilization for social-economic interest of society; and (3) the fisheries policy and management dimension itself. Therefore, they require an ecosystem approach to fisheries management using analysis of three domains namely social, economic and institutional domains (Thrush and Dayton, 2010). This study aims to assess the resources of laying fisheries by using ecosystem-based indicators of aspects based on social, economic and institutional domains.

2. Method

2.1 Location and Time of Study

This study was conducted at Pelabuhan Perikanan Nusantara Pelabuhanratu, Sukabumi District, Sukabumi Regency, West Java. This study was conducted from May to September 2018. The precise location of this study is shown in Figure 1.
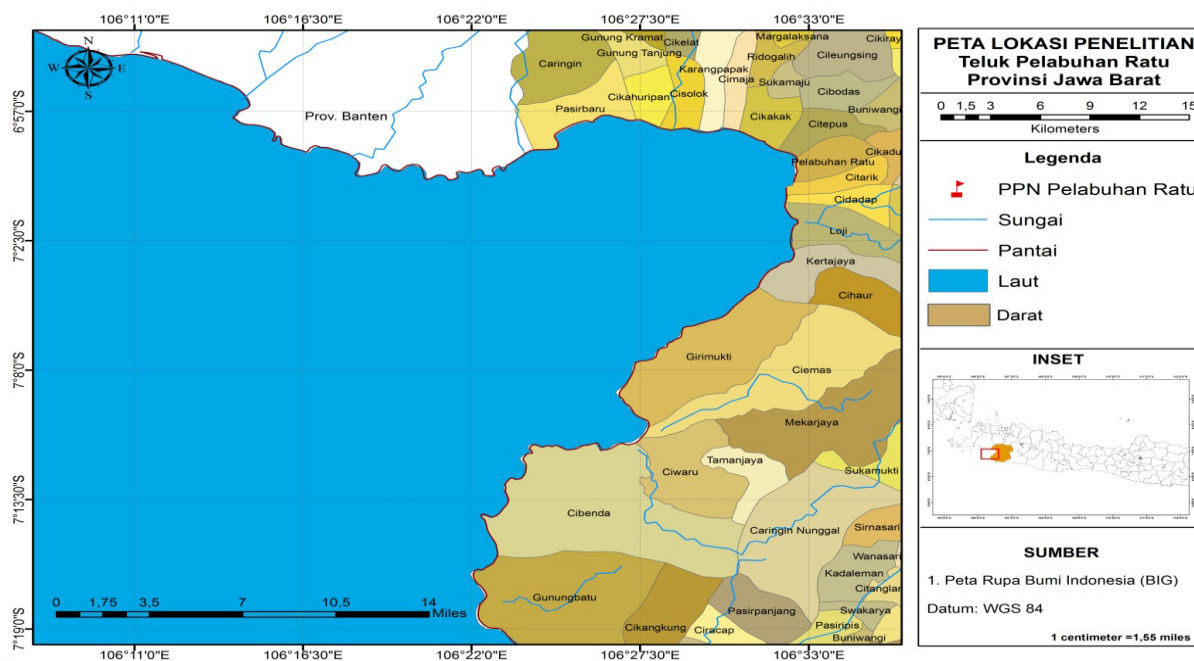
Figure 1. Map of Research Area
Source: Geospatial Information Agency (2018)

2.2 Sampling Method

Primary data are obtained by conducting surveys, observations and interviews. The selected respondents were determined by using purposive sampling based on the researcher's consideration of fulfilling theexpected elements of the study. This technique is also supported by interview techniques and field studies.

2.3 Analysis Method

EAFM Analysis

The analysis on the sustainability level of the fishery activities in Pelabuhanratu Bay waters was done by using EAFM approach (Ecological Approach to Fisheries Management). EAFM is a concept of how to maintain social-economic goals in fisheries management within consideration of knowledge, information and uncertainty about biotic, abiotic and human interaction components in aquatic ecosystems through integrated, comprehensive and sustainable fisheries management (FAO 2003). Integration part of the EAF is stakeholder involvement in the management process and consideration of the various objectives (Purcell et al., 2014).

2.4 Flag Modelling Analysis

Flag modeling analysis is one of multi-attribute analysis within approach of symptom or performance indication due to condition of marine ecosystem in general (Tallis and Polasky 2009). Substantially, the assessment of EAFM indicator is multi-criteria system that leads to a composite index associated with the level of achievement of a fishery management according to the principles of EAFM (Adrianto et al). Flag modeling technique is carried out using a multi-criteria analysis (MCA) approach where a set of criteria is established as the basis for the analysis of the fisheries management in certain area using EAFM through the development of composite index with the following stages (Budiarto, 2015):

1)   Defining the criteria for each indicator of each EAFM domain;

2)   Providing a score for each indicator's performance;

3)   Doing EAFM at each point of research location by using likert scale based on ordinal 1, 2 and 3;

4)   Determining the scoreof each indicator;

5)   Developing a composite index of each aspect for each assessment point.

Scoring in assessment conducted is based on field study, interview results, questionnaires and available secondary data. The score ranges from 1-3, depending on theeach circumstance based on modification of EAFM module from the Ministry of Marine Affairs and Fisheries, WWF and PKSPL IPB (2012). Bad scores reflect on theleast favorable conditions for sustainability management, while good scores reflect the most favorable conditions for sustainability management (Pitcher et al 2001).

3. Results and Discussion

Fish Resource Domain

The results of the EAFM assessment of fisheries in Pelabuhanratu Bay based on the domain of fish resources are presented in Table 2.

Standard CPUE

Based on interviews and series time data obtained during field study, the fish resources fromstandard CPUE indicator generally showa decrease of above 25% (42.26% per year) within 1 of score. So, it can be seen that the condition of the resources stock of fish around Pelabuhanratu Bay waters show a slight downward trend. The downward trend of CPUE can be inferred as an indication that there has been a tendency to negatively impact the stock of fish referred or even the overfishing tendency.

The Size of Fish Trend

The purpose of this data retrieval is to know the length of fish as the data of length frequency analysis. (KKP, 2014). The data required in this indicator is the morphometric data in the unit length of fish (TL) or the standard length (SL) in centimeters unit. Data collection is done periodically for five months.
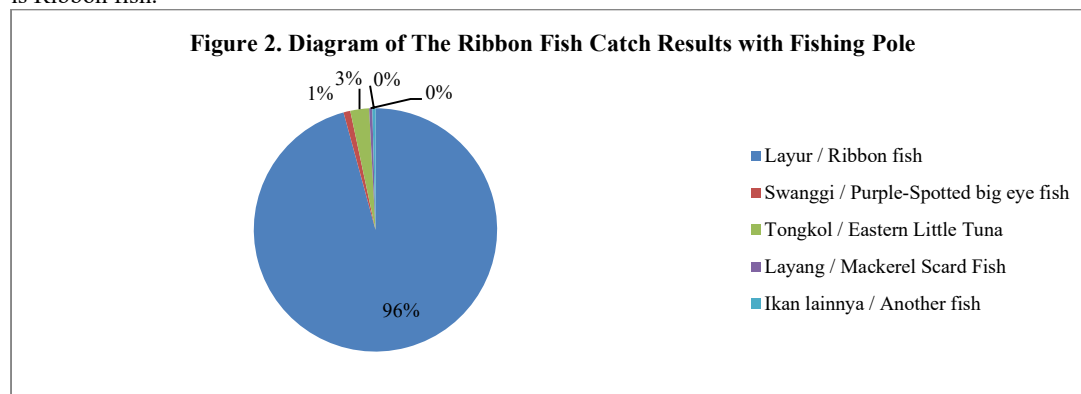
The decrease in the size of the target fish catch by a score of 1 indicates that the trending size of the fish becomes smaller. The fact indicates that there has been a possibility of overfishing over the territory of the waters from year to year. This, of course, is closely related to the indicator of standard CPUE value which also indicates an indication of overfishing in the area.

Species Composition

The purpose of determining the species composition index is to obtain the composition of fish and non-fish species that are targeted for catching activity and which are not targetedfor catching activity or otherwise non target (bycatch). Determination of the fish proportion is carried out on the catch of a fishing gear in the observed area (KKP, 2014).

The score of the indicator of the species composition that has been caught is 3 as shown in Figure 2. This indicates that the proportion of target species (Ribbbon fish) dominates the catch (> 30%). Based on the VAT data of Pelabuhanratu, the composition of catch fish is done by using fishing gear.

From the results obtained in the field study, it is known that the catch shows the proportion of target and non-target fish. The proportion of targetis higher than non-target fish and the average number of this difference is 96%. This is shown by criterion 3. The interpretation of this indicator shows that the higher of target fish composition appear, the more selectivecatching tools is needed to maximize the catch of the target species which is Ribbon fish.

Figure 2. Diagram of The Ribbon Fish Catch Results with Fishing Pole

Legend:
- Layur / Ribbon fish
- Swanggi / Purple-Spotted big eye fish
- Tongkol / Eastern Little Tuna
- Layang / Mackerel Scard Fish
- Ikan lainnya / Another fish

Source: Statistic Data of Fishing Port Nusantara Pelabuhan ratu 2017

Species of ETP (Endangered species, Threatened species and Protected Species)

The purpose of this Endangered species, Threatened species, and Protected Species (ETP) indicator is to examine the impacts of ETP species from fishing activities with specific tools in a region. From the data obtained in the field, there is no ETP catchingso that this indicator has gained 3 as a score with 255 of value. Based on the results of this assessment, fishing using proper equipment is sustainable fishing.

Range Collapse of Fish Resources

The score of range collapse of fish resources is 1. The results obtained show that the location of fishing by fisherman is more distant. The results of the indicator score obtained can be interpreted as well that the fish resources in the Pelabuhanratu waters range from collapse with increasingly "difficult" to catch because of spatial "shrinkage" from the fish stock biomass. The unit used for the fish stocks range collapse indicator is

based on the catch per effort (CPUE), which is consistent with the difficulty of obtaining catches in the fishing ground area at the original point. It is requiring fishermen to fish in more distant locations.

Ecosystem and Habitat Domain

The study of habitat and ecosystem conditions is crucial in ecosystem management (EcosystemApproach to Fisheries Management). The role of habitat is closely related to the existence of other resources and greatly determines the diversity, production and abundance of other resources. Within good habitat condition, recruitment process and availability of food will support fishery production to improve prosperity of coastal community.

From a variety of indicators such as water quality, mangrove ecosystem status, or unique or spawning ground, it can be seen that specific parameters will influence the fisheries management. For example, climate change, water conditions and habitats of each parameter will determine the success in fisheries management and the appliance of the sustainability as well.

Quality of Water

The first indicator to determine the quality of the waters is waste or pollution levels around the waters, where the presence of waste at the Pelabuhanratu is classified as moderate. The calculation is based on the calculation of pollution index of several parameters of chemical physics.

Table 1. Assessment of Fish Resources Domain

No	Domains	Indicator Scoring	Flag Model
1	Catch per unit effort	1	
2	Trends of fish size	1	
3	Species composition	3	
4	ETP species (Endangered species, Threatened speciesand Protected species)	3	
5	Range collapse of fish resources	1	

Based on he calculation of physical parameters due to aquatic chemicals in Pelabuhanratu, the result obtained shows that Pelabuhanratu water is classified safe to lightly contaminated. There are parameters such as brightness, garbage, oil layers and a will that exceeds the quality standard (Risnandar, 2013). The quality of waters in Pelabuhanratu from the pollution indicator is included to criterion number 2. It means that it is medium contaminated. If it is seen from the second indicator, namely turbidity (NTU) and total suspended solids (TSS), harbor water conditions are included in criterion number 3, meaning that the TSS and turbidity values are still below the water quality standard as defined in Decree LH 51/2004. This is obtained from research (Risnandar, 2013).

Status of Mangrove Ecosystem

Badrudin and Wudianto (2004) stated that the Ribbon fish habitat includes marine waters, estuaries (river estuaries), coastal swamps, mangroves and brackish waters. Thus, Ribbon fish has symbiosis to existence of mangrove. Assessment of status indicator of mangrove ecosystem score is 1 because of low density value in mangrove ecosystem condition in Pelabuhanratu. Mangrove is only found in Cikepuh Pangumbahan area, while in other sub-districts such as Pelabuhanratu port, Citepus, Cikakak, mangrove is not found or appearing in only a few spots. The types of mangroves found are Rhizophora sp., Bruguieras p., Sonneratia alba, Avicenia sp., Callophyluminophylum, Nypafructicans and Baringtoniaasiatica.

Unique/Particular Habitat

Pelabuhanratu has a unique or particular habitat that is the area that has fitted rumpon (FADs). Installation of FADs actually has been done by Payang fishermen, but there are a few fisherman who use equipment fishing line that utilize this FADs. Usually,Payang fishermen do catch target fishsuch as Tenggol fish including lisong and cob krai (Hidayat and Noegraha, 2015). There are 3 FADs areas that are often used as a favorite fishing sites by

fisherman, namely Cikarate rumpon area, Cikaja rumpon area and Rumpon Karang Deet area. However, although these three areas are often used as fishing sites, unfortunately there is no management by the government about FADsregulation in the region. Thus, the assessment score for this indicator is 2.

Impact of Climate Change

The study of impact to the climate change due to condition of waters and habitat at Pelabuhanratu has been done lately so that for this indicator has a score of 3. Review of the impact to the climate change at Pelabuhanratu is followed by adaptation strategy.It is related to fishery activities at Pelabuhanratu itself. Tropical climatic conditions in the Pelabuhanratu Bay coastal area of Sukabumi Regency are influenced by the west wind season that blows from east to west and the east wind season is blowing from west to east.

Geographical location that is adjacent to the sea also makes Pelabuhanratu vulnerable to storm surge. Storm surge is a surge (wave) caused by a storm, especially a tropical storm. This storm surge is a serious disaster in coastal areas especially in tropical and sub-tropical zones, where one of the effects of tropical storms is the rising of extreme water levels due to wind and pressure from the cyclone (Ningsih et al, 2010).

Domain of Fish Catching Technology

Method of Destructive Fish Catching

The value of destructive and/or illegal fishing scoring indicator is 3. This result indicates that the frequency of violations resulting from destructive and illegal fishing methods is less than 5 cases per year. Fishing methods that are destructive or illegal can directly result in damage to fish resources and their ecosystems. Destructive methods include the use of bombs, cyanide or potassium poison. A score of 3 on the destructive or illegal fishing method indicator indicates that fishermen in Pelabuhanratu Bay are using environmentally friendly fishing methods. This is reflected in the number of violations committed almost non-existent. This information was obtained from interviews with the Fisheries Supervisors in the Supervisory Unit of Sukabumi and Sukabumi Police in Pelabuhan Perikanan Nusantara Pelabuhanratu. To be able to catch Ribbon fish, all fishermen use fishing gear and fishing tools that catch the stone which is tied to the fishing line. The use of stone is also intended to accelerate the drop of the eye fishing line as a fish catching tools.

Table 2. Assessment of Habitat and Ecosystems Domains

No	Domains	Indicator Scoring	Flag Model
1	Water quality	3	
2	Status of mangroves ecosystem	1	
3	Protecting or enhancing habitats	3	
4	Climate change affects	3	

Modified Fish Catching Tools and Fishing Aids

The score of modified fish catching tools and fishing aids indicatoris 3. The score indicates that the modification of fish catching tools and fishing aids results in catching fish yields is dominated by fish that has larger size than Lm.

Based on the calculation, Ribbon fish's Lc value is greater than Lm value(Lc> Lm), which shows most of the fish landed in VAT Pelabuhanratu has no modification. Fishing activity using fish catching toolshas only done by limited way which is adding the length to the fishing line. The fishing aid used in this activity is a stone. It happens because the Ribbon fish that has been caught is deeper. It is also known thatRibbon fish usually appears on the surface at dusk to find food for themselves (Badrudin and Wudianto 2004).

Fishing Capacity

Fishing capacity is referred as the maximum number of fish catching that can be generated for a certain period of time (year) by a single ship or fleet when the are fully operated. This indicator has also be seen from where the effort and catch that are not hampered by any fisheries management measures that hinder it. Unit units used for fishing capacity are ton / year. (Wiyono, 2011). Score value is determined by the principle of higher value ratio (R) between the fishing capacity in the previous year compared to the fishing capacity in the last year.Furthermore, the score of this indicator is also high.

Table 3. R Value on Fishing Capacity of Ribbon Fish Management

Years	Catch	Efforts	CPUE	Ln CPUE	Deviation	Percentage	Value of R
2011	147,864	117,72	1.256,07	7,13	(959,18)	(323,08)	
2012	33,434	112,62	296,89	5,69	244,63	45,18	0,23
2013	81,402	150,32	541,52	6,29	(166,49)	(44,39)	1,82
2014	60,668	161,77	375,03	5,92	(50,66)	(15,62)	0,69
2015	90,385	278,65	324,36	5,78	(119,91)	(58,65)	0,86
2016	78,012	381,56	204,46	5,32	(204,46)		0,63
2017	60,121	235,52	255,27	5,54	(255,27)		1,24
Amount	491,765	1.202,64				(79,31)	0,91

Source: Statistic Data of Fishing Port Nusantara Pelabuhanratu in 2011-2017

Based on the calculation of Ribbon fish CPUE as seen in Table 2, it is obtained that R value of 0.91, so that it is smaller than 1. Thus, the indicator of fishing capacity obtained value of 1.
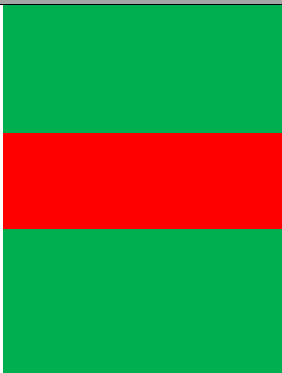
Selectivityof Fish Catching

Selectivity of fish catching is defined as the fishing activity that is associated with the extent, timing and diversity of the catch. The purpose of using this indicator is to estimate the percentage of not or less selective fishing tools and the impact on the sustainability of fish resources in a particular water territory. Score indicator of the selectivity of fish catching is 3. This result shows that Pelabuhanratu fishermen mostly use environmentally friendly fishing tools in catching Ribbon fish. Most fishermen in Pelabuhanratu Bay use fishing lines to catch Ribbon fish. Besides using fishing rods, catching Ribbon fish can also use other fishing tools such as purse seine, chart, rawai tuna and payang. However, fish species in these four fishing tools are not the main targets for fish catching.

The Function and Size of Vessels Compatibility Due to Legal Document

The function and size of vessels compatibility due to legal document is a comparison between legal documents held with the actual activity of the function and dimensions of vessel size in conducting fishing operations.

Table 4. Assessment of Fishing Tech Domain

No	Domains	Indicator Scoring	Flag Model
1	Destructive fishing method	3	
2	Modified fishing gear	3	
3	Fishing capacity	1	
4	Selectivity of fish catching	3	
5	The function and size of vessels compatibility due to legal document	3	

Selection of this indicator has to be done because of the permit issued. If the permit issued is different from the actual activity that exist in the region, then this can be categorized as breaking the rule or illegal fishing. The act of this case will indirectlygive potential threat to the sustainability of fish resources.

The score of this indicator due to the suitability of function and size of vessels compatibility due to legal document is 3. It means that the ship's alignment is highly compatible with the existing legal documents.

Social Domain

Stakeholders Participation

Stakeholders participation can be seen from the success in the management of fish resources. Score of

stakeholder participation indicator is 3 indicating that the involvement of stakeholders in Pelabuhanratu is very high. Measurement of stakeholders participation aims to see the activities of stakeholders in all management activities and utilization of fish resources.

Stakeholders in this study include the people in Pelabuhan PerikananNusantara Pelabuhanratu, SatuanPengawas PSDKP Sukabumi, Polair, fishery businessmen, fishermen, Marine and Fisheries Office of Sukabumi Regency and Marine and Fisheries Service of West Java and Local Community Monitoring Group (Pokmaswas).

Fishery Conflicts

Fishermen conflicts that occurred in Pelabuhanratu happen between fishermen and fishermen so as the conflict between fishermen and the government. Conflicts between fishermen and fishermen occur due to the seizure of the catching area. The conflict between fishermen and the government is caused by misunderstanding between the two parties in the management of fish resources.

Table 5. Assessment of Social Domain

No	Domains	Indicator Scoring	Flag Model
1	Stakeholders participation	3	
2	Fisheries conflicts	2	
3	The use of local knowledge in fish resources management	1	

Conflict may also be caused by authorityabusing over the rights of fishermen. Score of fishery conflicts indicator is 2. This shows that the conflicts that occur in the utilization of fish resources as much as 2-5 times during 1 year. Conflicts that occur are usually the seizure of fishing areas related to the existence of FADs, as well as the increase in the number of fishing equipment such as fishing tools and fishing gear.

The Use of Local Knowledge in Fish Resources Management

Measurement of local knowledge utilization aims to see the existence and effectiveness of the application due to local knowledge in fish resources management. The level of effectiveness due to local knowledge utilization greatly determines the success of fish resources management activities. Therefore, the more effective local knowledge utilization in fish resources management activities, the higher the level of successful management of fish resources.

Scores of this indicator which is local knowledge utilization in the fish resources management is 1. This result shows that there is no utilization of local knowledge in the management of fish resources, especially for Ribbon fish in Pelabuhanratu area as well.

Economy Domain

Asset Ownership

The asset ownership referred in this indicator is productive assets owned by fishery households from both fisheries and agriculture fields. The indicator score for asset ownership is 1. This can happen because it is known that the level of ownership of household fishery assets is still lowbased on interview results. Some respondents claimed that they did not have productive assets that could support their assets. The assets they own are only private owned land and homes that they buy in are in the peak of the season.

Household Income

The score of household fishery income indicator is 1. This shows that the income of fishermen in Pelabuhanratu isless than Sukabumi District minimum wage. Based on the Governor's Decree number of 561 / Kep. 1191-Bangsos / 2016 dated 21 November 2016 on Regency / City ofminimum wage in West Java per Year 2017 regulation, the minimum wage of Sukabumi Regency is about Rp2,376,558.39 (Two million three hundred seventy six thousand five hundred fifty eight point thirty nine rupiah).

Based on the results of interviews toward fishermen who use catching lines in Pelabuhanratu, their income have ranged between Rp500.000 per month in the famine season up to Rp1,500,000 per month for harvest season as crew position. As for the captain and ship owner, the wagehas ranged between Rp2,000,000 per month in famine season up to Rp2,500,000 per month in the harvest season.

Thus, the fishing income of the fishing pond is considered as not feasible because its value is below the minimum wage of the region after all.

Saving Ratio

Saving ratio is the ratio between income and difference in householdsexpenditure to income. The results of the analysis based on fishermen interviews, it is obtained that the expenditure of each fisherman is different in each

season. The score of this indicator is 2. Based on interviews with ship owners, the potential savings are moderate (about 40%) but they tend to choose not to save their money in the bank. While in the group of captain and crew fishermen, the potential savings are very low (only 8%) and some respondents claimed that they neversave their money in the bank. If the savingratio in fishermen compared to BRI micro credit interest rate which is 17.50% (www.bi.go.id), the aggregate ratio of fisherman saving in Pelabuhanratu is still low. The selection of Bank BRI as the reference for credit is due to the average fishermen using Bank BRI services.

Institutional Domain

Obedience Level to The Principles of Responsible Fisheries

Assessment inboth good or bad obedience level of indicators to the principles ofresponsible fisheries management with an ecosystem approach is to look at the level of compliance with established rules (Ruchimat et al., 2015).

In Pelabuhanratu area, there are relatively few violations happenedin fisheries management that have been established, especially for fishermen who use catching lines. Score obtained based on this indicatoris 2. This shows that obedience level within the principles of responsiblefisheries for fisheries management has not been maximized.

Table 6. Assessment of Economy Domain

No	Domains	Indicator Scoring	Flag Model
1	Fisheries HH asset ownership	1	
2	Fisheries HH income	1	
3	Fisheries HH saving ratio	2	

Based on observations and interviews result to PSDKP employees at Pelabuhan Perikanan Nusantara Pelabuhanratu, the frequent violations done by fishermen is the case number of fishermen using fishing gear of 10 GT-30 GT in size which has landed their catch outside the VAT of Pelabuhanratu without the Andon letter. So, it is classified as document abusing by the fishermen.

Ground Rules Completeness

The indicator score score of ground rules completeness in fisheries management is 3, which shows that law enforcement against existing rules has been effective. The regulations that are applied in the fisheries management in this area arerelated to the RI N0 45 Year 2009 on the amendment to Undang-Undang RINumber 31 of 2004 due to concerning Fisheries, Regulation of the Minister of Marine Affairs and Fisheries Number 2 / PERMEN-KP / 2015 on the Prohibition of the Use of Trawls and Seine Nets in State Fishery Management Areas of the Republic of Indonesia, Regulation of the Minister of Marine Affairs and Fisheries of Marine Fishery Number 45 of 2015 on SLO (Letter of Worthy of Operation), Fisheries Marine Candidate Number 36 of 2014 on Fishermen Andon, Fisheries Marine Candidate Number 13 of 2012 on certification of catch and Regulation of Dirjen PSDKP Number 10 on Technical Guidance Verification of Fish Landing.

Mechanism on Decision Making

The indicator score of mechanism on decision makingis 3, indicating that there is a mechanism (SOP) that is run and it has been running effectively. Fisheries management in Pelabuhanratu is implemented by Pelabuhan Perikanan Nusantara Pelabuhanratu where its institutional is centralistic, meaning that Pelabuhan Perikanan Nusantara Pelabuhanratu is an extension of policy implementer from central government. So, it does not have initiativeprogram in decision making after all.

Management Plan of Ribbon Fish Fisheries

A fisheries management plan is required as an operational standard for implementing responsible fisheries management. Indicator scoreof management plan on Ribbon fish fisheries is 1. This shows that there is no management plan about Ribbon fish fishery.

Synergism Level of Policy and Institutional of Fisheries Management

Score of this indicators which is synergism level of policy and institutional of fisheries management is 3. This shows that the synergy between institutions has been going well. The degree of synergy between policies and institutions in fisheries management is the integration of movement and steps between institutions and between policies in fisheries management so that there is no conflict of interest or policy clash (Budiarto 2015).

For example, the existence of coordination forum between fishermen and government in handling criminal acts both on provincial state and Sukabumi as regency state is a synergy.

Stakeholders Capacity

Score of stakeholder capacity indicator are 2. Generally, the capacity of stakeholders exists and functions well

(expertise gained in accordance with their job functions).Stakeholders may come from government, private, community, college andcommunity bureaucracies.

Table 7. Assessment of Institutional Domain

No	Domains	Indicator Scoring	Flag Model
1	Obedience level to the principles of responsible fisheries	2	🟨
2	Ground rules completeness	3	🟩
3	Mechanism on decision making	3	🟩
4	Synergism level of policy and institutional of fisheries management	3	🟩
5	Management plan of ribbon fish fisheries	1	🟥
6	Stakeholders capacity	2	🟨

Hasil Analisa *Flag Modelling*

Teknik *Flag Modeling* digunakan untuk dapat melihat status atau kategori penilaian indikator yang telah dilakukan. Indeks komposit agregat indikator EAFM dilakukan dengan menjumlahkan indikator pada domain sumber daya ikan, habitat dan ekosistem, teknik penangkapan ikan, ekonomi, sosial dan kelembagaan (Tabel 8). Indeks komposit agregat indikator tersebut menunjukkan domain ekonomi dalam kategori buruk dan habitat ekosistem dalam kategori kurang. Indikator sumberdaya ikan, teknik penangkapan ikan dalam kategori sedangk. Kategori baik yaitu domain sosial dan kelembagaan. Rata-rata nilai agregat dari keseluruhan domain adalah sedang, sehingga perlu ada pengelolaan yang lebih baik lagi agar dapat meningkat menjadi kategori baik.

Result of Flag Modeling Analysis

The Flag Modeling technique is used to view the status or category of assessment indicators that have been done. The aggregate composite index of the EAFM indicator is done by summing the indicators on the domains of fish resources, habitats and ecosystems, fishing techniques, economic, social and institutional (Table 8). The aggregate composite index of these indicators indicates the economic domains in the very low category and the ecosystem habitat in the very low category. Indicator of fish resources, fishing technique in medium category. Good categories are social and institutional domains. The average aggregate value of the entire domain is moderate, so there needs to be better management in order to increase become good category.

Table 8.The result of flag modelling analysis.

Domain	Domain Value Conversion	Flag Indicator
Fish Resources	51.0	Fair
Habitat and Ecosystems	48.2	Poor
Fishing Techniques	49.0	Fair
Social	80.5	Good
Ekonomics	27.6	Bad
Institutional	66.8	Good
Average	**53.85**	**Fair**

The composite value of each domain shown in the overlay diagram can be presented in Figure 2.
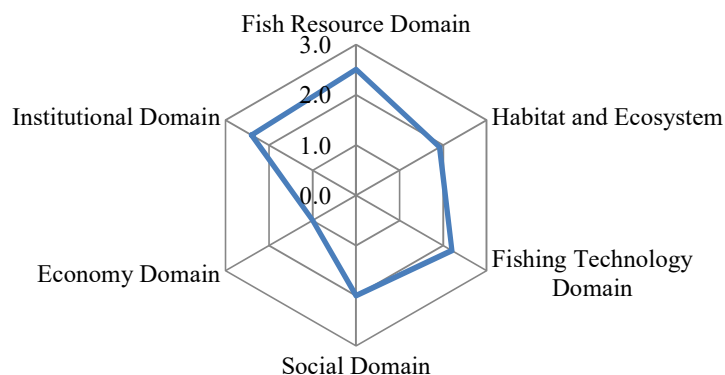
Figure 2. Overlay diagrams of composite results of each domain.

Strategies Tactical Steps and Management

Tactical decision (tactical decision) is required as one of the steps in the management of laying fisheries based on the results of scoring on each indicator in the domain. Recommended management is advised to use the ecosystem approach. Recommendation of policy strategy can be taken into consideration management of laying fishery resources (T.Lepturus) with ecosystem approach in Teluk Palabuhan ratu.
Based on Figure 12 it takes 5 years of management to be able to begin to enter the green square (healthy ecological and economic prosperity). When it comes to green, then the strategy that needs to be done is to keep the score and increase the red and yellow score.
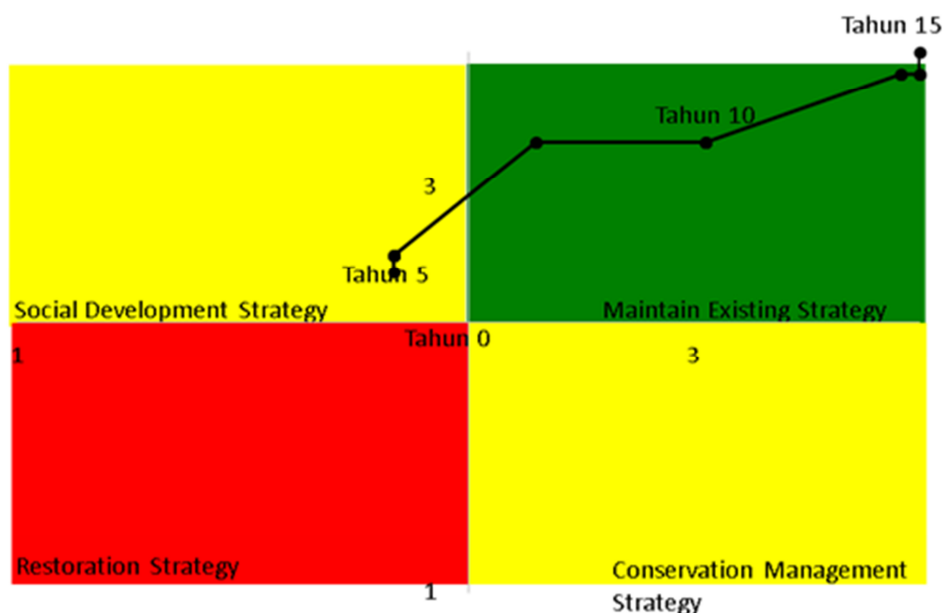
Figure 3. Results of analysis of cube plots of laying fisheries.

Based on the results of the assessment analysis using Flag modeling and cube plot, the recommendations that need to be done in the management of laying fishery resources in Palabuhanratu Bay is a restoration strategy and conservation management strategy. The strategy is implemented in stages with a range of each year as follows:

1. Strategic plan for 0 - 5 years
Trend CPUE based on the calculation of the last 7 years on average sharply decreased more than 25% included in the bad category (red) so that tactical steps implemented is the arrangement / control of the equipment restrictions of fishing gear and moratorium on fishing gear, this is because the number of fishing gear stretch very high. Closing the catch season at times where fish in the spawn phase are also needed to control. Tightening supervision of fishing licenses especially for vessels of size under 10 GT before going to sea. Mangrove planting

needs to be done around Palabuhanratu Bay so it can be used to support the spawning process and also make the mangrove forest as nursery ground. Improving the management of the economic sector needs to be socialized by the government to increase the awareness of the fishermen about the importance of saving, establishing cooperatives or associations that can accommodate the fishermen's money circulation and provide training to fishermen's wives to be able to utilize fishery products so they can be sold and also provide training in the product processing sector fishery products to fishermen in order to find other work alternatives in famine season. In the institutional field, the need to start the preparation of government regulation (RPP) plan of laying fishery.

2. The strategic plan for 6-15 years as follows:
The 6-15 year strategic plan for the next 6-15 years is a long-term strategic plan that can be used as a reference for the government in the management of the laying fishery in Teluk Palabuhanratu.

The management in improving water quality is done by controlling environmental pollution especially after the existence of PLTU operating in Palabuhanratu and to improve the ecological quality of fishery need socialization of prohibition of illegal rumpon usage which can disturb fish distribution especially layur fish. Estuary area maintenance also needs to be done in order to create a unique habitat for spawning and nursery ground. The institutional aspect needs to be regulation about zoning for fishing, tourism and industry area since there are currently colliding zonation zones which trigger the conflict of zonation interest.

IV. CONCLUSION
The current EAFM layout performance in Teluk Palabuhanratu is in the medium rating, as evidenced by the composite value of 53.8 and the yellow indicator flag. The current yellow position indicates that much work remains to be done in the field of fish resources, fishing techniques, and socioeconomic societies, so that the strategy of improving management in the field of developing those domains needs to get more portion. The action of the management of the laying fishery starts from the restoration and conservation strategy which is carried out based on the priority scale within the period of 0-5 years, furthermore to maintain the resources is carried out the sustainability strategy implemented with the period of 6-15 years.

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