

Problem of fisher community and it's implication on the management of South-East Aru conservation region

Fernando D. W. Dangeubun, Johannes M. S. Tetelepta

Faculty of Fisheries and Marine Science, Pattimura University, Indonesia. Corresponding author: F. D. W. Dangeubun, fernando_dange@yahoo.com

Abstract. Ninety percent of Aru Islands community are fishers and mostly inhabit coastal areas and small islands. This area mostly comprises of small islands, having unique characteristics of marine resources and quite a lot of endemic species such as turtles, dugongs, and dolphins. This area also has quite complex and diverse resources ecosystem, resulting a variety of illegal practices in natural resources utilization. This study was aimed to analyze the fisher characteristics, and try to reveal social, economic and cultural factors which lead to natural resources degradation. Result shows that: (1) social problems faced by the community are the limited access to meet the needs of education, health, light, clean water, clothing, food and shelter as well as limited information of eco-friendly natural resources technology utilization; (2) this limited access triggers the community to increase revenue by optimizing the utilization of resources in the ecosystems of the island, mangrove, sea grass, coral reefs and open waters; (3) low income and high expenditure eliminate the implementation of local wisdom in the use of natural resources in sustainable way; and (4) the level of compliance and trustfulness of the community towards the leaders are still exist, hence can be used as a key component in motivating people in the management of South-East Aru conservation area.

Key Words: Fisheries community, implications in management, conservation area.

Introduction. Majority of Aru Islands community live as a fishermen, inhabit the coastal area of small islands which are the majority of island found in Aru. Being part of small islands, this area has unique characteristics of fish resources shown by many endemic species like turtles, dugongs, dolphins, as well as a complex and variety of ecosystem. The current status of marine fisheries resources shows some indications of fish resources decline both at ecosystem of island, mangroves, sea-grass bed, coral reefs, and open waters. This is in accordance with some studies (Jackson & Sala 2001; Stachowitsch 2003; Halpern et al 2008) which shows that all coastal ecosystems worldwide potentially interact with human activities which hence there is no part of coastal area and small that can be considered untouched from human activity.

Due to population increased that increased also human activity in exploiting the resources either legal or illegal, has lead to fisheries resources degradation. Human has been considered to have a very great impact in changing coastal ecosystem (Vitousek et al 1997; Halpern et al 2008). Prolong unsustainable human activities bring about pressure towards the ecosystem that lead to ecosystem degradation (Crain et al 2008; Darling & Côté 2008; Doak et al 2008; Halpern et al 2008).

All the activities of natural resources utilization took place at conservation area that was an accumulation of prohibition on the use of resources on the area of Marine Protected Area established since 1991 to 2009. There is no space available for the community to utilize resources. On the other hand, the main objective of protecting zone through conservation approach not only to conserve species diversity or biodiversity together with sustainable resources management, but also should give benefit to the surrounding community (Brodziak et al 2005; Worm et al 2009). United Nation Convention on Biodiversity (Secretary of Biodiversity Convention 2009) declares that protected area is an important tool to conserve biology and ecosystem as a supply of

natural resources and environmental service as a basis for sustainable development strategy. Very often this objective fail to achieve what has been targeted since the community, at the same time, has been put in isolation as a consequence of the approach. The community have to strife to find area and resources for their subsistence life. This in particular happened most at developing countries (Straede & Treue 2006).

Conservation and poverty eradication should be conducted in one program through a collaboration encompassing both government agency and the community in order to achieve the objective of conservation itself (Adams et al 2004). To ensure that protected area have a local long last collaboration now and then, the need for undersanding the dynamic of social economic that determine the present and future use of natural resources within and the vicinity of protected area become an important issue (DeFries at al 2007). During the last 20 years, the use of community based conservation and its development has become an approach by many conservation agencies (Browder 2002; Gjertsen 2005).

It was predicted that high usage of resources at protected area were simultaneously a valuables of social, economy, and culture exist within the surrounding community. This study therefore was aimed to study fisher community characteristics surrounding protected area and try to expose which factors contribute to the fisheries resources degradation at protected area.

Material and Method. The study of fisher community characteristics of protected area was focused on Sub District of Southern Central Aru and Southern East Aru commencing June to August 2010. Secondary data were gathered from provincial (Ambon City), district area (Dobo City), and sub-district area (Longgara and Meror). Apart from that, data were collected also from the villages of Bemun, Longgar, Aparar, Karei, and Batugoyang.

For social, economic, and cultural studies, a survey through questionnaire distribution to respondents constitute of focus group discussion (a group of religious leader, community leader, and village leader), and direct interview with common respondents sampled randomly from villages community. Information required through focus group discussion covering village history development, property right and ownership and land utilization, indigenous knowledge in natural resources management, village development progress, form of policy implementation at provincial, district, sub-district, village's level and expectation on future community development. For community outside focus group, 20 respondents were selected randomly form 5 villages, making 100 respondents in total. The twentieth respondents of each villages were grouped into fisher (10 respondent), and farmer, local mercantile, hard coral miner, forester, 2 respondents each. Village's chosen were the one where their community has an access to natural resources *i.e.* Bemun, Longgar, Aparar, Karei, and Batugoyang.

Community characteristic analysis was divided into two components as follows:

- 1) Fisher community potency analysis covering:
 - Population aspects: number, growth rate, density, perception, age structure, education level, sex ratio, responsibility ratio;
 - Socio-economic aspects: occupation, income and expenditure as well as economic infrastructure;
 - Cultural aspects: people perception, social structure, infrastructure and cultural values.
- 2) Factors affecting the community in utilizing natural resources at protected area: respondent characteristics (age, sailing experience, education level), environmetal knowledge, level of natural resources utilization; social dimension (population change over time, fisher number, education, health, and information access, clean water and light availability, housing condition, family relationship, community collaboration, conflicts (community, village, land ownership), economic dimension: market access, transportation, main food availability, building construction materials cost, cost of health and education, market value of fish resources, wood logs, sand, stones/coral pebble, income and expendityre level.

Analysis of factors in point two was conducted through class interval category/score of three comprising: high/good = 3; moderate = 2; and low/bad = 1. Utilization problems were map which will then describe the existing condition of the whole ecosystem. The results will provide the change direction of natural resources utilization level at each ecosystem which will be used further as a basis for implication analysis on participative management of the protecting zone through causal loop approach (Fatsey et al 2011).

Results and Discussion

Community potency

Social dimension. Two Sub-districts that have an access to the protected area were Sub-district of Southern-East Aru and Central-South Aru. At the formation there have been 12 villages and then remain 7 villages. Of all the villages from sub-district of Southern-East Aru, Karey was the village with highest population (813 individual) with 199 family head while village of Dosimar was the lowest in population (136 individual) with 44 family head. Village of Meror was the head of the sub-district with the population of 161 individual of 48 family head. With the space availability, the village of Meror can be developed more as a sub-district city. The village of Longgar has the highest population density (1,282 individual with 277 family head) of the sub district of Central-South Aru. In total, number of population of these two sub-districts was 10,285 individual with 2,433 family head.

Education level is one of the factor affecting ones in decision making, it has positive contribution in relation to the way that people think. Quite substantial number (55.11%) of Karey Village community just having elementary education level, followed by group who did not/have not started any education (21.6%). Only a small proportion (0.12%) of the population reached high degree education. The same situation was also found at Batugoyang Village with community did not/had not started school yet amounted of 25.72%. All these pictures of education level were almost the same at all villages of these two sub-districts with quite substantial (41% - 50%) individual who just finished the elementary school. People finished high school up to university varies between 1% - < 5% only.

This education level socially puts the fishermen low in the community and very often under estimate by others Satria (2002). The government should look at this situation more seriously and put more effort in developing programs for empowering the fishermen and those with low level of education. Approaches used in developing or empowerment should consider indigenous knowledge and cultural aspects of the community. This will enable the government to achieve their goal more easily. The involvement of all community in the management of natural resources and the protected zone using simplified approaches lifted from indigenous knowledge exist in the community, will be more fruitful in motivating people towards what was aimed by the management.

Sometime religious or believe views has been seen as one that can separate the community. In natural resources management, however, values in the religious/believe views can be an entry point for building an understanding and implementation of management strategies. Religious/believe views also have some values in the resources management for the wellbeing of its believer. There were Moslem, Christian, and Catholic believers in both sub-districts with various in their composition. Some dominated by Moslem like in the villages of Gomo-Gomo, Jambu Air and Warabal (90 – 100%), whilst villages of Aparas, Longgar, and Mesiang having 77.69%, 73.09%, and 42.74% Christian believer respectively. Even with this composition, all the community lives side by side.

A quite substantial person from those two sub-districts has no job and some work as fishermen. For sub district of Southern-East Aru, the unemployed people varies from 35.09% (Meror) up to 55.82% (Batu Goyang), whilst fishermen varies between 39.38% (Batu Goyang) up to 57.76% (Dosimar). For sub-district of Central-South Aru, the unemployed group vary between 25.2% (Longgar) up to 60.26% (Gomo-Gomo), whilst the fishermen vary between 31.315 (Longgar) to 66.52% (Aapara). For productive age category Southern-East Aru, Karey Village was the dominant one (445 individuals)

followed by Gomar Meti (225 individuals) and the least one was Dosimar (70 individuals). Productive age category for sub district of Central-South Aru, the Village of Mesiang and Longgar has 574 and 561 individuals respectively (the highest), and the lowest one was Warbal (147 individuals).

Economy dimension. Being small and productive islands with natural resources, majority of Aru Islands District community lives in coastal area as fishermen. Most of them highly depend on marine natural resources *i.e.* mother pearl oyster, sea cucumber, top-shell, and other economic mollusks. Farming is just a part time job as it shown by the small cultivated areas (20 x 40 m).

West season was the peak of fisheries activity in South-East Aru, mainly for mother pearl oyster diving, sea cucumber, sea-weeds, fishing on various fishes, squid, shrimps. Fishing technique was mainly artisanal such as gill net, cast net and hook and line, sparrow, trap. The harvest was sold within the village and neighboring village or brought to Dobo (capital of Aru Islands District) if transportation was available. From interviewed, it was found that income of the community surround the protected area was low, ranged between 850,000 –1,000,000 Rp. per month.

Community living in the coastal area of protected region had a mix of jobs such as fishermen, farmer, and hunter. There was clear job division in doing their work with man (husband mostly) fishing mainly in deep waters while women (wife) and children fishing in shallow waters and reef flat. Simple canoe was the main transportation for fishing, only some equipped with engine.

Cultural dimension. Majority of Aru people have Aru ethnic, communicate either with Aru language or Indonesia language. In school, church, mosque or other formal meeting, Indonesia language was the main communication language. The people of South-East Aru have a family relationship commonly known as "*mata rumah*". One specific characteristic of this kind of relationship was the marriage. They should married individuals with different family name (exogamy), baring man/father family name (patrilineality), and live at man side (patrilocality).

According to local legend and believe by native Aru ethnic, the Enu (or Eno) and Karang Island used to be one island. The native of Aru people came from those islands. According to them, the islands were sub-merge and its people scatered around and live in other islands. The sub-merge and the scatter of people were widely known as "Pica Eno-Karang". Based on that legend, majority of natives Aru claimed that Enu and Karang Island belong to native Aru. People of Longgar and Aparas just look after Enu and Karang since they just close to those islands. The native Aru people, therefore, have the right to live and exploit those islands. On the other hand, the people of Longgar and Aparas claimed to have those two islands.

From interviewed people of the village of Longgar and Aparas, revealed that the islands of Pulau Jeh, Mar, Jeudin and Marjinjin belongs to them, whilst the island of Kurtubal Selatan belong to the village of Bemun. The people of Longgar and Aparas assume that the four islands are history's islands for them, since these four islands has been considered as the first place where their ancestor lives after the sub-merge of Enu and Karang. As a form of respect, every October of the year the people of Longgara and Aparas held a traditional festival for their ancestors and pray for the blessing to their environment. Prior to West monsoon, before people start to dive for pearl oyster, the *Deba* (pearl oyster diver) will perform ritual celebration for their ancestor, asking for the blessing as well.

The ownership towards land and tidal area are still strongly exist. If there is a trespassing, this could lead to a conflict between villages. Quite recently, the people of Karey Village fight with people of Aparas Village because the trespassing property right. People form Aparas had been accused for violating the Karey properly property right for seeking abalone.

Like many community in Central Maluku which have communal relationship known as *Pela*, people of the Village of Karey, Salarem, and Sia also have *Pela*; also pople of Batu Goyang and Beltubur. This kind of relationship still exists, and gives an opportunity to share the resources mainly where the *Pela* is till in practice. Apart from *Pela*, the

people of Aru also have an indigenous way for resources management well known as *Sasi*, which regulate time of fishing, tools and its size for fishing. *Sasi* was mainly operated for pearl oyster, sea cucumber, and top-shell mollusk (marine products) as well as sago, coconut, and fruits (agricultural products). During the *Sasi* period, a sign post (usually young coconut leaves) was put in products being in *Sasi*.

For the people surround the protection zone, sea was seen as having religious-magic, socio-cultural, and economy power. In utilizing marine natural resources should be followed with proper norm or regulations practices since their ancestor. Fail to do so, will bring condemnation to the community. The community believes, when sea are not used in a proper way according to rules, they will be haunted or kidnapped by the ancestors who they believe that still look for resources.

Long before religions came, the people surround conservation area and Aru in general, used to be an animism which believes in spirits they believe lives in big trees, mountains, sea, and corals. Of almost all islands at South-East Aru conservation area, had historic and religious values hence assigned as mystical place (Enu, Karang and Jin Islands: Jeh, Mar, Jeudin, Marjinjin and South Kultubai). Apart from that, the people also believe on the power that lives in the sky of their area, which they believe were their ancestor who can answer and solve their problems.

For the people surround South-East Aru conservation area, marine area had been seen as their mother, the one who feed them. Sea environment had been seen as a space containing natural resources that support their needs. As a consequence of having believe that their ancestors also lives at sea, if people outside wants to do activity in that area, a ritual had to be performed, a kind of permission, prior any activity. They are insisted of doing nothing immoral or other activities that could destruct the area since this will bring harm to their self.

For people surrounding the conservation area, they had a zonation for coastal and marine area, they also had ownership over coastal and marine area. Those areas had been claimed as their belonging since they are the first and frequently fishing at those areas. They also applied *Sasi* to those areas and its natural resources. Two type of *Sasi* were applied: 1) *Sasi* for particular area covering all resources in that particular area for certain period of time (usually a period of six months); and 2) *Sasi* applied for particular natural resources, mainly with economic importance, such as top-shell, sea-cucumber, and pearl oyster (usually one year at least).

Perception of social, economic, and cultural change of the community

Social changes. From five villages sampled (Bemun, Longgar, Aparu, Karey, and Batu Goyang), 13 change of components were able to be identified. Of 13 components identified (Table 1) 4 gave positive change *i.e.* number of people and number of fisher (about 14% increased) and acquaintance and collaboration within community (about 13% increased). There were also 3 positive impact of change shown by decrease of conflicts between village, community, and ownership (3% - 5% decreased). The remaining (6 components) having less change and gave strain to the community *i.e.* access towards health, transportation, education, electricity, clean water, and house condition (4% - 7%). All these social components if connected with economy and cultural problems will then gave strong hardship to the community surrounding conservation zone in having proper life.

Education access in these two new sub-districts that just recently formed (2010) was considered low, especially when they want to continue to primary high school (SLTP) or secondary high school (SMU). There was only two primary high school situated in Batu Goyang and Longgar Aparu. When they wanted to continue to secondary high school then they had to go to Jerol, the capital city of South Aru sub-district, or even to Dobo, the capital city of Aru Islands district. That is why, many of the community of these two sub-districts having many elementary to primary high school background education. Those who have more economy capability will be able to send their children to have more education outside their village. This is a common problem faced by community surround the conservation area concerning further education.

Table 1

Change direction, value and percentage of social components change of the community at South-East Aru conservation zone

Crt. no.	Changed component	Direction	Social characteristic of the fisherman at five villages of conservation area											
			Bemun		Longgar		Apara		Karey		Batu Goyang		Mean	%
			Mean	%	Mean	%	Mean	%	Mean	%	Mean	%		
1	Number of people	↑	4.60	14.33	4.50	14.20	4.50	14.15	4.50	13.60	4.50	14.02	4.52	14.05
2	Number of fisherman	↑	4.80	14.95	4.40	13.88	4.50	14.15	4.50	13.60	4.50	14.02	4.54	14.12
3	Education access	↓	1.90	5.92	2.10	6.62	2.10	6.60	2.20	6.65	2.10	6.54	2,08	6.47
4	Health access	↓	1.40	4.36	1.50	4.73	1.50	4.72	1.50	4.53	1.50	4.67	1.48	4.60
5	Information access	↓	1.50	4.67	1.50	4.73	1.50	4.72	1.50	4.53	1.50	4.67	1.50	4.66
6	Clean water	↓	1.90	5.92	2.20	6.94	2.20	6.92	2.40	7.25	2.20	6.85	2.18	6.78
7	Electricity	↓	1.40	4.36	1.50	4.73	1.50	4.72	1.90	5.74	1.40	4.36	1.54	4.79
8	Housing condition	↓	2.10	6.54	2.20	6.94	2.20	6.92	2.70	8.16	2.20	6.85	2.28	7.09
9	Acquaintance	↑	4.30	13.40	4.20	13.25	4.20	13.21	4.20	12.69	4.20	13.08	4.18	13.00
10	Community collaboration	↑	4.30	13.40	4.20	13.25	4.20	13.21	4.20	12.69	4.20	13.08	4.22	13.12
11	Villages conflict	↓	1.00	3.12	1.00	3.15	1.00	3.14	1.00	3.02	1.00	3.12	1.00	3.11
12	Community conflict	↓	1.90	5.92	1.50	4.73	1.50	4.72	1.50	4.53	1.80	5.61	1.64	5.10
13	Ownership conflict	↓	1.00	3.12	1.00	3.15	1.00	3.14	1.00	3.02	1.00	3.12	1.00	3.11
	Total		32.10	100.00	31.70	100.00	31.80	100.00	33.10	100.00	32.10	100.00	32.16	100.00

Like education problem, the community bordering the conservation area also showed lack in health care facility. Access to health services and its infrastructure was very limited. If the people of the village get ill, they will tend to use traditional medicine to cure their illness. Shortage of medicine, medical personnel, and health facilities became the main issue for the community. There was only one medical doctor for those two sub-districts lived in Batu Goyang, where people from other villages can go there. Sometime they can go to Dobo (district) if the weather and transportation is available, but quite expensive.

Economy changes. Like social problems encounter by the community at conservation area, there were also economy problems the community had to live with. Together with the community, we identified 15 economy issues which bring pressure to the community in general (Table 2), like access to market. The people had to go to Dobo to sell their product, or depend on collector mercantile with low price offer.

Limited access toward public transportation infrastructure in this area especially for domestic products distribution force the people to rent private transportation with consequently high cost. For building construction for example, the materials such as cement, zink roof, spike, etc. were also limited. Most of it had to be bought in Dobo meant another extra cost expenses by the people. The same pictures happened also to daily foodstuff like rice, sugar, flour and so forth. People had to purchase 50 – 100% higher than price commonly in Dobo.

Costs for education, health, electricity/light, were also high, not equal to income they got from the product they sold. Price for fish production in this area was very low. All these increased pressure to the community of the region. All these components agreed by the people that force them to exploit the natural resources which high economy value, either the resources was protected or not. On the contrary, the price for sand, wood, hard coral, was quite high compared to price for fishes. This in turn pushed the people to do sand mining, hard coral dredging, and timber cutting. All these conducted with very less consideration on environmental sustainability. The establishment Longgar/Apara as a capital city of Aru Central-South sub-district, gave people opportunity to sell sand, hard coral, and timber for city infrastructure development. In consequence, these activities put small islands that had been assigned as South-East Aru conservation zone in fragile condition.

Economic pressure was the main important factor that pushed the people in the use of their natural resources/environment in unsustainable manners. If this condition lasted for longer time, this will even more distracted region ecosystem and also threatening some outer small islands which was categorized as micro island with high fragility.

Cultural dimension. Cultural values and local indigenous knowledge were still existing in this area apart from *Sasi* that had been degraded (Table 3). Of five change components agreed, *Sasi* was the one that decreased, however the practice of ritual before fishing/sailing was still continuing. Traditional zonation on natural resources management was still practiced. The practice of *Sasi* should be increased and empowered in order to protect and sustain the fish resources.

The result shows that, people reverences' towards their leader (religious, ethnic, and village) proved that those leaders should be considered in the management of conservation zone. They should be involved actively in all aspects of the management (planning, organizing, implementation, monitoring, and evaluation) of that area. This will ensure the management to be more liable.

Table 2

Direction change, value, and percentage of community economy components changes at South-East Aru conservation area

Crt. no.	Changed component	Direction	Economic characteristics of the fisher community at South-East Aru conservation area											
			Bemun		Longgar		Apara		Karey		Batu Gotang		Mean	%
			Mean	%	Mean	%	Mean	%	Mean	%	Mean	%		
1	Market access	↓	1.70	3.39	1.50	3.11	1.50	3.08	1.60	3.18	1.50	3.03	1.56	3.16
2	Infrastructure availability	↓	2.30	4.58	1.30	2.70	1.30	2.67	2.20	4.37	2.20	4.44	1.86	3.77
3	Transport to sub-district	↓	1.70	3.39	1.50	3.11	1.50	3.08	1.60	3.18	1.50	3.03	1.56	3.16
4	Food availability	↓	2.30	4.58	2.20	4.56	2.20	4.52	2.30	4.57	2.20	4.44	2.24	4.54
5	Build. constr. availability	↓	2.30	4.58	1.90	3.94	1.90	3.90	2.40	4.77	2.20	4.44	2.14	4.33
6	Food price	↑	4.50	8.96	4.60	9.54	4.70	9.65	4.50	8.95	4.50	9.09	4.56	9.23
7	Building materials price	↑	4.60	9.16	4.70	9.75	4.80	9.86	4.80	9.54	4.60	9.29	4.70	9.52
8	Education costs	↑	4.90	9.76	4.80	9.96	4.90	10.06	4.90	9.74	4.90	9.90	4.88	9.88
9	Health costs	↑	4.70	9.36	4.80	9.96	4.90	10.06	4.80	9.54	4.70	9.49	4.78	9.68
10	Electricity costs	↑	4.60	9.16	4.70	9.75	4.80	9.86	4.70	9.34	4.60	9.29	4.68	9.48
11	Fish selling price	↓	2.20	4.38	2.20	4.56	2.20	4.52	2.40	4.77	2.20	4.44	2.24	4.54
12	Wood selling price	↑	3.60	7.17	3.40	7.05	3.40	6.98	3.60	7.16	3.70	7.47	3.54	7.17
13	Sand selling price	↑	3.60	7.17	3.50	7.26	3.60	7.39	3.70	7.36	3.70	7.47	3.62	7.33
14	Expenditure level	↑	4.40	8.76	4.40	9.13	4.50	9.24	4.10	8.15	4.50	9.09	4.38	8.87
15	Income level	↓	2.80	5.58	2.70	5.60	2.50	5.13	2.70	5.37	2.50	5.05	2.64	5.35
	Total		50.20	100.00	48.20	100.00	48.70	100.00	50.30	100.00	49.50	100.00	49.38	100.00

Table 3

Change direction, values and cultural components change at South-East Aru conservation area

Crt. no.	Changed component	Direction	Cultural characteristics of fisher community at South-East Aru conservation area											
			Bemun		Longgar		Apara		Karey		Batu Goyang		Mean	%
			Mean	%	Mean	%	Mean	%	Mean	%	Mean	%		
1	Sasi practices	↓	2.20	12.09	3.00	15.79	2.50	13.51	3.00	15.54	2.20	12.09	2.58	13.84
2	Rituals for sailing	↑	3.00	16.48	3.00	15.79	3.00	16.22	3.00	15.54	3.00	16.48	3.00	16.09
3	Respectful ethnic leader	↑	5.00	27.47	5.00	26.32	5.00	27.03	5.00	25.91	5.00	27.47	5.00	26.82
4	Respectful religious leader	↑	5.00	27.47	5.00	26.32	5.00	27.03	5.00	25.91	5.00	27.47	5.00	26.82
5	Respectful village leader	↑	3.00	16.48	3.00	15.79	3.00	16.22	3.30	17.10	3.00	16.48	3.06	16.42
	Total		18.20	100.00	19.00	100.00	18.50	100.00	19.30	100.00	18.20	100.00	18.64	100.00

The component which always shows an increasing tendency for the locals was the financial problem, which is related to low price of fishery commodity against high household expenditure. Change that related to money was also connected to the change in people behavior. Many became more individualistic in the utilization of natural resources. Social life in the community was also affected like individual or familial contribution in social life.

Increase of population also had an effect on the increased of human needs, increased of fisher number which also increased competition on resources utilization. Another impact of population increased was potential increased in housing when the people enter marriage age which will further increase the need of building materials.

Community income increases will have an effect on the ability to sort out their problem (B1-B3; Figure 1). Money increases will increase the ability to improve child education, more access to health services, and more chances to satisfy their main family requirement. All these impact will have a positive implication on responding and solving problems that might come.

Lastly, many problems encountered by community needs collaboration across community (R18; Figure 1). This was one of main reason why leaders of community tried hard to maintain life closeness within their community or even between villages within conservation area. Altogether, main influence in system change was the needs for having better family welfare supported by better income that enable to fulfill community or people needs.

Conclusions. Some conclusions based on the analysis of fisher community characteristics of South-East conservation area as follows:

1. Social problems faced by the people of the area were: limitation on education needs, health access, light/electricity, clean water, food and housing, as well as information on the friendly technology of natural resources management;
2. Due to social obstacles the fisher faced, trigger them to increase their income to fulfill what they need by optimizing their effort in using the natural resources within the ecosystem (mangrove, sea-grass bed, coral reefs, open waters) either within conservation area or outside;
3. Low income and high expenditure reduced the implementation of indigenous knowledge (*Sasi*) on sustainable management of the resources.

Compliance and respectfulness towards the community leaders still sustain hence can be a key component in persuading the better management of South-East Aru conservation area.

References

- Adams W. M., Aveling R., Brockington D., Dickson B., Elliott J., Hutton J., Roe D., Vira B., Wolmer W., 2004 Biodiversity conservation and the eradication of poverty. *Science* 306(5699):1146–1149.
- Brodziak J., Traver M., Col L., 2005 Georges Bank Haddock, pp. 30–80.
- Browder J. O., 2002 Conservation and development projects in the Brazilian Amazon: Lessons from the Community Initiative Program in Rondônia. *J Environ Manage* 29(6):750-762.
- Crain C. M., Kroeker K., Halpern B. S., 2008 Interactive and cumulative effects of multiple human stressors in marine systems. *Ecol Lett* 11:1304–1315.
- Darling E. S., Côté I. M., 2008 Quantifying the evidence for ecological synergism. *Ecol Lett* 11:1278–1286.
- DeFries R., Hansen A., Turner B. L., Reid R., Liu J., 2007 Land use change around protected areas: management to balance human needs and ecological function. *Ecol Appl* 17:1031–1038.
- Doak D. F., Estes J. A., Halpern B. S., Jacob U., Lindberg D. R., Lovvorn J., Monson D. H., Tinker M. T., Williams T. M., Wootton J. T., Carroll I., Emmerson M., Micheli F., Novak M., 2008 Understanding and predicting ecological dynamics: are major surprises inevitable? *Ecology* 89:952–961.

- Fatzey I., Pettorelli N., Kenter J., Wagatora D., Schuett D., 2011 Maladaptive trajectories of change in Makira, Solomon Islands. In: Global environmental change: Human and policy dimensions. Adger N., Brown K., Conway D. (eds), 21(4):1275-1289
- Gjertsen H., 2005 Can habitat protection lead to improvements in human well-being? Evidence from marine protected areas in the Philippines. *World Dev* 33(2):199–217.
- Halpern B. S., McLeod K. L., Rosenberg A. A., Crowder L. B., 2008 Managing for cumulative impacts in ecosystem-based management through ocean zoning. *Ocean Coast Manag* 51:203–211.
- Jackson J. B. C., Sala E., 2001 Unnatural oceans. Volume 65, Issue Supplement 2, pp. 273-281, University of California, La Jolla, United States.
- Satria A., 2002 Pengantar Sosiologi Masyarakat Pesisir. Penerbit PT Pustaka Cidesindo, Jakarta. 63 hal.
- Secretary of Biodiversity Convention, 2009 The convention on biological diversity, year in review. Marine and coastal biodiversity; ocean play critical role in climate change. Montreal, Quebec, Canada H2Y 1N9. P 42:28-29.
- Stachowitsch M., 2003 Viewpoint: Research on natural marine ecosystems a lost era. *Mar Pollut Bull* 46:801-805.
- Straede S., Treue T., 2006 Beyond buffer zone protection: a comparative study of park and buffer zone products' importance to villagers living inside Royal Chitwan National Park and to villagers living in its buffer zone. *J Environ Manag* 78:251–267.
- Vitousek P. M., Mooney H. A., Lubchenco J., Melillo J. M., 1997 Human domination of Earth's ecosystems. *Science* 277:494–499.
- Worm B., Hilborn R., Baum J. K., Branch T. A., Collie J. S., Costello C., Fogarty M. J., Fulton E. A., Hutchings J. A., Jennings S., Jensen O. P., Lotze H. K., Mace P. M., McClanahan T. R., Minto C., Palumbi S. R., Parma A. M., Ricard D., Rosenberg A. A., Watson R., Zeller D., 2009 Rebuilding global fisheries. *Science* 325(5940):578–585.

Received: 02 August 2013. Accepted: 05 September 2013. Published online: 07 October 2013.

Authors:

Fernando Dayandri Willem Dangeubun, Pattimura University, Faculty of Fisheries and Marine Science, Indonesia, Jl. Mr. Chr. Soplanit, Kampus Poka Ambon 0911-3825060, e-mail: fernando_dange@yahoo.com
 Johannes Marthen Stephen Tetelepta, Pattimura University, Faculty of Fisheries and Marine Science, Indonesia, Jl. Mr. Chr. Soplanit, Kampus Poka Ambon 0911-3825060, e-mail: fpik_unpatti@yahoo.com

This is an open-access article distributed under the terms of the Creative Commons Attribution License, which permits unrestricted use, distribution and reproduction in any medium, provided the original author and source are credited.

How to cite this article:

Dangeubun F. D. W., Tetelepta J. M. S., 2013 Problem of fisher community and it's implication on the management of South-East Aru conservation region. *AAFL Bioflux* 6(6):518-529.