Enhancing small-scale community for coastal management in Puntondo Bay, Indonesia

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Abstract. Coastal communities were mostly characterized by small-scale fisheries, facing difficulties to improve livelihoods and coastal management. Thus, community needs to build the organization and alternative livelihoods must be developed. This study aims to: 1) Assess the socio-economic information; 2) Analyze the dynamic of marine and fisheries activities, and 3) Analyze the activity to improve the capacity of community for coastal resource management. Data were collected during 2017 through interviews using structured and semi-structured questionnaires, both open and closed ones to 42 fishermen/seaweed farmers; 20 respondents from local fishery officers, seaweed collectors, traders, and exporters, processing companies, and coastal women/fishermen’s wives. Representatives of 11 relevant stakeholders were also interviewed. The result shows that coastal community livelihood activities in Takalar District consist of fishing, aquaculture, and the processing of fishery products. Fishing activities carried out by fishermen using the size <5 GT vessels and fishing gear such as nets and fishing rods. There is growing aquaculture in seaweed commodities particularly Eucheuma cottonii and Eucheuma spinosum, while for Gracilaria sp., and Caulerpa sp. were started to be developed. Initial activity planning was done to increase the resilience of coastal communities, based on the social and economic profile then composed the activities plan to increase resilience of people in Takalar District.

1. Introduction
Coastal resources are covering natural resources contained in coastal areas covering land, coast, and sea. In the case of fishery resources, marine and other natural resources contained in coastal areas such as mangrove forest land, ponds, and land areas that serve sustain the lives of people in the region. The management of coastal resources is one of the keys to supporting sustainable village development that can ensure the livelihoods of people in coastal rural areas. Therefore, the strategic plan for coastal resources management is an important document in supporting the running of coastal village development process.

In Indonesia, the development of marine and fisheries is covered as the natural resource and environment sector. It is very important for the provider of raw materials to support living systems. The strategies are implemented in several ways: 1) Minapolitan, 2) entrepreneurship, 3) networking, 4) technology and innovation, 5) empowerment and 6) the institutional strengthening of community groups. The condition of the coastal resources proposed may illustrate the dynamics of the development.
of the condition of the resource, the problems faced and the action estimates that are an alternative solution to the problems faced at the village level.

South Sulawesi Province has an abundant natural resource which lasts to make the coastal societies prosperous, particularly in Takalar District. Nevertheless, it was exactly increased the intensity of exploitation activity that threatens the preservation of natural resources. The coastal resource management strategic plan addresses all the results of meetings and discussions of stakeholders (institutional) in the existing coastal areas of Laikang.

The questions then were: How the socio-economic condition of coastal communities in Puntondo Bay?; What the problems occur in fisheries activities?; How did it respond to better marine and fisheries resources management? Therefore, This study aims to: 1) Identify baseline socio-economic information; 2) Describe marine and fisheries activities, and 3) Analyze the activity to improve the capacity of community for coastal resource management.

2. Methodology

2.1. Duration and study area
Data collection was conducted in July - December 2016. A study was conducted in the eastern part of Indonesia, namely Takalar District in South Sulawesi Province. One village was selected from Takalar District based on marine aquaculture and capture fisheries. South Sulawesi Province is located in the southernmost part of Sulawesi Island, at S 0°12′ – 8′ and from E 116°48’ up to E 122°36’. Makassar City is the capital city of South Sulawesi Province. The average daily temperature in Makassar fluctuates between 22° C and 33° C. Takalar District is located on the south side of South Sulawesi Province. This district has a land area of 566.51 km², which is bounded by Gowa District (N), Gowa District and Jeneponto District (E), Flores Sea (S), and Makassar Strait (W)[1].

2.2. Data collection
Interviews were conducted using structured and semi-structured questionnaires, by using qualitative and quantitative questions, both open and closed ones. Group discussions were also designed and implemented to explore the perceptions of fishermen. Total samples were collected from 42 fishermen/seaweed farmers; 20 respondents from local Fishery Officers, seaweed collectors, traders, and exporters, processing companies, and coastal women/fishermen’s wives. Representatives of 11 relevant stakeholders were also interviewed.

Secondary data were collected mainly from the Ministry for Marine and Fisheries (MMAF), the Republic of Indonesia. At the local level, the data was collected from the Marine Affairs and Fisheries service office of Province (DKP-province) and the Marine Affairs and Fisheries service offices of the district (DKP-district) of South Sulawesi Province, village offices and research institutes, and universities. Statistics data, published books, scientific journals and other resources related to the research topic were also collected.

2.3. Data analysis
This study used a qualitative analysis method to analyze data from the research location. The data obtained through a structured questionnaire will be analyzed using descriptive statistics. Descriptive analysis will be focused on the socio-economic condition of respondents and the research locations, participation of community, and livelihood. Descriptive statistics is the branch of statistics that focuses on collecting, summarizing, and presenting a set of data [2]. Descriptive statistics essentially aims to provide a better understanding of how frequent the data value is, and of how much variability there is around a typical value in the data [3].

3. Results and discussions

3.1. Socio economy characteristic of respondents
Characteristics of respondents based on the age distribution showed that 95% of respondents are in productive age percentage 15-64 years. According to the Central Bureau of Statistics, the composition of the Indonesian population by age group comprised of young people (0-14 years), productive age (15-64 years) and elderly (≥65 years). The population age structure is considered young when the proportion of the young population as much as 40% or more, while older age groups are less than or equal to 5%. However, population age structure is considered old when the young group is less than or equal to 30% while its old age group is greater than or equal to 10%. Based on this, the age structure of fishermen mostly falls into young groups (productive age) who are able to work in order to produce goods or services to meet the needs of themselves and to community. Most respondents are less educated (38.10%) or only attended formal elementary education (30.95%). This is because the demands of the economy and the mindset of parents believing that every child should help parents to earn a living. Only up to 2.38% of the respondents have higher education on diploma level, it indicates that there is still a desire to receive capture technology seen in the respondents’ efforts, to increase ability to innovate.

The next social and economic characteristics of respondents is the amount of revenue per year with a range of income of IDR 3 million to 865 million/year. The 51% respondents' income is quite high at around IDR > 5 million/year, this shows that the fishing is not the only livelihood but they also have side jobs as farmers, self-employed, workers of fisheries, industrial workers, building porters, stone porters, village officials, or factory workers with an average income of IDR 750,000 per month. The respondents used the revenue to support their families of average 3-4 people. About 50% of respondents are fishermen with <3 family members and 48% respondents have to support between 3-5 persons. The patterns of consumption and household expenses generally vary between typology of fisheries, among income groups, ethnic, or tribal and inter time. The number of family members, fewer family members means the less they need to make ends meet, and vice versa, the more family members, and more needs that must be met. Education of family members of respondents (wife or children) some only attended elementary school and some didn’t go to school at all. The average age of respondents was 16 years old; this indicates that the respondent’s children have entered the productive age that may contribute to the family income.

Social institutions are systems of behavior and relationship-centered activities to meet the complex special needs in public life [4]. Social organizations also are interrelated as a set of norms on all levels that range on staple goods in people's lives [5] The functions of social institutions are: 1) Provide guidance to individuals behave/community; 2) Maintaining the integrity; and 3) Provide direction to the people to hold social control. Takalar District community is generally established institutions by the initiation of local government as a vessel for channeling government assistance. The respondents’ participation in the institutions is still very low in both institutions formed by the initiation of the government, NGOs and of the community itself. The results of the baseline survey showed that there are three institutions on the research sites namely seaweed farmer group, a fishermen group, and fish processing group. Only 23% were involved in business institutions both as administrators and members.

Source of respondents’ capital in running their business comes from their own capital and loans. To start a business, of respondents use their own capital, loan capital is generally used to run and develop the business. Most of the loan capital came from seaweed collectors with loan size ranges between IDR 500,000 to IDR 5,000,000, the term of the loan and the amount of installment is very flexible depending on the respondent's ability to pay. This loan is more to seaweed traders' strategy to bind the respondents in order to sell seaweed. Respondents do not operate financial management of business properly, lacking the habit of recording income and business expenses. This resulted in mixing business finances with household finances. In terms of savings, the majority of respondents have no savings of any kind, only about 12% of respondents who have deposits of gold or savings.

3.2. Marine and fisheries activities
Catching fleet used by respondents fishermen is <5 GT traditional boats with pelagic fish, shrimps and crabs as the main commodities. Respondents are ‘one-day fishermen’ which means that the capture sites are between 0–4 miles of shoreline on the Puntondo coast up to Jeneponto coast. Fishermen’s operational
time generally starts in the afternoon at about 5 PM when the fishermen install nets, then pick up the nets the next morning around 8 am. They caught fish every day, except when they are sick or there is an urgent need. The fishermen still largely use traditional technology with fishing gear such as gillnets, fishing line, longline or trawl. Fishermen have some ways to sell the catch, like selling the catch themselves or through local retailers or collectors. Fishermen sell their catch themselves when they only caught a few, they sell the fish to the neighbors or restaurants. Sales through retailers and collectors are only for big catch.

Income from fishing is depending on weather conditions, and earned is just enough to meet for daily needs. Respondents will continue to survive and run the fishing effort due to limited skills and capital to start another business. Respondents consider fishing is a job with a bleak future. Respondents have expectations to increase revenue from fishing effort is by increasing their resources like bigger boats, more fishing gear (more nets), capital support from the government as well as preserving the fish resources through the use of environmentally friendly fishing gear.

The fishery commodities cultivated by the people of Takalar District including the seaweed, milkfish, crab and tiger prawns. In addition, some people perform catfish and tilapia cultivation in the inland open waters. However, seaweed farming is predominant among the community. Therefore total production continues to increase and it becomes a commodity for the region of South Sulawesi. In 2015, Takalar District has contributed 31.80% of total seaweed production in South Sulawesi. Meanwhile, when compared to national production, Takalar District seaweed made 23.04% contribution [6].

Most of the farmers in Mongarabombang sub-districts followed by Sanro bone and Mappakasungguie successively as many as 2830 people, 2250 people, and 1520 people. Based on the increasing number of farmers and the amount of production, there is a tendency of farmers to cultivate Eucheuma also Gracilaria. The reason is Gracilaria has several advantages including relatively more resistant to disease and the planting is done in the pond so that weather risk can be minimized. While Eucheuma is cultivated on sea waters so that disease and resistance to the current become greater risks. But the advantage is because mainly Eucheumacottonii has a wider market share compared to other types. There are types of collector: small, medium and large based on the number of loans to farmers, the number of members, and purchase capacity (Table 1).

Table 1. Types of seaweed traders collector in Takalar District

| No | Type           | ∑ members (people) | Capacity (tonnes) | Criteria | ∑ Interest receivable to members | Marketing target          |
|----|----------------|-------------------|-------------------|----------|---------------------------------|---------------------------|
| 1  | small collector| 5 – 10            | < 2               | cultivator | 200,000 – 500,000               | Big trader                |
| 2  | medium collector| 11 – 20           | > 2 – 10          | cultivator | 500,000 – 2 million             | Big trader and company    |
| 3  | large collector| > 20              | > 10              | cultivator, small collector, medium collector | < 2 million – 40 million | company                   |

Therefore, farmers feel they have limited access to market information and thus require the assistance of the authorities to provide a solution to this problem. Better information would enable farmers to increase bargaining power against a specified price from the collectors [7]. Despite the problem on market access limitations were only raised by a small part of the farmers, but the results of observations show that this problem is the problem of all farmers. As many as 73% of farmers felt quite knowledgeable about the marketing because of their low level of education and limited transportation so they do not make any effort to search for more extensive information and quite satisfied with existing conditions. The price is entirely in the hands of collectors and farmers generally do not know more broadly condition of seaweed market.
3.3. Discussions

3.3.1. Community capacity improvement for coastal resource management. The concept of fisheries resource management has not been socialized properly in the community. About 83% of respondents did not know how to manage resources sustainably, although 40% of respondents feel the decline of fishery resources. The knowledge of respondents in managing fishery resources is limited to the use of fishing gear that does not cause any damage such as bombs and potassium as well as on programs and government assistance [8].

Based on the interview, the respondents said that the management of fisheries resources is the responsibility of the government, a group of fishermen and fishermen. The role of the respondent in the management of fishery resources includes (1) engage in fishing activities in accordance with applicable regulations, (2) supervise the infringement and (3) do not pollute the sea. Knowledge in the management of fishery resources respondent obtained from the print media, department of marine and fisheries as well as from friends / around the community.

An economic institution such as cooperative is necessary to create build economic welfare[9]. Managing cooperative business is more difficult than managing the private business; public participation is therefore needed. A cooperative business is more difficult than a private business. Good participation, the lack of capital will not be an issue. The current issue is strengthening the very weak institutions. Village Business enterprise (BUMDes) can take the form of limited company and cooperative. BUMDesis owned by a village; it is allowed to manage village fund but is not allowed to do it directly, because BUMDes is not a legal entity. It is important for entrepreneurs to learn one’s talent so that the knowledge will lead forwards, building a cooperative that will strengthen the economy.

Coastal communities have always been identified as the disadvantaged and marginalized communities, both from the perspectives of economy, education and development infrastructure. From an economic perspective, there is a poor practice of coastal community derived from the pattern of their livelihood where the goods from the sea are obtainable on daily basis and so is their consumption[10]. Various efforts have been put together to solve this economic problem, both by the government and/or private companies. Some critical success can only be executed through good open integration and cooperation with the community.

Business monopoly by investors will surely slowly turn off the economic activities of a small community. The most suitable measure that can be done to revive the small local economy are 1) Analyze the supply of resources available in a certain region (Laikang Village) 2) Find out the population growth surrounding existing local resources. 3) Find out the local community dependency on the available coastal resources. 4) Find out the issues or limiting factors in optimizing their potentials. 5) Provide knowledge and skills to the communities who use available resources to manage the resources they own in an optimal and sustainable way. The key to the solution is accuracy in solving issues of the local economy by taking into account the harmony of the existing potentials and the amount of capital development budget given along with the available control and guidance [11,12].

Coastal management in Laikang village includes aspects of social, economic, environmental and institutional strengthening. Economy improvement of coastal communities in Laikang village is still the central issue within coastal management. Institutional cooperation is required as a platform for collaboration and fostering the groups. Jentoft [13] argued that as long as one group member is aware of empowering with others, co-management will be sustainable and co-management must be pursued in relation with other efforts to build the society. The community has the right to utilize Marine Fisheries Resources but they are also obliged to preserve the sustainable benefits of these resources. In relation to their rights, the community has to have position(s) on all levels, both in operational and decision-maker. Implementation strategy of managing marine fisheries resources comprises of three aspects, i.e. 1) institutional strategy (i.e. who and how to manage the resources); 2) technical strategy (i.e. what are the appropriate management instrument options); and 3) adaptive strategy (i.e. how to monitor and improve the resources management quality).
The forum above basically would assist Head of Laikang Village in providing ideas and inputs to the village head in preparing the program up to running the program. The group of “Coastal Economy Development” will develop and implement the programs related to coastal economy development of Laikang Village based on fisheries, agriculture, animal husbandry, marine tourism services and other potentials that can be used as economic resources for Laikang Village community. In carrying out its duties, the field coordinator always coordinates with the village head in the process of formulating and implementing the village program. The role of this group is as initiators, catalysts and voluntary controls in encouraging the development of the coastal economy in Laikang Village. The group of “Coastal Resources Management” will prepare and implement programs related to the management of coastal resources of Laikang Village based on fisheries, agriculture, animal husbandry, marine tourism services, and other potentials to maintain controlled utilization and sustainment. In carrying out its duties, the field coordinator always coordinates with the village head in the process of formulating and implementing the village program. This group would as initiators, catalysts and voluntary controls in encouraging coastal resource management in Laikang Village. The group of “Ecotourism Development” will prepare and implement program activities related to ecotourism development of Laikang Village that utilize the potential of fishery, agriculture, animal husbandry, and other potentials that can be used as tourist services in Laikang Village. In carrying out its duties, the field coordinator always coordinates with the village head in the process of formulating and implementing the village program. This group will also as the initiator, catalyst, and voluntary control in ecotourism in Laikang Village.

In managing coastal resources and exploiting the potential of coastal resources in Laikang Village, representatives of institutions in Laikang agreed to form a forum called "Laikang Coastal Resources Development Forum" (figure 1).

![Coastal resources development forum at laikang village](image-url)
Conclusion

Coastal community livelihood activities in Takalar District consist of fishing, aquaculture, and the processing of fishery products. Fishing activities carried out by fishermen using the size <5 GT vessels and fishing gear such as nets and fishing rods. The fish catch was usually sold in the form of fresh products for local consumption, a small portion is used for processing activities in the form of meatballs, crab meat, and fish crackers. There is growing aquaculture in seaweed commodities particularly *Eucheuma cottonii* and *Eucheuma Spinosum*, while for *Gracilaria sp.*, and *Caulerpa sp.* were started to be developed.

Initial activity planning was done to increase the resilience of coastal communities, based on the social and economic profile then composed the activities plan to increase resilience of people in Laikang Village.

Finally, a coastal resource management plan was formulated and would apply in coastal village management, which consist of three groups in coastal resources development forum, namely: Community economic development division, Resources & environment management division, and Ecotourism development division.

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