

Fishermen's perception and participation in fisheries resources conservation of Batungap swamp in Tapin Regency, South Kalimantan, Indonesia

Leila A. Sofia

Study Program of Fisheries Agribusiness, Faculty of Fisheries and Marine Science, Lambung Mangkurat University, South Kalimantan, Indonesia. Corresponding author: L. A. Sofia, lelaulm2017@gmail.com

Abstract. This study aims to know the fishermen's perception and participation and the government's role in fisheries resources conservation of Batungap swamp, Tapin Regency. Field study was done in November 2015 to January 2016 using survey method. Data collected from questionnaires were ordinal data measuring response levels, from very positive to very negative using Likert scale. Results showed that the fishermen around Batungap swamp area had sufficiently high perception (80.9%) on the benefit of the aquatic environmental management since it was aware that fish catches be highly dependent upon good aquatic ecosystem conditions, and they had moderate level of participation (65.62%) because they were still using traditional and environmentally friendly fishing gears. Nevertheless, control on the fishermen's participation was low since they thought that there were Controlling Community Groups (CCG). The government's role in the management of Batungap swamp area was also moderate (62.5%) because the respondents thought that it was good enough, but the socialization on regulations and boundary mark setting of the protected area was still low so that the fishermen around and out of the area had low knowledge on the boundaries of the protected area.

Key Words: government's role, survey, fish catch, traditional fishing gear, fisheries management.

Introduction. Batungap swamp, Tapin Regency, is one of the freshwater in South Kalimantan possessing high fisheries resources potency. It covers about 939.30 ha, including river and swamp with depth range of 0.5-5 m, and belongs to fertile waters of high plankton content (Baharuddin et al 2016), so that this habitat becomes one of the highly suitable habitats for typical freshwater fish of Kalimantan, such as common snakehead (*Channa striata*), giant snakehead (*C. micropeltes*), climbing perch (*Anabas testudineus*), snakeskin gourami (*Trichopodus pectoralis*), three spot gourami (*Trichopodus trichopterus*), kissing gouramis (*Helostoma temminkii*), and other fishes.

Fisheries production of Batungap swamp averagely reaches 924.4 tons yr⁻¹, consisting of 534.7 tons of river fish and 389.7 tons of swamp fish, with a total value of IDR 14.19 billion yr⁻¹, IDR 7.28 billion yr⁻¹ for river fish production and IDR 6.91 billion yr⁻¹ for swamp production, respectively (Animal Husbandary and Fisheries Services of Tapin regency 2015). This amount makes the area of Batungap swamp be one of the major suppliers of local fish in South Kalimantan and its surroundings, and livelihood source of local communities around the swamp working as traditional fishermen.

Nevertheless, fish demand increment with population growth and economic growth has pushed irresponsible practice of fish exploitation that does not follow environmental conservation and sustainability principles (Fauzi & Anna 2005). Quick yielding production practice continuously occurs in Batungap swamp area, such as fishing of fish spawners and unmaturing fish, electricity fishing practice, and fish poisoning. As a result, fish production of fishing fisheries tends to decline in the past 5 years with mean annual decline rate of 10% (Baharuddin et al 2016).

One of the efforts of the regional government to protect the fisheries resources is the development of conservation area of Batungap swamp waters. To reach the goal, support of user groups, especially fishermen, is highly required, either the quality of human resources or the capacity of social and economic institutions. This is what underlies the necessity to study on community's perception and participation, particularly fishermen, in swamp fisheries resources management.

Fisheries resources conservation is effort of protecting, conserving, utilizing fish resources, including ecosystem, species, genetic, to ensure the occurrence, availability, and its sustainability by constantly maintaining and increasing the quality of the value and the diversity of the fish resources (Government Regulation of Republic of Indonesia numbered 60/2007). The embodiment of fisheries resources conservation effort and its habitat is the development of aquatic conservation area. The principle of an aquatic conservation area is the spill over effect, in which the fish stock is left to grow in the protected area, and the spill over will flow out of the protected area, then can be sustainably exploited without reducing the stock development source in the protected area (Fauzi & Anna 2005). Aquatic conservation area has been able to maintain the ecosystem condition from extinction and irresponsible human disturbance, give income development of 10-30%, and development of regional revenue as gross regional domestic product (GRDP), particularly 5.67% from tourism sector (Bato et al 2013).

Management and development of an area highly depends upon the surrounding community's participation since they are direct resources users (Rizal 2011; Ayunita & Hapsari 2012; Annis et al 2017). The participation level covers planning, implementation, controlling, and evaluation (Sabardi 2014; Sulistyowati & Karyadi 2016).

Individual participation is closely related with perception to an object (Jannah et al 2013). Perception is an integrated activity in personal response, in which what is in the individual will actively be involved in perception (Walgito 2003). Community's perception on the occurrence of object potential actually reflects opinion, desire, expectation, appraisal/evaluation, and response to the development activities in their area (Haruddin et al 2011; Latupapua 2011). Perception gives important implication on behavioral orders, including social order affecting the social system or biogeophysical environment (ecosystem). According to Silva & Lopes (2015), one of the failure causes of the aquatic protection area development is the disobedience of the illegal fishing perpetrators against the restrictions and regulations, so that assessment is needed on the attitude of the stakeholders as a result of the presence of the aquatic protection area.

This study was aimed at knowing fishermen's perception and participation and the regional government's role in fisheries resources conservation in Batungap swamp, Tapin regency.

Material and Method. Field study was conducted in November 2015 to January 2016. This study used survey method to obtain data on recent facts and symptoms in the study location. Population on study was fishermen in the conservation area development of Batungap waters, Bakarangan district, Tapin Regency, covering Bundung village, Gadung village, and Masta village (Figure 1). Thirty respondents were randomly taken or about 10% of total number of fishermen.

Questioner-based data obtained were ordinal data measuring different levels, from very positive to very negative level. The scale of measuring the individual or people group's attitude, opinion, and perception on social phenomena applied Likert scale (Sugiyono 2006). To quantify the qualitative data, the respondent's responses were scored as follows:

No.	Statement	Score
1.	Highly agree/know well/very positive	4
2.	Agree/know/positive	3
3.	Disagree/know a little bit/never/negative	2
4.	Notoriously disagree/unknown/never	1

Fishermen's participation includes fishermen's involvement, particularly those related with fishing fisheries resources management around Batungap swamp, Tapin Regency. They could be involved in fishermen's group or swamp fisheries resources management

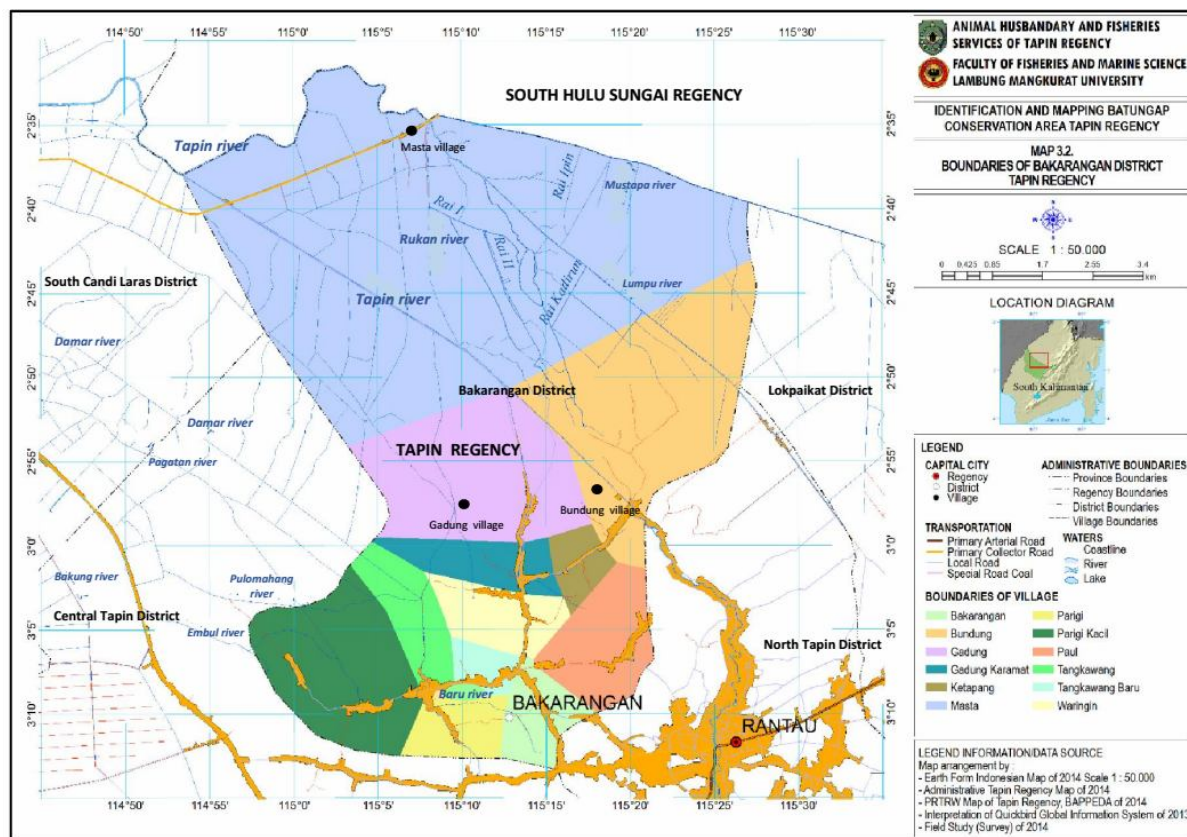


Figure 1. Study site in Batungap swamp area, Tapin Regency.

Results and Discussion

Fishing fisheries business conditions. Fishing has been done for many generations as major livelihood and or side job. The fishing gears mostly used by the local fishermen were longline, hook and line, trap, *tempirai*, and *andrenge (gill net)*. Fishing season in freshwater ecosystem was set about 6 months a year (in dry season) with approximately 120 fishing trips. Mean catch per was 5-10 kg. The fishing gears mostly used in the study site were line and *banjur*.

Fisheries production of Batungap swamp in 2015 reached 924.38 tons, 534.69 tons of river fish and 389.69 tons of swamp fish, respectively. Dominant catches in the swamp were *A. testudines*, 145 tons yr^{-1} (37.21%), *T. pectoralis*, 85.15 tons yr^{-1} (21.85%), and *C. striata*, 56.39 tons yr^{-1} (14.47%). These three species belong to importantly economic fish with production value of IDR. 3.39 billion for *A. testudines*, IDR. 1.17 billion for *C. striata*, and IDR. 885.6 million for *T. pectoralis*, respectively. Meanwhile, the river fish species dominantly caught were catfish, 78.62 tons or 14.70%, *Hemibagrus* sp., 76.07 tons or 14.23%, and mixed fish, 155.58 tons or 29.10%, respectively (Table 1).

Fishing business requires a capital of IDR. 6.7 million, comprising boat, boat engine, fishing gear. The boat used was 1 m x 6 m sized with a price of IDR. 4 million with a durability estimate of 15-20 years. The boat engine used was small-powered with a price of IDR. 2.5 million unit^{-1} , with a durability of 4-5 years. The fishing gear was purchased for IDR. 159,000/set for only a single fishing trip, so that each trip needed new set of fishing gear. Overall investment, production cost, and revenue are given in Table 2.

Table 1

Production and value of fishing fisheries in Batungap swamp area, Tapin regency with species in 2015

No.	Water type/fish species	Production		Net value/yr (IDR)
		(ton yr ⁻¹)	%	
<i>Swamp</i>				
1	<i>C. striata</i>	56.39	14.47	1,172,908,492.77
2	<i>C. micropeltes</i>	27.49	7.05	371,676,710.25
3	<i>T. trichopterus</i>	85.15	21.85	885,608,671.71
4	<i>H. temminkii</i>	15.96	4.10	290,437,804.54
5	<i>T. pectoralis</i>	15.35	3.94	159,688,492.77
6	Other fish	42.51	10.91	552,633,757.74
7	Shrimp	1.84	0.47	81,500,404.34
8	<i>A. testudineus</i>	145.00	37.21	3,392,944,640.40
Sub total (1)		389.69	100.00	6,907,398,974.52
<i>River</i>				
1	<i>L. hoevenii</i>	74.67	13.97	1,164,905,924.21
2	<i>Pangasius</i> sp.	72.91	13.64	758,301,818.18
3	<i>Kryptopterus</i> sp.	42.01	7.86	436,942,774.12
4	<i>Chitalalopis</i> sp.	11.95	2.23	279,725,817.47
5	Other fish	155.58	29.10	2,022,509,170.97
6	Shrimp	22.88	4.28	1,011,192,753.96
7	<i>C. batrachus</i>	78.62	14.70	817,660,081.84
8	<i>Hemibagrus</i> sp.	76.07	14.23	791,113,747.26
Sub total (2)		534.69	100.00	7,282,352,088.01
Total (1+2)		924.38		14,189,751,062.53

Source: Processed data of Tapin Regency in numbers, 2015 and Survey of 2016.

Table 2

Estimation of investment need, production cost, fishermen's income of all line fishing types around Batungap swamp area for one year

No.	Description	Value (IDR)
I.	<i>Investment</i>	6,659,000
1	Boat	4,000,000
2	Boat engine	2,500,000
3	Fishing gear	159,000
II.	<i>Total cost</i>	7,205,583
1	Fixed cost	614,583
2	Variable cost	6,591,000
III.	<i>Revenue and financial analysis</i>	
1	Revenue	15,000,000
2	Business profit	7,794,417
3	Fishermen's income/month	649,534.72
4	Cost-benefit ratio	2.08
5	Payback period (year)	1.7

Source: Processed data of 2016.

Total cost of fishing activity consist of fixed cost and variable cost. The former is not dependent upon number of production. In this case, fixed cost is total cost for vessel depreciation, engine, and fishing gear, and vessel maintenance cost, such as painting, cleaning, brushing, and others, engine maintenance, such as propeller, axles, and others. The latter is dependent upon number of production. The latter covered fuel consumption as much as 2 liters per tripwith the price range of IDR. 8,000 to IDR. 9,000. Fishing

yields a gross income of about IDR. 15,000,000 yr⁻¹ and net income of IDR. 7,800,000 yr⁻¹ or IDR. 650,000 month⁻¹. Fishing business was sufficiently beneficial with B/C ratio of 2.08 and payback period of about 20 months.

Fishermen's perception on conservation and aquatic environment. Community's response to the structured questions distributed to fishermen of Bundung village, Gadung village, and Masta village is demonstrated in Table 3.

In general, the respondents demonstrated that the condition of river and swamp around the villages was good enough (77.14%) so that number of fish and species were still sufficiently high (58.06%) and its utilization still gave good income. About 65.12% respondents stated that limitation of inland fisheries resources utilization was highly needed so that the ecosystem and its biota, such as fish, aquatic plants, and others, could be protected. Thus, 72.73% respondents felt that the presence of Aquatic Protected Area was very useful for the surrounding communities as source of livelihood for farmers and fishermen.

Moreover, about 85.71% respondents claimed that the main problem for the fish resources sustainability and the waters around the village was electricity fishing practice. The people had good knowledge about this fishing practice, because it killed not only the economic fishes, but also hazarded the presence of all fish species, fish fries, and fishermen themselves. To give a deterrent effect against the culprit, then according to 63.16% of respondents, those who undertake destructive fishing practices should be penalized with legal action.

Nevertheless, implementation of fishing prohibitions or restrictions at the study sites often practically caused conflicts, and even they were not ashamed to disobey the law enforcement because their livelihood was threatened. The enforcement action setting the fishing activities has resulted in complex social cultural responses (Ermolin & Svolkinas 2016). Thus, the regulation implementation should also be followed with preparations of alternative livelihoods or other social aid programs (Nunoo & Asiedu 2015). Good understanding on conflicts, including context, actor, cause, relationship dynamics, and community's participation process, so that it could help solving the conflict in facilitating the needed conditions in the aquatic area management implementation (Meyer-McLean & Nursey-Bray 2017).

Table 3

Fishermen's perception on conservation and aquatic environment

No.	Description	Score				Percent			
		4	3	2	1	4	3	2	1
1.	Aquatic condition (river; swamp) around the village	4	27	4	0	11.43	77.14	11.43	0.00
2.	Number and fish species in surrounding waters of the village	4	18	8	1	12.90	58.06	25.81	3.23
3.	Limitation of freshwater resources exploitation to protect environment and its biota	28	15	0	0	65.12	34.88	0.00	0.00
4.	Aquatic Protected Area beneficial for fishermen	32	12	0	0	72.73	27.27	0.00	0.00
5.	Electricity-using fishing becomes major problem of fish resources sustainability and water around the village	36	3	2	1	85.71	7.14	4.76	2.38
6.	People damaging/polluting the natural environment must be punished	12	24	2	0	31.58	63.16	5.26	0.00

Source: Processed data of 2016.

Fishermen's participation in fisheries resources conservation. Measurement of the community participation level on aquatic resources sustainability indicates that people around the area actively participate in keeping the aquatic resources sustainability, in which 86.96% respondents used environmentally friendly fishing gear (Table 4). It could be seen from the fishing gears mostly used there, such as hook and line, longline, trap, *tempirai*, and *rengge*. These gears belong to selective fishing gear, and only large-sized fish are caught.

Table 4

Fishermen's participation in fisheries resources conservation

No.	Description	Score				Percent			
		4	3	2	1	4	3	2	1
1.	Indestructive fishing	40	6	0	0	86.96	13.04	0.00	0.00
2.	Active role in meeting conducted by Controlling Community Group (CCG)	0	12	16	0	0.00	42.86	57.14	0.00
3.	Frequency of controlling activities	0	6	12	4	0.00	27.27	54.55	18.18
4.	Actions in utilization and maintenance of fish resources conservation	4	12	14	0	13.33	40.00	46.67	0.00

Source: Processed data of 2016.

The respondents did not actively participate in CCG meeting, and only about 57.14% did, because only CCG members were active in the CCG meeting. Similar to supervision, 54.55% respondents stated that they did not get involved in monitoring activities. Nevertheless, 46.67% respondents decided to do selective fishing, both species and size, in order to maintain the sustainability of fisheries resources and provide sustainable economic benefit.

Intensive fisheries could cause conflicts in 2 complimentary dimensions, (a) in relation with resources sustainability reflecting contradiction between economy and ecology, and (b) in relation with the interests and perspectives of different local stakeholders on the outsiders who have access to the resources. The active participation of the fishermen in the monitoring activities could be raised through collaboration between the fishermen and the government in taking advantage of the local knowledge and the available social networking (Saha 2015; Steven et al 2015; Gray et al 2017). An agreement is a good step toward a compromise between individual and collective interests yielding benefits in both dimensions.

Fishermen's perception on government's role in aquatic resources management.

Freshwater ecosystem in Tapin Regency is quite prone to illegal fishing activities, especially in Binuang district, Tapin Selatan, Tapin Tengah, Bakarangan, Candi Laras Selatan and Candi Laras Utara. Therefore, the Animal Husbandary and Fisheries Services of Tapin regency with local police department has increased and tightly controlled the freshwater ecosystems. So far, 71 CCGs were established and trained to minimize the illegal fishing practices (Animal Husbandary and Fisheries Services of Tapin Regency, 2014).

Scoring on the government's role in aquatic resources management at the study site is presented in Table 5. Socialization activities on aquatic and fisheries resources protection regulations, according to 57.14% respondents, were rare. It indicates that these activities need to be developed that people could understand the regulations. Based on the International Convention of Aarhus Denmark in 1998, one of the community's rights in environmental management was access to information, in which everyone has the right to gain complete, accurate, and up to date information for various purposes (Yusuf 2014).

Table 5

Fishermen's perception on the government's role in the aquatic resources management

No.	Description	Score				Percent			
		4	3	2	1	4	3	2	1
1.	Socialization of legal aspects on aquatic resources and fisheries conservation	8	3	16	1	28.57	10.71	57.14	3.57
2.	Government's role in helping community empowerment in the aquatic environment or conservation area	0	9	18	0	0.00	33.33	66.67	0.00
3.	Government's guidance to management efforts of aquatic environment and conservation area	0	30	4	0	0.00	88.24	11.76	0.00
4.	Government's role in controlling the aquatic environment or conservation area	0	21	10	0	0.00	67.74	32.26	0.00
5.	Government's role in setting markers of conservation area	4	12	14	0	13.33	40.00	46.67	0.00

Source: Processed data of 2016.

According to 66.67% of respondents, assistance for means to support the environmentally-friendly fishing practice and the oversight provided by the government was still low. These include selective fishing gear, meeting room, Fish Landing Base, monitoring center, and patrol boat. It means that the involvement of the community, particularly fishermen, in fisheries resources management plan preparation needs to be developed in line with the necessity of the local communities (Purba 2005; Alves & Hanazaki 2015).

The government's development for management efforts of the aquatic protected area or conservation area supported by 88.24% respondents was categorized as good enough. The government's role in monitoring the aquatic conservation area was also good enough (67.74%). Up to 2013, number of CCGs in Bakarangan district were 4 groups, each of which was distributed in Bundung village, Masta village, Gadung Hilir village, and Tangkawang Lama (Table 6).

Total number of CCG members were 108 people. Each CCG got development from control division of Animal Husbandary and Fisheries Services of Tapin regency. Besides, the CCG has gradually got supporting facility of controlling activities, such as motorboat, handphone, handy talking (HT), and floats. However, the respondents said that marker setting of the conservation area was still very low (46.67%), since so far good mark setting has not been done yet so that the fishermen communities in or outside the area had low knowledge about the border area to develop as protected area.

Table 6

Controlling Community Group (CCG) in Bakarangan district of 2013

No.	Name of CCC	Village	No. members	Available infrastructures
1.	Sumber Rezeki	GadungHilir	20 people	Ht, Klotok, Hp
2.	Rawa Lestari	Masta	30 people	Ht, Klotok
3.	Keratau Jaya	Bundung	45 people	-
4.	Padang Karukan	Tangkawang Lama	13 people	-

Source: Animal Husbandary and Fisheries Services of Tapin Regency of 2014.

Conclusions. Fishermen around Batungap swamp had sufficiently high perception (80.9%) on the benefit of aquatic area management because they are aware that catch is dependent upon good aquatic ecosystem condition. The fishermen's participation in

aquatic resources conservation is categorized as moderate (65.62%), in which they still used traditional and environmentally friendly fishing gear, even though the participation in controlling activities was still low, since the local communities assumed that CCGs were responsible for the oversight. The government's role in swamp area management was moderate (62.5%), because the government worked well enough in the controlling activities, even though the socialization on regulations and border markings of the protected area was still low so that the fishermen communities around or outside the area did not know much about the protected area borders.

Recommendations. Fisheries resources protection in Batungap swamp area requires good community's active participation, especially those living around the swamp. It could be done through: (1) development of information distribution about the ecological and economic role of conservation area for the communities; (2) development of CCG member's involvement in management stage, from planning, implementation, controlling, and evaluation; (3) law enforcement of areal utilization; and (4) mark setting with clear borders of the aquatic conservation area.

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Author:

Leila Ariyani Sofia, Study Program of Fisheries Agribusiness, Faculty of Fisheries and Marine Science, Lambung Mangkurat University, Jl. A. Yani Km. 36 Banjarbaru, South Kalimantan, Indonesia, e-mail: lelaulm2017@gmail.com

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