

Sustainable fisheries resource management based on local knowledge of pole and line fishers (Case study, murante villages, Luwu regency, South Sulawesi, Indonesia)

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ABSTRACT

This research aimed to (i) the pattern of working relationship in Pole and Line Fishers Groups and (ii) Social aspect support for the development of catch fishery management at Pole and Line fishers Groups in Luwu regency. The basic method in this research was descriptive analysis with mix method research strategy and used case study approach. This research during October 2016 until September 2017. The population in this research was fishers of skipjack fish unit in Bone Gulf waters with sample location in Luwu regency. This research use Qualitative data analysis. Start of the research by collecting data and processed systematically done by data reduction where the data obtained is selected, focused, simplified and abstracted according to field notes obtained. The result showed the work structure or pattern of working relationships contained in the working group of PAL fishers have been neatly structured and have responsibility respectively from the level of work theirresponsible. The calculation of the profit sharing system result of accumulation of income for 1 month by the *punggawa* who acts as the owner of capital and the owner of the vessel, done the process of division by 50 percent system for the right of *punggawa* and 50 percent for the rights of the crew and captain of the ship. The existence of the power of social and economic relations enclosed in the pattern of working relationships and profit sharing system owned by PAL fishers group in Luwu Regency is a social capital that can be a support of fishery resources management, especially on skipjack commodities to create sustainable resources.

Key words : Social aspect, Local knowledges, Fisheries resource

Introduction

The Province of South Sulawesi is one of the largest provinces as a producers of fishery commodities in Indonesia. The Ministry of Marine Affairs and Fisheries estimates that in 2015, South Sulawesi produced 296,132.00 tons from capture fisheries, and 3.101.883,00 tons from aquaculture production.

The Abundant fishery production in South Sulawesi is supported by geographical location. South Sulawesi is directly adjacent to Makassar Strait in the west, Bone Gulf in the east and Banda Sea in the South. One of the most important commodities to of capture fishery production is the skipjack (*Katsuwonus pelamis*, Linnaeus 1758), most of which is harvested by small-scale (artisanal) fishers. The de-

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velopment of skipjack fishery can directly promote the welfare of fishers and in the general fishery community. Bone Gulf is one of the territorial waters that has the potential of to grow skipjack fishery production. According to Jamal (2011) the sustainability potential of skipjack in Bone Gulf is 15,782 tons per year. Currently the number of catches allowed for the Bone Gulf is 8,600 ton per year, a policy base on the size of the catchable fish and the size of the first skipjack of ripe gonads.

The management of fishery resources was inseparable from the role of action carried out by fishers, especially in skipjack fishing. In South Sulawesi, skipjack fishing activities are often carried out in a working group system of fishers for whom fishing is a way of life. The formation of relationships between fishers and capital owners is believed to be an old product of culture from coastal communities in South Sulawesi. Such a relationship is not based on a formal contract and be terminated at any time. Most importantly, the system benefits both patrons (capital owners) and Fishermen (Pelras, 2000)

The Capture Fisheries Development and Management Program, one of which is through the development of Fishing and Small Scale Fishers Empowerment implemented by the Ministry of Marine Fisheries Indonesia can encourage the production of skipjack fishers in Bone Gulf because the skipjack fish in this region is generally cultivated by local small scale fishers or business.

Fishing activity conditions in Indonesian waters are increasingly experience the degradation of ecosystems caused by over fishing and illegal fishing in Indonesian waters. Bone Gulf waters around the island of Sulawesi is one of the potential areas in eastern Indonesia as a fishing ground area, especially on skipjack fish commodity (*katsowonuspelamis*). This indirectly has a perceived impact with the decline of skipjack catches in the area which is the result of over exploitation of skipjack fishing methods. Amir and Achmar (2015) explained that the rate of exploitation of skipjack fishing in Sulawesi waters shows a very high level of exploitation that has passed the value of MSY thereby reduced the catch of skipjack. With the decline, it is necessary to have integrated fisheries management by not only paying attention to ecological and economic aspects but also emphasizing on social aspect area as the executor of skipjack production activity.

As the skipjack fisheries are developed, it is nec-

essary to consider the principles of sustainable management. Development and management of skipjack fish can be done through an institutional approach of working with skipjack fishers in who are part of *apunggawa-sawir* relationship. These were societies that adapt to changes and learn to interpret signals from the resource stock through a dynamic social-ecological process, thus develop flexible institutions to deal with resource management crises. This statement was not incorrect but is arguably a narrow interpretation of institutional change focused on the role of environmental influences. Such interpretations have colored the lens of much empirical work, contributing to, we argue, an incomplete understanding of institutional emergence and evolution (Fabinyi, Evans, & Foale, 2014)

The sustainable management of fishery resources is indirectly related to the socio-economic behavior of fishers communities. Therefore, this research aimed to characterize (i) the pattern of working relationship in Pole and Line Fishers Groups in Luwu Regency and (ii) Social aspect support for the development of catch fishery management at Pole and Line fishers Groups in Luwu regency.

Material and Method

The basic method in this research was descriptive analysis with mix method research strategy and used case study approach. This research during October 2016 until September 2017. The population in this research was fishers of skipjack fish unit in Bone Gulf waters with sample location in Luwu regency. Determination of the number of informants used snowball sampling technique by interview all fishers members and customary figures involved in Skipjack fish process on Pole and Line fishers group in Luwu regency. The data obtained were then analyzed use qualitative methods, to validate data using triangulation in accordance with the opinion of Creswell (2012) describes the strategy used to perform validity (data validity) is to triangulate different sources of data by examining the evidence tastes from these sources and uses them to justify coherent themes. Qualitative data analysis in this research is started at the start of the research by collecting data and processed systematically done by data reduction where the data obtained is selected, focused, simplified and abstracted according to field notes obtained. Then the presentation of data classified according to the categories based on the variables

seen and the last is the withdrawal of conclusions or interpretations and verification of data from the results of the presentation of classified data. Miles and Haberman in Sugiyono (2011) explained that data activity in qualitative data analysis is done continuously with data reduction phase, data presentation and conclusion.

Result

Working Relationship Form

Pole and line (PAL) fishers is one of the fishers working collectively in the process of doing skipjack production. The existence of PAL fishers as a form of livelihood in the fishers community, especially on the coast of Bone Gulf requires not only the level of capital or the cost of large production, but human resources were formed in the workforce in PAL fishers fishing boats that require the implementation of the production of more than 10 people. The type of vessel used by PAL fishers in Luwu Regency as a means of production with an average size of 30 GT (gross ton) resulted in the obligation of large numbers of labor in the process of fishing activities, especially skipjack fishers in PAL fishers. This also applies to groups of PAL fishers who are particularly located in Murante Village, Suli District, Luwu Regency with fishing operation area around Bone Gulf waters.

The pattern of working relationships established in PAL fishers was a similar form of working relationship with other working groups of fishers residing in South Sulawesi. The pattern of working relationships of PAL fishers was created because of the mutual need between capital owners and fishers who were unable to have the capital and the means of production so united in the form of working groups that need each other to generate income and how to improve their welfare. The economic fulfillment demands for fishers in Luwu County who are unable to own ordinary production equipment known as *sawi* in terms of fishers in South Sulawesi, make one of survival strategies by joining the working group of PAL fishers residing in their neighborhood. Scott (1993) in Wilson James (2006) makes an interesting and important argument to the effect that individual fishing rights can be expected to promote a strong interest in the private and collective acquisition of knowledge for maximizing the benefits stream associated with the right.

PAL fishers activity process by use only simple fishing gear which consists of 3 parts, namely (i) fishing rod, (ii) fishing line, and (iii) fishing rod with rod made of bamboo, requires the process of fishing activity on skipjack, used enough fishers to get maximum results because of the condition of large vessels to impose a lot of catch is also to be able to cover the cost of production is also large in one time the production process of fishing boats PAL. Based on the results of data analysis obtained in the field, PAL fishers in Luwu regency on average consisted of 15-17 people in doing one skipjack fishing tap.

In the working group of PAL fishers, other than fishers (*sawi*) who work as hookers, were also supported by experts as martial arts judges or so-called ship captains, engineers, and workers considered most important in the PAL fishing group is the term *Bo-boi* that serves as a determinant of the policy of the arrest process both from the time of fishing and fishing ground which will be used as a place to catch the skipjack. In detail can be seen in the following table:

Based on the above table and figure 1, illustrates that the work structure or pattern of working relationships contained in the working group of PAL fishers have been neatly structured and have responsibility respectively from the level of work their responsible. From the table above shows there are 4 elements of work that are equally important in one skipjack fishing trip by the PAL fishing team in Luwu District. Based on the results of information obtained from an informant in this study, illustrates that the most important element in the activities of the capture process is in the workload of a *bo-boi*. In addition there is a pattern of working relationships of PAL fishers groups in the process of skipjack fish

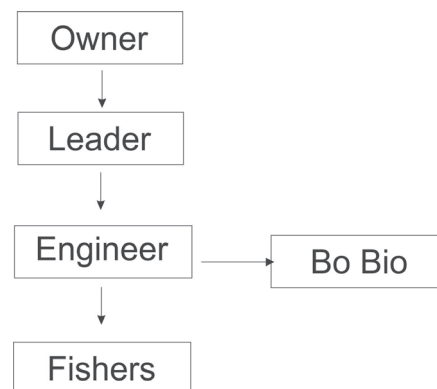


Fig 1. Organization Structure Pole and Line Fishers Group

activities, inaccordance with the above described that the pattern of working relationship of the Pal fishers is also included in the pattern of working relationship between the capital owners and the executor of the fishing tasks on the ship.

The owner of the capital in the PAL Fishers group is the highest level in the pattern of working relationships in Luwu regency, because the owner of capital also as the owner of the means of production from ship to rumpon used in the waters of Bone Gulf. The role of the work of the owner of capital or commonly referred to as *punggawa* in Luwu regency is also a guarantee of life for the families of abkfishers ship PAL owned by the owner of the capital. The role of *punggawa* who not only must be able to provide capital or production costs of arrest and *punggawa* must be able to attend in solving problems or anxiety experienced by the families of fishers members who work on their ships.

The pattern of working relationships in the form of a *sawi* gardener in the working group of PAL fishers, has special distinct from the pattern of the form of *punggawasawi* in other fishers groups in South Sulawesi. The pattern of working relationships in the form of a *sawi* gardener in the working group of PAL fishers, has a different identity with

the pattern of the form of *punggawasawi* in other fishers groups in South Sulawesi. PAL *punggawa* fishing system PAL focuses on the role of the *sawi* or ship crew who carry out the production compared with the role of *punggawa* as the owner of capital and production equipment in the working group of fishers PAL. The highest decision in the implementation of production activities is not in the decision of the courtier but is in *Bo-boi's* decision as the full responsibility of the implementation of production activities. This is typical of the PAL fishing group, where in other areas in South Sulawesi using the *sawi* sawmill system, full responsibility for both production and marketing activities is fully in the hands of a courtier as the highest leader in the group. The following is the division of job roles in the PAL fishing group in Luwu regency of South Sulawesi.

Based on the above table 2 shows that the division of job roles within the PAL fishers group there was a separate role of each worker element in the PAL fishers group with the same weight level. In the table overview above the most easily visible load is the function of *punggawa* and *sawi* work holding fishing gear but in depth the burden is a heavier load compared to the burden of other worker

Table 1. Details of number of workers in Pole and Line Fishers Ships in Luwu District

No.	Kinds of Job	Job Function	Total
1.	Quarter Master (Leader)	As a ship bearer and fully responsible in the production of fishing activities	1
2.	Enginerrss	Responsible in repair and maintenance ship engine	1
3.	<i>Bo-Boi</i>	<ul style="list-style-type: none"> • Determine of fishing ground location and time of arrest • Bait Launcher 	1
4.	Fishers	Implement the fishing process	14
	Total		17

Source : Primary Data Analysis, 2017

Table 2. Distribution of the Role of Work Between *Punggawa* and crew ship in the working group of PAL Fishers

<i>Punggawa</i> (Owner)	Member in Ship			
	Leader	<i>Bo-Boi</i>	Engineers	<i>Sawi</i> (Fishers)
<ul style="list-style-type: none"> • Prepare the capital • Prepare materials 3and productions equipment • Prepare maintain cost for ship and machines 	<ul style="list-style-type: none"> • Select the fishers and machine interpreter • Prepare the market for the catch • Communication liaison between <i>punggawa</i> and other ship members 	<ul style="list-style-type: none"> • Decision maker for time arrest and fishing ground location • Bait Launcher • Determination of the number of catches that can be obtained 	<ul style="list-style-type: none"> • Full Responsible for machine condition 	<ul style="list-style-type: none"> • Prepare tools production (Pole and Line) • Maintain tools production(pole and line) • Fishing activities

elements. Heavier burden of the owner (*punggawa*) in the pattern of working relationship of PAL fishers groups was found where the *punggawa* must be able to be a savior for all family members who work on the ship both for economic security as well as security and social security in the coastal environment in Luwu regency. In PAL Fishers group, besides recruitment of high-qualified *sawi*, there was also a recruitment process at *Bo-boi* which is the duty of the *punggawato* get and hire *Bo-boi* who are skilled and experienced in coastal community of Luwu regency. The process of negotiation *Bo-boi* as a person who has special expertise in the process of fishing PAL fishers conducted by *punggawa* often occur in a tough negotiation in determine the value of the contract and profit sharing (profit sharing system) that will be obtained *Bo-boi* later. So no wonder *Bo-boi* was believed to have special skills will earn a greater income compared with other parts of workers who are on board the fishing boat PAL Fishers. Gerke Solvay and Judith Ehlert (2009) explain it has been shown that local knowledge is adapted to the changing human-water relationship and its growing natural fish scarcity. It turned out that the strategic element is a constituent part of local knowledge itself as well as inherent in the process of knowledge sharing.

The level of specific *Bo-boi* have, other people also said to be a person who has equality with a *punggawa* in the PAL fishers group in Luwu Regency. The competition between *punggawa* to get best *Bo-boi* could be work in their group by offering a lucrative offer on the work that *Bo-boi* will get in Luwu Regency becomes a distinct advantage for *Bo-boi* to provide a reasonable price benchmark for using their services. The accuracy in determining the location of the decline of FADs as well as the time of the proper process of catching and how to launcher the bait into the sea was a technique and expertise that is not owned by other crew in the of PAL fisher group in Luwu Regency. A lesson from traditional ecological knowledge was that values and beliefs are an important part of a knowledge system if it is to lead to a moral code or ethics toward the environment (Berkes Fikret, et al, 1998).

Profit Share System⁶

In each working relationship will be generated a payment system of the work and which carried out cooperation in the same relationship with the work of the *punggawa-sawi* PAL fishers group created a

profit sharing system different from the others. Mustafa (2015) describes the profit-sharing system in the working group of the *punggawa-sawi* was a hereditary model that has been used by the fishers group and it was still traditional because it is an oral agreement between the *punggawa* as the owner of capital and the means of production, the ship leader as the operational leader of the arrest and the *sawi* as the arresting executor.

In a work system, has the ultimate goal to earn income from the level of work it does in the work system. Similarly, in the PAL fishing group which is a system of work with the aim to fulfill the income of the involved elements framed in the system for the results in the group of fishers. Scott (1994) explains that terms of profit sharing or fixed rent are often naming that do not reflect the actual arrangement of the relationship. In the PAL fishing working group, the profit-sharing system imposed is a tradition that is still trusted and held today as a guideline for the sharing of results between workers and owners of capital (*punggawa* and *sawi*) in the PAL fishers group.

The profit sharing system in the PAL fishers group in Luwu Regency was a division system obtained by the fishers group during one month of work in the skipjack fish production process. The sharing system between the *punggawa* and the *sawi* in the PAL fished group, uses a payment system that was done just like an employee system in a company with monthly payments. This is in contrast to the profit-sharing system with other fishers groups in South Sulawesi, where the payment of *sawi* works was based on a one-time process of catch production.

The payment system imposed by the PAL fishers group in Luwu Regency by using the monthly salary payment system has the consideration that the production cost level required in 1 capture trip is high, so the owner payment process to the crew is the accumulation of the net income earned during the one month work period. According to Satria (2002) explains that one of the changes in the production relationship is a profit sharing system where the profit-sharing system in a fishery business is formed as a consequence of the high risk of fishing effort.

The following illustration of production cost for 1 month used in PAL fishing group in Luwu Regency:

Based on the above table 3 illustrates that the net revenue obtained by PAL fishers groups in

Luwu Regency within one month of skipjack fishing activity in Bone Gulf waters, reaches IDR. 246.500.000. This illustrates the high level of income for the size of the profession produced by the fishers group. The calculation of the result of accumulation of income for 1 month by the *punggawa* who acts as the owner of capital and the owner of the vessel, done the process of division by 50 percent system for the right of *punggawa* and 50 percent for the rights of the crew and captain of the ship. The results of the division earned for the crew were then divided equally to the total number of crew involved in the capture process for 1 month. The illustration of the system sharing between *punggawa* and the crew was attached in the following table:

Based on the above table shows that the dominance of the *punggawa* as the owner of the capital has more rights than the crew or ship leader who carries out the production process while the average sharing of crew with the ship leader was a policy by PAL group fishers own who considered that the level of risk and workload the same in the implementation of skipjack fishing activities. In the table above also shows that the level of income of the crew has met the provincial minimum wage in South Sulawesi is IDR. 2,674,000 by 2017. The revenue sharing system of the PAL fishers groups in Luwu Regency illustrated above is also in line with the government regulation set forth in Law Fisheries Number 16 1964th regarding the Law on Fishery Sharing Profit System obtaining a minimum of 40% of the net proceeds obtained. This is in accordance with the Law of Indonesia which requires the fishers to obtain at least 40% of the sale of fishery pro-

Table 3. Illustration of production cost of PAL fishers group in Luwu Regency for 1 Month

No.	Description	Amount (IDR)
A.	Production cost	
1.	Equipment gear	3.000.000,00
2.	Solar	120.000.000,00
3.	Live Feed	60.000.000,00
4.	Fuel	500.000,00
16.	Ship Maintenance	35.000.000,00
17.	Machine maintenance	35.000.000,00
	Total Production Cost	253.500.000,00
B.	Revenue	
	Sale Of Fish	500.000.000,00
C.	Profit (B-A)	246.500.000,00

Source: Primary Data analysis, 2017

cessing by using motorized vessels in the operation of fishing in the sea.

This was seen from the perspective that the fishers are considered a whole fishers group members who were involved in the process of skipjack catch production, resulting in 50 percent accumulated percentage. If the calculation of the law was defined as the meaning of the fishers are individual fishers who participate in the skipjack fishing activities, this resulted in inappropriate pattern of outcomes of the PAL fishers group based on the applicable laws in Indonesia.

The amount of revenue illustration or profit sharing system described above is an illustration of income prevailing in the catching season from April to August. During the fishing season, the level of consistency of the skipjack catches of PAL fishers is at a high level, while in the other month it still creates uncertainty over the catch so it affects the amount of income that will be obtained later.

The uncertainty in the catch obtained in the PAL fishers group in Luwu Regency indirectly causes no guarantee of economic sustainability for the *sawi* (Fishers). This prompted the PAL fishing group members in Luwu Regency to engage in lending or credit activities to the courtiers so as to cover the economic vacuum they face. The profit sharing system applied by the PAL fishers group in Luwu Regency was not a guarantee of the survival of the poultry to get out of the poverty chain experienced by the fishers community in Murante Village, Suli District, Luwu Regency. Fabinyi Michael (2009), Fishers characterized the relationship between themselves and politician at a higher scale trying to implement the live reef fish regulation as a form of negative reciprocity, the assumption was never that the state was going to manage the resource in a sensible and responsible manner; instead, fishers believed that the politicians would simply mine the resources for their own purposes or clients.

The illustration of the profit sharing system described above cannot be a benchmark for the income levels obtained by the *sawi* in the PAL fishers group. Consistency of earnings that can be guaranteed in PAL fishers group was illustrated in certain seasons and only valid in certain months, thus increasing the level of poverty chain experienced by the *sawi* (fishers) in PAL fishing group. This encourages the *sawi* to borrow to the owner as a "savior" so as to be able to meet the needs of their family life both in the form of goods and in the form of money. On

the other hand, the high dependence of the *sawi* to the owner (*punggawa*) will increasingly bring the *sawi* to remain in the poverty chain because of the social and economic relationships that are bound in the frame of work relation between *punggawa* and *sawi* in PAL group of Luwu regency. Rudlle Kenneth (2011) The fisheries household sampled obtained credit and other financial services from various sources, one or more informal sources mainly family, informal sources remain preeminent in marine capture fishing communities.

Social Aspects Support in Skipjack Fish Resource Management

The integration of sub-systems in the management of fishery resources was the relation between the role of human as the subject and the condition of the aquatic environment as the object of the arrangement of the source of income and place of execution of human life. The role of human ecology in the management of fishery resources of Skipjack fish commodities was important as the direction of the study in formulating an integrated system of sustainable skipjack fishery resources management in the waters of Bone Gulf. The co-evolutionary character reflects the fact that social-ecological systems can change qualitatively to generate and implement innovations that are truly creative, in the sense of

opportunities for novel cooperation and feedback management (Folke, 2003).

The utilization of PAL fishers group in Luwu Regency as community based resources management (CBRM) can be utilized to create the balance of utilization and the need of skipjack fishery resource in Bone Gulf waters. The central role of traditional institutions within the frame of PAL fisher groups conservation can be the front guard as a framework and policy manager to create sustainable skipjack fishery resource management. The existence of the power of social and economic relations enclosed in the pattern of working relationships and profit sharing system owned by PAL fishers group in Luwu Regency is a social capital that can be a support of fishery resources management, especially on skipjack commodities to create sustainable resources. Community based management is a process that empowers local communities to manage their resources by letting individuals in the community contribute to decisions that affect local resources. One of the major benefits of community-based management is the development of strategies compatible with the unique environment, with the specific resources, and with the cultural and historical context of the local area (Tissot, 2005).

Perspectives developed in coastal development are the main problem view that coastal communities

Table 4. Illustration of Profit Sharing System of PAL Fishers Group in Luwu Regency

No.	Position	Amount (IDR)	Percentage (%)
1.	<i>Punggawa</i> (Owner)	123.250.000	50
2.	Leader	7.250.000	2,94
3.	<i>Bo-Boi</i>	7.250.000	2,94
4.	Head of Engineers	7.250.000	2,94
5.	Engineers assistant	7.250.000	2,94
6.	Fisher	7.250.000	2,94
7.	Fisher	7.250.000	2,94
8.	Fisher	7.250.000	2,94
9.	Fisher	7.250.000	2,94
10.	Fisher	7.250.000	2,94
11.	Fisher	7.250.000	2,94
12.	Fisher	7.250.000	2,94
13.	Fisher	7.250.000	2,94
14.	Fisher	7.250.000	2,94
15.	Fisher	7.250.000	2,94
16.	Fisher	7.250.000	2,94
17.	Fisher	7.250.000	2,94
18.	Fisher	7.250.000	2,94
	Total	246.500.000	100

Source: Primary Data Analysis, 2017

are unable to develop due to strong ties between the owners of capital and the means of production with fishers who have nothing but their physical capabilities. The bond is considered as the basis for the fisherman workers to not be able to improve their living capacity for the better because of the strong grip of the owners of capital so that the development of the capacity of the fishers workers become unworkable. Kusnadi (2003) explained that one of the root causes of coastal community poverty due to client patron relationships that occur in coastal communities are tied up with debts and powerlessness of the community is weak to make better bargaining position. Based on this then government programs to develop in coastal communities with the aim of removing these ties without regard to even to be able to involve the owners of these capital as part of the development of coastal communities themselves.

Based on this, the paradigm of coastal community development, especially in Luwu regency should be shifted into a more appropriate target of coastal communities. As explained above, the social capital owned by the system in the PAL fishers group can be the entrance to the development of coastal communities in Luwu regency. In social capital terms, strength these relationships also changes the nature of the networks that characterize these connections, potentially increasing the diversity within the networks and trust between members (DeFilippis, 2001).

The utilization of social institutions in a *sawi* social system with high social capital strengths should be a tool for government programs as a bridge to directly touch the *sawi* who needs help for the better. Investment trust and norms imposed by *punggawa* both in groups and in coastal communities can be the foundation of development policy stakeholders for coastal communities to make life of coastal communities better and improved. The Created economic investment and social investment in the life of coastal communities that can be used to move in a better direction by giving the role to *punggawa* and utilize the social capital owned between *punggawa* and *sawi* so that development policy could be perceived as something beneficial for coastal communities and can improve the living standard of coastal community welfare in Luwu regency. Mudiyo (2013) explains that in social life social capital is like a lubricant for the implementation of various joint actions both to preserve the life

of society and to improve the condition of life.

Conclusion

The paradigm of fisheries development should be able to shift in accordance with the coastal communities need as targets in development. The position of local institutions as a guideline for the behavior of coastal communities can be a strategy that can be utilized in managing fisheries development in a sustainable manner. Rules and cultures contained in coastal communities that are framed in *punggawa* and *sawi* relationships can be a tool and path of fisheries development based on coastal communities. The strength of the social aspects contained in the working relationship of the *punggawa – sawi* can be utilized as the foundation of policy formulation and development actors based on sustainable fisheries environment.

Authors' contributions

All authors contributed equally in the development of research design, data collection, data analysis writing and editing the manuscript

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