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## Institution of Panglima Laôt in Supporting Sustainable Capture Fisheries Based on Local Wisdom in Aceh Jaya District

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### Abstract

This research has been conducted at six sub-districts namely Jaya, Sampoiniet, Setia Bakti, Krueng Sabee, Panga and Teunom in Aceh Jaya district, Aceh Province, Indonesia from September 2012 to February 2013. Study aimed to determine the sustainability status of catching fisheries based on local wisdom in Aceh Jaya district in perspective of institutional dimensions. The methods used were the literature study and survey method by using questionnaires.

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Data and information were analyzed using the technique of RAPFISH (Rapid Appraisal of the status of Fisheries), in which samples consisted of 117 respondents with 24 fishing activities selected by purposive sampling for being interviewed. The results showed that the institutional dimension of sustainability status of catching fisheries based on local wisdom in Aceh Jaya district has sustainability index values between 88.32 to 95.82 (in status category of excellent or very sustainable). The attributes that were very influential in determining the sustainability index values were the attributes of law enforcement or sanctions for fishermen who broke the law. In the development, it was needed strict punishment from personal of local law enforcement that they had agreed upon for generations as well as efforts to preserve the values of local wisdom that has existed.

**Keywords:** institutional; Panglima Laôt; fisheries sustainability; local wisdom; Aceh Jaya

## **1. Introduction**

Utilization of fish resources in the field of fisheries requires strong institutional governance as part of the resource management of sustainable fisheries. Institutional management is directed not only to fish resources as the utilization target but also to fisheries stakeholders, namely human resources and institutions [1].

Administratively, the province of Aceh in general and Aceh Jaya district in particular besides Department of Marine and Fisheries, there has also been already formal institution that manages fisheries namely Panglima Laôt. Panglima Laôt is the oldest traditional institution in the world in terms of local wisdom-based management of fisheries. This fisherman institution has played an important role in regulating the fishery industry in Aceh for more than four centuries. Panglima Laôt is as indigenous or local wisdom stakeholder, of which formation is guaranteed by law both positive laws and local regulations known as Qanun Aceh. Some rules regarding the recognition of the existence of positive law to local wisdom relating to the management of fisheries resources in Aceh are as follows; Law No. 31/2004 [2] on Fisheries, Article 52 says "The government set up, encourage, and/or conduct fishery research and development to produce the required knowledge and technology in the development of fishing effort to be more effective, efficient, economical, powerful competitive, and environmentally friendly, as well as appreciate the local wisdom." Qonun Aceh No. 16/2002 [3] on the Management of Marine Resources and Fisheries, article 11 paragraph 2 says "In the management of fishery resources, the provincial government recognizes the existence of Panglima Laôt institution and customary laws that have been existed in the lives of fishing communities in Aceh province."

Based on the article explained above, the Government of Aceh gives recognition to the existence of Panglima Laôt which is customary law institution that plays an important role in managing fishing activities in Aceh. This is reinforced by Qanun Aceh No. 10/2008 [4] on Indigenous Institution in which article 2 paragraph 2 subparagraph i says "Indigenous institutions serve as a vehicle for public participation in governance, development, community development, and resolution of social problems."

Panglima Laôt is also defined as a person who leads the customs, habits prevailing in the field of marine fisheries and settlement of disputes (Article 1 (13) Regulation No. 7/2000) [5]. Regulation No. 7 of 2000,

Section 1, paragraph (18), "Indigenous customary law is Acehnese live and thrive in the community in the Region". In article 1 paragraph 19, "...is a custom rule or act based on prevalent Islamic law obeyed, respected, venerated since ancient and serve as the foundation of life". Article 1, paragraph 20, " Habits is an activity or action that basically is not derived from customary law or customs but it has been recognized by the public and has been carried out repeatedly and continuous". In article 1 paragraph 12 of Aceh Qanun No. 21/2002 [6] on the Management of Natural Resources, it is found the term "indigenous peoples" is a group of people who live in a certain area for generations and they are based on the similarity residence or blood relationship which has own indigenous territories and indigenous institutions." Article 1, paragraph 8 of Aceh Qanun No. 4 of 2003 [7] of Mukim, says, "Customary law is all custom rules, customs and habits of the people living in Aceh, which has binding and legal consequences". In article 1, paragraph 11, 12 and 13 of Aceh Qanun No. 9 of 2008 [8] on the fostering of indigenous life and customs, says, "Customary law is a set of unwritten provision that lives and thrives in Acehnese society, which has the sanction if it is violated". "Customs is eternal and behavior patterns passed down from generation predecessors are honored and glorified as inheritance according to Islamic law". "Habit is the attitude and actions are performed repeatedly for the same thing, which is alive and growing and implemented by the community".

Article 1 (29), (30), and (31) of Aceh Qanun No. 10/2008 concerns about the indigenous institution. In the Aceh Qanun, "Panglima Laôt or any other name is a person who leads and arranges customs in coastal and marine areas".

Thus all the rules and customary law (value-the value of local knowledge) related to fisheries must be executed by the Panglima Laôt, the problem is in compliance with these rules. This issue becomes very interesting because of regulations governing the management of the environmental impact of fisheries resources [9] in addition to the national character set in the context of the global as well as introduced by world bodies such as the FAO. FAO has made rules about utilization of fishery resources, both capture fisheries and aquaculture, known as the Code of Conduct for Responsible Fisheries (CCRF) whose goal is to make the code of conduct of responsible fisheries development in 1995.

Institutional sustainability is a prerequisite for the other three components of sustainability, namely ecological sustainability, economic sustainability, and technological and socio-cultural sustainability, involving the maintenance of appropriate financial and organizational capabilities and long-term administration. In particular, institutional sustainability refers to the law/rules governing fisheries management organizations with tools of those implements [1, 10, and 11]. Therefore, it is necessary to study to measure the sustainability of fisheries on the institutional dimensions, in order to determine the effect and the role of Panglima Laôt in achieving institutional sustainability of fisheries based on local wisdom in Aceh in general and Aceh Jaya in particular. The purpose of this study was to determine the sustainability status of capture fisheries based on local wisdom in Aceh Jaya district on institutional dimensions.

## **2. Methods**

The research was conducted from September 2012 to February 2013 in the Aceh Jaya district, Aceh Province, Indonesia, including Jaya, Sampoiniet, Setia Bakti, Krueng Sabee, Panga and Teunom sub-districts (Figure 1).

The study was conducted using a literature review and survey method. The data collected were in the form of primary and secondary data. The primary data were obtained through interviews with respondents. The respondent were the fishermen who used certain fishing gears such as purse seine, mobile liftnet, hand line, troll line, gillnet and trammel net. Each group of fishing gear consisted of 5 (five) people each in each sub-district in Aceh Jaya, thus totaling 117 respondents specified by purposive sampling with the consideration that the respondent is fisheries. Secondary data were obtained from the relevant authorities, such as the Panglima Laôt of Aceh Institution, Department of Marine and Fisheries and report research results.

The analytical method used in evaluating the sustainability of fisheries based on local wisdom in Aceh Jaya district was RAPFISH (Rapid Appraisal for the status of Fisheries), which was an analysis technique to evaluate the sustainability of fisheries in multidisciplinary [1,11,12].

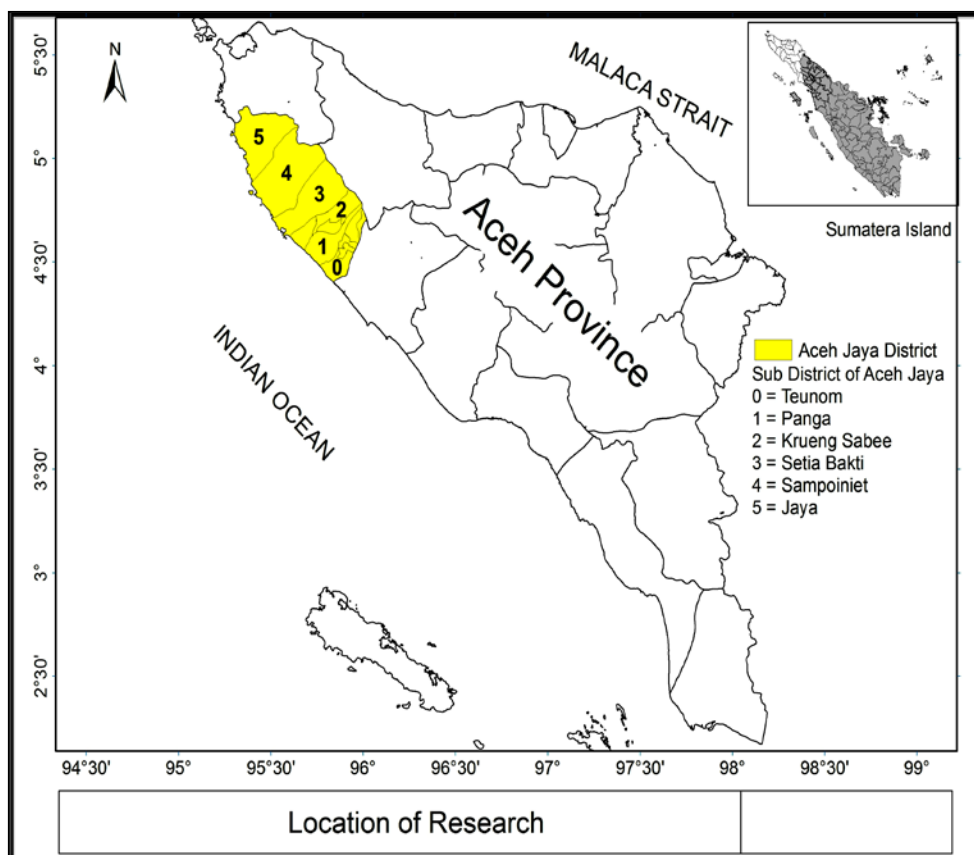


Figure 1. Map of research sites (Aceh Jaya District)

The application of Rapfish approach in this study was based on the identification of fishing activities at the sites. This activity resulted in the identification of types of fishing gears used namely purse-seine, gillnet, trammel net, mobile liftnet, troll line, hand line and mini long line, in the utilization of fish resources in the 6 sub-districts at Aceh Jaya. Determination of the institutional dimension attributes (Table 1) was prepared [1, 13, 14, 15, and 16] based on the values of local wisdom.

Table 1. Attribute of sustainability and institutional dimensions the scoring criteria

Attribute	Preference Scores	Good	Bad	Information
Institution and infrastructure of Panglima Laôt	0, 1, 2, 3, 4	4	0	(0) No; (1) exist at the provincial level; (2) exist at the District/City level; (3) exist at the Sub-district level; (4) There ranging from Lhok /village to provincial level
Membership of Panglima Laôt as local institution engaged in fishery management	0, 1, 2, 3, 4	4	0	(0) No; (1) exist at the provincial level; (2) exist at the District/City level; (3) exist at the Sub-district level; (4) There ranging from Lhok /village to provincial level
Availability of institutional operating costs	0, 1, 2, 3, 4	4	0	(0) No; (1) exist at the provincial level; (2) exist at the District/City level; (3) exist at the Sub-district level; (4) There ranging from Lhok /village to provincial level
Mechanism of Leader Election	0, 1, 2, 3	3	0	(0) no mechanism; (1) not the same every area; (2) almost the same every area; (3) at each region
Legal Recognition positively to the Panglima Laôt	0, 1, 2	2	0	(0) No; (1) Not obviously; (2) very obviously
Availability of local regulations in fisheries management	0, 1, 2, 3	3	0	(0) No; (1) Not obviously; (2) seasonal; (3) available
Availability and role of local leaders in the management of fisheries	0, 1, 2, 3	3	0	(0) No; (1) available but have arole; (2) have arole but seasonal; (3) have a role
Availability of local law enforcement personnel	0, 1, 2, 3, 4	4	0	(0) No; (1) few (2) depending on the circumstances; (3) many but rarely in locations; (4) there and often in locations
Enforcement of rules/penalties for those who violated	0, 1, 2, 3, 4	4	0	(0) no strict sanctions; (1) sanctions is not clear; (2) just a warning; (3) strict sanctions

Illegal fishing	0, 1, 2	0	2	(0) No, Never; (1) sometimes; (2) every so often
Justice in law	0, 1, 2, 3, 4	4	0	(0) Very unfair; (1) Unfair; (2) fair sometimes; (3) depending on the circumstances; (4) very fair
Compliance with regulations fishermen or local laws	0, 1, 2, 3	3	0	(0) not Complying; (1) obedient if any officers in the field (2) sometimes obedient (3) very obedient even though no officer
The benefits of local rules for fishermen	0, 1, 2, 3	3	0	(0) do not know; (1) No; (2) little benefit; (3) so many benefits
The role of local institutions in the management of fisheries	0, 1, 2	2	0	(0) no role; (1) No, but there is no role; (2) yes very role
Fisherman involvement in the formulation of institutional policies	0, 1, 2, 3	3	0	(0) 5 - 20 %; (1) 20 - 50 %; (2) 50 - 75%; (3) > 75%
Democracy in determining policy	0, 1, 2, 3	3	0	(0) Not obviously; (1) no democracy; (2) little democracy; (3) very democracy
Group fishermen	0, 1, 2, 3	3	0	(0) no; (1) yes but not active; (2) seasonal; (3) yes there is and it works fine

After arranging the attributes, then arrange the assessment criteria (Table 2). Attributes on the dimensions and criteria of good and bad [11 and 17], as well as the opinions of experts and stakeholders associated with the system being studied.

Each attribute was estimated its score, of which maximum score was 4 for good category, 0 for bad category and the state of category between good and bad. Score is the definitive value, which is analyzed to determine the points that reflect the sustainability of the relative system to the position of the good and bad points with MDS ordination technique. The score of each dimension is expressed by the scale of the worst 0 % until the best 100 %.

### **3. Results and Discussion**

#### ***3.1 Institutional Panglima Laot in attribute of Rapfish***

Preparation of scores on the dimensions of institutional sustainability status of fisheries based on local wisdom was based on the state of research and field areas based on the reference of the criteria that have been made, then analyzed as facts or data in the attribute of Rapfish reality.

Table 2. Categories of index each dimension of sustainability

Index Value	Valuation	Category Sustainability
0 – 19	Bad	Not Sustainable
20 – 39	Enough	Less of Sustainable
40 – 59	Moderate	Sustained moderate
60 – 79	Good	Sustainable
80 – 100	Very good	Very Sustainable

### ***3.1.1 Institution and infrastructure of Panglima Laôt***

Traditional institution of Panglima Laôt is an institution that supports fishing activities in Aceh. Panglima Laôt as an institution has an institutional structure to carry out its functions and duties. Panglima Laôt institutional structure [18] in Aceh consists of 3 levels namely: (1) Panglima Laôt of Province; (2) Panglima Laôt of district/city and (3) Panglima Laôt of Lhok (Table 3). Institutional structures owned by the three levels of Panglima Laôt institutions are different, because the higher position will have the more complex institutional structure. All levels of these Panglima Laôt have places as secretariats.

### ***3.1.2 Membership of Panglima Laôt as local institution engaged in fishery management.***

The membership of Panglima Laôt includes the entire of Aceh fishing community, academics, legal practitioners and other stakeholders who want to promote fisheries in Aceh.

### ***3.1.3 Availability of institutional operating costs***

As a large organization of all fisherman house of Aceh, the Panglima Laôt also needs institutional cost (budget) in its operational work. At the first time, institution of Panglima Laôt did not have operating budget, and the personnel involved in this institution dedicated solely to the community without expecting any compensation. Now, Panglima Laôt institution has budget (fund) approximately in amount of Rp. 60,000,000,000,- (sixty billion rupiahs) which was derived from the results of the auction of fishing boats and fishing gears owned by Thai fishermen who were arrested by Aceh fishermen at fishing operation in Aceh waters because of illegal fishing, and the grants from Coordinating Minister for People's Welfare of Republic of Indonesia. The budget has been used as an institutional endowment of Aceh Panglima Laôt.

Table 3. Structure of Institutional Panglima Laôt at Provincial level until Panglima Laôt Lhok/village

Panglima Laôt Province level	Panglima Laôt District/city level	Panglima Laôt Lhok level
9 Advisory Council members;	3 advisors;	3 advisors;
2 Advisors;;	1 Chairman (Panglima Laôt District level);	1 Chairman (Panglima Laôt Lhok level)
1 Chairman (Panglima Laôt Aceh)	1 Vice Chairman	1 Vice Chairman
5 Vice chairman;		

### ***3.1.4 Mechanism of Leader Election***

During the Islamic Kingdom of Aceh “Samudra Pasei” led by Sultan Iskandar Muda, Panglima Laôt was appointed by the king who was an representative of Sultan Iskandar Muda [19], whose role is to collect taxes from merchant ships in the harbor and to mobilize the masses in the war. However, at the present time, Panglima Laôt is elected directly by the fishing master who has the right to vote, and the election Panglima Laôt is done no more than 3 years. The requirements of being Panglima Laôt are Indonesian citizen, male, maximum age of 55 years, minimum education of graduating elementary school or being able to write and read, having experiences in the field of fishing, and understanding Laôt customary law (the value of local wisdom). Mechanism Assembly election is conducted by the Great of Panglima Laôt subsequently confirmed in a decree for the stewardship of the Provincial and Regent/Mayor for District/City.

### ***3.1.5 Legal Recognition positively to the Panglima Laôt***

Laôt customary law or local wisdom has been around a long time in Aceh and continues to grow along with the growth of indigenous culture fishermen in Aceh. Laôt customary law or local wisdom remains adhered to without any coercion and executed in accordance with the cultural values, customary norms in accordance with Islamic law by indigenous fishermen in Aceh. Laôt local wisdom in Aceh is recognized by positive law, which is applicable law in Indonesia. Some rules regarding the legal recognitions of positive law (Table 4) to the existence of Laôt customary law or local wisdom relating to the management of fisheries resources in Aceh are shown in table 4.

### ***3.1.6 Availability of local regulations in fisheries management***

The availability of these local regulations is established by the Panglima Laôt by agreement of the fishing communities. Local Regulation was formed because of the need of fishing community for clarity of management of fishery resources. Local rules in the management of fishery resources agreed by fishermen in Aceh Jaya are the prohibition of fishing on certain days, the existence of customary rules in the maintenance of



coastal and marine environment, and the presence of the zoning arrangement in the fishing business. Thus it can be said that the overall regulatory Panglima Laôt for fishery sustainability has been existed in Aceh Jaya district.

Table 4. Several laws and regulations issued by the government of the Republic of Indonesia and the Aceh government relating to the management of fisheries resources

Law/Regulation	Features
Law No. 23/1997	Environmental Management
Law No. 22/1999	Local Government
Law No. 39/1999	Human Rights.
Law No. 44/1999	Implementation of specialty areas of Aceh
Law No. 18/2001	Special Autonomy for Aceh, Nanggroe Aceh Darussalam of Province name.
Law No. 10/2004	Establishment of Legislation
Law No. 32/2004	Local Government
Law No. 11/2006	The Government of Aceh (UUPA)
Law No. 27/2007	Management of Coastal and Small Islands.
Law No. 45/2009	Fisheries
Law No. 32/2009	Environmental Protection and Management.
Government regulations No. 60/2007	Conservation of Fish Resource.
Minister of marine and fisheries regulations of the Republic of Indonesia No: 17/Men/2006	Business of capture fisheries.
Minister of marine and fisheries regulations of the Republic of Indonesia No. 12/Men/2009	The Capture fisheries.
Minister of marine and fisheries regulations of the Republic of Indonesia No: 02/Men/2002	Guidelines for Surveillance of Fishing
Aceh government regulations No. 2/1990	Coaching and Development customs, habits Indigenous Peoples and Institutions Aceh.
Aceh government regulations No. 7/2000	Implementation of specialty areas of Aceh
Qanun Aceh Nomor 16/2002	Marine Resources and Fisheries
Qanun Aceh Nomor 21/2002	Natural Resource Management.
Qanun Aceh Nomor 3/2007	Preparation Procedures Qanun in Aceh.
Qanun Aceh No. 9/2008	Development of Indigenous life and lokal wisdom in Aceh
Qanun Aceh No. 10/2008	Local wisdom Institution
Qanun Aceh No. 7/2010	Aceh of Fisheries
Aceh governor decree No.: 523/315/2000	Inauguration Panglima Laôt Aceh.

Aceh governor decree: 523.11/012/2005  
regent decrees of Aceh Jaya No. 3/2010

Inauguration Panglima Laôt Aceh.  
Establishment of Protected Areas in Aceh Jaya  
District

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### ***3.1.7 Availability and role of local leaders in the management of fisheries***

The availability and the role of local community leaders who truly been and can be trusted by local fishermen is necessary given the diversity of perceptions of fishers in fisheries management in general. The role of leaders is very important, especially to handle the social problems of illegal fishing by fishermen outside of Aceh, and the event of a conflict between the fishermen. The role of the fishermen community leaders Aceh Jaya is highly visible in various aspects of social life including in protecting the fishing environment and the local fishing waters from destructive activities performed by both local fishermen and outsiders.

### ***3.1.8 Availability of local law enforcement personnel***

According to interviews conducted with respondents, it can be stated that, law enforcement personnel and local rules always exist, if not when the case occurs, fishermen who saw the case can report the incident to the local Panglima Laôt and the case will be processed in the court by law enforcement agencies and Panglima Laôt, and if the case cannot be resolved by the local Panglima Laôt it will be reported to the law enforcement authorities of the Republic of Indonesia (in this case, the police).

### ***3.1.9 Enforcement of rules/penalties for those who violated***

Results of interviews with fishermen in Aceh Jaya district, all respondents stated that in Aceh Jaya district, conflicts with fishermen have never occurred, and infringement of prohibited law by institution of Panglima Laôt has never occurred, because according to the respondents, if the violation occurred, legal sanctions or penalties will firmly applied for anyone who violated.

### ***3.1.10 Illegal fishing***

Fishing activities in the waters of Aceh Jaya are done generally by local fishermen of Aceh and there is no indication of illegal fishing done by local fishermen, both violations of fishing area and type of fishing gear. If there is illegal fishing in the waters of Aceh Jaya, it is usually done by outsider of Aceh fishermen (fishermen from North Sumatra and Fishermen Thailand).

### ***3.1.11 Justice in law***

Fairness in this law can be understood as justice in resolving the problem or case law by law enforcement officers, either from the police or private parties and local law enforcement in order to utilize the fish resources. So far, the role of law enforcement in dealing with fisheries has been running very well and very fair.

### ***3.1.12 Compliance with regulations fishermen or local laws***

So far in the management of fishery resources, the regulations are issued by both the formal institutions of the central government and the Aceh government for sustainable fishing activities. However, the implementation on the field, there is sometimes no supervision in practice so that the implementation is neglected. According to interviews with respondents, all fishermen in Aceh Jaya district comply with the regulations, both national laws and regulations set by the institution of Panglima Laôt.

### ***3.1.13 The benefits of local rules for fishermen***

Based on interviews with respondents, they state that the rules made by the Panglima Laôt are excellent for the preservation of the environment and fish resources and support fishermen. All rules issued by agencies of Panglima Laôt are always followed by fishing communities because these rules have been implemented from generation to generation.

### ***3.1.14 The role of local institutions in the management of fisheries***

Institution of Panglima Laôt strongly supports the management of fishery resources in Aceh and plays an important role in the sustainability of fisheries. This institution was formed because of the needs of the fishing community as a manifestation of the desire of the fishermen themselves who are worrying to the decline in aquatic environment and also for sustainability of fish resources.

### ***3.1.15 Fisherman involvement in the formulation of institutional policies***

Determination of marine and fisheries development policy in general and in particular Aceh Aceh Jaya conducted by Panglima Laôt has involved the direct role of fishing communities. Determination and policy formulation of Panglima Laôt are always done with sharing opinion or discussion of Great Panglima Laôt followed by any representative of Panglima Laôt on each level. Policy formulation is always issued with a result that is binding on all parties and it is expressed in the Decree. Questionnaire results are distributed to the respondents, all of them chose number two (2) which means that the institutional policy formulation of Panglima Laôt always involves fishing communities.

### ***1.3.16 Democracy in determining policy***

Determination of marine and fisheries development policy in Aceh Jaya always involve direct opinion Panglima Laôt of Aceh Jaya which is indigenous stakeholders who runs the values of indigenous fishing communities. The interviews with the head of the Department of Marine and Fisheries Aceh Jaya and Aceh Jaya Panglima Laôt, almost in every work program of Department of Marine and Fisheries Aceh Jaya District involves Panglima Laôt of Aceh Jaya, so that information and development programs initiated by the local government are quickly accepted by the fishing community. So the fishermen felt that the determination of policy was very democratic.

### **1.3.17 Group fishermen**

The support group of fishermen are fishing group involvement in supporting the sustainability of fishing activities based on local wisdom, in the form of group activity fishermen, fishing groups support programs in fisheries sustainability which shows a strong correlation between fishing group support and the sustainability of catching fisheries.

According to an interview with the Department of Marine and Fisheries Aceh Jaya, Aceh Jaya fishermen have already formed many groups of fishermen. Fishing groups are formed in rehabilitation and reconstruction after Tsunami attacked Aceh, so that running programs and development of marine fisheries in Aceh Jaya is very easy, especially in terms of the distribution of aid fishing boats and fishing gears.

### **3.2 Status of fisheries sustainability based on local wisdom of institutional dimension**

Value contained in the dimension scores was then analyzed using method of institutional RAPFISH. The output obtained by the method indicates that RAPFISH on institutional dimensions of fisheries sustainability index values based on local wisdom as presented in Table 5. This value will determine the relative position of each of the ordination of fishing activities that are in the good range with a value of 100, and bad with a value of zero.

Table 5. The Value dimensions of the institutional sustainability of fisheries based on local wisdom in Aceh Jaya District

Activity of Capture Fisheries	Institutional dimension values	sustainability status
Gillnet (Jaya)	91,31	Very Good
Trammel net (Jaya)	91,31	Very Good
Hand line (Jaya)	91,31	Very Good
Troll line (Jaya)	91,31	Very Good
Gillnet (Sampoiniet)	88,40	Very Good
Hand line (Sampoiniet)	88,40	Very Good
Troll line (Sampoiniet)	88,40	Very Good
Mobile lift net (Sampoiniet)	88,40	Very Good
Gillnet (Setia Bakti)	95,82	Very Good

Trammel net (Setia Bakti)	95,82	Very Good
Handline (Setia Bakti)	95,82	Very Good
Troll line (Setia Bakti)	95,82	Very Good
Mobile lift net (setia Bakti)	95,82	Very Good
Purse seine (Krueng Sabee)	95,82	Very Good
Gillnet (Krueng Sabee)	95,82	Very Good
Trammel net (Krueng Sabee)	95,82	Very Good
Troll line (Krueng Sabee)	95,82	Very Good
Gillnet (Panga)	88,32	Very Good
Hand line (Panga)	88,32	Very Good
Gillnet (Teunom)	93,88	Very Good
Trammel net (Teunom)	93,88	Very Good
Hand line (Teunom)	93,88	Very Good
Troll line (Teunom)	93,88	Very Good
Mini long line (Teunom)	93,88	Very Good

If the value of the institutional dimension in Table 5, over in Plot in Figure ordinance, it will appear as seen Figure 2.

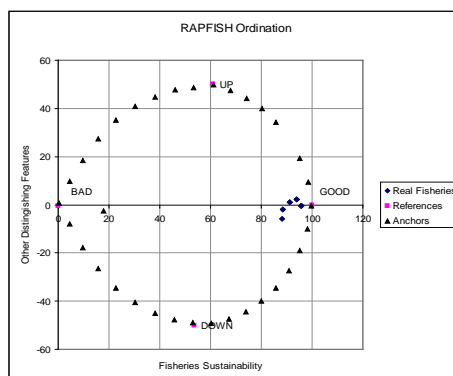


Figure 2. The Ordinated institutional of fisheries dimensions based on local wisdom in Aceh Jaya District

Analysis of the ordinance in the institutional dimension of the number of iterations for three (3) times, produced a value squared correlation (R<sup>2</sup>) of 97.26 percent and the value of stress (S) equal to 11.80 percent. Thus, the institutional dimension analysis in this study indicates the good condition or goodness of fit of which the stress value obtained is less than 25 percent.

While the results of Monte-Carlo analysis and Leverage were conducted to determine the uncertainty aspects and anomalies of the attributes analyzed (Figure 3). Fishing activities in Aceh Jaya district has excellent sustainability status (very sustainable), it is seen from the value dimensions (Table 5) with range from 88.32 to 95.82. The coefficient of determination (R<sup>2</sup>) is equal to 97.26 percent and 11.80 percent of the value of stress. To evaluate the impact of random error was conducted the ordinance stability analysis with Monte Carlo simulation method which was conducted on all dimensions [11 and 12]. There are three types to perform Monte Carlo algorithm. In this study, it was only analysis of the Monte Carlo method "scatter plot" that shows the ordination of any dimension. Analysis of the results in view of the stability of the ordinance was done to see the level of disturbance (perturbation) of the value of ordination [20], which was carried in 25 times iteration.

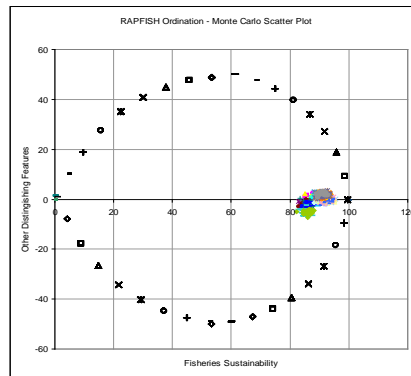


Figure 3. Monte-Carlo results of the analysis of the institutional dimension of fisheries based on local wisdom in Aceh Jaya District

Leverage analysis results against indicators that are used in the institutional dimension (Figure 4) showed the highest value of 3.94 on the attributes of law enforcement/sanctions for noncompliance and the lowest value of 0.35 for the attribute group of fishermen. Leverage analysis results are used for all the attributes in the institutional dimension.

Sustainability status of fisheries based on local wisdom in Aceh Jaya district with Rapfish technique was done through several stages and perspective analysis related institutional dimension of Panglima Laôt in Aceh Jaya district. These stages include (1) an inventory of the regulations related to fisheries, including their implementation, and the role of institutions in sustainable fisheries development efforts, which is done by comparing a collection of documentation and observation of actual conditions in the field (2) determination of the sustainability index scores and, (3) depiction Rapfish ordinance institutional dimension, (4) test of goodness of fit with the procedure of multidimensional scaling (MDS), (5) determination of the coefficient of determination (R<sup>2</sup>), (6) stability test ordinance with Monte Carlo analysis techniques, (7) sensitivity test with

leverage analysis method, (8) attribute of sensitive portrayal institutional dimension and (9) the determination of the response (the implications of alternative policy) to sensitive attributes [11].

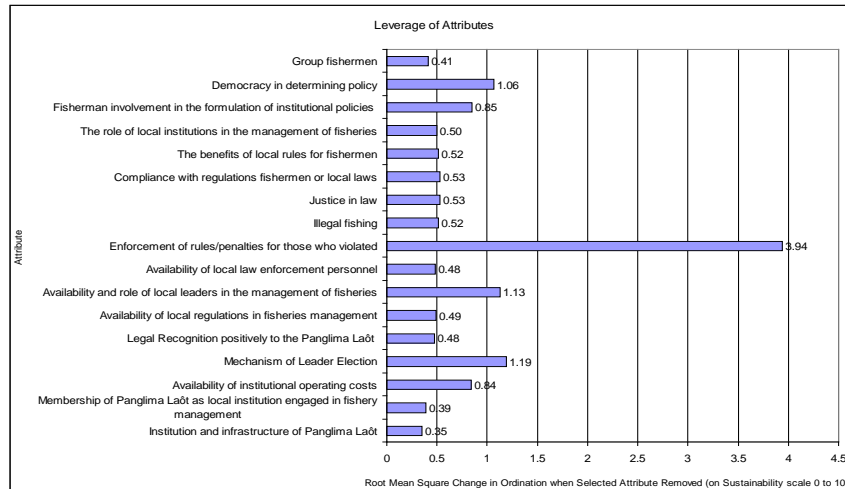


Figure 4. Results of the analysis of the institutional dimension Leverage based on local wisdom in Aceh Jaya district

Based on the results of the sensitivity analysis with leverage (Figure 4), it indicates that the law enforcement/sanctions for noncompliance [21], is an attribute that greatly affects the value or sustainability status of fisheries in Aceh Jaya. Lack of respect for the values of local or indigenous knowledge can be assumed that the fishermen have not fully complied with the rule of law and selfish [22]. Root mean square change value of the attribute of law enforcement/sanctions for noncompliance is much higher than other attributes. Law enforcement/sanctions for noncompliance in fisheries sustainability has become very necessary because the legal consequences of institution in realizing a law enforcement [23]. Sustainability of fisheries system based on local wisdom is highly dependent on the institutional values in maintaining socio-ecological and ecosystem function [24]. A socio-ecological system consists of units of bio-geophysical and social actors and the institutions associated with it. Social-ecological systems are complex, adaptive and constrained by the limits of spatial or functional institutions that surround the institutions [25]. Sustainability also requires equal access to good quality of life, including obeying the law and impose sanctions for noncompliance, material, social and emotional well-being. Welfare is a holistic concept combining human connectedness with the law and its institutions were included [10].

#### 4. Conclusions

Status of the institutional dimensions of sustainability in capture fisheries based on local wisdom in Aceh Jaya district has excellent sustainability index score based on each of the existing fishing activities in Aceh Jaya district with sustainability values between 88.32 to 95.82 (status excellent/very sustainable).

Attributes that highly influential in determining the sustainability index value are the attribute of the law enforcement/sanctions for noncompliance. The development is likely to be done through a policy aimed at

improvement of the quality attributes of the sustainability of fisheries policy improvement without discouraging other attributes within the institutional dimension.

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