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Fishermen's Perspective on the Performance of Panglima Laot in Managing Coastal Areas in Aceh, Indonesia

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ABSTRACT

The existence of the *Panglima Laot* (sea commander) to sustainably manage coastal areas in Aceh Province faces various problems. Moreover, the role of the *Panglima Laot* institution is sub-optimal in implementing customary maritime (*adat laot*) rules for managing coastal areas. This study aims to analyze the institutional performance of *Panglima Laot* in the sustainable management of coastal areas. This study was conducted in Aceh, Indonesia. Observation and structured interviews (questionnaires) were utilized to gather primary data. Secondary data were acquired from various agencies. Data were analyzed through multiple linear regression analysis, and qualitative data was analyzed by scoring the Likert scale. The performance of the *Panglima Laot* institution, ranked from highest to lowest, was as follows: (1) the application of customary maritime law, (2) fishermen's compliance with the customary maritime law, (3) the implementation of roles and functions by the *Panglima Laot*, and (4) dispute resolution among fishermen. The role of *Panglima Laot* is significant in preserving coastal ecosystems. Enhancing the performance requires developing a strong synergy with the government for effective fisheries supervision and management.

1. INTRODUCTION

Coastal resource management is a critical issue that involves various stakeholders, with fishermen being the primary users of these resources. Their perspectives are not just important but integral to the process. Understanding fishermen's perspective on coastal resource management is essential and a global concern, as it can provide valuable insights for more effective and sustainable management efforts. Previous studies have highlighted the diverse perceptions of fishermen worldwide regarding coastal resource management [1, 2].

Community-based coastal resource management has been widely recognized as a practical approach to achieving sustainability. The involvement of customary institutions in coastal management has produced varying outcomes, but their role is crucial. Depending on how well customary rules are integrated and accepted by the fishing community, these institutions can significantly contribute to sustainable management. Experiences from Samoa, Hawaii, Canada, and Vanuatu demonstrate that customary institutions are crucial in maintaining coastal communities' ecological balance and economic sustainability [3-6].

In several regions of Indonesia, the management of coastal resources is governed by customary law rooted in local wisdom. This unwritten law remains widely respected by the Indonesian people, as each region has the authority to manage and develop its area according to its unique capabilities and potential [7]. Several other coastal areas that simultaneously use customary law as a policy instrument for managing coastal and marine resources can be found in Aceh (*Panglima Laot*), Maluku (sasi), Bali-Lombok (awig-awig), and Riau Islands-Batam (Kelong) [8-10].

Local wisdom refers to insightful indigenous concepts rich in value, deeply embedded within a community, and widely embraced by its members. It encompasses the knowledge passed down through generations, guiding local people in survival and reflecting their collective intelligence [11]. This wisdom is exemplified by fishermen who operate in traditional fishing grounds, following practices shaped by local culture and wisdom [12]. In the coastal communities of Aceh, the traditional fishing community is led by a figure known as the *Panglima Laot* (Sea Commander). The leader of this customary institution embodies the local wisdom of the Acehnese coastal people.

Panglima Laot has been a longstanding institution since the 14th century Samudra Pasai Kingdom and was further emphasized during the reign of Sultan Iskandar Muda (1607-1636). During this period, *Panglima Laot* served as an extension of the Sultan's authority, primarily tasked with collecting taxes from merchant ships docked at the port and mobilizing the population for military purposes. Under Sultan Iskandar Muda's reign, the Kingdom of Aceh established customary maritime laws that specifically governed aspects of

sea fishing, including relationships with fishermen, wages, boats, fishing gear, and other related matters. The official who managed it all was *Panglima Laot*. The statement above provides evidence that *Panglima Laot* has been present in the lives of Aceh fishermen for quite a long time [11].

Panglima Laot, a maritime cultural heritage, has existed in the life of the people of Aceh until now [13, 14]. Local wisdom, such as *Panglima Laot*, can manage the coastal and marine environment [15, 16]. Aceh Province has a long coastline reaching 2,666.27km with 272 islands, including six frontier small islands. Some regencies/cities in Aceh Province are geographically located on the seafront. This geographical situation encourages some people of Aceh to live on the coast. Some people of Aceh also live on the coast and have a livelihood as fishermen. This condition will allow people to interact with each other and nature, resulting in local culture and wisdom [17].

The area covered by *Panglima Laot* encompasses the coastal zone and the open sea [18]. The physical space under its jurisdiction includes Bineh Pasie (beach), Leun Pukat (land trawl traction zone), estuary, and Teupien (boat beaches, both in the bay, not at the mouth of the river) and Laot Luah (offshore). The extent of *Panglima Laot*'s authority over the high seas is subject to the law regarding the economic management of marine resources by the community. Meanwhile, physical spaces associated with coastal ecosystems include mangrove forests, Pasir forests, cypress and pine forests, ponds, and salt fields in coastal areas. *Panglima Laot*'s institutional performance in managing coastal areas aims to maintain harmony between development activities, environmentally friendly utilization of coastal resources, non-destructive patterns, and consideration for future generations.

According to Munawwarah and Abdi [19], the marine environment management system governed by the *Panglima Laot* institution includes four key aspects. First, marine environment management is guided by legal rules, where every maritime activity is regulated under customary maritime (Adat Laot) law. Second, the *Panglima Laot*, the highest authority in the organizational structure, is responsible for enforcing and overseeing the implementation of this customary law in marine management. Third, the *Panglima Laot* Court adjudicates any actions that violate customary maritime law, with sanctions typically involving non-physical penalties such as confiscation of the catch or temporary prohibition from working at sea. Finally, the *Panglima Laot* collaborates closely with government agencies, including the Maritime Affairs and Fisheries Service, Syahbandar, and the water police. These agencies provide guidance, particularly in adopting environmentally sustainable fishing technologies and ensuring compliance with government regulations related to marine environment management.

According to Tripa [20], the management of coastal resources must be carried out by considering the principles of sustainable development and environmental preservation. There are two substantial aspects: positioning customary law of the sea and fisheries management and considering the principles of sustainable development. The studies by Adhuri [21] and Lin et al. [22] suggested that capacity building within local communities is essential to empower them with the authority to understand and address issues related to coastal area management, thereby motivating them to improve their quality of life.

The potential damage to the coastal and marine environment arises due to the limited role of government in supporting fisheries sustainability and the ineffective function of existing regulations [23]. Hence, sustainable natural resource management seeks to preserve and utilize existing fisheries and natural resources to ensure long-term availability.

Researches conducted by Rudi et al. [24] and Bustamam-Ahmad [25] showed that enforcing Adat Laot fishing regulations by *Panglima Laot* has proven beneficial to the community and the environment. The northern sea area of Aceh, protected and managed by *Panglima Laot*, has a greater abundance of fish species than the open sea. The strict prohibition of explosives and cyanide in fishing has not only resulted in a more diverse fish population in this area but also offers hope for the recovery of the Aceh Archipelago, which has suffered damage due to unsustainable fishing practices. Research by Islam et al. [26] in Bangladesh revealed that local fishermen have mixed perceptions regarding the causes of declining fish stocks, highlighting the need for increased efforts to raise their awareness and involvement in fisheries management.

The *Panglima Laot* institution shows that local wisdom significantly influences people's daily lives in managing coastal and marine resources. It is legally supported by the government [27, 28]. *Panglima Laot* has the authority to guard the coastal and marine areas in Aceh's coastal communities. The *Panglima Laot* in the laot customary law institution occupies the role of a traditional leader in sustainable coastal resources management. This research examines the fishermen's perspective on the institutional performance of *Panglima Laot* in managing coastal areas sustainably, including implementing the roles and functions of *Panglima Laot* and applying customary maritime law.

2. MATERIALS AND METHODS

This research was conducted in Aceh Province in three Regencies: North Aceh, West Aceh, and Sabang City. The three districts represent the working area of *Panglima Laot* in Aceh Province, which is home to Customary Maritime Law Institutions. The West-South coastal area was represented by West Aceh District, the central coastal area, which includes small islands, was represented by Sabang City, and the North-East coastal area was represented by North Aceh District (Figure 1). February to July 2024 was the implementation time of this research.

The research area was determined using multistage stratified random sampling, sequentially selecting districts, sub-districts, and villages (Figure 2). Phase I was district selection: The West-South coastal area was represented by the West Aceh District, the Central coastal area, including small islands, by Sabang Municipality, and the North-East coastal area by North Aceh District. Phase II was sub-district selection: Two coastal sub-districts were chosen per district from the three selected districts (West Aceh District, Sabang Municipality, and North Aceh District). Phase III was village selection: From the chosen sub-districts (Johan Pahlawan and Meurebo in West Aceh District; Sukajaya and Sukakarya in Sabang Municipality; and Dewantara and Syamtalira Bayu in North Aceh District), two coastal villages were selected from each sub-district, resulting in a total of 12 villages across the research area. Phase IV was respondent selection. From each of the 12 villages, 15 fishermen were randomly selected as respondents. This process yielded a total of 180 respondents for the study.

Figure 1. Map of research locations

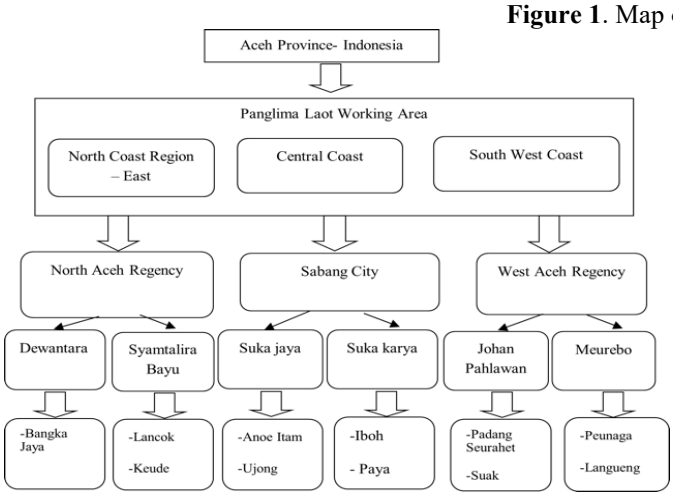

Figure 2. Research locations and distribution of research samples

Information related to the research was also obtained from key informants, including the Provincial, the District, and the regency *Panglima Laot*s. The object of this research is the coastal community who work as capture fisheries fishermen from research villages. The scope of this research is limited to the perspectives of fishermen on the performance of *Panglima Laot* institutions in managing coastal areas in Aceh Province, Indonesia.

Primary and secondary sources of data were used in this study. Interviews and questionnaires were used to gather primary data from the fishermen. The respondents in this study were fishermen who faced challenges in understanding the purpose of academic research. Therefore, a tailored approach was necessary to ensure their consent was informed, voluntary, and free from coercion and that their confidentiality was maintained. The researchers ensured the respondents that their participation would not affect their relationship with *Panglima Laot* or other parties.

Secondary data was in the form of documents obtained from provincial and district Central Bureau of Statistics (BPS) offices in Aceh Province, Provincial and regency fisheries and maritime services, scientific journal articles, and literature reviews. Secondary data in this study was obtained from the Central Statistics Agency (BPS), including the number of fishermen (fishermen population per district/city in Aceh Province, fisheries production, Aceh coastal area map, coastal area data which includes the working area of *Panglima Laot*. Social demographics of fishermen included age, education level, number of fishermen households, and fishermen infrastructure. Data from the Department of Fisheries and Marine Affairs encompassed programs and policies for fishermen, such as assistance initiatives (e.g., boats, fishing gear, fuel subsidies) facilitated through *Panglima Laot* institutions. Additionally, data on active fishing groups, licenses, and regulations, including government policies (Qanun) related to *Panglima Laot*, such as fish catch zoning, were incorporated. Relevant scientific articles, books, and journal publications relevant to the research topic were reviewed and utilized.

The data analysis was conducted thoroughly using multiple linear regression, a modeling technique chosen for its fundamental role in econometric studies involving more than one independent variable. Through multiple linear regression,

researchers can simultaneously observe the impact of numerous independent factors and use the p-value to identify which independent variables significantly affect the dependent variable. It is feasible to examine the degree to which each independent variable influences the dependent variable using multiple linear regression.

This technique can indicate whether each independent variable has a positive or negative relationship in predicting the dependent variable [29]. It was employed to assess the influence of the independent variable (X) and the dependent variable (Y) on *Panglima Laot's* role in sustaining Aceh Province's coastal ecosystems. The results, generated by SPSS 22, are presented in tables and regression outputs, following the model (1).

$$Y = a + b1Xil + b2Xi2 + b3Xi3 + b4Xi4 + \varepsilon i \quad (1)$$

Y is Role of *Panglima Laot*, a constant, b is unstandardized coefficients B, X1 is Fisheries ecosystem, X2 is Mangrove ecosystem, X3 is Coral reef ecosystem, X4 is Estuary/ Coastal ecosystem, εi is remainder of a random variable that is independent of the value of X.

This study employed a qualitative survey with descriptive analysis. Qualitative inquiry represents a concentrated and multi-faceted approach to understanding phenomena through natural and comprehensive investigation. It explores meanings, interpretations, concepts, traits, manifestations, symbols, and narratives associated with a phenomenon [30, 31]. In this study, the method used to analyze the data is a qualitative descriptive using a Likert scale. The Likert scale examines the attitudes, opinions, and perceptions of individuals or groups regarding a symptom or phenomenon. Usually employed in surveys, this scale is the foremost method for quantifying responses in research [30].

Data management employed tabulation techniques and was formulated as a frequency distribution. It was then analyzed using analytical methods, such as collecting and interpreting data to provide an overview of the problem under study. On a Likert scale, individuals indicate their degree of agreement with a statement by choosing from the available options. The data collection results were tabulated using a Likert scale, and then the index value was obtained based on the following conditions.

Index formula [30]:

Index %=TS/Y×100

where,

TS=Total Score

Y=Likert's highest score × Number of Respondents

The interval or distance is used to determine the index value. The method of finding the percent score interval of the index value (I) is as follows:

I=Highest index - lowest index

4

Then:

I=100%-25%: 4

I=75% / 4

I=18.75%

Based on the value (I), the interval used is as follows:

a) 25%-43.75%=Very low

b) 43.76%-62.5%=Low

c) 62.6%-81.25%=High

d) 81.26%-100%=Very high

where,

a) If the index is 25%-43.75%, fishermen's perspective on the institutional performance of *Panglima Laot* is in a very low category.

b) If the index is 43.76%-62.5%, fishermen's perspective on the institutional performance of *Panglima Laot* is in the low category.

c) If the index is 62.6%-81.25%, fishermen's perspective on the institutional performance of *Panglima Laot* is in the high category.

d) If the index is 81.26%-100%, fishermen's perspective on the institutional performance of *Panglima Laot* is in a very high category.

3. RESULT

In this study, fishing communities' characteristics (demographics) consist of age, formal education, experience, number of dependents, and income. The distribution of respondents' demographic data in Aceh province can be seen in Table 1.

Table 1 shows that the average age of fishermen falls within the productive range, allowing them to absorb information quickly and maintain the physical fitness required for their work. Conversely, those past their productive years may not be as effective in their fishing activities. In terms of education, most fishermen have completed junior high school, indicating a generally low level of formal education. Fishermen with higher education levels are more likely to adopt innovations and technologies, making them more dynamic and efficient. However, the lack of formal education is often offset by extensive practical experience, with many fishermen having over 10 years of experience. Budi [32] found that longer experience enhances fishermen's abilities and maturity in managing their various challenges.

Table 1. Respondents' characteristics

Characteristics	Frequency	Percentage
Age		
20-29	12	6.67
30-39	52	28.29
40-49	68	37.78
50-59	42	34.44
60-69	6	3.33
Formal Education		
No Schooling	6	2.78
Elementary School	41	22.78
Junior High school	68	37,78
Senior High school	62	34,44
Higher Education	3	1.67
Length of Experience as a Fisherman		
0-10	42	23.33
11-19	68	37.78
20-29	43	23.89
30-39	27	15.00
Number of Dependents		
<2	19	10.56
2-3	98	54.44
4-5	62	34.44
>5	1	0.56
Income		
< IDR. 1.000.000	6	3.57
IDR. 1.000.000-IDR. 3.000.000	105	58.33
IDR. 3.000.000-IDR. 5.000.000	65	36.11
>IDR. 5000.000	4	2.22

The average number of family dependents is 2-3 people. The number of dependents greatly influences activities as a fisherman because some of the fishing costs are spent to meet the needs of the number of dependents of fishermen. The average income of fishermen in coastal areas of Aceh is below the 2023 Provincial Minimum Wage of IDR 3,413,660. This low-income level influences fishermen's inability to lead prosperous lives. The low income of fishermen could be due to several factors, such as insufficient capital for fishing activities [33].

3.1 The influence of Panglima Laot in chief on the sustainability of coastal ecosystems

The analysis results showed the coefficient of determination (R^2) for the role of *Panglima Laot* in chief on the sustainability of coastal ecosystems of 0.79 (Table A1). Hence, it can be said that the variables of Fishery Ecosystems (X1), Mangrove Ecosystems (X2), Coral Reef Ecosystems (X3), and Estuary/Coastal Ecosystems (X4) can explain the variable of *Panglima Laot's* role (Y) by 79%. In other words, the remaining 21% is influenced by other variables not studied. The regression equation model obtained from the t-test results is as follows.

$$Y=24.205-0.095\ X1+0.000\ X2+0.056X3-0.126X4+e$$

The regression analysis results indicate that the constant of 24.205 is statistically significant (T=53.535; p=0.000) and represents the role of *Panglima Laot* in coastal ecosystem sustainability when the independent variables are zero. The fisheries ecosystem has a significant negative relationship with the role of *Panglima Laot* (b=-0.095; T=-7.521; p=0.000), while the coral reef ecosystem shows a significant positive relationship (b=0.057; T=5.522; p=0.000). The estuary/beach ecosystem had a significant negative relationship (b=-0.126; T=-8.831; p=0.000), while the mangrove ecosystem had no significant effect (b=0.000; T=-1.315; p=0.190).

The regression analysis results indicate that *Panglima Laot*'s role significantly affects the overall sustainability of each coastal ecosystem. However, when examined individually, the Mangrove Ecosystem variable (X2) does not show a significant impact from the role of *Panglima Laot.* The involvement of *Panglima Laot* in protecting mangrove forests is limited to issuing appeals and prohibitions against damaging the ecosystem. The customary maritime institution lacks the legal enforcement capacity, which is the government's responsibility for sanctioning violations. The limited legal capacity and enforcement abilities of customary institutions necessitate collaboration with government authorities to ensure effective conservation efforts. However, there is hope in the form of community-based management practices. These practices, such as establishing taboo areas, have proven effective in sustaining coastal ecosystems. Their potential, combined with the cooperation of local authorities and traditional leaders, who may not have formal legal authority, is a beacon of hope for the future of coastal ecosystem conservation [34].

3.2 Fishermen's perspectives on Panglima Laot's performance in coastal area management

The results of tabulation and data analysis using Likert scale measurements of the performance of the *Panglima Laot* Institution in managing coastal resources reveal that: a) The implementation of the roles and functions of *Panglima Laot* is 76.05% (high category), b) Application of customary maritime law is 89.25%, (very high category) c) Fishermen's compliance with the rules of the *Panglima Laot* institution is 83,78 (very high category) d) The settlement of disputes between fishermen is 70.62% (high category).

Fishermen in coastal areas perceive that the performance of *Panglima Laot* in carrying out its roles and functions is in the high category. Based on Regional Regulation (Qanun) No. 10/2008 on Aceh's customary institutions [35], the role of *Panglima Laot* consists of (1) implementing and supervising the implementation of customs and customary law of the sea, (2) government partners in fisheries and marine development activities, (3) resolving conflicts between fishermen based on customary law of the sea, (4) protecting the coastal and marine environment, (5) fighting for the welfare of fishermen, and (6) preventing fishing that is not environmentally friendly (Ilegal). The role of *Panglima Laot* is well established, with this institution having de jure authority over various aspects of fishing activities. This authority includes determining the right to access fishing areas, regulating environmentally friendly fishing gear, prohibiting fishing on religious holidays, initiating searches for missing fishermen, deciding compensation claims in the event of fishing boat accidents, and mediating conflicts between fishermen [36].

Based on comparing the interviews across the research locations, the role of *Panglima Laot* in North Aceh District and West Aceh District is highly significant. In contrast, *Panglima Laot's* performance falls into the high category in Sabang. This difference is due to government-designated conservation areas in Sabang, which have rules that differ from customary maritime law, particularly regarding the use of fishing gear. Customary maritime rules permit only the use of traditional nets for fishing. In contrast, in the government-designated tourism conservation area in Sabang City, trawl fishing nets, which can damage coastal ecosystems, are prohibited. This regulation is intended to protect the coral reef ecosystem, which is predominant in the coastal area of Sabang and serves as a critical habitat for fish.

Most fishing communities perceived the institutional performance of *Panglima Laot* in terms of the application of customary law (Khanduri Adat Laot – Sea Feast, social customs, environmental care customs, and drifting goods customs) to be very high (Table A2). Based on the results of implementation research Khanduri Adat Laot carried out no later than three years or depending on the agreement and ability of local fishermen, fishermen are prohibited from going out to sea for three days in the Khanduri Laot event, starting from the time the sun comes out on the day of Khanduri Laot until it sets on the third day.

The implementation of social customs in the life of fishermen includes: (1) if there is damage to the ship/boat or other fishing equipment at sea, they will signal by raising a flag as a sign of asking for help. The boats, seeing the signal, immediately approach to assist; (2) if a fisherman drowns at sea, all boats search for his body for at least one full day and are obliged to lift and bring the body to land when finding a body in the sea, and (3) if there is damage to the ship/boat or fishing equipment and other disasters at sea, they provide information via communication equipment (radio) to other boats and *Panglima Laot* on land.

Customs related to environmental maintenance include several important restrictions: (1) a ban on harmful practices

such as bombing, poisoning, using anesthesia or electrification, and extracting coral reefs or other materials that can damage the environment and marine life; (2) a ban on cutting down or damaging coastal trees, such as Arun/Pine trees, Ketapang, mangroves, and other shoreline vegetation; and (3) a ban on catching protected marine species like dolphins, turtles, and others. Wahyuddin et al. [37] and Zamzami and Nursyiwan [38] argued that traditional local wisdom for conserving marine resources involves controlling equipment, avoiding the use of dangerous fishing gear, committing to not catching or killing turtles, and refraining from littering the sea or cutting down mangroves. Furthermore, drifting goods customs dictate that every item (Boats, Panglong boats, etc.) floating in the sea and found by fishermen should be turned over to the local *Panglima Laot* for further management and distribution under applicable customary regulations.

According to this study, the level of obedience among fishermen in conserving the environment while utilizing coastal resources is very high. The involvement of fishermen in managing coastal areas significantly contributes to the degree of community compliance and the established rules in those areas [9]. Based on the acknowledgment of several fishermen, fishing activities by bombing have been carried out by fishermen from other areas but were quickly prevented after receiving information from fishermen directed to marine law institutions coordinated with law enforcement officials. The research results by Wibowo et al. [39] revealed that the conservation of fish resources is highly substantial for either fishermen or most traditional fishermen because they highly depend on fish resource preservation. Therefore, monitoring environmentally friendly fishing practices and providing sanctions against illegal actors must be prioritized.

At the research location, the fishing community has been socialized about the dangers of using bombs, anesthetics, and trawling gear carried out by the Adat Laot Law institution in collaboration with the Regional Maritime Affairs and Fisheries Service. The main elements of customary law are coastal communities, especially fishermen, with the capacity to protect marine resources' potential and manage them [40].

Table 2. Distribution of the number of abstinence days for one year [20, 41]

No.	No-Sea Days	Number of Days
1	*Khanduri Laot* (Sea Feast)	3
2	Friday	48 days a year
3	*Eid Al-Fitr Mubarak*	3
4	*Eid Al-adha*	3
5	Republic of Indonesia Independence Day on August 17th	1
6	The Aceh Tsunami Commemoration Day (every December 26th)	1
	Total days	**59**

The level of compliance of fishermen with abstinence from going to sea (no going to sea) is also in the high category, where most fishermen are very obedient to the rules of abstinence from going to sea. The number of abstinence days for a year is 59, consisting of Khanduri Laot Day, Friday, Eid Al-Fitr, Eid al-Adha, RI Independence Day, and Aceh Tsunami Commemoration Day (Table 2).

For fishing communities, refraining from the sea is part of customary law and reflects multiple meanings, such as (1) religious values as seen in the practice of avoiding going to sea on Fridays and holidays, (2) socio-cultural values as observed in the abstinence from *Meulaot* (traditional fishing gear) during *Khanduri Laot* day (a series of activities of thanksgiving for the bounty of the sea- Sea Feast) carried out in cooperation with all fishing communities, (3) kinship value as fishermen gather with their families and coastal communities during the abstinence from going to sea day, (4) the loyalty value as commemorated during abstinence day honoring Indonesia independence day symbol, and (5) the environmental sustainability value as total abstinence from going to sea (59 days per year) that significantly influence ecological processes and allows fishery ecosystems to grow and develop sustainably.

Disputes are resolved using laot customary law led by the *Panglima Laot*, as the regulation outlines. According to the same regulation, *Panglima Laot* Lhok's jurisdiction in settling disputes is confined to matters not including criminal aspects arising at sea. If the dispute contains a criminal element, it will be referred to law enforcement agencies. Customary justice procedures differ from those of formal law in resolving disputes. *Panglima Laot* Lhok oversees issues at the local level of Lhok. If disputes remain unresolved at this level, they will be escalated to the Regency/City *Panglima Laot*. Should the issues persist beyond the district/city level, they will be referred to the provincial *Panglima Laot* for resolution.

Panglima Laot Lhok has the role of guarding and supervising the implementation of customary maritime law, coordinating forms of fishing activities, organizing and conducting traditional ceremonies, resolving disputes between Lhok fishermen and the local government, and intermediaries between fishermen and the government. Meanwhile, the provincial *Panglima Laot* does not only resolve conflicts between fishermen at the provincial/city level but at a broader level, especially those involving relations with foreign countries or international parties.

According to Kusumawati and Huang [42], *Panglima Laot* in Aceh also acts as an intermediary between fishermen and the government, fishermen with particular agencies or organizations, protects marine and fisheries policies, protects the law for the interests of fishermen, and acts as a representative of fishermen when they need more serious government support in different subjects. The authorities, duties, and functions of *Panglima Laot* are regulated in Article 28 of Qanun Aceh Number 10 Year 2008 concerning customary institutions [35].

Various fishermen disputes in coastal areas include quarrels or fights that can cause physical injury between fishermen, catch-sharing disputes, disputes over the rights of fish herds among fishermen, fish catching in the estuary/estuary area with particular tools by local customs, disputes over fishing areas or fishing gear, fishing at sea on days when fishing is prohibited, catching certain protected species of fish, destruction of coral reefs within the management area of customary law areas, and destruction of coastal forests (mangroves and others).

Legal consequences include: 1) seizure of all catches; 2) A ban from sea activities for a minimum of three days to a maximum of seven days for infringements of specified legal measures; 3) In cases of legal violations, the Customary Maritime law Trial Institution (known LPHAL) will conduct administrative measures through authorized staff based on consultations with the customary maritime law Institute staff. Implementing strict sanctions is necessary to preserve local

wisdom values in the sustainable management of coastal resources [43].

In the document Qanun Aceh Number 9 Year 2008 concerning fostering customary life and customs [44], Maritime cases are delegated to *Panglima Laot*, and dispute resolution is based on *Panglima Laot* customary sea law. Then, the authority of *Panglima Laot* Lhok is limited to resolving disputes containing a criminal element and occurring at sea.Customary law has different procedures from formal law. If the dispute contains criminal elements, it will be handed over to law enforcement officials.

Customary maritime law strongly emphasizes balancing efforts to meet economic needs with habitat preservation and ecosystem sustainability. This concept is related to vertical balance with the God Almighty and horizontal balance with fellow humans. The prohibition on going to sea on certain days, such as Friday, Islamic holidays, and major holidays, including the tsunami commemoration day on December 26 every year, is not just a traditional procession. The ban aims to provide opportunities for marine biota to reproduce and for fishermen to repair their boats. All used ship repairs must not be thrown away carelessly, including prohibiting the use of fishing equipment that is not environmentally friendly, socializing with others, continuing to increase your devotion to God Almighty, maintaining the balance of nature and its creatures, and always remembering the month of December. The earthquake and tsunami incident on August 26, 2004, provided valuable lessons for preserving nature. It aligns with research by Hendri and Yulinda [45], mentioning three local wisdom values: Islamic sharia, social, and sustainable fisheries values.

Panglima Laot and customary maritime law play a role in community renewal. Customary maritime law is still obeyed without coercion and carried out following cultural values, norms of wisdom, and local knowledge adopted by laws and regulations in the specific context of Aceh and nationally. *Panglima Laot* and customary maritime law in Aceh are the models of modern indigenous peoples without abandoning their original traditional identity and even strengthening it through written legal products in their legality as a nationally recognized maritime customary dispute resolution. It aligns with research by Satria and Matsuda [13], which emphasized the need to increase the performance and capacity of local wisdom institutions in managing coastal resources.

The implementation of customary law in the diverse coastal and marine areas of Aceh Province requires careful attention to the sustainability of marine resource management, guided by local wisdom. Strengthening the performance of the *Panglima Laot* institution is essential, and this can be achieved by fostering synergy with the government in monitoring and managing fisheries. This collaboration should include assistance and training involving the government, private sector, non-governmental organizations, and other parties active in coastal areas.This is consistent with research findings in Taiwan, which indicate that despite significant efforts to increase capacity, gaps remain, particularly in inter-agency coordination and community participation [22]. In Papua New Guinea, integrating traditional ecological knowledge with modern conservation strategies has successfully managed coastal and marine resources. Clan-based stewardship and traditional taboos contribute to the resilience of these ecosystems [46].

The important findings of this research emphasize strengthening *Panglima Laot*'s role by increasing *Panglima Laot*'s capacity to manage coastal areas better, especially in enforcing Laot customary law rules more effectively and better coordination and collaboration between various parties. This research can strengthen the position of sea customary law in coastal area management by promoting the role of *Panglima Laot* as a relevant local wisdom-based management model to be applied in other coastal areas, both in Indonesia and other countries, especially those with customary or community-based management systems.

Differences in local policies, customs, coastal management systems, or the level of participation of fishers in customary laws such as *Panglima Laot* institutions may influence how fishers assess the performance of these customary institutions. While these findings provide important insights into the performance of *Panglima Laot* institutions in Aceh-Indonesia. However, these findings cannot be easily generalized to all coastal areas in Indonesia without conducting further research in other areas with different contexts.

4. CONCLUSIONS

The role of the *Panglima Laot* significantly impacts the sustainable management of coastal ecosystems, including fisheries, mangroves, coral reefs, and estuaries. However, its influence on the sustainability of the Mangrove Ecosystem is relatively minor. Fishermen's perceptions of the *Panglima Laot* Institution's performance in managing coastal resources are notably high, particularly regarding the application of marine customary law and the level of compliance among fishermen with these laws, both of which are rated very highly. Additionally, the implementation of the *Panglima Laot*'s roles and functions and the resolution of disputes between fishermen are both rated highly. Applying customary law in coastal and marine areas with diverse characteristics requires a nuanced approach rooted in local wisdom. To manage coastal resources effectively, *Panglima Laot* institutions must build synergies with non-governmental organizations, the private sector, and the government in socializing, supervising, and enforcing customary rules to achieve sustainable coastal management.

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APPENDIX

Table A1. Role of *Panglima Laot* in chief on the sustainability of coastal ecosystems

Variables	*Unstandardized Coeff*(B)	T	Sig
(Constant)	24.205	53.535	0.000*
Fisheries Ecosystem	-0.095	-7.521	0.000*
Mangrove Ecosystem	0.000	-1.315	0.190
Coral Reef Ecosystem	0.057	5.522	0.000*
Estuary/Coastal Ecosystem	-0.126	-8.831	0.000*

Source: Primary data, 2023.Coefficients fifth; Dependent variable is the role of *Panglima Laot*; R-squared = 0.79; *significant at 1% level

Table A2. *Panglima Laot* institutional performance

No.	*Panglima Laot* Institutional Performance Indicators	Index Value	Interpretation
1	Implementation of the roles and functions of *Panglima Laot*	76.05	High
2	Application of customary law of the sea	89.25	Very high
3	Fishermen's compliance with the rules of the *Panglima Laot* institution	83.78	Very high
4	Settlement of disputes between fishermen	70.62	High

Research questionnaire

Respondent No.
Phone No.
Date of Survey
Date of Data Entry

Assalamualaikum Wr. Wb
Respectfully

Our research team will conduct research on the topic "Fishermen's Perspectives on the Performance of the *Panglima Laot* Institution in Managing Coastal Areas in Aceh Province".

This questionnaire is one of the instruments used for the purpose of collecting data from respondents, and through this questionnaire I ask you several questions. It is my hope that these questions can be answered honestly. The information I receive from this questionnaire is confidential and is only used for research purposes.

I would like to thank you for taking the time to answer this question.

RESEARCH QUESTIONNAIRE

Fishermen's Perspective on the Performance of the *Panglima Laot* Institution Coastal Area Management in Aceh Province

I. Personal Information

1	Respondent ID	.....
2	Name	.....
3	Gender	1. Male
4	Age	.....
5	Village/Sub-district/District	..... / ..... / .....

II. Socio-Demographic Characteristics

6	Formal Education	.....Year (1) Not in school, (2) elementary school, (3) junior high school (4) high school (5) university
7	Experience as a Fisherman	(1) 0-12.5 Years (2) 12.5-25 Years (3) 25-37.5 Years (4) 37.5- 50 Years
8	Number of Dependents	(1) < 1 person; (2) 2-3 people; (3) 4-5 people; (4) > 5 people
9	Residence Ownership	(1) owned, (2) family owned, (3) rented
10	Income Level	(1) <1.000.000 (2) 1.000.000-3000.000 (3) 3000.000-5000000 (4) >5.000.000
11	Length of stay/residence in the village	(1) <5 Years (2) 5-10Years (3) >10 Years
12	Side job (if any)	.....
13	Monthly family expenses	(1) Less than 100 (2) 100-500 (3) More than 500
14	Type of fishing gear used	(1) Circle Net (2) Trawl (3) Gill nets and puntal nets (4) Fishing rod (5) Other fishing gear

The following statements contain statements about the Application of Laot Customary Law Rules in coastal area ecosystems measured on a scale of 1-5: **(1) strongly disagree; (2) disagree; (3) Neither agree nor disagree; (4) Agree; (5) Strongly agree.**

A. Application of Laot Customary Law Rules to Fisheries Ecosystems

1	Fishermen are aware of the regulation of the use of fishing gear that is not environmentally friendly.	1 2 3 4 5
2	Fishermen are aware of the rules regarding the prohibition of anesthesia, bombing and electricity in fishing activities.	1 2 3 4 5
3	ishermen are aware of the preventive regulation of the use of fishing gear used.	1 2 3 4 5
4	Fishermen are aware of the regulation on the prohibition of catching protected fish/marine biota.	1 2 3 4 5
5	Fishermen are aware of the regulation of fishing area restrictions at certain distances on fish habitat.	1 2 3 4 5
6	Fishermen are aware of the fishing method (meupayang) regulated by laot customary law.	1 2 3 4 5
7	Fishermen know about the procedures for installing tuasan, FADs and bubut sea. and bubu that are installed at sea.	1 2 3 4 5
8	Fishermen are aware of the damage and consequences caused by errors/damage to the installation of tuasan, FADs and bubu installed at sea.	1 2 3 4 5

B. Application of Laot Customary Law Rules to Mangrove Ecosystems

1	Fishermen comply with the prohibition of cutting/damaging mangrove trees, cypress, ketapang and other trees that live on the beach.	1 2 3 4 5
2	Fishermen know that trees that live around the coast should not be cut down because it will cause fish to move away from the coastal area.	1 2 3 4 5
3	Fishermen know about the prohibition of cutting down/damaging mangrove trees, cypress, ketapang and other trees that live on the beach based on the provisions of laot customary law.	1 2 3 4 5
4	The community knows the function of mangrove ecosystems as an effort to prevent disasters in coastal areas	1 2 3 4 5
5	The community realizes the importance of mangrove ecosystem conservation to support the economic activities of coastal communities.	1 2 3 4 5
6	The community also monitors the existence of mangrove ecosystems as part of obedience to the rules of laot customary law.	1 2 3 4 5
7	The community agrees and can accept the sanctioning of laot customary rules if there are parties who damage the mangrove ecosystem.	1 2 3 4 5

C. Application of Laot Customary Law Rules to Coral Reef Ecosystems

1	Fishermen know and comply with the prohibition of damaging coral reefs.	1 2 3 4 5
2	Fishermen know that coral reefs that live around the coast should not be taken on the grounds that they will cause fish to move away to the middle of the sea. cause the fish to move away to the middle of the sea.	1 2 3 4 5
3	Fishermen know about the prohibition of damaging coral reefs coral reefs/other biota that live on the beach based on laot customary law.	1 2 3 4 5
4	Fishermen support the provision of witnesses to those who use fishing gear that can damage coral reef habitats.	1 2 3 4 5
5	Fishermen know that damage to coral reefs/other biota will have a negative effect on the sustainability of fisheries resources in coastal areas.	1 2 3 4 5
6	The community will participate if there are efforts to improve the coral reef ecosystem.	1 2 3 4 5
7	The community participates in monitoring the existence of coral reef ecosystems as part of obedience to the rules of laot customary law	1 2 3 4 5

D. Application of Laot Customary Law Rules to Estuary/Coastal Ecosystems

1	Fishermen know about the prohibition of dumping garbage on the beach and estuary, which causes pollution of the beach/quarry ecosystem.	1 2 3 4 5
2	Fishermen know about the prohibition to throw the remains of ship repair materials into the sea which will cause pollution of the beach / bay ecosystem to be maintained.	1 2 3 4 5
3	Fishermen know about the prohibition to throw used oil into the sea, which will cause pollution of the coastal area.	1 2 3 4 5
4	Fishermen support the provision of witnesses to those who damage the estuary and coastal ecosystems in accordance with the provisions of laot customary law.	1 2 3 4 5
5	Fishermen help prevent siltation of the estuary ecosystem that can disrupt the economic activities of coastal communities.	1 2 3 4 5
6	The community participates in monitoring the existence of the Estuary / beach ecosystem as part of obedience to the rules of laot customary law	1 2 3 4 5

1) Do you think the application of laot customary law rules to all coastal ecosystems is very good?
2) Need to increase the compliance of fishing communities with the rules of laot customary law in coastal area management?
3) Enforcement of sanctions / *punishments* to fishermen who violate the rules of laot customary law in accordance with agreed provisions?
4) What efforts should be made by the *Panglima Laot* institution so that the coastal ecosystem (fisheries, mangroves, coral reefs, estuaries / beaches) will be better in the future?
5) Expectations of the fishermen community towards the existence of the *Panglima Laot* Institution in the better life of fishermen for now and the future?

The Role of *Panglima Laot*

The following statements address the role of *Panglima Laot* measured on a scale of 1-5: **(1) strongly disagree; (2) disagree; (3) neither agree nor disagree; (4) agree; (5) strongly agree.**

1	Fishermen know and understand the role of *Panglima Laot* in terms of implementing, maintaining and supervising the implementation of laôt customs and customary law.	1 2 3 4 5
2	Fishermen know and understand that *Panglima Laot* helps the government in the field of Maritime Affairs and Fisheries in the development of coastal communities. peat for production follows other members of the community.	1 2 3 4 5

3	Fishermen know and understand the role of *Panglima Laot* in resolving disputes and disputes that occur among fishermen in accordance with the provisions of laôt customary law.	1 2 3 4 5
4	Fishermen know and understand the role of *Panglima Laot* in maintaining and preserving the environmental functions of coastal areas and laôt.	1 2 3 4 5
5	Fishermen know and understand and feel the role of *Panglima Laot* in fighting for the improvement of the standard of living of the fishing community.	1 2 3 4 5
6	Fishermen know that *Panglima Laot* plays a role in preventing illegal fishing in coastal areas.	1 2 3 4 5

1) In your opinion, the role of *Panglima Laot* is the most important and should be improved in the future to improve the lives of fishermen?

2) In your opinion, all the roles of *Panglima Laot* have been carried out well, what are your expectations for the future role of *Panglima Laot*?

3) What efforts should be made by *Panglima Laot* in order to organize the lives of fishermen to be better and sustainable and ethical in utilizing natural resources in meeting the economic needs of the community?