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The study to manage mangrove forests by the community and local government is considered inadequate to maintain and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this reason, management recommendations need to be implemented by the community by collaborating with relevant agencies such as the Agriculture, Forestry and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems.

Apart from that, drafting village regulations regarding the management of mangrove ecosystems such as regulations prohibiting logging and other activities that have a negative impact on mangrove areas which can affect mangrove growth by reactivating the duties of marine and forest kewang in monitoring forest and coastal areas. Then it is necessary to carry out rehabilitation and conservation activities for mangrove species that grow quickly and use the mangroves as food ingredients so that the surrounding community needs to take part in training on how to rehabilitate mangroves and increase community participation in the management and utilization of mangroves.

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Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia

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The study to manage mangrove forests from the community and local government is considered inadequate to maintain and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this reason, management recommendations need to be implemented by the community by collaborating with relevant agencies such as the Agriculture, Forestry and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems.

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Research on the Participation of The Communities in the Mangrove Conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia has never been carried out by previous researchers.

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Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia

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Abstract. Mangroves have a very large function for coastal areas, including as a barrier to seawater currents, as an absorber of carbon dioxide gas (CO₂) and oxygen (O₂) producer, as a barrier to sea water currents, and as a place to live and shelter various species of marine biota such as small fish. Mangroves are a very clear source for maintaining aquatic ecosystems between the sea, coast, and land. In addition, the benefits of mangroves will also help humans in getting the most comfortable climate and weather to prevent natural disasters. The threat in the Valentine strait area is the damage to the mangroves that occurs due to land conversion. But on the other hand, there are still people who try to preserve and maintain mangroves in their area. This study aims to describe the efforts of the community around the area with the concept of cultural capital they have. The method used is descriptive qualitative and the data is obtained through in-depth interviews and observation. The results showed that the community began to re-apply the concept of the cultural capital of the "Sasi" tradition that they once had as traditional ecological knowledge to maintain and preserve mangroves so that mangrove conservation was maintained around the Valentine strait area.

Key words: community, cultural capital, mangrove, sasi, valentine strait

INTRODUCTION

Indonesia is a country with the potential for forest resources that are very potent and become the lungs of the world. Forests with all the potential contained in them are wealth that must be maintained and preserved so that they can be optimally useful for the welfare of the community without destroying existing ecosystems. Forests are natural resources that have high economic, ecological and social values (Baciu et al. 2021; Bjärstig and Sténs 2018), and tropical natural forests also function as the lungs (Kurniawan 2020) and support life so they must preserve and maintained through appropriate and sustainable forest development. However, this does not always work as it should because the existence of the forest cannot be separated from the activities of the people who still depend on the forest, especially the people who live around the forest (Doley 2022; Newton et al. 2016). Over 350 million people around the world who live around forests rely on forests and derive their livelihoods from forest resources (Chao 2012; Langat et al. 2016). Conservation, protection, and proper use of forests play an important role in global environmental sustainability (Haji et al. 2021). Forest ecosystems provide valuable services to society, however, many forests are degraded and their services have been underestimated (Nguyen et al. 2020).

Mangroves are a group of coastal plants (Lestyaningrum et al. 2017) which have an important role as a coastal defense against natural disasters, sea level rise (Unnikrishnan et al. 2013; Spalding et al. 2014), carbon sinks (Shedage et al., 2019), places to find food (Castellanos-Galindo et al. 2017), places to care (Abu El-Regal and Ibrahim 2014), places to lay eggs and places to find food for various marine biota, producers of food, drink, medicine, firewood, building materials and even a source of income for local residents (Islamy and Hasan 2020) as well as tourist sites (Kissinger et al. 2020; Spalding & Parrett 2019). Mangrove ecosystems are also known as a source of nutrients (Riwayati, 2014) for water, which then becomes a source of energy for aquatic biota. Mangroves also have social functions as conservation areas, educational purposes, ecotourism spots, and cultural identity (Kristiningrum et al. 2020; Siahaya et al. 2021).

The Maluku Islands are a group of islands located in eastern Indonesia. Maluku Island is also an archipelago consisting of large islands and small islands. Maluku is an archipelago province with a natural wealth of beaches, forests, mountains, and historical objects. The culture of the Maluku people in every place and island tends to have almost the same characteristics and patterns, namely being communal and cosmopolitan, prioritizing harmony and brotherhood, and maintaining human interaction with the natural environment in which they live. This is evident in the diverse traditions and customs which are still preserved by the local community.

50 The Buano people use the forest for their customary activities because there are many sacred places in the forest. Part
51 of it is related to respect for the natural environment which is believed to be a sacred and sacred place. For instance, sacred
52 places are prohibited from being used to prevent forest destruction. As per Mulyadi et al. (2022), this also occurs in several
53 regions in Indonesia, for example, in Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and Dayak Kanayatn
54 where indigenous people regard forests as clean and sacred places. Traditional belief systems and conservation have been
55 proven to protect forests while ensuring the availability of natural resources and ecosystem services for surrounding
56 people.

57 Along with population growth, and economic and industrial growth, the pressure on natural resources is becoming
58 greater due to the higher level of demand and interest in natural resources. This is clear from a number of facts where
59 mangrove exploitation is increasing year by year. This was also stated by (Cahyaningsih et al. 2022) that Indonesia is a
60 country with the largest area of mangroves in the world, however, as the human population increases, the area and quality
61 of mangroves decrease. Population growth is consistent with increased human activities that lead to deforestation and the
62 degradation of mangrove forests.

63 Buano indigenous people are still faithful to the implementation of various traditions and customs passed down from
64 their ancestors since ancient times to protect and preserve their natural environment. Pratiwi et al. (2019) also stated that
65 Indigenous peoples have knowledge from generation to generation about how to sustain and use the forest resources
66 around them. The role of indigenous peoples in the management of customary forest resources is critical to maintaining
67 continuity of forest functions. Until now, these cultures and traditions take the form of social institutions, social practices,
68 and various artifacts. The existence of customs and traditions that are still being carried out and have certain functions in
69 society are very valuable social capital in the process of development and community empowerment and preservation.

70 The involvement of local communities in managing forests is an important aspect of sustainable development.
71 Marschke and Berkes (2005) explain that various ways of community-based management, such as self-organization,
72 institutional development, experimentation, elaboration of knowledge, and social learning can make unsustainable
73 practices more sustainable. This is in accordance with the opinion of Hong and Saizen (2019) stating that local and
74 community-based forest management is a multi-dimensional approach to sustainable forest management in which different
75 stakeholders with different interests play a role in achieving common goals.

76 Local communities are part of the forest ecosystem (Shishany et al. 2022), the culture of the people who live near/in
77 the forest always interact with forest ecosystems, both forming and adapting to the natural environment (Ngo et al. 2021),
78 have rights to get equal opportunities in the management of local resources and development in the region.

79 The people of Buano, both individually and in groups from young to adults, have been motivated to plant mangroves
80 by Community Development Participation Institute (LPPM) Maluku since 2017. Community awareness has emerged after
81 counseling by the LPPM Maluku and their desire to get better fish catches if the mangrove ecosystem recovers. Berkes and
82 Folke (1992) argue that the community's ability to return the natural environment to its original status after being damaged
83 by exploitation is a cultural capital. In the context of natural resource management, both ecologically and economically,
84 the term cultural capital refers to factors that provide the means and adaptations for human communities to deal with the
85 natural environment and actively modify it. Understanding a society's cultural capital can be an important lesson in efforts
86 to conserve natural resources such as mangrove forests.

87 Based on the foregoing, the purpose of this research is to explain the cultural capital of the community in preserving
88 the mangroves of the Valentine Strait on Buano Island, West Seram Regency, Maluku, Indonesia.

89 MATERIALS AND METHODS

90 Study area

91 This research was carried out in June - August 2022 in Valentine's Strait in the coastal zone of Buano Island, West
92 Seram, Maluku, Indonesia, which includes the hamlet of Huhua and Pua Island in the village of North Buano. The
93 materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia.

94 Procedures

95 The field survey was carried out using a purposive sampling method. Each point is visited, followed by the gathering
96 of data, observation, and recording of significant information. The data taken was the coordinates of the field observation
97 points from the GPS, the condition of the land cover around the field points which are equipped with pictures, and the
98 results of interviews with the community.

99 The method used to determine the stations in this study was a purposive sampling method (Etikan et al. 2016). Each
100 station was determined by transects perpendicularly from sea to land so that there were 2 stations. Each station is divided
101 into 2 plots as repetition so that the total number of plots were four. The sampling plot consists of several subplots. Sub-
102 plots of 10m×10m were for the growth rate of the tree category, while 5m×5m were for the growth rate of the saplings
103 category, and 2m×2m for the growth rate of the seedling category.

106 This research was conducted using an analytical method in which satellite imagery was digitally interpreted through
107 supervised classification, then mapping was carried out using GIS to analyze the forest land cover. Digital image
108 processing for Landsat 8 images is carried out by preparing mosaic images, creating composite images, and performing
109 visual classification and digital classification to obtain land cover classes.

110 The method of collecting animal data in the field uses the line transect method, direct observation (encountering
111 directly in the field), and indirectly through footprints, excrement, sounds, and information from local people who
112 accompany researchers while at the research site in accordance with the characteristics of animals that always change
113 location. The line transect method was chosen to cover as large a research area as possible in one location in a short time
114 with a small work team.

115 To understand why people preserve mangroves, this research uses case studies, where data are collected through in-
116 depth interviews and observations. Key informants are community leaders and communities that actively engage in
117 mangrove conservation efforts.

119 Data Analysis

120 Data for the identification of mangrove species were tabulated to determine the composition of mangrove species in the
121 Valentine Strait Region and data from satellite imagery processing were tabulated to determine land cover classes.

122 The collected data from the communities were then analyzed using the theory of cultural capital by (Berkes and Folke
123 1994) by examining traditional ecological knowledge and local institutions existing in the local community. Figure 1
124 provides a map of the research locations.



Figure 1. Map of the research locations at Valentine Strait, West Seram, Moluccas, Indonesia

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RESULTS AND DISCUSSION

Mangrove ecosystem in the Valentine Strait coastal area

The mangrove area is approximately 474 ha, including the area of vegetation associated with mangroves covering an area of 106 ha that spans the coast of the island of Buano (Figure 1).

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The mangrove conditions in the Valentine Strait at three locations are presented in Table 1 below:

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Table 1. Mangroves condition in the Valentine Strait

No.	Hamlets	Location	Dominant Species	% Land Cover	Status	Substrate Type
1	Huhua	Anauni 1	<i>Rhizophora mucronata</i>	83.50%	Dense	Rocky sand
2.	Huhua	Anauni 2	<i>Rhizophora apiculata</i>	68.25%	Medium	Rocky sand
3.	Pulau Pua	Apa	<i>Rhizophora apiculata</i>	78.90%	Dense	Rocky sand
Totals				76.88%	Dense	

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The results of the observation of the condition of the mangroves of the 2 places mentioned above show dense and medium categories with a proportion of coverage value between: 68.25%-85.50%. The average condition of the mangroves of the island of Buano falls into the category of dense forests with a coverage of 76.88%. The species that predominate are *Rhizophora apiculata* and *Rhizophora mucronata* (Figure 2). Likewise in Pangempang Beach where one of the species that dominates the mangrove ecosystem is *Rhizophora apiculata* (Aipassa et al. 2022). as well as the research conducted by Kristiningrum et al. (2019) in the Mentawir Village that *Rhizophora Apiculata* and *Rhizophora mucronata* dominate in the area.

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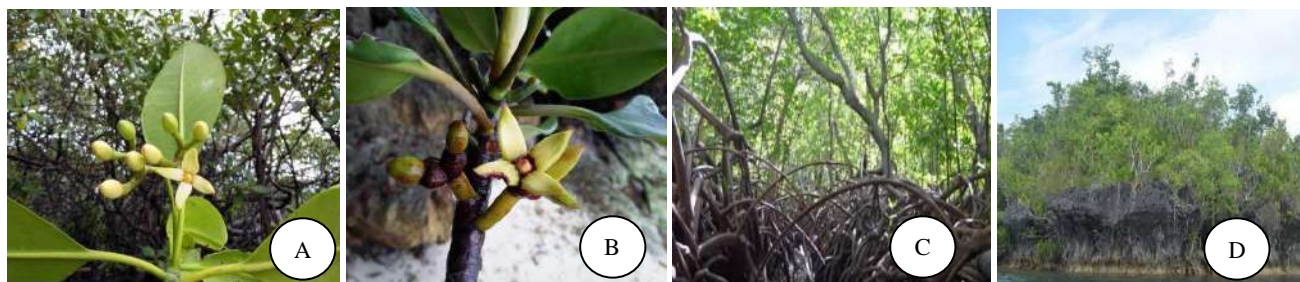


Figure 2. A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; Mangroves are dominated by Rhizophora species; D. Corals are overgrown by mangroves.

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The species of mangroves and their associations can be seen in Table 2 below:

Table 2. Mangroves species in Valentine Strait

Family	Species	Local Name
Rhizophoraceae	<i>Rhizophora apiculata</i>	Ate
Rhizophoraceae	<i>Rhizophora mucronata</i>	Ate
Rhizophoraceae	<i>Bruguiera gymnorhiza</i>	Ain
Rhizophoraceae	<i>Rhizophora stylosa</i>	Ate
Rhizophoraceae	<i>Ceriops tagal</i>	Ahusu
Lythraceae	<i>Sonneratia alba</i>	-
Arecaceae	<i>Xylocarpus moluccensis</i>	Pohon Kira-kira
Arecaceae	<i>Xylocarpus granatum</i>	Pohon Kira-kira
Primulaceae	<i>Aegiceras corniculatum</i>	Maulopee
Arecaceae	<i>Nypa fruticans</i>	Nipa
Malvaceae	<i>Hibiscus tiliaceus</i>	Papatal
Goodeniaceae	<i>Scaevola taccada</i>	Moral
Leguminosae	<i>Pongamia pinnata</i>	Alane
Leguminosae	<i>Peltophorum pterocarpum</i>	Kerulau
Pteridaceae	<i>Acrostichum aureum</i>	Susuuna
Combretaceae	<i>Terminalia catappa</i>	Sanisa
Lythraceae	<i>Pemphis acidula</i>	Tipopi
Lecythidaceae	<i>Barringtonia asiatica</i>	Hutun
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Unupatil

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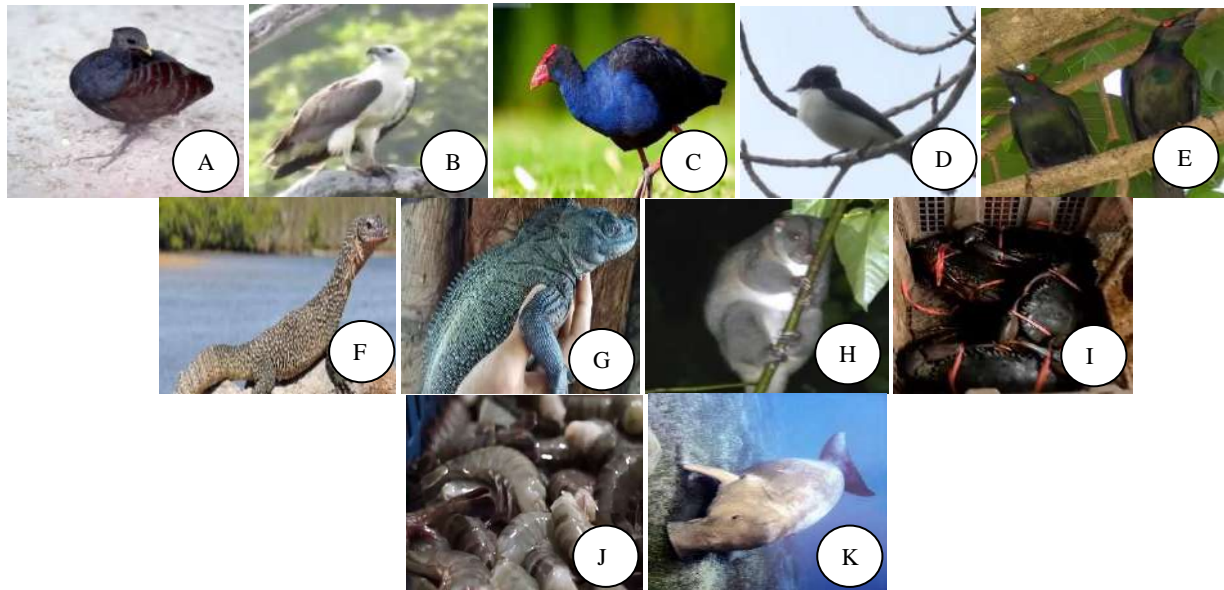
The Valentine Strait mangroves are located in the bay and are one of the ecosystems that have an important role in the coastal communities of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangroves provide benefits and various services to local communities along the coast, in particular fishing communities in Lampung Bay. In addition to being dominated by mangroves, the coastal ecosystem of Valentin's Strait also includes karst reefs, seagrasses, coral reefs, and coastal forests (Figure 2). These ecosystems provide productive natural resources, both as a source of food, as well as leisure or tourist areas.

As part of the coastal ecosystem, the existence of the mangrove ecosystem along the coast of Valentine's Strait makes a very significant contribution, both directly and indirectly. These benefits include physical protection, in particular against waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove stands can protect settlements, buildings, and agriculture against strong winds and seawater intrusion. Mangroves also play an important role in coastal protection against storms. The capacity of mangroves to develop their territory in the direction of the sea is one of the important roles of mangroves in the formation of new lands.

Mangrove not only serves as a barrier to natural abrasion of sea water and reduces the impact of tsunami waves, mangroves can also be used as a Natural Tourism Attraction which also has educational value. Apart from its beautiful beaches and rich underwater charm, the Valentine Strait also has mangrove tourist destinations with cool nature.

Some of wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area such as various birds of Gosong Maluku (*Eulipoa wallacei*), elang-laut perut-putih (*Haliaeetus leucogaster*), Mandar besar (*Porphyrio porphyria*), sikatan kelabu (*Myiagra galeata*), perling ungu (*Aplonis metallica*); ; reptiles such as biawak maluku (*Varanus indicus*), soa-soa (*Hydrosaurus amboinensis*); mamals such as kuskus (*Phalanger sp.*); and crustaceans such as kepiting bakau (*Scylla serrata*), udang windu (*Penaeus sp.*), and mermaids (*Dugong dugon*).

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Figure 3. Fauna found at mangrove area of Valentine Strait: A. *Eulipoa wallacei*; B. *Haliaeetus leucogaster*; C. *Porphyrio porphyria*; D. *Myiagra galeata*; E. *Aplonis metallica*; F. *Varanus indicus*; G. *Hydrosaurus amboinensis*; H. *Phalanger sp.*; I. *Scylla serrata*; J. *Penaeus sp.*; K. *Dugong dugon*

Prior to the counseling from NGOs (LPPM Maluku) in 2017, according to the head of LPPM Maluku, Mr. Piet Wairisal, mangrove encroachment continued to occur along the coast of Huhua hamlet (Figure 4), where mangrove wood had been cut down near the local residents' housing, this action damaged the ecosystem around the mangrove area. Although it is known that there is biodiversity in this area that needs to be protected, such as Buano Kehicap/Black-headed Monarch (*Symposiachrus boanensis*). If logging is done correctly and only takes a small portion of the forest each year, the impact on the environment will be very small, because mangrove forests have the ability to be able to renew themselves.



Figure 4. A. Residential communities around the mangrove; B. Mangrove timber exploitation around the mangrove in the hamlet of Huhua (Photo source: LPPM Maluku 2018)

Efforts to prevent mangrove degradation in Huhua Hamlet are starting to be carried out again at this time by increasing the local community's understanding of the functions and roles of mangroves. The preservation or maintenance of mangrove ecosystems as habitats will have an impact on the maintenance of marine life which in turn will support the current economy of the Buano people and future generations.

Various losses due to coastal abrasion are mainly felt by the people who live along the coast, such as people who have to move their houses because they are eroded by tidal waves. Damage to mangrove ecosystems and coral reefs has led to a reduction in the environmental quality of fisheries resources, resulting in a reduction in fisheries production. The cutting down of mangroves for firewood has also led to the intrusion of seawater into the mainland.

There have been numerous previous studies on the importance of mangrove restoration and conservation of mangrove management with a variety of perspectives and goals. Ellison et al. (2020) argues that rehabilitated and restored mangrove ecosystems have important ecological, economic, and social values for coastal communities.

TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom, which, if used properly can become an important social capital in the responsible management of natural resources. The natural resources in Buano village are sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there are three categories of local wisdom and their function in the Buano community. (1) the human relationship with God, or supernatural powers which are thought to have power over life; (2) human relations with others are a means of solidarity, closeness, and fraternity; (3) related to the natural environment which functions as an effort to protect humans and nature so that they can live side by side in harmony and sustainability.

Local wisdom that grows in the Buano community is important to note because it is the noble values that apply during the life of the local community, among others, to protect and manage the environment and natural resources in a sustainable manner. (Berkes, 2018) defines local ecological knowledge as a cumulative collection of knowledge, practices and beliefs, developed by adaptive processes and passed down from generation to generation through cultural transmission, about the relationships of living things where one another has ways of understanding, dynamic, built by experience and adapt to change.

The Sasi tradition had been forgotten, but the activity of reviving Sasi values managed by LPPM Maluku, in a limited number of protected forests and mangroves, was able to control forest destruction such as the implementation of mangrove Sasi. The use of mangrove wood is quite small, because since mid-2017 the village government and the Buano Customary Leaders in both villages have banned mangrove logging.

Sasi is a prohibition against taking certain resources at a certain point in time with the goal of managing sustainable resources. *Sasi* regulates how communities manage forest and marine resources, and how to apply customary punishments to those who violate *sasi* laws. Through *sasi*, it is regulated when the community may take or harvest naturally available local natural resources.

Sasi can be a social capital in maintaining the balance between humans and nature. When *sasi* is implemented, the community is prohibited from picking certain fruits on land and taking certain products from the sea, for a period of time determined by the village government. *Sasi's* role allows increasingly limited natural resources to grow and develop. In other words, biological and vegetable natural resources can be continuously conserved within a certain period and provide an opportunity for nature to restore its own growth and development in order to achieve satisfactory results.

The surrounding community believes that mangroves are a source of life which is the main source of food for the existence of fish, shrimp, crabs, clams, and others that they use. So that marine products are always available in abundance, the existence of mangroves must be properly maintained. For this reason, the community, both individually and in groups, voluntarily seeks to preserve the mangrove area. Marine products are harvested with the aim of selling

263 (commercial) or as family consumption to fulfill the family economy (subsistence). On the off chance that there are no
264 mangroves, then it is certain that the production from the sea and the coast that they cultivate will decrease significantly. In
265 addition, the community believes that the existence of mangroves has an important role in protecting coastal areas,
266 especially their settlements from abrasion and strong winds that often occur.

267 As for the results of discussions with key village figures, the local community had received support in the form of
268 seeds from the Maluku Watershed Management Center (BPDAS) and received environmental conservation training as a
269 form of concern for the government and the community as well as other elements for the importance of preserving forests.
270 During the training, participants consisting of elementary/junior high school/senior high school students who represented
271 the training also planted a number of tree species together. The Ministry of Forestry and the environment as an institution
272 that has responsibility for forest conservation provides assistance, environmental cadre training for these students as young
273 cadres to love the environment. This training is to provide understanding, motivation, awareness, and to awaken young
274 souls that protecting the environment and planting trees is the duty of all as pious human beings.

275 Furthermore, from the results of discussions with key village figures, training on environmental conservation was also
276 provided by NGOs from LPPM Maluku for leaders of traditional institutions for sustainable natural resource management
277 on Buano Island.

278 Forms of local community participation in mangrove conservation include: (1) Communities as beneficiaries of
279 mangrove resources know that there are rules governing life in the village and natural resources. The custom owned by the
280 village is *sasi*, namely sea (beach) *sasi*, river *sasi*, and land (forest) *sasi*. In efforts to preserve mangroves, there are various
281 related parties who still care about the existence of these mangroves. Supervision is carried out by the community itself,
282 such as village institutions (*Saniri Negeri and Kewang*) and families who have rights. *Saniri Negeri*, is a custom forum for
283 meetings of various social and customary institutions in Buano, while *Kewang* is a customary position for a traditional
284 leader who is tasked with overseeing the village's natural resources in the land (forest) environment as well as the coast
285 and sea. According to Uphoff (1986) institutions can be at the same time as organizations and vice versa. Institutions in the
286 sense of an organization that forms community groups that have good rules to regulate relations between people and rules
287 relating to the management of the surrounding forest resources. (2) Communities whose source of livelihood is fishermen
288 have their own initiative and awareness to plant mangroves. The seeds are taken from the mangroves around the coastal
289 route that they take when they go to sea. This planting is intended as plant enrichment or to replace dead mangroves.
290 (3) Communities collect both organic and inorganic wastes that become lodged in mangrove roots during floods and high
291 tides. The waste is then sorted again. Garbage such as rubber sandals and mineral water bottles is repurposed as a float
292 used for seaweed cultivation.

293 Based on this description it is clear how environmental aspects describe the assimilation of community awareness
294 around the Valentine Strait mangroves and how the culture of the community believes mangroves as a tree of life has
295 implications for mangrove conservation and the practice of realizing community protection for their environment. This
296 was also pointed out by Salampessy et al. (2015) that the community understands the cultural capital of a community as an
297 effort to preserve natural resources, especially mangroves where the conservation of mangroves in the Ambon Dalam Bay
298 is strongly influenced by the important role of traditional ecological knowledge of the community.

299 Efforts to manage mangrove forests from the community and local government are considered inadequate to maintain
300 and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this reason,
301 management recommendations need to be implemented by the community by collaborating with relevant agencies such as
302 the Agriculture, Forestry and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of
303 Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Apart from that, drafting
304 village regulations regarding the management of mangrove ecosystems such as regulations prohibiting logging and other
305 activities that have a negative impact on mangrove areas which can affect mangrove growth by reactivating the duties of
306 marine and forest *kewang* in monitoring forest and coastal areas. Then it is necessary to carry out rehabilitation and
307 conservation activities for mangrove species that grow quickly and use the mangroves as food ingredients so that the
308 surrounding community needs to take part in training on how to rehabilitate mangroves and increase community
309 participation in the management and utilization of mangroves.

310 ACKNOWLEDGEMENTS

311 The authors would therefore like to thank to Piet Wairisal from LPPM Maluku NGOs (The community institute for
312 participation in development) and to the communities of Buano who provided guidance on data analysis, providing photos
313 that support our research, and reviewers who provided suggestions to improve this research.

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SUBMISSION CHECKLIST

Ensure that the following items are present:

The first corresponding author must be accompanied with contact details:

Give mark (X)

<ul style="list-style-type: none">E-mail address	X
<ul style="list-style-type: none">Full postal address (incl street name and number (location), city, postal code, state/province, country)	X
<ul style="list-style-type: none">Phone and facsimile numbers (incl country phone code)	X

All necessary files have been uploaded, and contain:

<ul style="list-style-type: none">Keywords	X
<ul style="list-style-type: none">Running titles	
<ul style="list-style-type: none">All figure captions	X
<ul style="list-style-type: none">All tables (incl title and note/description)	X

Further considerations

<ul style="list-style-type: none">Manuscript has been "spell & grammar-checked" Better, if it is revised by a professional science editor or a native English speaker	
<ul style="list-style-type: none">References are in the correct format for this journal	X
<ul style="list-style-type: none">All references mentioned in the Reference list are cited in the text, and vice versa	X
<ul style="list-style-type: none">Colored figures are only used if the information in the text may be losing without those images	X
<ul style="list-style-type: none">Charts (graphs and diagrams) are drawn in black and white images; use shading to differentiate	X

403

We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia".

Our decision is: Revisions Required

Reviewer M:

Point 1: While the structure of the paper is mostly clear, the method section could be improved as it is currently not completely clear which data collection and data analysis techniques were specifically used. For instance, what was the exact purpose of the in-depth interview and observation? Were the results analyzed with specialized software? Did the coding happen by more than one researcher separately so that results could be compared and discussed to reach a consensus? What topics were selected for the semi-structured interviews? The interview scenario could be added as an appendix. Also clarify if the study relies on two (in-depth interview) or three (observation) data collection methods. Explain the role of each of these methods in answering the research question

Rephrase the first sentence in the abstract part to be read clear without any scientific conflicts. Line number 10-12.

Point 2: The text needs to have its English language accuracy and professional writing skills evaluated. There are other sections that discuss the past while others discuss the current. I suggest switching the tense from present to past.

Point 3: Provide evidence/reference from the following statements

- Line 38: *which then becomes a source of energy for aquatic biota*
- Line 48-49: *Indonesia is a country with the largest area of mangroves in the world, however, as the human population increases, the area and quality of mangroves decrease*

Point 4: in the study area (line 65-68) please provide details on the following

- Locations (long&lat) of maps
- Describe the location of study areas in the text/ coordinates
- Population of the area, economic activities, community surrounding the areas, main source of energy, income levels, etc
- Maps of the study sites need to be revised.

Point 5: In the procedures sub-section

- Mixture of methods were used including geospatial techniques like collection of location using GPS and application of Landsat 8. In addition, in-depth interviews and observation methods were also used in the data collection methods. But the following issues need your attention.
 - Why purpose sampling was used? Justify the reason.
 - Interview was done to who? Sample size and sampling frame was not identified, methods used to extract sample size was not shown,
 - GPS position was taken but it is not shown anywhere in the manuscript the reason for GPS position to be taken neither the geospatial analysis done for the GPS position taken.
 - Landsat 8 was used for what? No map shown for land cover derived from Landsat 8 shown. No land cover classification was made for this kind of analysis. Land cover classes are not available in the manuscript. Which software was used to pre-process and classify the Landsat 8?
 - The quadrants method was used in the manuscript but it was not stated clearly why this method was done and its results was not identified.
 - In the abstract, only in-depth interview method and observation method was mention but in the methodology part/Procedure's part many methods were used.
 - Add questions used for in-depth interview in the appendix. As well, add the observation guide used in the observation method as appendix.
 - Line transect method used to collect animal data was not well explained. Length of the line, cite references that this method is the best one.
 - The purpose of this research is to explain the cultural capital of the community in preserving the mangroves, ***unfortunately, none of the method used shows signs that the it will acquire knowledge and data on cultural capital of the community in preserving mangrove.***

Point 6: in the results and discussion section

- Table 1 title needs to be changed, may be "***dominant mangrove species composition and abundance***"
- Line 109-110: why "The mangrove area is approximately 474 ha", no data? No reference? Approximation is based on what? This is not scientifically healthy.

- Line 116: there is contradiction. The table 1 shows 3 locations but the statement indicates 2 places (The results of the observation of the condition of the mangroves of the 2 places)
- Line 124: (The species of mangroves and their *associations* can be seen in Table 2 below). The word association stands for what? The association is not available in the table.
- The community capitals available in the study areas have to be well shown if possible, using chart with percentage.
- When making statements about the behavior, attitudes and opinions of local communities, it is not always clear which of these statements are based on the focus groups, on previous studies, or reflect the personal interpretation of the researchers. Please check this carefully.
- It may also be interesting to have a look at the approach followed by other countries when managing mangrove forests to look for similarities or to be inspired to take future actions
- I would also recommend checking the text carefully as I noted several linguistic issues in this section.

Point 7: References, from a formal point of view the chronology of the references has to be checked

Recommendation: See Comments

Dear Bapak Ahmad Dwi Setiawan

Managing Editor

Journal Biodiversitas

Please find attached the revised and edited manuscript " Participation of The Communities in the Mangrove Conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia". (Revised with tracked file doc.)

We tried to add and change all comments from reviewer M. We hope the revised manuscript has met the requirements for publication in the Biodiversitas Journal. Thank you very much for your help and attention.

Thank you and best regards,

REVIEW FEEDBACK

“Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia”

Point 1

No.	Line	Reviewer comments	Author feedback and revision
1.		The method section could be improved as it is currently not completely clear which data collection and data analysis techniques were specifically used	We’ve changed and added “The method used was a combination of qualitative and quantitative methods. This combination of qualitative and quantitative data was by connecting the qualitative and quantitative data obtained as a support for one another so as to produce a complete result. In further data processing, more emphasis was given to the qualitative aspects. in which data collection was conducted through in-depth interviews and participant observation. The data were analysed using the theory of cultural capital.
2	Line 10-12	Rephrase the first sentence in the abstract part to be read clear without any scientific conflicts. Line number 10-12.	We’ve changed sentences “Mangrove forest is a forest area containing mangrove plants which is an important ecosystem in coastal areas.”
	Line 81	Methods	

Point 2

No.	Line	Reviewer comments	Author feedback and revision
1.		The text needs to have its English language accuracy and professional writing skills evaluated. There are other sections that discuss the past while others discuss the current. I suggest switching the tense from present to past.	We’ve corrected the writing skills

Point 3

No.	Line	Review	Feedback and Revision
1.	38	Provide evidence/reference from the following statements “ <i>which then becomes a source of energy for aquatic biota</i> ”	We’ve added reference by Saifullah et. al. 2016
2.	Line 48	Provide evidence/reference from the following statements “ <i>Indonesia is a country with the largest area of mangroves in the world, however, as the human population increases, the area and quality of mangroves decrease</i> ”	Done: reference by Cahyaningsih et al. 2022

Point 4

No.	Line	Reviewer comments	Author feedback and revision
1.		Locations (long and lat) of maps	We've added the coordinate
2.		Describe the location of study areas in the text/ coordinates	We've added coordinates in the text

Point 5

No.	Line	Reviewer comments	Author feedback and revision
1.		Purposive sampling methods	We've used a combination of qualitative and quantitative methods because our study was calculating and describing the result form data we've got.
2.		GPS Position	We've deleted the analytical method where this data will be used for our other research.
3.		The quadrants method was used in the manuscript but it was not stated clearly why this method was done and its results was not identified.	We've changed the line transect method and used Point Centered Quarter method for collecting vegetation data because we have used also this method to collect vegetation data and besides it tends to be more efficient.
4.		In the abstract, only in-depth interview method and observation method was mention but in the methodology part/Procedure's part many methods were used.	We've changed the method used and data collected where this study used a combination of qualitative and quantitative methods. The data collected in this study were primary and secondary data. Primary data were collected directly at the study location, and secondary data were obtained through local community information, various website, documents on the management of natural resources and key informants, consisting of the leader of the village, <i>Kewang</i> and LPPM Maluku (NGO). Data for the identification of mangrove species were calculated and tabulated to determine the species density of mangrove species in the Valentine strait region The collected data from the communities were then analyzed using the theory of cultural capital..”

Point 6

No.	Line	Reviewer comments	Author feedback and revision
1.		Table 1 title needs to be changed, may be “ <i>dominant mangrove species composition and abundance</i> ”	We've added another Table. Table 1 was about The standard criteria for damage to mangrove forests established by the Ministry of Environment RI No. 201 in the year of 2004. We change the old Table 1 becomes Table 2. The mangrove conditions in the Valentine Strait at two locations
2.		Line 109-110: why “The mangrove area is approximately	We've used The area of the research location was 25,000 m ² . Set in 2

		474 ha”, no data? No reference? Approximation is based on what? This is not scientifically healthy.	mangroves area namely far from the community settlements (A) was 12,000 m ² , and near the settlements area (B) was 13,000 m ² .”
3.		there is contradiction. The table 1 shows 3 locations but the statement indicates 2 places (The results of the observation of the condition of the mangroves of the 2 places)	We’ve changed the table already
4.		The species of mangroves and their <i>associations</i> can be seen in Table 2 below). The word association stands for what? The association is not available in the table.	We’ve deleted the table 2 because it has no relation with our study.
5.		When making statements about the behavior, attitudes and opinions of local communities, it is not always clear which of these statements are based on the focus groups, on previous studies, or reflect the personal interpretation of the researchers. Please check this carefully.	We’ve added the opinions of local communities, leaders of village and others by the sentences of based on interviews

Point 7

No.	Line	Reviewer comments	Author feedback and revision
		References, from a formal point of view the chronology of the references has to be checked	We’ve checked the references

Coresponding author

Aipassa

Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia

Abstract. Mangroves have a very large function for coastal areas, including as a barrier to seawater currents, as an absorber of carbon dioxide gas (CO₂) and oxygen (O₂) producer, as a barrier to sea water currents, and as a place to live and shelter various species of marine biota such as small fish. Mangrove forest is a forest area containing mangrove plants which is an important ecosystem in coastal areas. Mangroves are a very clear source for maintaining aquatic ecosystems between the sea, coast, and land. In addition, the benefits of mangroves will also help humans in getting the most comfortable climate and weather to prevent natural disasters. The threat in the Valentine strait area is the damage to the mangroves that occurs due to land conversion. But on the other hand, there are/were still people who try to preserve and maintain mangroves in their area. This study aims to describe the efforts of the community around the area with the concept of cultural capital they have. The method used is descriptive qualitative and the data is obtained through in-depth interviews and observation. This study used a combination of qualitative and quantitative methods. The data collected in this study were primary and secondary data. Primary data were collected directly at the study location, and secondary data were obtained through local community information, various website, documents on the management of natural resources and key informants, consisting of the local community leaders, *Kewang* and LPPM Maluku (NGO). Data for the identification of mangrove species were calculated and tabulated to determine the species density of mangrove species in the Valentine strait region. The collected data from the communities were then analyzed using the theory of cultural capital. The results showed that the community began to re-apply the concept of the cultural capital of the "Sasi" tradition that they once had as traditional ecological knowledge to maintain and preserve mangroves so that mangrove conservation was maintained around the Valentine strait area. Mangrove forests have become home to fish, shrimp and crabs. In addition, this forest is also important for birds, primates, and reptiles.

Key words: community, cultural capital, mangrove, sasi, valentine strait

INTRODUCTION

Forests are natural resources that have high economic, ecological and social values (Baciu et al. 2021; Bjärstig and Sténs 2018), and tropical natural forests also function as the lungs (Kurniawan 2020) and support life so they must preserve and maintained through appropriate and sustainable forest development. However, this does not always work as it should because the existence of the forest cannot be separated from the activities of the people who still depend on the forest, especially the people who live around the forest (Doley 2022; Newton et al. 2016). Over 350 million people around the world who live around forests rely on forests and derive their livelihoods from forest resources (Chao 2012; Langat et al. 2016). Conservation, protection, and proper use of forests play an important role in global environmental sustainability (Haji et al. 2021). Forest ecosystems provide valuable services to society, however, many forests are/were degraded and their services have been underestimated (Nguyen et al. 2020).

Mangroves are a group of coastal plants (Lestyningrum et al. 2017) which have an important role as a coastal defense against natural disasters, sea level rise (Unnikrishnan et al. 2013; Spalding et al. 2014), carbon sinks (Shedage et al. 2019), places to find food (Castellanos-Galindo et al. 2017), places to care (Abu El-Regal and Ibrahim 2014), places to lay eggs and places to find food for various marine biota, producers of food, drink, medicine, firewood, building materials and even a source of income for local residents (Islamy and Hasan 2020) as well as tourist sites (Kissinger et al. 2020; Spalding and Parrett 2019). Mangrove ecosystems are also known as a source of nutrients (Zuhri et al. 2022) for water, which then becomes a source of energy for aquatic biota (Saifullah et al. 2016). Mangroves also have social functions as conservation areas, educational purposes, ecotourism spots, and cultural identity (Kristiningrum et al. 2020; Siahaya et al. 2021).

The Buano people use the forest for their customary activities because there are/were many sacred places in the forest. Part of it is/was related to respect for the natural environment which is/was believed to be a sacred and sacred place. For

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51 instance, sacred places are prohibited from being used to prevent forest destruction. As per Mulyadi et al. (2022), this also
52 occurs in several regions in Indonesia, for example, in Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and
53 Dayak Kanayatn where indigenous people regard forests as clean and sacred places.

54 Along with population growth, and economic and industrial growth, the pressure on natural resources is becoming
55 greater due to the higher level of demand and interest in natural resources. This is clear from a number of facts where
56 mangrove exploitation is increasing year by year. This was also stated by (Cahyaningsih et al. 2022) that Indonesia is a
57 country with the largest area of mangroves in the world, however, as the human population increases, the area and quality
58 of mangroves decrease. Population growth is consistent with increased human activities that lead to deforestation and the
59 degradation of mangrove forests.

60 Buano indigenous people are still faithful to the implementation of various traditions and customs passed down from
61 their ancestors since ancient times to protect and preserve their natural environment. Pratiwi et al. (2019) also stated that
62 Indigenous peoples have knowledge from generation to generation about how to sustain and use the forest resources
63 around them.

64 The involvement of local communities in managing forests is an important aspect of sustainable development. This is
65 in accordance with the opinion of Hong and Saizen (2019) stating that local and community-based forest management is a
66 multi-dimensional approach to sustainable forest management in which different stakeholders with different interests play
67 a role in achieving common goals.

68 Local communities are part of the forest ecosystem (Shishany et al. 2022), the culture of the people who live near/in
69 the forest always interact with forest ecosystems, both forming and adapting to the natural environment (Ngo et al. 2021),
70 have rights to get equal opportunities in the management of local resources and development in the region.

71 Based on the foregoing, the purpose of this research is to explain the cultural capital of the community in preserving
72 the mangroves of the Valentine Strait on Buano Island, West Seram Regency, Maluku, Indonesia.

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73 MATERIALS AND METHODS

74 Study area

75 This research was carried out in June - August 2022 in Valentine's Strait in the coastal zone of Buano Island, West
76 Seram, Maluku, Indonesia, which includes the hamlet of Huhua and Pua Island in the village of North Buano. The
77 materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia (Figure 1.
78 [Map of the research locations at Valentine Strait, West Seram, Moluccas, Indonesia](#)):-

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$$d = \frac{d_1 + d_2 + d_3 + \dots + d_n}{n}$$

$$MAI = \frac{Vt}{t}$$

$$d = \frac{d_1 + d_2 + \dots + d_n}{n}$$

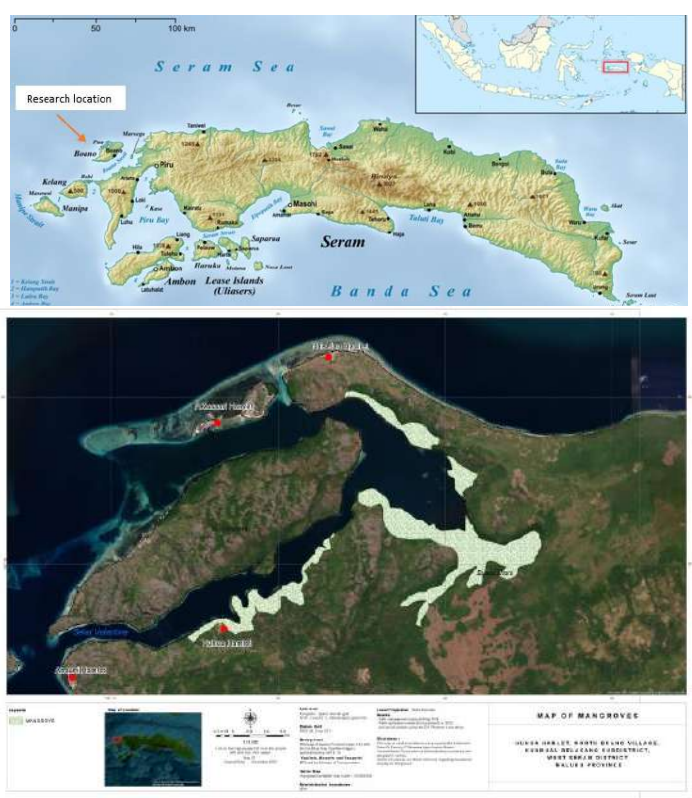
- Where:
- d = Distance of individual trees to measurement points in each plot
 - n = The large number of trees
 - $(d)^2$ = Average area/individual, namely the average surface area of land occupied by one individual plant

b. Species density

$$d_i = \frac{n_i}{A}$$

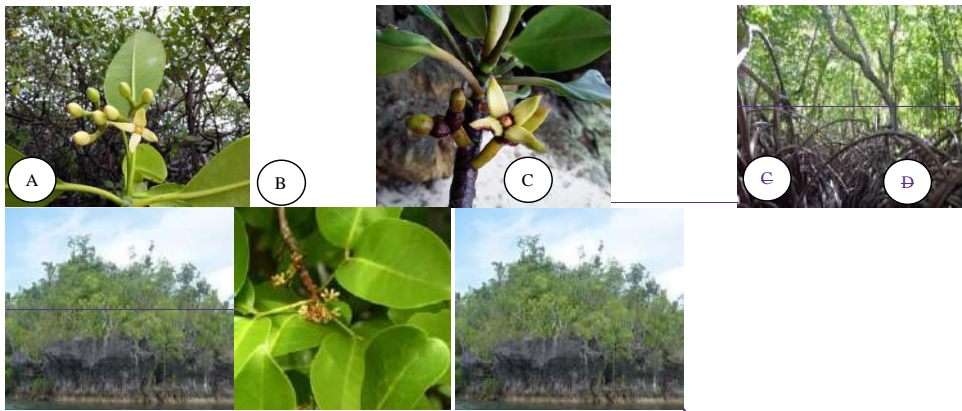
- Where:
- d_i = Species density
 - n_i = total number individual of species
 - A = total area of measurments plots

The collected data from the communities were then analyzed using the theory of cultural capital by (Berkes and Folke 1994) by examining traditional ecological knowledge and local institutions existing in the local community. Figure 1 provides a map of the research locations.



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251 effort, it is hoped that the people living around the mangrove forest will always look after, maintain and protect the
 252 rehabilitation area. This means that the community must participate in rehabilitating mangrove areas that have been
 253 damaged. The species that predominate are *Rhizophora apiculata* and *Rhizophora mucronata* (Figure 2). Likewise in
 254 Pangempang Beach where one of the species that dominates the mangrove ecosystem is *Rhizophora apiculata* (Aipassa et
 255 al., 2022), as well as the research conducted by Kristiningrum et al. (2019) in the Mentawir Village that *Rhizophora*
 256 *Apiculata* and *Rhizophora mucronata* dominate in the area.



258 **Figure 2.** A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; Mangroves are dominated by *Rhizophora* species; D. Corals are
 259 overgrown by mangroves; C. *Xylocarpus moluccensis*; E. Corals were overgrown by mangroves

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Commented [D20]: We've deleted Table 2 Mangrove species in Valentine Strait

261 The species of mangroves and their associations can be seen in Table 2 below:

262 **Table 2.** Mangroves species in Valentine Strait

Family	Species	Local Name
Rhizophoraceae	<i>Rhizophora apiculata</i>	Ate
Rhizophoraceae	<i>Rhizophora mucronata</i>	Ate
Rhizophoraceae	<i>Bruguiera gymnorhiza</i>	Ain
Rhizophoraceae	<i>Rhizophora stylosa</i>	Ate
Rhizophoraceae	<i>Ceriops tagal</i>	Ahusu
Lythraceae	<i>Sonneratia alba</i>	-
Arecaceae	<i>Xylocarpus moluccensis</i>	Pohon Kira-kira
Arecaceae	<i>Xylocarpus granatum</i>	Pohon Kira-kira
Primulaceae	<i>Aegiceras corniculatum</i>	Maulopee
Arecaceae	<i>Nypa fruticans</i>	Nipa
Malvaceae	<i>Hibiscus tiliaceus</i>	Papatal
Goodeniaceae	<i>Scaevola taccada</i>	Moral
Leguminosae	<i>Pongamia pinnata</i>	Alane
Leguminosae	<i>Peltophorum pterocarpum</i>	Kerulau
Pteridaceae	<i>Acrostichum aureum</i>	Susuuna
Combretaceae	<i>Terminalia catappa</i>	Sanisa
Lythraceae	<i>Pemphis acidula</i>	Tipopi
Leceythydaceae	<i>Barringtonia asiatica</i>	Hutun
Convolvulaceae	<i>Ipomoea pes-caprae</i>	Unupatih
Asteraceae	<i>Wedelia biflora</i>	Sugu-sugu

266 The Valentine Strait mangroves are located in the bay and are one of the ecosystems that have an important role in the
 267 coastal communities of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangroves
 268 provide benefits and various services to local communities along the coast, in particular fishing communities in Lampung
 269 Bay. In addition to being dominated by mangroves, the coastal ecosystem of Valentin's Strait also includes karst reefs,
 270

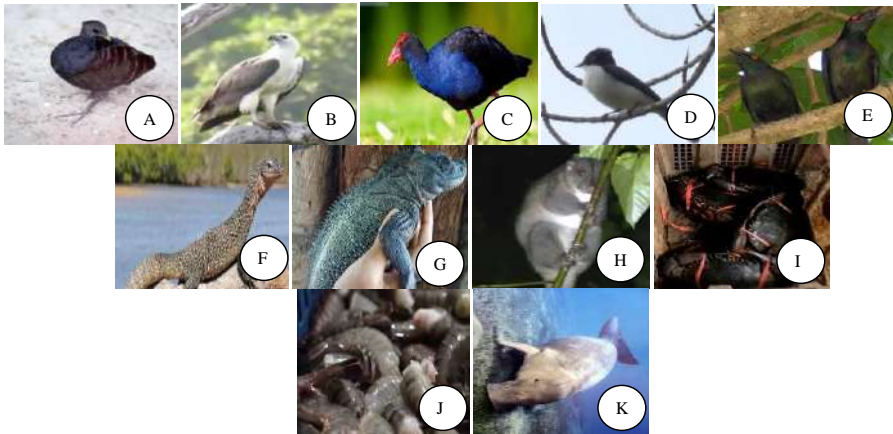
271 seagrasses, coral reefs, and coastal forests (Figure 2). These ecosystems provide productive natural resources, both as a
272 source of food, as well as leisure or tourist areas.

273 As part of the coastal ecosystem, the existence of the mangrove ecosystem along the coast of Valentine's Strait makes a
274 very significant contribution, both directly and indirectly. These benefits include physical protection, in particular against
275 waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove stands can protect settlements, buildings,
276 and agriculture against strong winds and seawater intrusion. Mangroves also play an important role in coastal protection
277 against storms. The capacity of mangroves to develop their territory in the direction of the sea is one of the important roles
278 of mangroves in the formation of new lands.

279 Mangrove not only serves as a barrier to natural abrasion of sea water and reduces the impact of tsunami waves,
280 mangroves can also be used as a Natural Tourism Attraction which also has educational value. Apart from its beautiful
281 beaches and rich underwater charm, the Valentine Strait also has mangrove tourist destinations with cool nature.

282 Some of wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area such as various birds of Gosong
283 Maluku (*Eulipoa wallacei*), elang-laut perut-putih (*Haliaeetus leucogaster*), Mandar besar (*Porphyrio porphyria*), sikatan
284 kelabu (*Myiagra galeata*), perling ungu (*Aplonis metallica*); reptiles such as biawak maluku (*Varanus indicus*), soa-soa
285 (*Hydrosaurus amboinensis*); mamals such as kuskus (*Phalanger sp.*); and crustaceans such as kepiting bakau (*Scylla*
286 *serrata*), udang windu (*Penaeus sp.*), and mermaids (*Dugong dugon*).
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Figure 3. Fauna found at mangrove area of Valentine Strait: A. *Eulipoa wallacei*; B. *Haliaeetus leucogaster*; C. *Porphyrio porphyria*; D. *Myiagra galeata*; E. *Aplonis metallica*; F. *Varanus indicus*; G. *Hydrosaurus amboinensis*; H. *Phalanger sp.*; I. *Scylla serrata*; J. *Penaeus sp.*; K. *Dugong dugon*

Socio-culture

Buano people occupy two main villages in the coastal area of the island of Buano, which is now divided into North Buano and South Buano.

In addition to the indigenous people who live in the two traditional villages on Buano Island, there were also immigrant communities from the Buton tribe from Southeast Sulawesi who were thought to have migrated to this island 300 years before Indonesia's independence. Migrant communities occupy several villages called Petuanan which were located on the west coast to the north of the island of Buano and currently administratively they have been formed in hamlets.

Socio-economic

In general, the distribution of educational attainment for the people of Buano who have graduated from junior high school was higher than those who have graduated from elementary and high school. Community education is one of the factors that influence the level of understanding of mangrove conservation. The results obtained from the people living on Buano Island show that people's education varies greatly. The number of people who did not go to school was 22.46%, who did not finish elementary school 12.46%, graduated from elementary school 11.98%, junior high school 33.65%, high school 12.66%, undergraduate level 4.36%, and diploma level 1.06%. Whereas for undergraduate level graduates it was 1.30%, postgraduate 0.05%, and doctoral degrees 0.02%.

Livelihood

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314 Mata pencaharian masyarakat pulau Buano 80% adalah petani. Mata pencaharian lain adalah nelayan. Nelayan tangkap
315 baik ikan demersial dan pelagis, hanya sebagian kecil yang menjadi nelayan budidaya (keramba jaring tancap dan
316 kepiting). Produksi perikanan pulau Buano dijual ke pulau Seram dan pulau Ambon. Hasil tangkapan laut dibeli langsung
317 oleh pedagang ikan dari dusun Kawa, Pelita Jaya, Masika dan sekitarnya yang berada di pulau Seram dan pulau Ambon.
318 Masyarakat pulau Buano khususnya lelaki juga banyak yang bekerja sebagai penebang kayu dengan menggunakan mesin
319 chainsaw.

320 80% of the livelihoods of the Buano island community are farmers. Another livelihood are fishermen. Fishermen catch
321 both demersal and pelagic fish, only a small proportion are aquaculture fishermen (planting net cages and crabs). Fishery
322 production from Buano Island was sold to Seram Island and Ambon Island. Marine catches were purchased directly by
323 fish traders from the hamlets of Kawa, Pelita Jaya, Masika and their surroundings which were on the islands of Seram and
324 Ambon islands. Many of the people on the island of Buano, especially men, also work as loggers using chainsaws.

325 Mangrove wood such as *R. Apiculata*, *S.alba* and *A.alba* were mostly used as fuel wood for burning cajuputi oil
326 refining furnaces. This was also the cause of reduced density of mangrove species (rare category) both in areas near
327 settlements and those far from settlements. Logging of mangroves for firewood has become the main occupation of fishing
328 communities. Firewood was also very important for the community, especially for the poor, when the price of fuel oil
329 soars. On the grounds that mangrove wood has the ability to generate much higher heat energy when compared to other
330 woods, the destruction of mangrove forests continues to occur. This condition makes the people around the mangrove
331 forest always cut down mangrove wood to fulfill their daily needs.

332 Prior to the counseling from NGOs (LPPM Maluku) in 2017, according to the head of LPPM Maluku, Mr. Piet
333 Wairisal, mangrove encroachment continued to occur along the coast of Huhua hamlet (Figure 4), where mangrove wood
334 had been cut down near the ~~local residents' housing~~ community settlement, this action damaged the ecosystem around the
335 mangrove area. Although it ~~is~~was known that there ~~is~~was biodiversity in this area that needs to be protected, such as Buano
336 Kehicap/Black-headed Monarch (*Sympotachrus boanensis*). If the logging activities ~~is~~was done correctly and only takes
337 a small portion of the forest each year, the impact on the environment will be very small, because mangrove forests have
338 the ability to be able to renew themselves.

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342 **Figure 4.** A. Residential communities around the mangrove; B. Mangrove timber exploitation around the mangrove in the
343 hamlet of Huhua (Photo source: LPPM Maluku 2018)

344 Efforts to prevent mangrove degradation in Huhua Hamlet ~~are~~were starting to be carried out again at this time by
345 increasing the local community's understanding of the functions and roles of mangroves. The preservation or maintenance
346 of mangrove ecosystems as habitats will have an impact on the maintenance of marine life which in turn will support the
347 current economy of the Buano people and future generations.

348 Various losses due to coastal abrasion ~~are~~were mainly felt by the people who live along the coast, such as people who
349 have to move their houses because they ~~are~~were eroded by tidal waves. Damage to mangrove ecosystems and coral reefs
350 has led to a reduction in the environmental quality of fisheries resources, resulting in a reduction in fisheries production.
351 The cutting down of mangroves for firewood has also led to the intrusion of seawater into the mainland.

352
353 There have been numerous previous studies on the importance of mangrove restoration and conservation of mangrove
354 management with a variety of perspectives and goals. Ellison et al. (2020) argues that rehabilitated and restored mangrove
355 ecosystems have important ecological, economic, and social values for coastal communities.

356 The people of Buano, both individually and in groups from young to adults, have been motivated to plant mangroves
357 by Community Development Participation Institute (LPPM) Maluku since 2017. Community awareness has emerged after
358 counseling by the LPPM Maluku and their desire to get better fish catches if the mangrove ecosystem recovers. Berkes and
359 Folke (1992) argue that the community's ability to return the natural environment to its original status after being damaged
360 by exploitation ~~is~~was a cultural capital. In the context of natural resource management, both ecologically and
361 economically, the term cultural capital refers to factors that provide the means and adaptations for human communities to

362 deal with the natural environment and actively modify it. Understanding a society's cultural capital ~~can~~ could be an
363 important lesson in efforts to conserve natural resources such as mangrove forests.

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TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom, which, if used properly can become an important social capital in the responsible management of natural resources. The natural resources in Buano village ~~are~~ were sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there ~~are~~ were three categories of local wisdom and their function in the Buano community. (1) the human relationship with God, or supernatural powers which ~~are~~ were thought to have power over life; (2) human relations with others ~~are~~ were means of solidarity, closeness, and fraternity; (3) related to the natural environment which functions as an effort to protect humans and nature ~~so that~~ therefore they can live side by side in harmony and sustainability.

Local wisdom that grows in the Buano community is important to note because it ~~is~~ was the noble values that apply during the life of the local community, among others, to protect and manage the environment and natural resources in a sustainable manner. (Berkes, 2018) defines local ecological knowledge as a cumulative collection of knowledge, practices and beliefs, developed by adaptive processes and passed down from generation to generation through cultural transmission, about the relationships of living things where one another has ways of understanding, dynamic, built by experience and adapt to change.

~~Based on interviews and direct observations in the field with the kewang, the sasi tradition has begun to be forgotten, but activities to revive sasi values managed by LPPM Maluku, in a limited number of protected forests and mangroves in damaged mangrove areas, were able to control forest destruction such as the application of sasi to mangroves. The sasi tradition had been forgotten, but the activity of reviving Sasi values managed by LPPM Maluku, in a limited number of protected forests and mangroves, was able to control forest destruction such as the implementation of mangrove Sasi. The use of mangrove wood is~~ was quite small, because since mid-2017 the village government and the Buano Customary Leaders ~~socal~~ community leaders in both villages have banned mangrove logging.

Sasi is a prohibition against taking certain resources at a certain point in time with the goal of managing sustainable resources. Sasi regulates how communities manage forest and marine resources, and how to apply customary punishments to those who violate sasi laws. Through sasi, it is regulated when the community may take or harvest naturally available local natural resources.

Sasi ~~can~~ could be a social capital in maintaining the balance between humans and nature. When sasi ~~is~~ was implemented, the community is prohibited from picking certain fruits on land and taking certain products from the sea, for a period of time determined by the village government ~~customary leader~~. Sasi's role allows increasingly limited natural resources to grow and develop. In other words, biological and vegetable natural resources can be continuously conserved within a certain period and provide an opportunity for nature to restore its own growth and development in order to achieve satisfactory results.

~~Based on interviews with the local communities, the surrounding community they believed that mangroves are the a source of life which is the main source of food for the existence of fish, shrimp, crabs, clams, and others that they use. So that marine products are always available in abundance, the existence of mangroves must be properly maintained. they believed that mangroves are the source of life which is the main source of food for the existence of fish, shrimp, crabs, clams, and others that they use. therefore if marine products are willing in abundance, the existence of mangroves must be properly maintained.~~ For this reason, the community, both individually and in groups, voluntarily seeks to preserve the mangrove area. Marine products ~~are~~ were harvested with the aim of selling (commercial) or as family consumption to fulfill the family economy (subsistence). On the off chance that there are no mangroves, then it is certain that the production from the sea and the coast that they cultivate will decrease significantly. In addition, the community believes that the existence of mangroves has an important role in protecting coastal areas, especially their settlements from abrasion and strong winds that often occur.

As for the results of discussions with key village ~~community figures~~ leaders ~~figures~~, the local community had received support in the form of seeds from the Maluku Watershed Management Center (BPDAS) and received environmental conservation training as a form of concern for the government and the community as well as other elements for the importance of preserving forests. During the training, participants consisting of elementary/junior high school/senior high school students who represented the training also planted a number of tree species together. The Ministry of Forestry and the environment as an institution that has responsibility for forest conservation provides assistance, environmental cadre training for these students as young cadres to love the environment. This training ~~is~~ was to provide understanding, motivation, awareness, and to awaken young souls that protecting the environment and planting trees is the duty of all as pious human beings.

Furthermore, from the results of discussions with key village ~~community leaders~~ figures, training on environmental conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions for sustainable natural resource management on Buano Island.

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421 Forms of local community participation in mangrove conservation include: (1) Communities as beneficiaries of
422 mangrove resources know that there ~~are-were~~ rules governing life in the village and natural resources. The custom owned
423 by the village ~~is-was~~ *sasi*, namely sea (beach) *sasi*, river *sasi*, and land (forest) *sasi*. In efforts to preserve mangroves, there
424 ~~are-were~~ various related parties who still care about the existence of these mangroves. Supervision ~~is-was~~ carried out by
425 the community itself, such as village institutions (*Saniri Negeri and Kewang*) and families who have rights. *Saniri Negeri*,
426 is a custom forum for meetings of various social and customary institutions in Buano, while *Kewang* is a customary
427 position for a traditional leader who is tasked with overseeing the village's natural resources in the land (forest)
428 environment as well as the coast and sea. According to Uphoff (1986) institutions ~~can-could~~ be at the same time as
429 ~~organizations-organisations~~ and vice versa. Institutions in the sense of an ~~organization-organisation~~ that forms community
430 groups that have good rules to regulate relations between people and rules relating to the management of the surrounding
431 forest resources. (2) Communities whose source of livelihood is ~~a~~ fishermen have their own initiative and awareness to
432 plant mangroves. The seeds ~~are-were~~ taken from the mangroves around the coastal route that they ~~take-have taken~~ when
433 they go to sea. ~~This planting is intended as plant enrichment or to replace dead mangroves. This planting activity was~~
434 ~~intended as plant enrichment or to replace dead mangroves.~~ (3) Communities collect both organic and inorganic wastes
435 that become lodged in mangrove roots during floods and high tides. The waste ~~is-was~~ then sorted again. Garbage such as
436 rubber sandals and mineral water bottles ~~is-was~~ repurposed as a float used for seaweed cultivation.

437 Based on this description it ~~is-was~~ clear how environmental aspects describe the assimilation of community awareness
438 around the Valentine Strait mangroves and how the culture of the community ~~believes-believed~~ mangroves as a tree of life
439 has implications for mangrove conservation and the practice of realizing community protection for their environment. This
440 was also pointed out by Salampey et al. (2015) that the community understands the cultural capital of a community as an
441 effort to preserve natural resources, especially mangroves where the conservation of mangroves in the Ambon Dalam Bay
442 ~~is-was~~ strongly influenced by the important role of traditional ecological knowledge of the community.

443 Efforts to manage mangrove forests from the community and local government ~~are-were~~ considered inadequate to
444 maintain and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this
445 reason, management recommendations need to be implemented by the community by collaborating with relevant agencies
446 such as the Agriculture, Forestry and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries
447 Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Apart from that,
448 drafting village regulations regarding the management of mangrove ecosystems such as regulations prohibiting logging
449 and other activities that have a negative impact on mangrove areas which can affect mangrove growth by reactivating the
450 duties of marine and forest kewang in monitoring forest and coastal areas. Then it is necessary to carry out rehabilitation
451 and conservation activities for mangrove species that grow quickly and use the mangroves as food ingredients so that the
452 surrounding community needs ~~to take part in training on how to rehabilitate/maintain~~ mangroves and increase community
453 participation in the management and utilization of mangroves.

454 ACKNOWLEDGEMENTS

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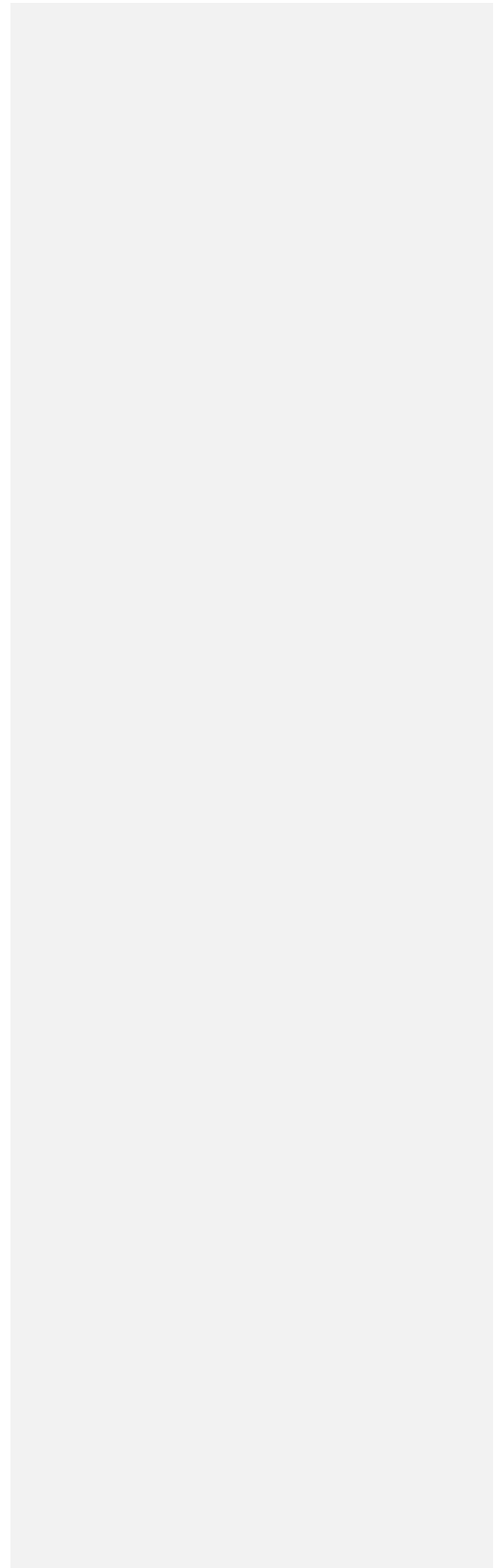
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We have reached a decision regarding your submission to Biodiversitas Journal of Biological Diversity, "Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia".

Our decision is: Revisions Required

Reviewer A:

Notes:

I have just read a half of the introduction. It was poorly written. The ideas were not presented coherently. It should be completely revised. The ideas should run smoothly from a sentence to the next sentence, and from one paragraph to the next paragraph. There should be no redundancies.

Recommendation: Revisions Required

Participation of the communities in the mangrove conservation in the coastal areas of Valentine strait, West Seram, Moluccas, Indonesia

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Abstract. Mangrove forest is a forest area containing mangrove plants which is an important ecosystem in coastal areas. Mangroves are very clear source for maintaining aquatic ecosystems between the sea, coast, and land. In addition, the benefits of mangroves will also help humans in getting the most comfortable climate and weather to prevent natural disasters. The threat in the Valentine strait area is the damage to the mangroves that occurs due to land conversion. But on the other hand, there were still people who try to preserve and maintain mangroves in their area. This study aims to describe the efforts of the community around the area with the concept of cultural capital they have.. This study used a combination of qualitative and quantitative methods, The data collected in this study were primary and secondary data. Primary data were collected directly at the study location, and secondary data were obtained through local community information, various website, documents on the management of natural resources and key informants, consisting of the local community leaders, *Kewang* and LPPM Maluku (NGO). Data for the identification of mangrove species were calculated and tabulated to determine the species density of mangrove species in the Valentine strait region The collected data from the communities were then analyzed using the theory of cultural capital. The results showed that the community began to re-apply the concept of the cultural capital of the "Sasi" tradition that they once had as traditional ecological knowledge to maintain and preserve mangroves so that mangrove conservation was maintained around the Valentine strait area. Mangrove forests have become home to fish, shrimp and crabs. In addition, this forest is also important for birds, primates, and reptiles.

Key words: community, cultural capital, mangrove, sasi, valentine strait

INTRODUCTION

Forests ~~are natural resources that~~ have high economic, ecological and social values (Baciu et al. 2021; Bjärstig and Sténs 2018), ~~which can be called the forest ecosystem services, and tropical natural forests also function as the lung that support many lives.~~ (Kurniawan 2020) ~~and support life so they must preserve and maintained through appropriate and sustainable forest development. However, this does not always work as it should because the existence of the forest cannot be separated from the activities of the people who still depend on the forest, especially the people who live around the forest (Doley 2022; Newton et al. 2016).~~ Over 350 million people around the world who live around forests rely on forests and derive their livelihoods from forest resources (Chao 2012; Langat et al. 2016). ~~Conservation, protection, and proper sustainable use of forests play an important role in global environmental sustainability (Haji et al. 2021). Forest ecosystems provide valuable services to society, however, many forests were degraded and their services have been underestimated (Nguyen et al. 2020).~~

One type of forest ecosystem is ~~Mangroves mangrove in are group of~~ coastal ~~plants~~ (Lestyningrum et al. 2017) which have ~~many functions: an important role~~ as a coastal defense against natural disasters, ~~such as storms and~~ sea level rise (Unnikrishnan et al. 2013; Spalding et al. 2014)-, carbon sinks (Shedage et al., 2019), places to find food (Castellanos-Galindo et al. 2017), ~~places to raise the juvenile seare~~ (Abu El-Regal and Ibrahim 2014), ~~places and~~ to lay eggs ~~and places to find food~~ for various marine biota, producers of food, drink, medicine, firewood, building materials, ~~and even~~ a source of income for local residents (Islamy and Hasan 2020), ~~as well as~~ tourist sites (Kissinger et al. 2020; Spalding and Parrett 2019). ~~Mangrove ecosystems are also known as a source of nutrients (Zuhri et al. 2022) for water, which then becomes a source of energy for aquatic biota (Saifullah et. al. 216). Mangroves also have social functions as~~ conservation areas, educational ~~purposes areas, ecotourism spots,~~ and cultural identity (Kristiningrum et al. 2020; Siahaya et al. 2021).

The Buano people use the forest for their customary activities because there were many sacred places in the forest. Part of it was related to respect for the natural environment which was believed to be a sacred and sacred place. For instance,

51 sacred places are prohibited from being used to prevent forest destruction. As per Mulyadi et al. (2022), this also occurs in
52 several regions in Indonesia, for example, in Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and Dayak
53 Kanayatn where indigenous people regard forests as clean and sacred places.

54 Along with population growth, and economic and industrial growth, the pressure on natural resources is becoming
55 greater due to the higher level of demand and interest in natural resources. This is clear from a number of facts where
56 mangrove exploitation is increasing year by year. This was also stated by (Cahyaningsih et al. 2022) that Indonesia is a
57 country with the largest area of mangroves in the world, however, as the human population increases, the area and quality
58 of mangroves decrease. Population growth is consistent with increased human activities that lead to deforestation and the
59 degradation of mangrove forests.

60 Buano indigenous people are still faithful to the implementation of various traditions and customs passed down from
61 their ancestors since ancient times to protect and preserve their natural environment. Pratiwi et al. (2019) also stated that
62 Indigenous peoples have knowledge from generation to generation about how to sustain and use the forest resources
63 around them.

64 The involvement of local communities in managing forests is an important aspect of sustainable development. This is
65 in accordance with the opinion of Hong and Saizen (2019) stating that local and community-based forest management is a
66 multi-dimensional approach to sustainable forest management in which different stakeholders with different interests play
67 a role in achieving common goals.

68 Local communities are part of the forest ecosystem (Shishany et al. 2022), the culture of the people who live near/in
69 the forest always interact with forest ecosystems, both forming and adapting to the natural environment (Ngo et al. 2021),
70 have rights to get equal opportunities in the management of local resources and development in the region.

71 Based on the foregoing, the purpose of this research is to explain the cultural capital of the community in preserving
72 the mangroves of the Valentine Strait on Buano Island, West Seram Regency, Maluku, Indonesia.

73

MATERIALS AND METHODS

74 Study area

75 This research was carried out in June - August 2022 in Valentine's Strait in the coastal zone of Buano Island, West
76 Seram, Maluku, Indonesia, which includes the hamlet of Huhua and Pua Island in the village of North Buano. The
77 materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia (Figure 1.
78 Map of the research locations at Valentine Strait, West Seram, Moluccas, Indonesia).

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109 **Figure 1.** Map of the research locations at Valentine Strait, West Seram, Moluccas, Indonesia. **A.** 127 56'21.432" E . 2 56'31.479"
110 **S B.** 127 54'17.174"E . 2 57'18.026" S

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112

113 **Procedures**

114

115 This study used a combination of qualitative and quantitative methods. The quantitative and qualitative data were
116 intermingled by linking qualitative and quantitative data that supported each other to produce a complete result. Still, more
117 emphasis was placed on qualitative aspects in further data operation.

118 The data collected in this study were primary and secondary data. Primary data were collected directly at the study
119 location, and secondary data were obtained through local community information, various website, documents on the
120 management of natural resources on the coastal area of Valentine strait and key informants, consisting of the leader of the
121 village, *Kewang* and LPPM Maluku (NGO).

122 The vegetation data were collected using the Point Centered Quarter method (Mitchell, 2010) at each station. The
123 measured mangrove trees were located at the point centered quarter which was found in 2 areas, namely, the mangroves
124 area far from the settlements (natural), and the mangroves area near community settlements (mangrove rehabilitation area),
125 where each area has 4 stations. The population observed was trees with a diameter at breast height ≥ 20 cm, which were in
126 the plot area from quadrants 1 to 4. Tree samples were taken from 4 quadrants. The selected trees were the closest trees in
127 each quarter (Mitchell 2010) then all mangroves included in the plots were counted (species density data).

128 The animals data collection was carried out through direct observation (encountering directly in the field), and
129 indirectly through footprints, excrement, sounds, and information from local people who accompany researchers while at
130 the research site in accordance with the characteristics of animals that always change location.

131

132 **Data Analysis**

133 Data for the identification of mangrove species were calculated and tabulated to determine the species density of
134 mangrove species in the Valentine Strait Region--The standard criteria for damage to mangrove forests established by the
135 Ministry of Environment RI No. 201 in the year of 2004 could be seen in Table 1.

136

137 **Table 1.** Standard criteria for damage to mangrove forests

Conditoin	Criteria	Density (Tree ha ⁻¹)
Good	Very Dense	>1,500
	Medium	$\geq 1,000$ - <1,500
Damage	Rare	<1,000

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139 To calculate the quantitative values of mangroves parameters was as follows:

140 The average distance of individual trees to the measurement point:

$$d = \frac{d1 + d2 + d3 + \dots + dn}{n}$$

141

142

143 Where:

d = Distance of individual trees to measurement points in each plot

n = The large number of trees

(d)2 = Average area/individual, namely the average surface area of land occupied by one individual plant

144

145 Species density

$$di = ni/A$$

146

147 Where:

di = Species density

ni = total number individual of species

A = total area of measurments plots

148

149 The collected data from the communities were then analyzed using the theory of cultural capital by (Berkes and Folke
150 1994) by examining traditional ecological knowledge and local institutions existing in the local community.

152 Mangrove ecosystem in the Valentine Strait coastal area

153 The area of the research location was 25,000 m². Set in 2 mangroves area, namely far from the community settlements
 154 (A) was 12,000 m² in the coordinate of 127 56'21. 432" E. 2 56'31. 479" S, and near the area of the settlements (B) was
 155 13,000 m² in the coordinate of 127 54'17. 174" E. 2 57'18. 026" S. The mangrove conditions in the Valentine Strait at two
 156 locations were presented in Table 2 below:

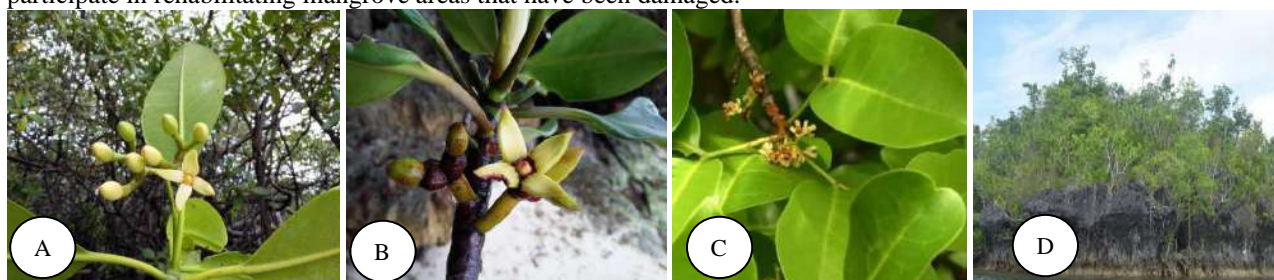
157 Table 2. Mangroves condition in the Valentine Strait at two locations

No.	Station	Species	Species Density	Criteria
A Natural area (far from the community settlement)				
1	I	<i>Rhizophora mucronata</i>	1550	Very dense
2	II	<i>Rhizophora apiculata</i>	1,600	Very dense
3	III	<i>Avicennia alba</i>	825	Rare
4	IV	<i>Sonneratia alba</i>	575	Rare
B Rehabilitation area (near the community settlement)				
1	I	<i>Rhizophora apiculata</i>	2.050	Very dense
2	II	<i>Bruguiera gymnorhiza</i>	1,250	Medium
3	III	<i>Rhizophora mucronata</i>	1,600	Very dense
4	IV	<i>Xylocarpus molucensis</i>	1,500	Very dense

161 Based on the results of measuring the density of mangrove species in Table 2, the highest density value in the
 162 mangrove natural area (A) was found at station I, the very dense category, namely *R. mucronata* 1,550 individuals/m², and
 163 station II was *R. apiculata* 1,600 individuals/m², and the rare category were found at station III was *A. alba* 825
 164 individuals/m² and station IV was *S. alba* 575 individuals/m². While the highest species density value in the rehabilitation
 165 mangroves area (B) for the dense category were at station I, namely *R. Apiculata* 2,050 individuals/m², station III was *R.*
 166 *mucronata* 1,600 individuals/m², and at station IV was *X. molucensis* 1,500 individuals/m² while for the medium category
 167 was at station II namely *B. Gymnorhiza* 1,250 individuals m⁻². The species that predominate were *R. apiculata* in both
 168 area and *R. mucronata* while *X. molucensis* was found at mangrove rehabilitation area (Figure 2). Likewise in Pangempang
 169 Beach where one of the species that dominates the mangrove ecosystem was *Rhizopora apiculata* (Aipassa et al. 2022). as
 170 well as the research conducted by Kristiningrum et al. (2019) in the Mentawir Village and the research of Rafiq et. al.
 171 (2020) in Mandeh bay of West Sumatra state that *Rhizopora apiculata* and *Rhizopora mucronata* dominate in the area.

172 In the natural mangrove area (A) at each observation station, the density of mangrove species in the very dense
 173 category was only found at stations I and II, while stations III and IV were in the rare category. This could be happening
 174 due to the natural mangrove area in the front zone is an area directly facing the sea which is flooded with seawater.

175 When the density of mangrove species in the natural mangrove area (A) and the mangrove rehabilitation area (B) were
 176 compared, it could be said that the density of mangrove species in location (B) is much denser, reaching 2,050
 177 individuals/m². This happened because at this location it deliberately planted. So with these efforts it was clear that the
 178 density of mangrove species is much higher (denser), so with this effort, it is hoped that the people living around the
 179 mangrove forest will always look after, maintain and protect the rehabilitation area. This means that the community must
 180 participate in rehabilitating mangrove areas that have been damaged.



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182

183 **Figure 2.** A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; C. *Xylocarpus molucensis*; D. Corals were overgrown by mangroves

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185 The Valentine Strait mangroves are located in the bay and are one of the ecosystems that have an important role in the
 186 coastal communities of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangroves
 187 provide benefits and various services to local communities along the coast, in particular fishing communities in Lampung
 188 Bay. In addition to being dominated by mangroves, the coastal ecosystem of Valentin's Strait also includes karst reefs,
 189 seagrasses, coral reefs, and coastal forests (Figure 2). These ecosystems provide productive natural resources, both as a
 190 source of food, as well as leisure or tourist areas.

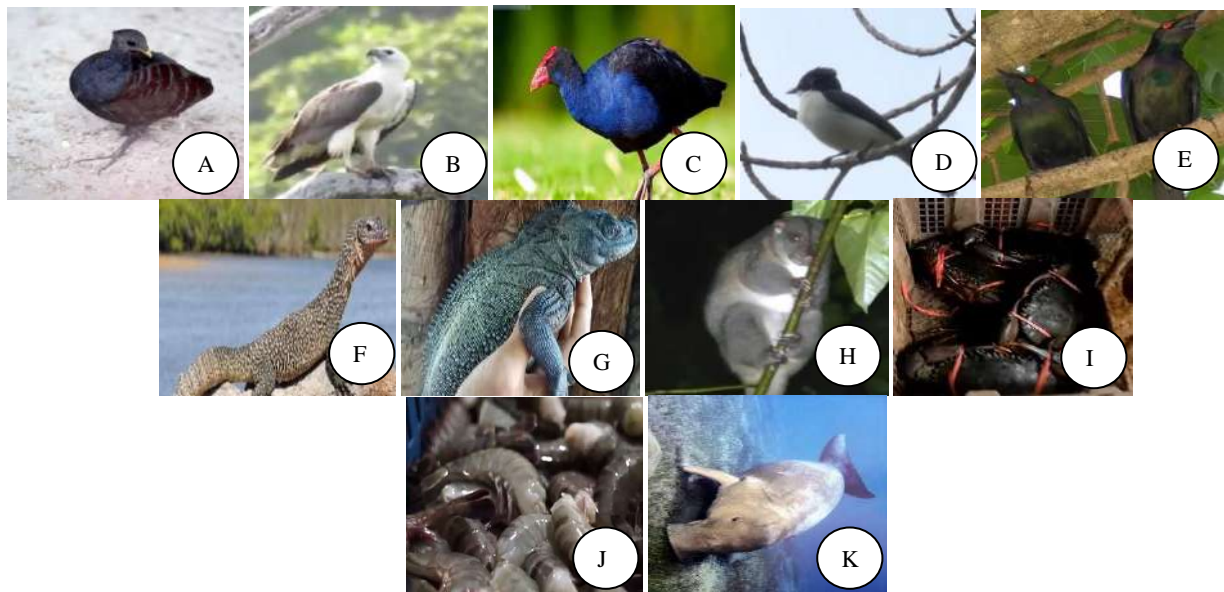
191 As part of the coastal ecosystem, the existence of the mangrove ecosystem along the coast of Valentine's Strait makes a
 very significant contribution, both directly and indirectly. These benefits include physical protection, in particular against

192 waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove stands can protect settlements, buildings,
193 and agriculture against strong winds and seawater intrusion. Mangroves also play an important role in coastal protection
194 against storms. The capacity of mangroves to develop their territory in the direction of the sea is one of the important roles
195 of mangroves in the formation of new lands.

196 Mangrove not only serves as a barrier to natural abrasion of sea water and reduces the impact of tsunami waves,
197 mangroves can also be used as a Natural Tourism Attraction which also has educational value. Apart from its beautiful
198 beaches and rich underwater charm, the Valentine Strait also has mangrove tourist destinations with cool nature.

199 Some of wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area such as various birds of Gosong
200 Maluku (*Eulipoa wallacei*), elang-laut perut-putih (*Haliaeetus leucogaster*), Mandar besar (*Porphyrio porphyria*), sikatan
201 kelabu (*Myiagra galeata*), perling ungu (*Aplonis metallica*); ; reptiles such as biawak maluku (*Varanus indicus*), soa-soa
202 (*Hydrosaurus amboinensis*); mamals such as kuskus (*Phalanger sp.*); and crustaceans such as kepiting bakau (*Scylla*
203 *serrata*), udang windu (*Penaeus sp.*), and mermaids (*Dugong dugon*).
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209 **Figure 3.** Fauna found at mangrove area of Valentine Strait: A. *Eulipoa wallacei*; B. *Haliaeetus leucogaster*; C. *Porphyrio*
210 *porphyria*; D. *Myiagra galeata*; E. *Aplonis metallica*; F. *Varanus indicus*; G. *Hydrosaurus amboinensis*; H. *Phalanger sp.*;
211 I. *Scylla serrata*; J. *Penaeus sp.*; K. *Dugong dugon*
212

213

213 Socio-culture

214 Buano people occupy two main villages in the coastal area of the island of Buano, which is now divided into North
215 Buano and South Buano.

216 In addition to the indigenous people who live in the two traditional villages on Buano Island, there were also immigrant
217 communities from the Buton tribe from Southeast Sulawesi who were thought to have migrated to this island 300 years
218 before Indonesia's independence. Migrant communities occupy several villages called Petuanan which were located on the
219 west coast to the north of the island of Buano and currently administratively they have been formed in hamlets.
220

221

221 Socio-economic

222 In general, the distribution of educational attainment for the people of Buano who have graduated from junior high
223 school was higher than those who have graduated from elementary and high school. Community education is one of the
224 factors that influence the level of understanding of mangrove conservation. The results obtained from the people living on
225 Buano Island show that people's education varies greatly. The number of people who did not go to school was 22.46%,
226 who did not finish elementary school 12.46%, graduated from elementary school 11.98%, junior high school 33.65%, high
227 school 12.66%, undergraduate level 4.36%, and diploma level 1, 06%. Whereas for undergraduate level graduates it was
228 1.30%, postgraduate 0.05%, and doctoral degrees 0.02%.
229

230

230 Livelihood

231 80% of the livelihoods of the Buano island community are farmers. Another livelihood are fishermen. Fishermen catch
232 both demercial and pelagic fish, only a small proportion are aquaculture fishermen (planting net cages and crabs). Fishery
233 production from Buano Island was sold to Seram Island and Ambon Island. Marine catches were purchased directly by
234 fish traders from the hamlets of Kawa, Pelita Jaya, Masika and their surroundings which were on the islands of Seram and
235 Ambon islands. Many of the people on the island of Buano, especially men, also work as loggers using chainsaws.

236 Mangrove wood such as *R. Apiculata*, *S.alba* and *A.alba* were mostly used as fuel wood for burning cajuputi oil
237 refining furnaces. This was also the cause of reduced density of mangrove species (rare category) both in areas near
238 settlements and those far from settlements. Logging of mangroves for firewood has become the main occupation of fishing
239 communities. Firewood was also very important for the community, especially for the poor, when the price of fuel oil
240 soars. On the grounds that mangrove wood has the ability to generate much higher heat energy when compared to other
241 woods, the destruction of mangrove forests continues to occur. According to Sathe et. al. (2013) that In Konkan region
242 India, the residents nearby utilize mangroves as source of energy. This condition makes the people around the mangrove
243 forest always cut down mangrove wood to fulfill their daily needs.

244 Prior to the counseling from NGOs (LPPM Maluku) in 2017, according to the head of LPPM Maluku, Mr. Piet
245 Wairisal, mangrove encroachment continued to occur along the coast of Huhua hamlet (Figure 4), where mangrove wood
246 had been cut down near the community settlement, this action damaged the ecosystem around the mangrove area.
247 Although it was known that there was biodiversity in this area that needs to be protected, such as Buano Kehicap/Black-
248 headed Monarch (*Symposiachrus boanensis*). If the logging activities was done correctly and only takes a small portion of
249 the forest each year, the impact on the environment will be very small, because mangrove forests have the ability to be
250 able to renew themselves.

251



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254 **Figure 4.** A. Residential communities around the mangrove; B. Mangrove timber exploitation around the mangrove in the
255 hamlet of Huhua (Photo source: LPPM Maluku 2018)

256 Efforts to prevent mangrove degradation in Huhua Hamlet were starting to be carried out again at this time by
257 increasing the local community's understanding of the functions and roles of mangroves. The preservation or maintenance
258 of mangrove ecosystems as habitats will have an impact on the maintenance of marine life which in turn will support the
259 current economy of the Buano people and future generations.

260 Various losses due to coastal abrasion were mainly felt by the people who live along the coast, such as people who
261 have to move their houses because they were eroded by tidal waves. Damage to mangrove ecosystems and coral reefs has
262 led to a reduction in the environmental quality of fisheries resources, resulting in a reduction in fisheries production. The
263 cutting down of mangroves for firewood has also led to the intrusion of seawater into the mainland.

264 There have been numerous previous studies on the importance of mangrove restoration and conservation of mangrove
265 management with a variety of perspectives and goals. Ellison et al. (2020) argues that rehabilitated and restored mangrove
266 ecosystems have important ecological, economic, and social values for coastal communities.

267 The people of Buano, both individually and in groups from young to adults, have been motivated to plant mangroves
268 by Community Development Participation Institute (LPPM Maluku) since 2017. Community awareness has emerged after
269 counseling by the LPPM Maluku and their desire to get better fish catches if the mangrove ecosystem recovers. Berkes and
270 Folke (1992) argue that the community's ability to return the natural environment to its original status after being damaged
271 by exploitation was a cultural capital. In the context of natural resource management, both ecologically and economically,
272 the term cultural capital refers to factors that provide the means and adaptations for human communities to deal with the
273 natural environment and actively modify it. Understanding a society's cultural capital could be an important lesson in
274 efforts to conserve natural resources such as mangrove forests.

275

276 **TEK and local institutions in mangrove conservation**

277 Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom, which, if used
278 properly can become an important social capital in the responsible management of natural resources. The natural resources
279 in Buano village were sensitive to the value of local knowledge, cultural customs, and belief values.

280 From a conceptual perspective, there were three categories of local wisdom and their function in the Buano
281 community. (1) the human relationship with God, or supernatural powers which were thought to have power over life; (2)
282 human relations with others were mean of solidarity, closeness, and fraternity; (3) related to the natural environment which
283 functions as an effort to protect humans and nature therefore they can live side by side in harmony and sustainability.

284 Local wisdom that grows in the Buano community is important to note because it was the noble values that apply
285 during the life of the local community, among others, to protect and manage the environment and natural resources in a
286 sustainable manner. (Berkes, 2018) defines local ecological knowledge as a cumulative collection of knowledge, practices
287 and beliefs, developed by adaptive processes and passed down from generation to generation through cultural
288 transmission, about the relationships of living things where one another has ways of understanding, dynamic, built by
289 experience and adapt to change.

290 Based on interviews and direct observations in the field with the *kewang*, the sasi tradition has begun to be forgotten,
291 but activities to revive sasi values managed by LPPM Maluku, in damaged mangrove areas, were able to control forest
292 destruction such as the application of sasi to mangroves. The use of mangrove wood was quite small, because since mid-
293 2017 the village government and the local community leaders in both villages have banned mangrove logging.

294 *Sasi* is a prohibition against taking certain resources at a certain point in time with the goal of managing sustainable
295 resources. *Sasi* regulates how communities manage forest and marine resources, and how to apply customary punishments
296 to those who violate *sasi* laws. Through *sasi*, it is regulated when the community may take or harvest naturally available
297 local natural resources.

298 *Sasi* could be a social capital in maintaining the balance between humans and nature. When *sasi* was implemented, the
299 community is prohibited from picking certain fruits on land and taking certain products from the sea, for a period of time
300 determined by the customary leader. *Sasi's* role allows increasingly limited natural resources to grow and develop. In other
301 words, biological and vegetable natural resources can be continuously conserved within a certain period and provide an
302 opportunity for nature to restore its own growth and development in order to achieve satisfactory results.

303 Based on interviews with the local communities, they believed that mangroves are the source of life which is the main
304 source of food for the existence of fish, shrimp, crabs, clams, and others that they use. therefore if marine products are
305 willing in abundance, the existence of mangroves must be properly maintained. For this reason, the community, both
306 individually and in groups, voluntarily seeks to preserve the mangrove area. Marine products were harvested with the aim
307 of selling (commercial) or as family consumption to fulfill the family economy (subsistence). On the off chance that there
308 are no mangroves, then it is certain that the production from the sea and the coast that they cultivate will decrease
309 significantly. In addition, the community believed that the existence of mangroves has an important role in protecting
310 coastal areas, especially their settlements from abrasion and strong winds that often occur.

311 As for the results of discussions with key village community leaders, the local community had received support in the
312 form of seeds from the Maluku Watershed Management Center (BPDAS) and received environmental conservation
313 training as a form of concern for the government and the community as well as other elements for the importance of
314 preserving forests. During the training, participants consisting of elementary/junior high school/senior high school students
315 who represented the training also planted a number of tree species together. The Ministry of Forestry and the environment
316 as an institution that has responsibility for forest conservation provides assistance, environmental cadre training for these
317 students as young cadres to love the environment. This training was to provide understanding, motivation, awareness, and
318 to awaken young souls that protecting the environment and planting trees is the duty of all as pious human beings.

319 Furthermore, from the results of discussions with key village community leaders, training on environmental
320 conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions for sustainable natural
321 resource management on Buano Island.

322 Forms of local community participation in mangrove conservation include: (1) Communities as beneficiaries of
323 mangrove resources know that there were rules governing life in the village and natural resources. The custom owned by
324 the village was *sasi*, namely sea (beach) *sasi*, river *sasi*, and land (forest) *sasi*. In efforts to preserve mangroves, there were
325 various related parties who still care about the existence of these mangroves. Supervision was carried out by the
326 community itself, such as village institutions (*Saniri Negeri and Kewang*) and families who have rights. Saniri Negeri, is a
327 custom forum for meetings of various social and customary institutions in Buano, while Kewang is a customary position
328 for a traditional leader who is tasked with overseeing the village's natural resources in the land (forest) environment as well
329 as the coast and sea. According to Uphoff (1986) institutions could be at the same time as organisations and vice versa.
330 Institutions in the sense of an organisation that forms community groups that have good rules to regulate relations between
331 people and rules relating to the management of the surrounding forest resources. (2) Communities whose source of
332 livelihood is a fishermen have their own initiative and awareness to plant mangroves. The seeds were taken from the
333 mangroves around the coastal route that they have taken when they go to sea. This planting activity was intended as plant
334 enrichment or to replace dead mangroves. (3) Communities collect both organic and inorganic wastes that become lodged
335 in mangrove roots during floods and high tides. The waste was then sorted again. Garbage such as rubber sandals and
336 mineral water bottles was repurposed as a float used for seaweed cultivation.

337 Based on this description it was clear how environmental aspects describe the assimilation of community awareness
338 around the Valentine Strait mangroves and how the culture of the community believed mangroves as a tree of life has
339 implications for mangrove conservation and the practice of realizing community protection for their environment. This
340 was also pointed out by Salampeyy et al. (2015) that the community understands the cultural capital of a community as an
341 effort to preserve natural resources, especially mangroves where the conservation of mangroves in the Ambon Dalam Bay
342 was strongly influenced by the important role of traditional ecological knowledge of the community.

343 Efforts to manage mangrove forests from the community and local government were considered inadequate to maintain
344 and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this reason,
345 management recommendations need to be implemented by the community by collaborating with relevant agencies such as
346 the Agriculture, Forestry and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of
347 Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Apart from that, drafting
348 village regulations regarding the management of mangrove ecosystems such as regulations prohibiting logging and other
349 activities that have a negative impact on mangrove areas which can affect mangrove growth by reactivating the duties of
350 marine and forest kewang in monitoring forest and coastal areas. Then it is necessary to carry out rehabilitation and
351 conservation activities for mangrove species that grow quickly and use the mangroves as food ingredients so that the
352 surrounding community needs maintain mangroves and increase community participation in the management and
353 utilization of mangroves.

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359

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Participation of the communities Community in the mangrove conservation Mangrove cConservation in cCoastal aArea of the coastal areas of Valentine StraitStrait, West Seram, Moluccas, Indonesia

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Abstract. Mangrove forest is a forest area containing a mangrove forest is composed of mangrove plants which is an important and constitutes a crucial ecosystem in coastal areas. Mangroves are very clear it is a vital source for maintaining aquatic ecosystems between the sea, coast, and land. In addition, the Additionally, it provides benefits of mangroves will also help to humans in getting the most, such as contributing to a more comfortable climate and weather to conditions that can prevent natural disasters. The threat However, the mangrove in the Valentine Strait area is the damage to the mangroves that occurs due to threatened by land conversion. But on the other hand, there were still, leading to damage and loss. Some people who try are trying to preserve and maintain mangroves mangrove in their area. This study aims Therefore, the aim of this research is to describe the efforts actions of the local community around in the area with, using the concept of cultural capital they have. This study used a. A combination of qualitative and quantitative methods. The data collected in this study were use, and both primary and secondary data were collected. Primary data were collected gathered directly at from the study research location, and while secondary data were obtained through local community information, various website, websites, and documents related to the management of natural resources and. Additionally, key informants, consisting of the including local community leaders, Kewang, and LPPM Maluku (NGO) Data, were interviewed to collect relevant data on the cultural capital possessed by the community. The data for the identification of identifying mangrove species were calculated and tabulated to determine the species density of mangrove species in the Valentine Strait region The Strait area. Furthermore, the collected community data from the communities were then analyzed using the cultural capital theory of cultural capital. The results showed indicate that the community began has started to re-apply apply the concept of the cultural capital of the "Sasi" tradition that they once had as traditional as ecological knowledge to maintain and preserve mangroves so that mangrove, hence, ensuring conservation was maintained around in the Valentine Strait area. Mangrove forests have become home to fish, shrimp, and crabs. In addition, this forest is and are also important for birds, primates, and reptiles.

Key words: community, cultural capital, mangrove, sasi, valentine strait

Keywords: Community, Cultural Capital, Mangrove, Sasi, Valentine Strait

INTRODUCTION

Forests have high possess significant economic, ecological, and social values, which can be worth, commonly called the forest-ecosystem services, that support many lives sustain countless livelihoods (Baciu et al. 2021; Bjärstig and Sténs 2018). Over 350 million people around the world who live around forests worldwide rely on forests and derive their livelihoods from forests their resources (Chao 2012; Langat et al. 2016). Conservation and sustainable use of forests play an important role in global environmental sustainability (Haji et al., 2021).

One type of forest ecosystem type is mangrove in coastal, which have has many functions, such as a coastal defense against natural disasters, such as storms and sea level rise (Unnikrishnan et al. 2013; Spalding et al. 2014; and Lestyningrum et al. 2017). Mangroves, Mangrove are the coastal areas' main woody habitats and are the main carbon carbon sinks of coastal regions (Shedage et al. 2019). Mangroves also places to find food (Castellanos-Galindo et al. 2017) and to lay eggs for various marine biota, producers of food, drink, medicine, firewood, building materials, a source of income for local These forests consist of (Castellanos-Galindo et al. 2017) various marine biota, food producers, drink, medicine, firewood, building materials, and a source of income for residents (Castellanos-Galindo et al. 2017; Islamy and Hasan 2020). Moreover, mangroves they are also conservation areas, educational areas area, and cultural identity (Kissinger et al. 2020; Kristiningrum et al. 2020; and Siahaya et al. 2021). According to Spalding and Parrett (2019) said stated that the importance

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50 of mangroves mangrove for cultural services, especially their use in recreation and tourism, has gotten very received little
51 attention despite frequently being mentioned in reviews.

52 The Buano people use the forest forests for their customary activities because there were many of their sacred places in
53 the forest. Part of it was related to respect for the natural environment which was believed to be a sacred and sacred place.
54 For instance, sacred places are prohibited from being used to prevent forest forests destruction. As per According to Mulyadi
55 et al. (2022), this also occurs in several regions areas in Indonesia, for example, in such as Nagari Sungai Buluh, Mollo,
56 Kampung Naga, Manggarai, and Dayak Kanayatn where indigenous people regard forests as clean and sacred places.

57 Along with In addition to the population growth, and eeeoniie the expansion of economies and industrial
58 growth industries, the pressure on demand for natural resources is becoming greater due to the higher level of demand and
59 interest in natural increasing, which in turn is putting greater pressure on these resources. This is clear from a number of
60 phenomenon is evidenced by several facts where mangrove, one of which is the steady increase in the exploitation is
61 increasing of mangrove each year by year. This was also stated by (Cahyaningsih et al. 2022) that, where Indonesia is a
62 country with has the largest area of mangroves mangrove in the world, however mangrove globally. However, as the human population
63 increases, the area and quality of mangroves mangrove decrease. Population growth is consistent with increased human
64 activities that lead to deforestation and the degradation of mangrove forests.

65 Buano indigenous people are still faithful to the implementation of various traditions, and customs passed down from
66 their ancestors since ancient times to protect and preserve their the natural environment. Pratiwi et al. (2019) also stated that
67 Indigenous indigenous peoples have knowledge from generation to generation about know how to sustain and use the forest
68 resources around them.

69 The involvement of local communities community in managing forests is an important aspect of sustainable development.
70 This is in accordance with the opinion of Hong and Saizen (2019) stated that local and community-based forest management
71 is a multi-dimensional approach to sustainable forest management in which where different stakeholders with different
72 interests play a role in achieving common goals.

73 Local communities community are part of the forest ecosystem (Shishany et al., 2022). Ngo et al. (2021) stated that
74 the culture of the people who live near in the forest always interact interacts with forest the ecosystems, both forming and
75 adapting to the natural environment, have rights to get equal opportunities in the management of local resources and
76 development in the region.

77 Based on the foregoing, the purpose of preceding, this research is aims to explain the community's cultural capital of the
78 community in preserving the mangroves of the Valentine Strait mangrove on Buano Island, West Seram Regency, Maluku,
79 Indonesia.

80 MATERIALS AND METHODS

81 Study Research area

82 This research was carried out in conducted between June to August 2022 in Valentine's the Valentine's Strait in the
83 coastal zone of Buano Island, West Seram, Maluku, Indonesia, which includes the hamlet of Huhua and Pua Island in the
84 village of North Buano. The materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps
85 of Indonesia (Figure 1. Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia).
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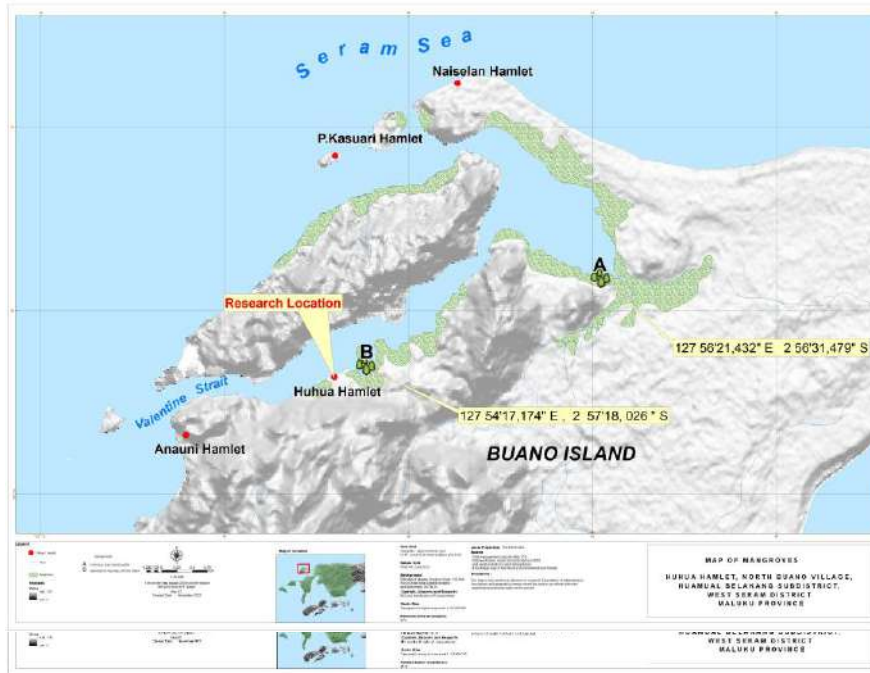


Figure 1. -Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia. A. 127 56'21.432" E . 2 56'31.479" S B. 127 54'17.174" E . 2 57'18.026" S

Procedures

This study research used a combination of qualitative and quantitative methods. The quantitative and qualitative data were intermingled by linking qualitative and quantitative data that supported each other to produce a complete result. Still, however, more emphasis was placed on qualitative aspects in further data operation.

The data collected in this study research were primary and secondary data. Primary data were collected directly at the study research location, and while secondary data were obtained through local community information, various website, and documents on the management of natural resources on the coastal area of the Valentine Strait. Furthermore, the key informants, consisting of the village leader, Kewang, and LPPM Maluku (NGO).

The vegetation data were collected using the Point Centered Quarter method (Mitchell, 2010) at each station. The measured mangrove trees were located at the point-centered quarter which was found in 2 areas, namely, the mangrove area far from the settlements (natural) and the mangrove area near community settlements (mangrove rehabilitation area), where each area has 4 stations. The population observed was trees with a diameter at breast height ≥ 20 cm, which were in the plot area from quadrants 1 to 4. Furthermore, the samples were taken from 4 quadrants. The selected trees were the closest trees in each quarter (Mitchell 2010) then all mangroves included in the plots were counted (species density data).

The animal data collection was carried out through direct observation (encountering directly in the field), and indirectly through footprints, excrement, sounds, and information from local people who accompany researchers while at. In contrast, the research site in accordance with the characteristics of animals that always change location.

Data Analysis

Data for the identification of mangrove species were calculated and tabulated to determine the species density of mangrove species in the Valentine Strait Region Area using Cottam and Curtis (1956) method. The standard criteria for damage to mangrove forests established by the Ministry of Environment RI No. 201 in the year of 2004 could be seen in Table 1.

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Table 1. Standard criteria for damage to mangrove forests

Condition	Criteria	Density (Tree ha ⁻¹)
Good	Very Dense	>1,500
	Medium	≥1,000 - <1,500
Damage	Rare	<1,000

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To calculate the quantitative values of mangroves parameters was as follows:
The average distance of individual trees to the measurement point from Cottam and Curtis (1956):

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$$d = \frac{d_1 + d_2 + d_3 \dots + d_n}{n}$$

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$$d = \frac{d_1 + d_2 + d_3 \dots + d_n}{n}$$

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Where:

- d = Distance of individual trees to measurement points in each plot
- n = The large number of trees
- (d)2 = Average area/individual, namely the average surface area of land occupied by one individual plant

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Species density from Cottam and Curtis (1956)

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$$d_i = \frac{n_i}{A}$$

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163

Where $d_i = \frac{n_i}{A}$

164

165

where:

- d_i = Species density
- n_i = total number individual of species
- A = total area of measurements plots

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The collected data from the community were then analyzed using the theory of cultural capital by theory (Berkes and Folke 1994) by examining traditional ecological knowledge and local institutions existing in the local community.

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RESULTS AND DISCUSSION

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Mangrove ecosystem in the Valentine Strait coastal area

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The area of the research location was covered an area of 25,000 m². Set in 2 mangroves square meters divided into two separate mangrove area, namely far from the community settlements (A Area A) was spanning 12,000 m² in the coordinate of square meters, was situated at the coordinates 127°56'21.0" E, 2°56'31.0" S, and was located a considerable distance from community settlements. Furthermore, Area B was situated near the area of the settlements (B) was covering 13,000 m² in square meters and at the coordinate of coordinates 127°54'17.0" E, 2°57'18.0" S. The Table 2 presents mangrove conditions at both locations in the Valentine Strait at two locations were presented in Table 2 below:

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Table 2. Mangroves condition in the Valentine Strait at two locations

No.	Station	Species	Species Density	Criteria
A Natural area (far from the community settlement)				
1	I	<i>Rhizophora mucronata</i>	1550	Very dense
2	II	<i>Rhizophora apiculata</i>	1,600	Very dense
3	III	<i>Avicennia alba</i>	825	Rare
4	IV	<i>Sonneratia alba</i>	575	Rare

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B Rehabilitation area (near the community settlement)				
1	I	<i>Rhizophora apiculata</i>	2,050	Very dense
2	II	<i>Bruguiera gymnorhiza</i>	1,250	Medium
3	III	<i>Rhizophora mucronata</i>	1,600	Very dense
4	IV	<i>Xylocarpus molucensis</i>	1,500	Very dense

Based on the results of measuring the density of mangrove species in Table 2, the highest density value in the mangrove natural area (A) was found at station I, the very dense category II, III, and IV, namely *R. mucronata*, *R. apiculata*, *A. Alba*, and *S. alba* at 1,550 individuals/m², and station II was *R. apiculata*, 1,600 individuals m⁻², and the rare category were found at station III was *A. alba*, 825 individuals/m², and station IV was *S. alba* 575 individuals/m². While the, respectively. The highest species density value in the rehabilitation mangrove area (B) for the dense category were at station I, III, and IV, namely *R. Apiculata* 2,050 individuals m⁻², station III was, *R. mucronata* 1,600 individuals m⁻², and at station IV was *Mucronata*, and *X. molucensis* at 2,050, 1,600, and 1,500 individuals/m² m⁻², while for the medium category was at station II, namely *B. Gymnorhiza* at 1,250 individuals m⁻². The predominated species that predominate were *R. apiculata* in both area and *R. mucronata*, while *X. molucensis* was found at in mangrove rehabilitation area, as shown in Figure 2). Likewise in Pangempang Beach where, one of the species that dominates the mangrove ecosystem was *Rhizophora apiculata* (Aipassa et al., 2022), as well as the research conducted by Kristiningrum et al. (2019) in the Mentawir Village and the research of Rafiq et. al. (2020) in Mandeh bay of West Sumatra stated that *Rhizophora apiculata* and *Rhizophora mucronata* dominate in the area.

In the natural mangrove area (A) at each observation station, the density of mangrove species in the very dense category was only found at stations I and II, while stations III and IV were in the rare category. This could be happening rare due to the natural mangrove area in the front zone is an area directly facing the sea which is flooded with seawater.

When the density comparison of mangrove species in the natural mangrove area (A) and the mangrove rehabilitation area (B) were compared, it could be said showed that the density of mangrove species in location (B) is much denser, reaching 2,050 individuals m⁻². This happened because at this location, it was deliberately planted. So with these efforts it was clear that, hence, the density of mangrove species is much higher (denser), so with this effort, it. It is hoped that the people living around the mangrove forests will always look after, maintain and protect the rehabilitation area. This means that the Therefore, community must participate in rehabilitating mangrove areas area that have been damaged.

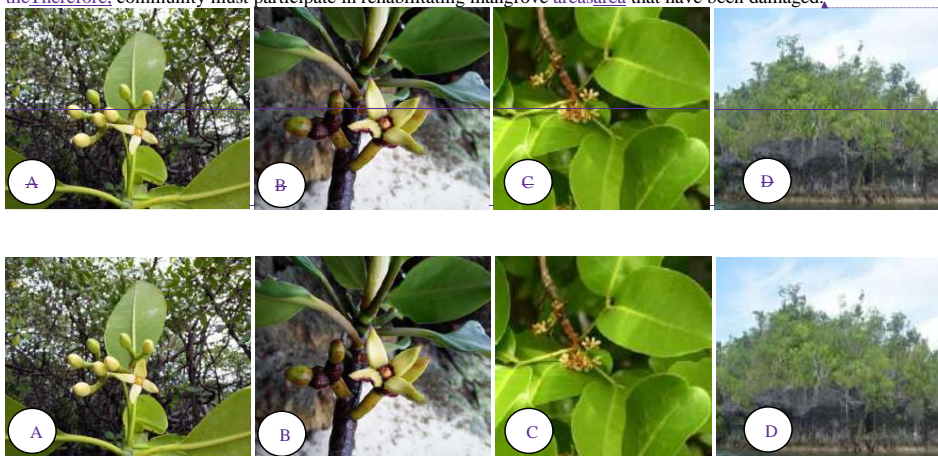


Figure 2.– A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; C. *Xylocarpus molucensis*; D. Corals were overgrown by mangroves mangrove

The Valentine Strait mangroves mangrove are located in the bay and are one of the ecosystems that have with an important role in the coastal communities community of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangroves mangrove provide benefits and various services to local communities community along the coast, in particular particularly fishing communities community in Lampung Bay. In addition to being dominated by mangroves, the Furthermore, coastal ecosystem of Valentine's Valentine's Strait also includes karst reefs, seagrasses, coral reefs, and coastal forests, as shown in Figure 2). These ecosystems provide productive natural resources, both as a source of food, as well as and leisure or for tourist areas area.

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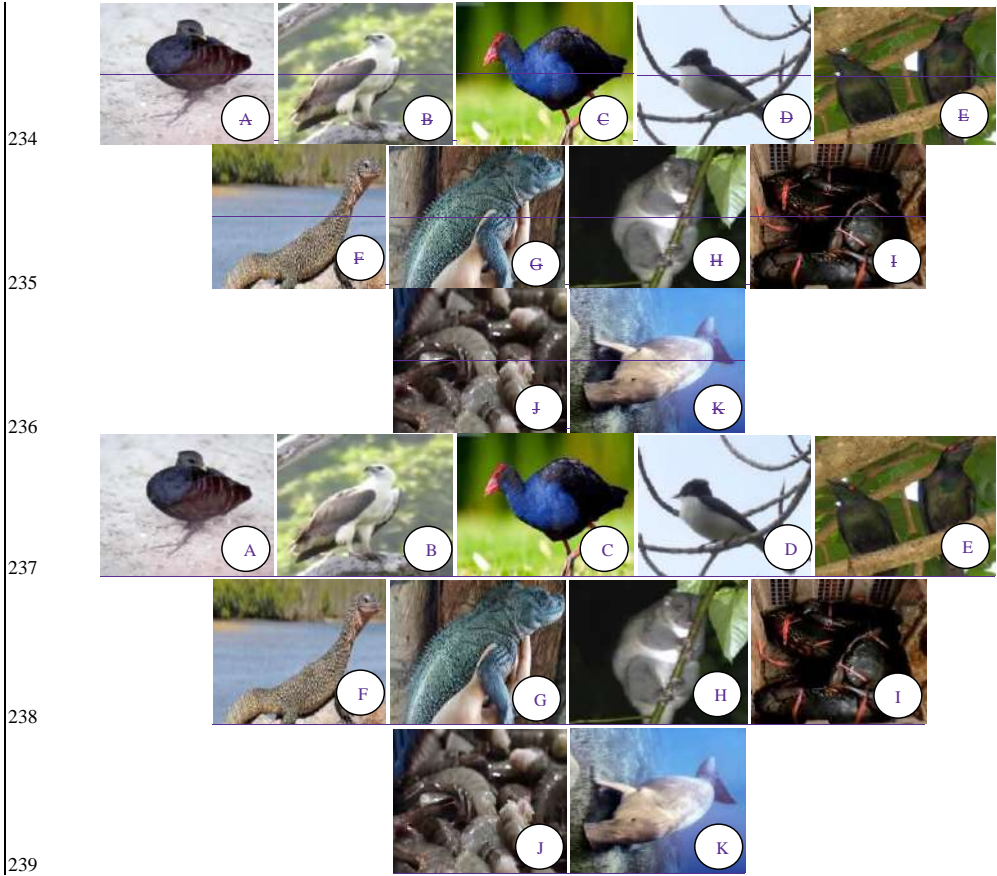
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219 As part of the coastal ecosystem, the existence of the mangrove ecosystem along the coast of Valentine's the Valentine's
 220 Strait makes a very significant contribution, both directly and indirectly. These benefits include physical protection, in
 221 particular against waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove stands can protect
 222 settlements, buildings, and agriculture against strong winds and seawater intrusion. Mangroves The forests also play an
 223 important role in coastal protection against storms. The capacity of mangroves to develop their territory in the sea's direction
 224 of the sea is one of the important roles of mangroves in the formation of forming new lands.

225 Mangrove not only serves as a barrier to natural abrasion of sea water seawater and reduces the impact of tsunami waves;
 226 mangroves can also be used as a Natural Tourism Attraction which also has educational value. Apart from, Besides its
 227 beautiful beaches and rich underwater charm, the Valentine Strait also has mangrove tourist destinations with cool nature.

228 Some of wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area, such as various birds of Gosong
 229 Maluku (*Eulipoa wallacei*), elang-laut perut-putih (*Haliaeetus leucogaster*), Mandar besar (*Porphyrio porphyria*), sikatan
 230 kelabu (*Myiagra galeata*), perling ungu (*Aplonis metallica*), reptiles such as biawak maluku (*Varanus indicus*), soa-soa
 231 (*Hydrosaurus amboinensis*), mamals such as kuskus (*Phalanger sp.*), and crustaceans such as kepiting bakau (*Scylla
 232 serrata*), udang windu (*Penaeus sp.*), and mermaids (*Dugong dugon*).
 233



239 **Figure 3.** Fauna found in mangrove area of the Valentine Strait: A. *Eulipoa wallacei*; B. *Haliaeetus leucogaster*; C. *Porphyrio*
 240 *porphyria*; D. *Myiagra galeata*; E. *Aplonis metallica*; F. *Varanus indicus*; G. *Hydrosaurus amboinensis*; H. *Phalanger sp.*; I. *Scylla serrata*;
 241 J. *Penaeus sp.*; K. *Dugong dugon*

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 244 Socio-culture
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246 Buano people occupy two main villages in the island's coastal area ~~of the island of Buano, which is now~~, divided into
247 North Buano and South Buano.

248 In addition ~~to the indigenous people who live in the two traditional villages on Buano Island~~, there ~~were~~are also
249 immigrant ~~communities~~community from the Buton tribe from Southeast Sulawesi, who ~~were~~was thought to have migrated
250 to this island 300 years before Indonesia's~~Indonesia's~~ independence. Migrant ~~communities~~community occupy several
251 villages called Petuanan ~~which~~, They were located on the west coast to the north of the island of Buano and ~~currently have~~
252 been formed administratively ~~they have been formed~~ in hamlets.

253 Socio-economic

254 In general, the The distribution of educational attainment for ~~the people of Buano who have graduated~~graduates from
255 junior high school was higher than ~~those who have graduated from~~ elementary and high school. Community education is
256 one ~~of the factors that influence the level of~~ factor influencing the understanding of mangrove conservation. ~~The, and the~~
257 results ~~obtained from the people living on Buano Island show that people's~~people's education varies greatly. The number of
258 ~~uneducated people who did not go to school~~ was 22.46%, who did not finish elementary school 12.46%, graduated from
259 elementary school 11.98%, junior high school 33.65%, high school 12.66%, undergraduate level 4.36%, and diploma level
260 1.06%. Whereas~~Meanwhile~~, for undergraduate level graduates, it was 1.30%, postgraduate 0.05%, and doctoral degrees
261 0.02%.

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262 Livelihood

263 Concerning livelihood, 80% of ~~the livelihoods of individuals in~~ the Buano island community are farmers. ~~Another~~
264 livelihood are fishermen and farmers. Fishermen catch ~~both demerical and pelagic fish~~, and only a small proportion
265 ~~are practice~~ aquaculture ~~fishermen (planting net cages and crabs)~~. Fishery production from Buano Island was sold to Seram
266 Island and Ambon Island. Marine catches were purchased directly by fish traders from the hamlets of Kawa, Pelita Jaya, and
267 Masika and their surroundings ~~which were on the islands of Seram and Ambon islands~~. Many ~~of the~~ people on the island of
268 Buano, especially men, also work as loggers using chainsaws.

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269 Mangrove wood such as *R. Apiculata*, *S. alba*, and *A. alba* ~~were~~was mostly used ~~as fuel wood for burning to burn~~ cajuputi
270 oil refining furnaces. This was also the cause of the reduced density of mangrove species (~~rare category~~) ~~both in~~ areas
271 ~~near settlements and those far from settlements~~. Logging ~~of mangroves for firewood~~ has become the main occupation of
272 fishing ~~communities~~community. Firewood was also very important for ~~the~~ community, especially for the poor, when the
273 price of fuel oil soars. ~~On the grounds that increased~~. Since mangrove wood ~~has the ability to can~~ generate ~~much~~ higher heat
274 energy when compared to ~~other woods~~others, the destruction of ~~mangrove~~the forests continues to occur. According to Sathe
275 et. al. (2013) ~~that in~~, in the Konkan ~~region~~area of India, the residents nearby utilize ~~mangroves~~mangrove as a source of
276 energy. This condition makes the people around the ~~mangrove forest~~forests always cut down mangrove wood to fulfill their
277 daily needs.

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278 Prior to~~The~~ head of LPPM Maluku, Mr. Piet Wairisal, ~~stated that before~~ the counseling from NGOs (LPPM Maluku) in
279 2017, ~~according to the head of LPPM Maluku, Mr. Piet Wairisal~~, mangrove encroachment ~~continued to occur~~occurred along
280 the coast of Huhua hamlet ~~(, as shown in Figure 4)~~, where ~~mangrove wood had been cut down near the community~~
281 ~~settlement, this action damaged the ecosystem around the mangrove area~~. Although it was known that, However, there was
282 biodiversity in this area that ~~needs~~needed to be protected, such as Buano Kehicap/Black-headed Monarch (*Symposiachrus*
283 *boanensis*). If the logging activities was done correctly and only takes a small portion of the forest each year, the
284 environmental impact ~~on the environment will~~would be very small, because mangrove forests ~~have the ability to be able~~
285 can renew themselves ~~when the logging activities are conducted correctly and only take a small portion each year~~.



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Figure 4. A. Residential community around the mangrove; B. Mangrove timber exploitation around the mangrove in the hamlet of Huhua (Photo source: LPPM Maluku 2018)

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The efforts to prevent mangrove degradation in Huhua Hamlet were started to be carried out again at this time performed by increasing the local community's understanding of the functions and roles of mangroves. The preservation or maintenance of mangrove ecosystems as habitats will have an impact on the maintenance of marine life, which in turn will support the current Buano people's economy of the Buano people and future generations.

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Various losses due to coastal abrasion were mainly felt by residents living along the coast, such as people who have to move their houses because they were eroded due to erosion caused by tidal waves. Damage to mangrove ecosystems and coral reefs has led to a reduction in the environmental quality of fisheries resources, resulting in a reduction in fisheries. The environmental quality of fisheries resources, resulting in a reduction in fisheries has been adversely affected because of the damage inflicted upon the ecosystems and coral reefs, leading to a decline in production. Furthermore, the cutting down of mangroves for firewood has also led to seawater intrusion into the mainland.

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There have been numerous previous studies on the importance of mangrove restoration and the need for effective conservation of mangrove management with a variety of perspectives and goals. Ellison et al. (2020) argued that rehabilitated and restored mangrove ecosystems have important ecological, economic, and social values for coastal communities.

The people of Buano, both individually and in groups from young to adults, have been motivated to plant mangroves by the Community Development Participation Institute (LPPM Maluku) since 2017. Community awareness has emerged after counseling by the LPPM Maluku and their desire to get better fish catches if the mangrove ecosystem recovers. Berkes and Folke (1992) argued that the community's ability to return the natural environment to its original status after being damaged by exploitation was a cultural capital. In the context of natural resource management, both ecologically and economically, the term cultural capital refers to factors that provide the means and adaptations for human community to deal with the natural environment and actively modify it. Understanding a society's cultural capital could be an important lesson in efforts to conserve natural resources such as mangrove forests.

TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom, which, if used properly. This wisdom can become an important social capital in the responsible management of natural resources, when properly used. The natural resources in Buano village were sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there were three categories of local wisdom and their function in the Buano community, namely (1) the human relationship with God, or supernatural powers which were thought to have power over life; (2) human relations with others were means as a means of solidarity, closeness, and fraternity; (3) related to the relationship between the natural environment which functions as an effort to protect and humans and nature therefore they can live side by side in harmony and sustainability.

Local Acknowledging the local wisdom that grows deeply rooted in the Buano community is important to note because crucial as it was the encompasses noble values that apply during community has upheld throughout their lives. One of these values is the life-sustainable protection and management of the local community, among others, to protect and manage the environment and natural resources in a sustainable manner. (Berkes, 2018) defines defined local ecological knowledge as a cumulative collection of knowledge, practices and beliefs, developed by adaptive processes and passed down from generation to generation through cultural transmission, about the relationships of living things where one another has ways of understanding, dynamic, built by experience and adapt to change.

Based on According to interviews and direct observations conducted in the field with the kewang, Kewang, the sasi Sasi tradition has begun to be forgotten, but started to fade from memory. However, activities to revive sasi Sasi values managed by LPPM Maluku, in damaged mangrove areas, were able to control forest destruction such as the application of

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338 ~~sasi to mangroves. The use~~utilization of mangrove wood was quite small, because ~~has been significantly limited~~ since mid-
339 2017 ~~the due to the prohibition of mangrove logging imposed by the~~ village government and the local ~~community~~community,
340 leaders in both villages have banned mangrove logging.

341 ~~Sasi is a prohibition~~limitation against taking ~~certain~~consuming specific resources at a ~~certain point in time with the goal~~
342 ~~of managing particular period in order to manage~~ sustainable resources. ~~Sasi~~It regulates how ~~communities~~community
343 manage ~~forest~~forests and marine resources, and ~~how to apply in~~ applying customary punishments to those who violate
344 ~~sasi~~violators of ~~Sasi~~ laws. ~~Through sasi, it is regulated when the community may take or harvest naturally available local~~
345 natural resources.

346 ~~Sasi could be a social capital in maintaining the balance between humans and nature. When sasi was implemented, During~~
347 the ~~implementation, community is~~was prohibited from picking certain fruits ~~on land and taking certain~~ products from the
348 ~~land and sea; for a period of time determined by the customary leader. Sasi's~~The role allows increasingly limited natural
349 resources to grow and develop. In other words, biological and vegetable natural resources can be continuously conserved
350 within a certain period ~~and provide an opportunity for, allowing~~ nature to restore its ~~own~~ growth and development ~~in order~~
351 to achieve satisfactory results.

352 Based on interviews with the local ~~communities, they believed that mangroves~~community, mangrove are the ~~food~~ source
353 of life which is the main source of food for the existence of fish, shrimp, crabs, ~~and~~ clams, and others that they use, therefore
354 if marine products are ~~willing in abundance. Therefore,~~ the existence of mangroves ~~mangrove~~ must be properly maintained:
355 when marine products are in abundance. For this reason, the community, both individually and in groups, voluntarily seeks
356 to preserve the mangrove area. Marine products were harvested with the aim of selling (~~commercial~~) or as family
357 consumption to fulfill the family economy (~~subsistence~~). On the off chance that there are no mangroves, then it is certain
358 that the production from the, ~~The~~ sea and the coast that they cultivate will decrease significantly ~~yield may substantially~~
359 ~~decline when mangrove are absent.~~ In addition, the community believed that the existence of mangroves ~~has an~~mangrove is
360 important role in protecting coastal ~~areas~~area, especially their settlements, from abrasion and strong winds that often occur.

361 ~~As for the results of discussions with key village community leaders, Furthermore,~~ the local community had received
362 support in the form of ~~through~~ seeds from the Maluku Watershed Management Center (BPDAS) and received environmental
363 conservation training as a form of concern for the government and the community as well as other elements for the
364 importance of preserving forests. During the training, participants consisting of elementary/junior high school/senior high
365 school students who represented the training also planted a number of several tree species together. ~~The~~As an organization
366 accountable for forests conservation, the Ministry of Forestry and the environment as an institution that has responsibility
367 for forest conservation ~~Environment~~ provides assistance, environmental cadre and training for these ~~to~~ young students as
368 young environmental cadres to promote their love and concern for the environment. This training was aimed to provide
369 understanding ~~impart~~ comprehension, motivation, and awareness, and to awaken among young souls ~~individuals and to instill~~
370 in them the realization that protecting the environment and planting trees is the ~~duty~~responsibility of all as ~~pious~~every
371 virtuous human beings ~~being~~.

372 Furthermore, from the results of ~~From~~ discussions with key village community leaders, training on environmental
373 conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions ~~for sustainable natural~~
374 resource management on Buano Island.

375 ~~Forms~~The methods of local community participation ~~engagement~~ in mangrove conservation ~~include~~comprise of the
376 following: (1) ~~Communities as~~ Educating community, who are the beneficiaries of mangrove resources ~~know that there were~~
377 rules, about the regulations governing life in the village and the use of natural resources. The village's custom ~~owned by the~~
378 village was ~~sasi~~Sasi, namely sea (beach) ~~sasi~~Sasi, river ~~sasi~~Sasi, and land (forest) ~~sasi~~. In efforts to preserve mangroves,
379 there were various related ~~Sasi~~. Various linked parties who still continue to care about the existence of these
380 mangroves: ~~presence of mangrove to preserve the forests,~~ Supervision was carried out by the community itself, such as village
381 institutions (Saniri Negeri and Kewang) and families who ~~have~~with rights. Saniri Negeri, is a custom forum for meetings of
382 various social and customary institutions in Buano, while Kewang is a ~~customary~~normal position for a traditional leader who
383 is tasked with overseeing the village's ~~village's~~ natural resources in the land (forest) environment as well as the coast and
384 sea. According to Uphoff (1986), institutions could be at the same time as organisations and vice versa ~~and organizations~~
385 can exist simultaneously. Institutions in the sense of ~~are~~ an organisation ~~organization~~ that forms community groups that
386 ~~have~~with good rules to regulate relations between people and ~~rules relating to~~ the management of the surrounding forest
387 resources. (2) ~~Communities~~Community whose source of livelihood is a fishermen have their ~~own~~the initiative and awareness
388 to plant mangroves. The seeds were taken from the mangroves around the coastal route that they have taken when they go
389 to sea. This planting activity was intended as plant enrichment or to replace dead mangroves ~~mangrove~~.
390 (3) ~~Communities~~Community collect both organic and inorganic wastes that become lodged in mangrove roots during floods
391 and high tides. The waste was then sorted again. Garbage such as rubber sandals and Rubber shoes and plastic mineral water
392 bottles was repurposed ~~were recycled~~ as a float used for seaweed cultivation ~~farming~~.

393 Based on this ~~This~~ description it was clear ~~highlights~~ how environmental aspects ~~describ~~efactors have influenced the
394 assimilation ~~integration~~ of community awareness around ~~regarding~~ mangrove in the Valentine Strait mangroves and how the
395 culture, ~~Cultural~~ perception of the community believed mangroves ~~mangrove~~ as a "tree of life" has significant implications
396 for mangrove conservation and ~~emphasizes the practice~~importance of ~~realizing~~promoting community protection for
397 their involvement in protecting the environment. This was also pointed out by Salampessy et al. (2015) that the community

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398 understands the cultural capital of a community as an effort to preserve natural resources, especially mangroves where the
399 conservation of mangroves in the Ambon Dalam Bay was strongly influenced by the mangrove. The important role of
400 traditional ecological knowledge of the community community has strongly influenced conservation of mangrove in Ambon
401 Dalam Bay.

402 Efforts to manage mangrove forests from the by community and local government were considered inadequate to
403 maintain and increase the viability of the mangrove ecosystem in the Valentine Strait around Huhua hamlet. For this reason,
404 community should implement management recommendations need to be implemented by the community by collaborating
405 with relevant agencies such as the Agriculture, Forestry, and Fisheries Extension Coordinating Agency and the Maritime
406 Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove
407 ecosystems. Apart from that, drafting Furthermore, these institutions should draft village regulations regarding the
408 management of managing mangrove ecosystems, such as regulations prohibiting logging and other activities that have a
409 negative negatively impact on mangrove areas which can affect mangrove growth by reactivating the duties of marine and
410 forest kewang in monitoring forest and coastal areas. Then it is necessary to carry out rehabilitation area. Rehabilitation and
411 conservation activities are also necessary for mangrove species that grow quickly and use the mangroves as food ingredients
412 so that the The surrounding community needs must maintain mangroves mangrove and increase community participation in
413 the management and utilization of mangroves managing and utilizing the resources.

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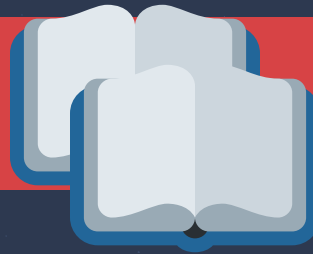
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Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Moluccas, Indonesia

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Abstract. Aipassa MI, Siahaya ME, Aponno HSES, Ruslim Y, Kristiningrum R. 2023. Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Moluccas, Indonesia. *Biodiversitas* 24: xxxx. A mangrove forest is composed of mangrove plants and constitutes a crucial ecosystem in coastal areas. It is a vital source for maintaining aquatic ecosystems between the sea, coast, and land. Additionally, it provides benefits to humans, such as contributing to a more comfortable climate and weather conditions that can prevent natural disasters. However, the mangrove in the Valentine Strait area is threatened by land conversion, leading to damage and loss. Some people are trying to preserve and maintain mangrove in their area. Therefore, the aim of this research was to describe the actions of the local community in the area, using the concept of cultural capital. A combination of qualitative and quantitative methods was used, and both primary and secondary data were collected. Primary data were gathered directly from the research location, while secondary data were obtained through local community information, various websites, and documents related to the management of natural resources. Additionally, key informants, including local community leaders, Kewang, and LPPM Maluku (NGO), were interviewed to collect relevant data on the cultural capital possessed by the community. The data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait area. Furthermore, the collected community data were analyzed using cultural capital theory. The results indicate that community has started to reapply the concept of cultural capital of the Sasi tradition as ecological knowledge to maintain and preserve mangrove; hence, ensuring conservation in the Valentine Strait area. Mangrove forests have become home to fish, shrimp, and crabs and are also important for birds, primates, and reptiles.

Keywords: Community, Cultural Capital, Mangrove, Sasi, Valentine Strait

INTRODUCTION

Forests possess significant economic, ecological, and social values, commonly called ecosystem services, that sustain countless livelihoods (Bjärstig and Sténs 2018; Baciú et al. 2021). Over 350 million people worldwide rely on forests and derive their livelihoods from their resources (Chao 2012; Langat et al. 2016). Conservation and sustainable use of forests play an important role in global environmental sustainability (Haji et al. 2021).

One forest ecosystem type is mangrove coastal, which has many functions, such as a coastal defense against natural disasters (Unnikrishnan et al. 2013, Spalding et al. 2014, and Lestyningrum et al. 2017). Mangrove are coastal areas' main woody habitats and carbon sinks (Shedage et al. 2019). These forests consist of (Castellanos-Galindo et al. 2017) various marine biota, food producers, drink, medicine, firewood, building materials, and a source of income for residents (Castellanos-Galindo et al. 2017; Islamy and Hasan 2020). Moreover, they are also conservation, educational area, and cultural identity (Kissinger et al. 2020; Kristiningrum et al. 2020; and

Siahaya et al. 2021). Spalding and Parrett (2019) stated that the importance of mangrove for cultural services, especially their use in recreation and tourism, has received little attention despite frequently being mentioned in reviews.

The Buano people use the forests for customary activities because of their sacred places. For instance, sacred places are prohibited from being used to prevent forests destruction. According to Mulyadi et al. (2022), this also occurs in several areas in Indonesia, such as Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and Dayak Kanayatn where indigenous people regard forests as clean and sacred places.

In addition to the population growth and the expansion of economies and industries, the demand for natural resources is increasing, which in turn is putting greater pressure on these resources. This phenomenon is evidenced by several facts, one of which is the steady increase in the exploitation of mangrove each year. This was also stated by Cahyaningsih et al. (2022), where Indonesia has the largest area of mangrove globally. However, as the human population increases, the area and quality of mangrove

decrease. Population growth is consistent with increased human activities that lead to deforestation and the degradation of mangrove forests.

Buano indigenous people are still faithful to the implementation of various traditions, and customs passed down from their ancestors since ancient times to protect and preserve the natural environment. Pratiwi et al. (2019) also stated that indigenous peoples know how to sustain and use forest resources.

The involvement of local community in managing forests is an important aspect of sustainable development. This is the opinion of Hong and Saizen (2019) that local and community-based forest management is a multi-dimensional approach where different stakeholders play a role in achieving common goals.

Local community are part of the forest ecosystem (Shishany et al. 2022). Ngo et al. (2021) stated that the culture of the people in the forest interacts with the ecosystems, forming and adapting to the natural environment. Based on the preceding, this research aims to explain community's cultural capital in preserving the Valentine Strait mangrove on Buano Island, West Seram District, Maluku, Indonesia.

MATERIALS AND METHODS

Research area

This research was conducted between June to August 2022 in the Valentine's Strait in coastal zone of Buano Island, West Seram, Maluku, Indonesia. The materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia (Figure 1. Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia).

Procedures

This research used a combination of qualitative and quantitative methods. The quantitative and qualitative data were intermingled to produce a complete result. However, more emphasis was placed on qualitative aspects in further data operation.

The data collected in this research were primary and secondary. Primary data were collected directly at the research location, while secondary data were obtained through local community information, various website, and documents on the management of natural resources in coastal area of the Valentine Strait. Furthermore, the key informants consisted of the village leader, *Kewang*, and LPPM Maluku (NGO).



Figure 1. Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia. A. 127 56'21.432" E . 2 56'31.479" S; B. 127 54'17.174" E . 2 57'18.026" S

The vegetation data were collected using the Point Centered Quarter method (Mitchell 2010) at each station. The measured mangrove trees were located at the point-centered quarter in 2 area, namely, mangrove area far from the settlements (natural) and near community settlements, where each area has 4 stations. The population observed was trees with a diameter at breast height ≥ 20 cm, which were in the plot area from quadrats 1 to 4. Furthermore, the samples were taken from 4 quadrats, and the selected trees were the closest in each quarter (Mitchell 2010).

The animal data collection was carried out through direct observation and indirectly through footprints, excrement, sounds, and information from local people. In contrast, the research site is under the characteristics of animals that always change location.

Data analysis

Data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait Area using Cottam and Curtis (1956) method. The standard criteria for damage to mangrove forests established by the Ministry of Environment RI No. 201 in 2004 can be seen in Table 1.

To calculate the quantitative values of mangrove parameters was as follows:

The average distance of individual trees to the measurement point from Cottam and Curtis (1956):

$$d = \frac{d_1 + d_2 + d_3 + \dots + d_n}{n}$$

Where:

d = Distance of individual trees to measurement point in each plot

n = The large number of trees

(d)2 = Average area/individual, namely the average surface area of land occupied by one individual plant

Species density from Cottam and Curtis (1956)

$$d_i = \frac{n_i}{A}$$

Where:

di = Species density

ni = Total number individual of species

A = Total area of measurements plots

The collected data from community were analyzed using cultural capital theory (Berkes and Folke 1994) by examining traditional ecological knowledge and local institutions in the local community.

Table 1. Standard criteria for damage to mangrove forests

Condition	Criteria	Density (Tree ha ⁻¹)
Good	Very Dense	>1,500
	Medium	$\geq 1,000$ - <1,500
Damage	Rare	<1,000

RESULTS AND DISCUSSION

Mangrove ecosystem in the Valentine Strait coastal area

The research location covered an area of 25,000 square meters divided into two separate mangrove area. Area A, spanning 12,000 square meters, was situated at the coordinates 127° 56' 21.432" E, 2° 56' 31.479" S, and was located a considerable distance from community settlements. Furthermore, Area B was situated near the settlements, covering 13,000 square meters and at the coordinates 127° 54' 17.174" E, 2° 57' 18.026" S. Table 2 presents mangrove conditions at both locations in the Valentine Strait:

Based on the results, the highest density value in mangrove natural area (A) was found at stations I, II, III, and IV, namely *R. mucronata*, *R. apiculata*, *A. alba*, and *S. alba* at 1,550, 1,600, 825, and 575 individuals/m², respectively. The highest species density value in the rehabilitation mangrove area (B) for the dense category was at stations I, III, and IV, namely *R. apiculata*, *R. mucronata*, and *X. molucensis* at 2,050, 1,600, and 1,500 individuals m⁻², while the medium category was station II, namely *B. gymnorhiza* at 1,250 individuals m⁻². The predominated species were *R. apiculata* in both area and *R. mucronata*, while *X. molucensis* was found in mangrove rehabilitation area, as shown in Figure 2. In Pangempang Beach, one species that dominated mangrove ecosystem was *Rhizophora apiculata* (Aipassa et al. 2022). The research conducted by Kristiningrum et al. (2019) in the Mentawir Village and Rafiq et al. (2020) in Mandeh bay of West Sumatra stated that *R. apiculata* and *R. mucronata* dominate in the area.

In the natural mangrove area (A) at each observation station, the density of mangrove species in the very dense category was only found at stations I and II, while III and IV were rare because the natural mangrove area is in the front zone directly facing the sea

Table 2. Mangrove condition in the Valentine Strait at two locations

Station	Species	Species Density	Criteria
(A) Natural area (far from community settlement)			
I	<i>Rhizophora mucronata</i> Lam.	1550	Very dense
II	<i>Rhizophora apiculata</i> Blume	1,600	Very dense
III	<i>Avicennia alba</i> Blume	825	Rare
IV	<i>Sonneratia alba</i> Sm.	575	Rare
(B) Rehabilitation area (near community settlement)			
I	<i>Rhizophora apiculata</i> Blume	2,050	Very dense
II	<i>Bruguiera gymnorhiza</i> (L.) Lam.	1,250	Medium
III	<i>Rhizophora mucronata</i> Lam.	1,600	Very dense
IV	<i>Xylocarpus molucensis</i> (Lam.) M.Roem.	1,500	Very dense



Figure 2. A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; C. *Xylocarpus moluccensis*; D. Corals were overgrown by mangrove

The comparison of mangrove species in the natural (A) and rehabilitation area (B) showed that location (B) was denser, reaching 2,050 individuals m^{-2} . At this location, it was deliberately planted, hence, the density of mangrove species was higher (denser). It is hoped that the people living around mangrove forests will always maintain and protect the rehabilitation area. Therefore, community must participate in rehabilitating mangrove area that have been damaged.

The Valentine Strait mangrove in the bay is one of the ecosystems with an important role in coastal community of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangrove provide benefits and services to local community along the coast, particularly fishing community in Lampung Bay. Furthermore, coastal ecosystem of Valentine's Strait also includes karst reefs, seagrasses, coral reefs, and coastal forests, as shown in Figure 2. These ecosystems provide productive natural resources as a source of food and leisure for tourist area.

As part of coastal ecosystem, the mangrove ecosystem along the coast of the Valentine's Strait makes a significant contribution. These benefits include physical protection against waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove can protect settlements, buildings, and agriculture against strong winds and seawater intrusion. The forests also play an important role in coastal protection against storms. The capacity to develop their territory in the sea's direction is important in forming new lands.

Mangrove serves as a barrier to natural abrasion of seawater and reduces the impact of tsunami waves. Besides having beautiful beaches and rich underwater charm, the Valentine Strait has mangrove tourist destinations with cool nature.

Some wildlife can also be found in the Valentine Strait Mangrove area, such as various birds, i.e., Gosong Maluku (*Eulipoa wallacei* G.R.Gray 1861), *elang-laut perut-putih* (*Haliaeetus leucogaster* Gmelin 1788), *mandar besar*

(*Porphyrio porphyrio* Linnaeus 1758), *sikatan kelabu* (*Myiagra galeata* G.R.Gray 1861), *perling ungu* (*Aplonis metallica* Temminck 1824), reptiles such as *biawak maluku* (*Varanus indicus* Daudin 1802), *soa-soa* (*Hydrosaurus amboinensis* Schlosser 1768), mammals such as *kuskus* (*Phalanger sp.*), and crustaceans such as *kepiting bakau* (*Scylla serrata* Forskål 1775), *udang windu* (*Penaeus sp.*), and mermaids (*Dugong dugon* Müller 1776).

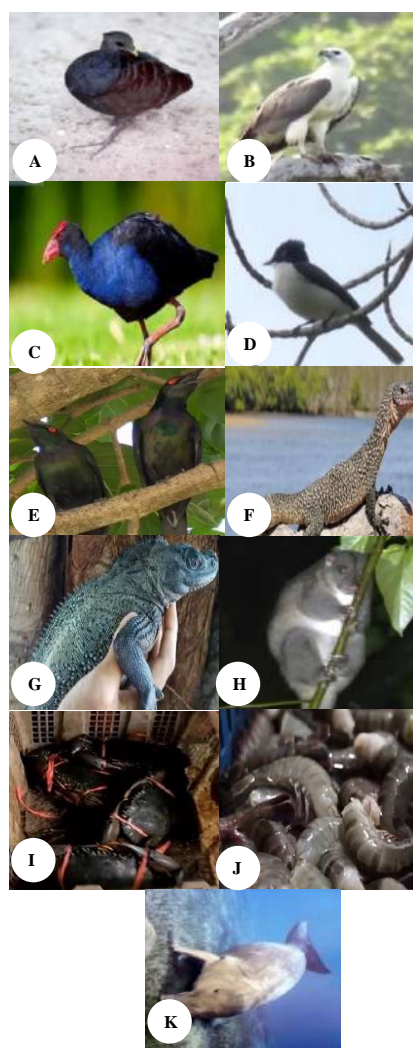


Figure 3. Fauna found in mangrove area of the Valentine Strait: A. *E. wallacei*; B. *H. leucogaster*; C. *P. porphyria*; D. *M. galeata*; E. *A. metallica*; F. *V. indicus*; G. *H. amboinensis*; H. *Phalanger sp.*; I. *S. serrata*; J. *Penaeus sp.*; K. *D. dugon*

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Socio-culture

Buano people occupy two main villages in the island's coastal area, divided into North and South Buano. In addition, there are also immigrant community from the Buton tribe from Southeast Sulawesi, who was thought to have migrated to this island 300 years before Indonesia's independence. Migrant community occupy several villages called Petuanan. They were located on the west coast to the north of the island of Buano and have been formed administratively in hamlets.

Socio-economic

The distribution of educational attainment for Buano graduates from junior high school was higher than elementary and high school. Community education is one factor influencing the understanding of mangrove conservation, and the results show that people's education varies greatly. The number of uneducated people was 22.46%, who did not finish elementary school 12.46%, graduated from elementary school 11.98%, junior high school 33.65%, high school 12.66%, undergraduate level 4.36%, and diploma level 1.06%. Meanwhile, for undergraduate level graduates, it was 1.30%, postgraduate 0.05%, and doctoral degrees 0.02%.

Livelihood

Concerning livelihood, 80% of individuals in the Buano island community are fishermen and farmers. Fishermen catch demersal and pelagic fish and only a small proportion practice aquaculture. Fishery production from Buano Island was sold to Seram and Ambon Island. Marine catches were purchased directly by fish traders from the hamlets of Kawa, Pelita Jaya, and Masika and their surroundings on the Seram and Ambon islands. Many people on the island of Buano, especially men, also work as loggers using chainsaws.

Mangrove wood such as *R. Apiculata*, *S.alba*, and *A.alba* was mostly used to burn cajuputi oil refining furnaces. This was also the cause of the reduced density of mangrove species in area near and far from settlements. Logging for firewood has become the main occupation of fishing community. Firewood was also very important for community, especially for the poor, when the price of fuel oil increased. Since mangrove wood can generate higher heat energy when compared to others, the destruction of the forests continues to occur. According to Sathe et al. (2013), in the Konkan area of India, the residents nearby utilize mangrove as a source of energy. This condition makes the people around the forests always cut down mangrove wood to fulfill their daily needs.

The head of counseling from institute for research and community service (LPPM) Maluku, Mr. Piet Wairisal, stated that before the counseling from NGOs (LPPM Maluku) in 2017, mangrove encroachment occurred along the coast of Huhua hamlet, as shown in Figure 4. However, there was biodiversity in this area that needed to be protected, such as Buano Kehicap/Black-headed Monarch (*Symphysichrus boanensis* Bemmels 1939). The environmental impact would be very small because mangrove forests can renew themselves when the logging

activities are conducted correctly and only take a small portion each year.

The efforts to prevent mangrove degradation in Huhua Hamlet were performed by increasing the local community's understanding of the functions and roles. The preservation or maintenance of the ecosystems as habitats will impact the maintenance of marine life to support the Buano people's economy and future generations.

Coastal abrasion has resulted in several losses that have predominantly impacted the residents living along the coast due to erosion caused by tidal waves. The environmental quality of fisheries resources has been adversely affected because of the damage inflicted upon the ecosystems and coral reefs, leading to a decline in production. Furthermore, the cutting down mangrove for firewood has led to seawater intrusion into the mainland.

Numerous studies in the past have emphasized the significance of mangrove restoration and the need for effective conservation management with varied perspectives and goals. Ellison et al. (2020) argued that rehabilitated and restored mangrove ecosystems have important ecological, economic, and social values for coastal community.



Figure 4. A. Residential community around mangrove; B. Mangrove timber exploitation around mangrove in the hamlet of Huhua (Photo source: LPPM Maluku 2018)

The people of Buano, individually and in groups, have been motivated to plant the forests by Community Development Participation Institute (LPPM Maluku) since 2017. Community awareness has emerged after counseling by the LPPM Maluku and the desire to obtain better fish catches. Berkes and Folke (1992) stated that community's ability to return the natural environment to its original status after being damaged by exploitation was a cultural capital. In natural resource management, cultural capital refers to factors that provide the means and adaptations for human community to deal with the natural environment. Understanding a society's cultural capital could be an important lesson in conserving natural resources such as mangrove forests.

TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom. This wisdom can become an important social capital in the responsible management of natural resources when properly used. The natural resources were sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there were three categories of local wisdom and their function in community, namely (i) the human relationship with God, or supernatural powers which were thought to have power over life, (ii) human relations with others as a means of solidarity, closeness, and fraternity, (iii) the relationship between the natural environment and humans to live in harmony and sustainability.

Acknowledging the local wisdom deeply rooted in the Buano community is crucial as it encompasses noble values that community has upheld throughout their lives. One of these values is the sustainable protection and management of the environment and natural resources. (Berkes 2018) defined local ecological knowledge as a cumulative collection of practices and beliefs developed by adaptive processes and passed down through cultural transmission.

According to interviews and direct observations conducted in the field with the *Kewang*, the *Sasi* tradition has started to fade from memory. However, activities to revive *Sasi* values managed by LPPM Maluku in damaged mangrove area were able to control forests destruction. The utilization of mangrove wood has been significantly limited since mid-2017 due to the prohibition of mangrove logging imposed by the village government and the local community leaders.

Sasi is a limitation against consuming specific resources at a particular period in order to manage sustainable resources. It regulates how community manage forests and marine resources in applying customary punishments to violators of *Sasi* laws.

Sasi could be a social capital in maintaining the balance between humans and nature. During the implementation, community was prohibited from picking certain fruits and products from the land and sea for a period determined by the customary leader. The role allows increasingly limited natural resources to grow and develop. In other words, biological and vegetable natural resources can be

continuously conserved within a certain period, allowing nature to restore its growth and development to achieve satisfactory results.

Based on interviews with the local community, mangrove are the food source for fish, shrimp, crabs, and clams. Therefore, the mangrove must be properly maintained when marine products are in abundance. For this reason, community voluntarily seeks to preserve mangrove area. Marine products were harvested with the aim of selling or as family consumption to fulfill the family economy. The sea and coast yield may substantially decline when mangrove are absent. In addition, community believed that the mangrove is important in protecting coastal area, especially their settlements, from abrasion and strong winds.

Furthermore, the local community received support through provision of seeds from the Maluku Watershed Management Center (BPDAS) and environmental conservation training as a form of concern for the government and community. During the training, participants consisting of elementary/junior high school/senior high school students who represented the training planted several tree species together. As an organization accountable for forests conservation, the Ministry of Forestry and Environment provides assistance and training to young students as environmental cadres to promote their love and concern for the environment. This training aimed to impart comprehension, motivation, and awareness among young individuals and to instill in them the realization that protecting the environment and planting trees is the responsibility of every virtuous human being.

From discussions with key village community leaders, training on environmental conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions.

The methods of local community engagement in mangrove conservation comprise the following: (i) Educating community, who are the beneficiaries of mangrove resources, about the regulations governing life in the village and the use of natural resources. The village's custom was *Sasi*, namely sea (beach) *Sasi*, river *Sasi*, and land (forest) *Sasi*. Various linked parties continue to preserve the mangrove forests. Supervision was carried out by community, such as village institutions (Saniri Negeri and *Kewang*) and families with rights. Saniri Negeri is a custom forum for meetings of various social and customary institutions in Buano, while *Kewang* is a normal position for a traditional leader tasked with overseeing the village's natural resources. According to Uphoff (1986), institutions and organizations can exist simultaneously. Institutions are an organization that forms community groups with good rules to regulate relations between people and the management of the surrounding forest resources. (ii) Community whose source of livelihood is fishermen have the initiative and awareness to plant mangrove. (ii) Community collect organic and inorganic wastes lodged in mangrove roots during floods and high tides. Rubber shoes and plastic mineral water bottles were recycled as a float for seaweed farming.

This description highlights how environmental factors have influenced the integration of community awareness regarding mangrove in the Valentine Strait. Cultural perception of mangrove as a “tree of life” has significant implications for conservation and emphasizes the importance of promoting community involvement in protecting the environment. This was also pointed out by Salampessy et al. (2015) that community understands cultural capital as an effort to preserve natural resources, especially mangrove. The important role of traditional ecological knowledge of community has strongly influenced conservation of mangrove in Ambon Dalam Bay.

Efforts to manage mangrove forests by community and local government were considered inadequate to maintain and increase the viability of the ecosystem in the Valentine Strait around Huhua, hamlet. For this reason, community should implement management recommendations by collaborating with relevant agencies such as the Agriculture, Forestry, and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Furthermore, these institutions should draft village regulations regarding managing mangrove ecosystems, such as prohibiting logging and other activities that negatively impact mangrove area. Rehabilitation and conservation activities are also necessary for mangrove species that grow quickly. The surrounding community must maintain mangrove and increase community participation in managing and utilizing the resources.

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DEWI NUR PRATIWI (dewinurpratiwi)

Gilang D. Nugroho (sectioneditor7)

Messages

Note

Dear Managing Editor

Section Editor

Ibu Nur Dewi Pratiwi (Funding coordinator)

,

Please find attached is the corrected proof for the manuscript "*Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Moluccas, Indonesia*".

We hope the revised manuscript has met the requirements for publication in the Biodiversitas Journal and could be publish on Volume 24. No.4 April 2023. Thank you very much for your help and attention. We send also Bill of the payment for manuscript publication.

Thank you and best regards,

Corresponding author,

Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Moluccas, Indonesia

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Abstract. Aipassa MI, Siahaya ME, Aponno HSES, Ruslim Y, Kristiningrum R. 2023. Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Moluccas, Indonesia. *Biodiversitas* 24: xxxx. A mangrove forest is composed of mangrove plants and constitutes a crucial ecosystem in coastal areas. It is a vital source for maintaining aquatic ecosystems between the sea, coast, and land. Additionally, it provides benefits to humans, such as contributing to a more comfortable climate and weather conditions that can prevent natural disasters. However, the mangrove in the Valentine Strait area is threatened by land conversion, leading to damage and loss. Some people are trying to preserve and maintain mangrove in their area. Therefore, the aim of this research was to describe the actions of the local community in the area, using the concept of cultural capital. A combination of qualitative and quantitative methods was used, and both primary and secondary data were collected. Primary data were gathered directly from the research location, while secondary data were obtained through local community information, various websites, and documents related to the management of natural resources. Additionally, key informants, including local community leaders, Kewang, and LPPM Maluku (NGO), were interviewed to collect relevant data on the cultural capital possessed by the community. The data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait area. Furthermore, the collected community data were analyzed using cultural capital theory. The results indicate that community has started to reapply the concept of cultural capital of the Sasi tradition as ecological knowledge to maintain and preserve mangrove; hence, ensuring conservation in the Valentine Strait area. Mangrove forests have become home to fish, shrimp, and crabs and are also important for birds, primates, and reptiles.

Keywords: Community, Cultural Capital, Mangrove, Sasi, Valentine Strait

INTRODUCTION

Forests possess significant economic, ecological, and social values, commonly called ecosystem services, that sustain countless livelihoods (Björstig and Sténs 2018; Baciú et al. 2021). Over 350 million people worldwide rely on forests and derive their livelihoods from their resources (Chao 2012; Langat et al. 2016). Conservation and sustainable use of forests play an important role in global environmental sustainability (Haji et al. 2021).

One forest ecosystem type is mangrove coastal, which has many functions, such as a coastal defense against natural disasters (Unnikrishnan et al. 2013, Spalding et al. 2014, and Lestyningrum et al. 2017). Mangrove are coastal areas' main woody habitats and carbon sinks (Shedage et al. 2019). These forests consist of (Castellanos-Galindo et al. 2017) various marine biota, food producers, drink, medicine, firewood, building materials, and a source of income for residents (Castellanos-Galindo et al. 2017; Islamy and Hasan 2020). Moreover, they are also conservation, educational area, and cultural identity (Kissinger et al. 2020; Kristiningrum et al. 2020; and

Siahaya et al. 2021). Spalding and Parrett (2019) stated that the importance of mangrove for cultural services, especially their use in recreation and tourism, has received little attention despite frequently being mentioned in reviews.

The Buano people use the forests for customary activities because of their sacred places. For instance, sacred places are prohibited from being used to prevent forests destruction. According to Mulyadi et al. (2022), this also occurs in several areas in Indonesia, such as Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and Dayak Kanayatn where indigenous people regard forests as clean and sacred places.

In addition to the population growth and the expansion of economies and industries, the demand for natural resources is increasing, which in turn is putting greater pressure on these resources. This phenomenon is evidenced by several facts, one of which is the steady increase in the exploitation of mangrove each year. This was also stated by Cahyaningsih et al. (2022), where Indonesia has the largest area of mangrove globally. However, as the human population increases, the area and quality of mangrove

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decrease. Population growth is consistent with increased human activities that lead to deforestation and the degradation of mangrove forests.

Buano indigenous people are still faithful to the implementation of various traditions, and customs passed down from their ancestors since ancient times to protect and preserve the natural environment. Pratiwi et al. (2019) also stated that indigenous peoples know how to sustain and use forest resources.

The involvement of local community in managing forests is an important aspect of sustainable development. This is the opinion of Hong and Saizen (2019) that local and community-based forest management is a multi-dimensional approach where different stakeholders play a role in achieving common goals.

Local community are part of the forest ecosystem (Shishany et al. 2022). Ngo et al. (2021) stated that the culture of the people in the forest interacts with the ecosystems, forming and adapting to the natural environment. Based on the preceding, this research aims to explain community's cultural capital in preserving the Valentine Strait mangrove on Buano Island, West Seram District, Maluku, Indonesia.

MATERIALS AND METHODS

Research area

This research was conducted between June to August 2022 in the Valentine's Strait in coastal zone of Buano Island, West Seram, Maluku, Indonesia. The materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia (Figure 1. Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia).

Procedures

This research used a combination of qualitative and quantitative methods. The quantitative and qualitative data were intermingled to produce a complete result. However, more emphasis was placed on qualitative aspects in further data operation.

The data collected in this research were primary and secondary. Primary data were collected directly at the research location, while secondary data were obtained through local community information, various website, and documents on the management of natural resources in coastal area of the Valentine Strait. Furthermore, the key informants consisted of the village leader, *Kewang*, and LPPM Maluku (NGO).



Figure 1. Map of the research locations at the Valentine Strait, West Seram, Moluccas, Indonesia. A. 127 56'21.432" E . 2 56'31.479" S; B. 127 54'17.174" E . 2 57'18.026" S

The vegetation data were collected using the Point Centered Quarter method (Mitchell 2010) at each station. The measured mangrove trees were located at the point-centered quarter in 2 area, namely, mangrove area far from the settlements (natural) and near community settlements, where each area has 4 stations. The population observed was trees with a diameter at breast height ≥ 20 cm, which were in the plot area from quadrats 1 to 4. Furthermore, the samples were taken from 4 quadrats, and the selected trees were the closest in each quarter (Mitchell 2010).

The animal data collection was carried out through direct observation and indirectly through footprints, excrement, sounds, and information from local people. In contrast, the research site is under the characteristics of animals that always change location.

Data analysis

Data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait Area using Cottam and Curtis (1956) method. The standard criteria for damage to mangrove forests established by the Ministry of Environment RI No. 201 in 2004 can be seen in Table 1.

To calculate the quantitative values of mangrove parameters was as follows:

The average distance of individual trees to the measurement point from Cottam and Curtis (1956):

$$d = \frac{d_1 + d_2 + d_3 + \dots + d_n}{n}$$

Where:

d = Distance of individual trees to measurement point in each plot

n = The large number of trees

(d)2 = Average area/individual, namely the average surface area of land occupied by one individual plant

Species density from Cottam and Curtis (1956)

$$d_i = \frac{n_i}{A}$$

Where:

di = Species density

ni = Total number individual of species

A = Total area of measurements plots

The collected data from community were analyzed using cultural capital theory (Berkes and Folke 1994) by examining traditional ecological knowledge and local institutions in the local community.

Table 1. Standard criteria for damage to mangrove forests

Condition	Criteria	Density (Tree ha ⁻¹)
Good	Very Dense	>1,500
	Medium	$\geq 1,000$ - <1,500
Damage	Rare	<1,000

RESULTS AND DISCUSSION

Mangrove ecosystem in the Valentine Strait coastal area

The research location covered an area of 25,000 square meters divided into two separate mangrove area. Area A, spanning 12,000 square meters, was situated at the coordinates 127° 56' 21.432" E, 2° 56' 31.479" S, and was located a considerable distance from community settlements. Furthermore, Area B was situated near the settlements, covering 13,000 square meters and at the coordinates 127° 54' 17.174" E, 2° 57' 18.026" S. Table 2 presents mangrove conditions at both locations in the Valentine Strait:

Based on the results, the highest density value in mangrove natural area (A) was found at stations I, II, III, and IV, namely *R. mucronata*, *R. apiculata*, *A. alba*, and *S. alba* at 1,550, 1,600, 825, and 575 individuals/m², respectively. The highest species density value in the rehabilitation mangrove area (B) for the dense category was at stations I, III, and IV, namely *R. apiculata*, *R. mucronata*, and *X. molucensis* at 2,050, 1,600, and 1,500 individuals m⁻², while the medium category was station II, namely *B. gymnorhiza* at 1,250 individuals m⁻². The predominated species were *R. apiculata* in both area and *R. mucronata*, while *X. molucensis* was found in mangrove rehabilitation area, as shown in Figure 2. In Pangempang Beach, one species that dominated mangrove ecosystem was *Rhizophora apiculata* (Aipassa et al. 2022). The research conducted by Kristiningrum et al. (2019) in the Mentawir Village and Rafiq et al. (2020) in Mandeh bay of West Sumatra stated that *R. apiculata* and *R. mucronata* dominate in the area.

In the natural mangrove area (A) at each observation station, the density of mangrove species in the very dense category was only found at stations I and II, while III and IV were rare because the natural mangrove area is in the front zone directly facing the sea

Table 2. Mangrove condition in the Valentine Strait at two locations

Station	Species	Species Density	Criteria
(A) Natural area (far from community settlement)			
I	<i>Rhizophora mucronata</i> Lam.	1550	Very dense
II	<i>Rhizophora apiculata</i> Blume	1,600	Very dense
III	<i>Avicennia alba</i> Blume	825	Rare
IV	<i>Sonneratia alba</i> Sm.	575	Rare
(B) Rehabilitation area (near community settlement)			
I	<i>Rhizophora apiculata</i> Blume	2,050	Very dense
II	<i>Bruguiera gymnorhiza</i> (L.) Lam.	1,250	Medium
III	<i>Rhizophora mucronata</i> Lam.	1,600	Very dense
IV	<i>Xylocarpus molucensis</i> (Lam.) M.Roem.	1,500	Very dense

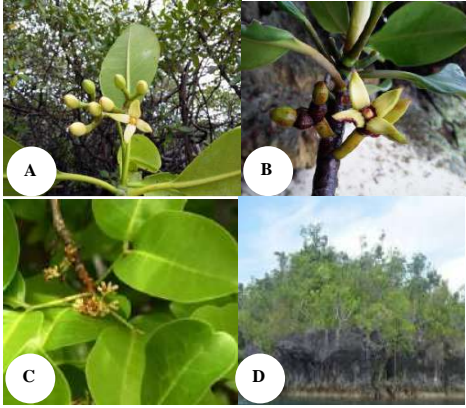


Figure 2. A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; C. *Xylocarpus moluccensis*; D. Corals were overgrown by mangrove

The comparison of mangrove species in the natural (A) and rehabilitation area (B) showed that location (B) was denser, reaching 2,050 individuals m^{-2} . At this location, it was deliberately planted, hence, the density of mangrove species was higher (denser). It is hoped that the people living around mangrove forests will always maintain and protect the rehabilitation area. Therefore, community must participate in rehabilitating mangrove area that have been damaged.

The Valentine Strait mangrove in the bay is one of the ecosystems with an important role in coastal community of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangrove provide benefits and services to local community along the coast, particularly fishing community in Lampung Bay. Furthermore, coastal ecosystem of Valentine's Strait also includes karst reefs, seagrasses, coral reefs, and coastal forests, as shown in Figure 2. These ecosystems provide productive natural resources as a source of food and leisure for tourist area.

As part of coastal ecosystem, the mangrove ecosystem along the coast of the Valentine's Strait makes a significant contribution. These benefits include physical protection against waves, wind, and storms. (McIvor et al. 2012; del Valle et al. 2020). Mangrove can protect settlements, buildings, and agriculture against strong winds and seawater intrusion. The forests also play an important role in coastal protection against storms. The capacity to develop their territory in the sea's direction is important in forming new lands.

Mangrove serves as a barrier to natural abrasion of seawater and reduces the impact of tsunami waves. Besides having beautiful beaches and rich underwater charm, the Valentine Strait has mangrove tourist destinations with cool nature.

Some wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area, such as various birds, i.e., Gosong Maluku (*Eulipoa wallacei* G.R.Gray 1861), *elang-laut perut-putih* (*Haliaeetus leucogaster* Gmelin 1788),

mandar besar (*Porphyrio porphyrio* Linnaeus 1758), *sikatan kelabu* (*Myiagra galeata* G.R.Gray 1861), *perling ungu* (*Aplonis metallica* Temminck 1824), reptiles such as *biawak maluku* (*Varanus indicus* Daudin 1802), *soa-soa* (*Hydrosaurus amboinensis* Schlosser 1768), mammals such as *kuskus* (*Phalanger sp.*), and crustaceans such as *kepiting bakau* (*Scylla serrata* Forskål 1775), *udang windu* (*Penaeus sp.*), and mermaids (*Dugong dugon* Müller 1776).

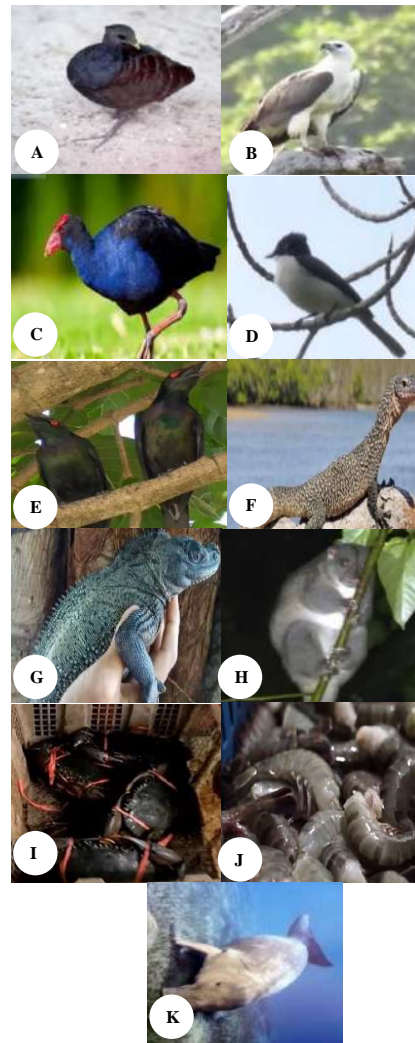


Figure 3. Fauna found in mangrove area of the Valentine Strait: A. *E. wallacei*; B. *H. leucogaster*; C. *P. porphyria*; D. *M. galeata*; E. *A. metallica*; F. *V. indicus*; G. *H. amboinensis*; H. *Phalanger sp.*; I. *S. serrata*; J. *Penaeus sp.*; K. *D. dugon*

Socio-culture

Buano people occupy two main villages in the island's coastal area, divided into North and South Buano. In addition, there are also immigrant community from the Buton tribe from Southeast Sulawesi, who was thought to have migrated to this island 300 years before Indonesia's independence. Migrant community occupy several villages called Petuanan. They were located on the west coast to the north of the island of Buano and have been formed administratively in hamlets.

Socio-economic

The distribution of educational attainment for Buano graduates from junior high school was higher than elementary and high school. Community education is one factor influencing the understanding of mangrove conservation, and the results show that people's education varies greatly. The number of uneducated people was 22.46%, who did not finish elementary school 12.46%, graduated from elementary school 11.98%, junior high school 33.65%, high school 12.66%, undergraduate level 4.36%, and diploma level 1.06%. Meanwhile, for undergraduate level graduates, it was 1.30%, postgraduate 0.05%, and doctoral degrees 0.02%.

Livelihood

Concerning livelihood, 80% of individuals in the Buano island community are fishermen and farmers. Fishermen catch demersal and pelagic fish and only a small proportion practice aquaculture. Fishery production from Buano Island was sold to Seram and Ambon Island. Marine catches were purchased directly by fish traders from the hamlets of Kawa, Pelita Jaya, and Masika and their surroundings on the Seram and Ambon islands. Many people on the island of Buano, especially men, also work as loggers using chainsaws.

Mangrove wood such as *R. Apiculata*, *S.alba*, and *A.alba* was mostly used to burn cajuputi oil refining furnaces. This was also the cause of the reduced density of mangrove species in area near and far from settlements. Logging for firewood has become the main occupation of fishing community. Firewood was also very important for community, especially for the poor, when the price of fuel oil increased. Since mangrove wood can generate higher heat energy when compared to others, the destruction of the forests continues to occur. According to Sathe et al. (2013), in the Konkan area of India, the residents nearby utilize mangrove as a source of energy. This condition makes the people around the forests always cut down mangrove wood to fulfill their daily needs.

The head of [the community institute for the participation in development counseling from institute for research and community service](#) (LPPM) Maluku, Mr. Piet Wairisal, stated that before the counseling from NGOs (LPPM Maluku) in 2017, mangrove encroachment occurred along the coast of Huhua hamlet, as shown in Figure 4. However, there was biodiversity in this area that needed to be protected, such as Buano Kehicap/Black-headed Monarch (*Symposiachrus boanensis* Bemmell 1939). The environmental impact would be very small

because mangrove forests can renew themselves when the logging activities are conducted correctly and only take a small portion each year.

The efforts to prevent mangrove degradation in Huhua Hamlet were performed by increasing the local community's understanding of the functions and roles. The preservation or maintenance of the ecosystems as habitats will impact the maintenance of marine life to support the Buano people's economy and future generations.

Coastal abrasion has resulted in several losses that have predominantly impacted the residents living along the coast due to erosion caused by tidal waves. The environmental quality of fisheries resources has been adversely affected because of the damage inflicted upon the ecosystems and coral reefs, leading to a decline in production. Furthermore, the cutting down mangrove for firewood has led to seawater intrusion into the mainland.

Numerous studies in the past have emphasized the significance of mangrove restoration and the need for effective conservation management with varied perspectives and goals. Ellison et al. (2020) argued that rehabilitated and restored mangrove ecosystems have important ecological, economic, and social values for coastal community.



Figure 4. A. Residential community around mangrove; B. Mangrove timber exploitation around mangrove in the hamlet of Huhua (Photo source: LPPM Maluku 2018)

The people of Buano, individually and in groups, have been motivated to plant the forests by Community Development Participation Institute (LPPM Maluku) since 2017. Community awareness has emerged after counseling by the LPPM Maluku and the desire to obtain better fish catches. Berkes and Folke (1992) stated that community's ability to return the natural environment to its original status after being damaged by exploitation was a cultural capital. In natural resource management, cultural capital refers to factors that provide the means and adaptations for human community to deal with the natural environment. Understanding a society's cultural capital could be an important lesson in conserving natural resources such as mangrove forests.

TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom. This wisdom can become an important social capital in the responsible management of natural resources when properly used. The natural resources were sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there were three categories of local wisdom and their function in community, namely (i) the human relationship with God, or supernatural powers which were thought to have power over life, (ii) human relations with others as a means of solidarity, closeness, and fraternity, (iii) the relationship between the natural environment and humans to live in harmony and sustainability.

Acknowledging the local wisdom deeply rooted in the Buano community is crucial as it encompasses noble values that community has upheld throughout their lives. One of these values is the sustainable protection and management of the environment and natural resources. (Berkes 2018) defined local ecological knowledge as a cumulative collection of practices and beliefs developed by adaptive processes and passed down through cultural transmission.

According to interviews and direct observations conducted in the field with the *Kewang*, the *Sasi* tradition has started to fade from memory. However, activities to revive *Sasi* values managed by LPPM Maluku in damaged mangrove area were able to control forests destruction. The utilization of mangrove wood has been significantly limited since mid-2017 due to the prohibition of mangrove logging imposed by the village government and the local community leaders.

Sasi is a limitation against consuming specific resources at a particular period in order to manage sustainable resources. It regulates how community manage forests and marine resources in applying customary punishments to violators of *Sasi* laws.

Sasi could be a social capital in maintaining the balance between humans and nature. During the implementation, community was prohibited from picking certain fruits and products from the land and sea for a period determined by the customary leader. The role allows increasingly limited natural resources to grow and develop. In other words, biological and vegetable natural resources can be

continuously conserved within a certain period, allowing nature to restore its growth and development to achieve satisfactory results.

Based on interviews with the local community, mangrove are the food source for fish, shrimp, crabs, and clams. Therefore, the mangrove must be properly maintained when marine products are in abundance. For this reason, community voluntarily seeks to preserve mangrove area. Marine products were harvested with the aim of selling or as family consumption to fulfill the family economy. The sea and coast yield may substantially decline when mangrove are absent. In addition, community believed that the mangrove is important in protecting coastal area, especially their settlements, from abrasion and strong winds.

Furthermore, the local community received support through provision of seeds from the Maluku Watershed Management Center (BPDAS) and environmental conservation training as a form of concern for the government and community. During the training, participants consisting of elementary/junior high school/senior high school students who represented the training planted several tree species together. As an organization accountable for forests conservation, the Ministry of Forestry and Environment provides assistance and training to young students as environmental cadres to promote their love and concern for the environment. This training aimed to impart comprehension, motivation, and awareness among young individuals and to instill in them the realization that protecting the environment and planting trees is the responsibility of every virtuous human being.

From discussions with key village community leaders, training on environmental conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions.

The methods of local community engagement in mangrove conservation comprise the following: (i) Educating community, who are the beneficiaries of mangrove resources, about the regulations governing life in the village and the use of natural resources. The village's custom was *Sasi*, namely sea (beach) *Sasi*, river *Sasi*, and land (forest) *Sasi*. Various linked parties continue to preserve the mangrove forests. Supervision was carried out by community, such as village institutions (Saniri Negeri and *Kewang*) and families with rights. Saniri Negeri is a custom forum for meetings of various social and customary institutions in Buano, while *Kewang* is a normal position for a traditional leader tasked with overseeing the village's natural resources. According to Uphoff (1986), institutions and organizations can exist simultaneously. Institutions are an organization that forms community groups with good rules to regulate relations between people and the management of the surrounding forest resources. (ii) Community whose source of livelihood is fishermen have the initiative and awareness to plant mangrove. (ii) Community collect organic and inorganic wastes lodged in mangrove roots during floods and high tides. Rubber shoes and plastic mineral water bottles were recycled as a float for seaweed farming.

This description highlights how environmental factors have influenced the integration of community awareness regarding mangrove in the Valentine Strait. Cultural perception of mangrove as a “tree of life” has significant implications for conservation and emphasizes the importance of promoting community involvement in protecting the environment. This was also pointed out by Salampessy et al. (2015) that community understands cultural capital as an effort to preserve natural resources, especially mangrove. The important role of traditional ecological knowledge of community has strongly influenced conservation of mangrove in Ambon Dalam Bay.

Efforts to manage mangrove forests by community and local government were considered inadequate to maintain and increase the viability of the ecosystem in the Valentine Strait around Huhua, hamlet. For this reason, community should implement management recommendations by collaborating with relevant agencies such as the Agriculture, Forestry, and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Furthermore, these institutions should draft village regulations regarding managing mangrove ecosystems, such as prohibiting logging and other activities that negatively impact mangrove area. Rehabilitation and conservation activities are also necessary for mangrove species that grow quickly. The surrounding community must maintain mangrove and increase community participation in managing and utilizing the resources.

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Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Maluku, Indonesia

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Abstract. *Aipassa MI, Siahaya ME, Aponno HSES, Ruslim Y, Kristiningrum R. 2023. Participation of community in mangrove conservation in coastal area of the Valentine Strait, West Seram, Maluku, Indonesia. Biodiversitas 24: 2467-2474.* A mangrove forest is composed of mangrove plants and constitutes a crucial ecosystem in coastal areas. It is a vital source for maintaining aquatic ecosystems between the sea, coast, and land. Additionally, it provides benefits to humans, such as contributing to a more comfortable climate and weather conditions that can prevent natural disasters. However, the mangrove in the Valentine Strait area (West Seram, Maluku, Indonesia) is threatened by land conversion, leading to damage and loss. Some people are trying to preserve and maintain mangrove in their area. Therefore, the aim of this research was to describe the actions of the local community in the area, using the concept of cultural capital. A combination of qualitative and quantitative methods was used, and both primary and secondary data were collected. Primary data were gathered directly from the research location, while secondary data were obtained through local community information, various websites, and documents related to the management of natural resources. Additionally, key informants, including local community leaders, Kewang, and LPPM Maluku (NGO), were interviewed to collect relevant data on the cultural capital possessed by the community. The data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait area. Furthermore, the collected community data were analyzed using cultural capital theory. The results indicate that community has started to reapply the concept of cultural capital of the Sasi tradition as ecological knowledge to maintain and preserve mangrove; hence, ensuring conservation in the Valentine Strait area. Mangrove forests have become home to fish, shrimp, and crabs and are also important for birds, primates, and reptiles.

Keywords: Community, cultural capital, mangrove, *sasi*, Valentine Strait

INTRODUCTION

Forests possess significant economic, ecological, and social values, commonly called ecosystem services, that sustain countless livelihoods (Björstig and Sténs 2018; Baciú et al. 2021). Over 350 million people worldwide rely on forests and derive their livelihoods from their resources (Chao 2012; Langat et al. 2016). Conservation and sustainable use of forests play an important role in global environmental sustainability (Haji et al. 2021).

One forest ecosystem type is mangrove coastal, which has many functions, such as a coastal defense against natural disasters (Unnikrishnan et al. 2013; Spalding et al. 2014; Lestyningrum et al. 2017). Mangroves are coastal areas' main woody habitats and carbon sinks (Shedage et al. 2019). These forests consist of various marine biota, food producers, drink, medicine, firewood, building materials, and a source of income for residents (Castellanos-Galindo et al. 2017; Islamy and Hasan 2020). Moreover, they are also conservation, educational area, and cultural identity (Kissinger et al. 2020; Kristiningrum et al. 2020; Siahaya et al. 2021). Spalding and Parrett (2019)

stated that the importance of mangrove for cultural services, especially their use in recreation and tourism, has received little attention despite frequently being mentioned in reviews.

The Buano people use the forests for customary activities because of their sacred places. For instance, sacred places are prohibited from being used to prevent forests destruction. According to Mulyadi et al. (2022), this also occurs in several areas in Indonesia, such as Nagari Sungai Buluh, Mollo, Kampung Naga, Manggarai, and Dayak Kanayatn where indigenous people regard forests as clean and sacred places.

In addition to the population growth and the expansion of economies and industries, the demand for natural resources is increasing, which in turn is putting greater pressure on these resources. This phenomenon is evidenced by several facts, one of which is the steady increase in the exploitation of mangrove each year. This was also stated by Cahyaningsih et al. (2022), where Indonesia has the largest area of mangrove globally. However, as the human population increases, the area and quality of mangrove decrease. Population growth is consistent with increased

human activities that lead to deforestation and the degradation of mangrove forests.

Buano indigenous people are still faithful to the implementation of various traditions, and customs passed down from their ancestors since ancient times to protect and preserve the natural environment. Pratiwi et al. (2019) also stated that indigenous peoples know how to sustain and use forest resources. The involvement of local community in managing forests is an important aspect of sustainable development. This is the opinion of Hong and Saizen (2019) that local and community-based forest management is a multi-dimensional approach where different stakeholders play a role in achieving common goals.

Local communities are part of the forest ecosystem (Shishany et al. 2022). Ngo et al. (2021) stated that the culture of the people in the forest interacts with the ecosystems, forming and adapting to the natural environment. Based on the preceding, this research aims to explain community's cultural capital in preserving the Valentine Strait mangrove on Buano Island, West Seram District, Maluku, Indonesia.

MATERIALS AND METHODS

Research area

This research was conducted between June to August 2022 in the Valentine's Strait in coastal zone of Buano Island, West Seram, Maluku (Moluccas), Indonesia. The materials used were Landsat 8 imagery, administrative boundary maps, and topographical maps of Indonesia

(Figure 1. Map of the research locations at the Valentine Strait, West Seram, Maluku, Indonesia).

Procedures

This research used a combination of qualitative and quantitative methods. The quantitative and qualitative data were intermingled to produce a complete result. However, more emphasis was placed on qualitative aspects in further data operation.

The data collected in this research were primary and secondary. Primary data were collected directly at the research location, while secondary data were obtained through local community information, various website, and documents on the management of natural resources in coastal area of the Valentine Strait. Furthermore, the key informants consisted of the village leader, *Kewang*, and LPPM Maluku (NGO).

The vegetation data were collected using the Point Centered Quarter method (Mitchell 2010) at each station. The measured mangrove trees were located at the point-centered quarter in 2 area, namely, mangrove area far from the settlements (natural) and near community settlements, where each area has 4 stations. The population observed was trees with a diameter at breast height ≥ 20 cm, which were in the plot area from quadrats 1 to 4. Furthermore, the samples were taken from 4 quadrats, and the selected trees were the closest in each quarter (Mitchell 2010).

The animal data collection was carried out through direct observation and indirectly through footprints, excrement, sounds, and information from local people. In contrast, the research site is under the characteristics of animals that always change location.

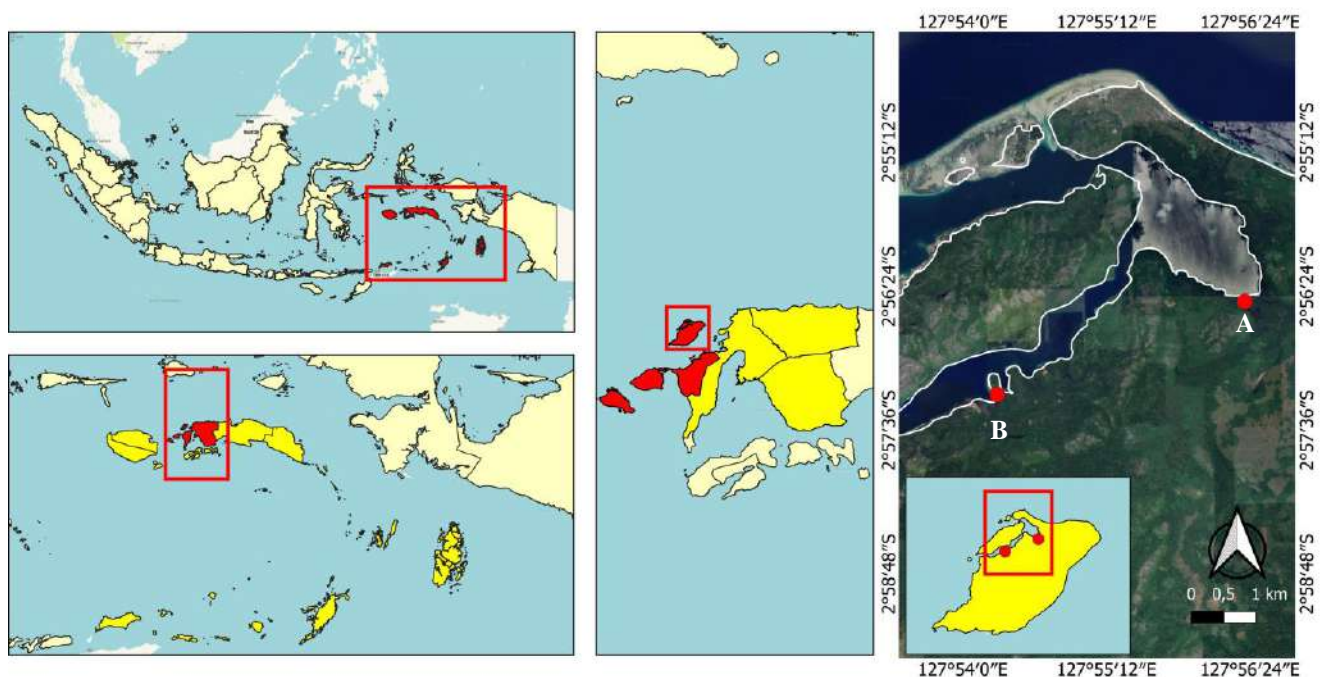


Figure 1. Map of the research locations at the Valentine Strait, West Seram, Maluku, Indonesia. A. 127 56'21.432" E . 2 56'31.479" S; B. 127 54'17.174" E . 2 57'18.026" S

Data analysis

Data for identifying mangrove species were calculated and tabulated to determine the species density in the Valentine Strait Area using Cottam and Curtis (1956) method. The standard criteria for damage to mangrove forests established by the Ministry of Environment RI No. 201 in 2004 can be seen in Table 1.

To calculate the quantitative values of mangrove parameters was as follows:

The average distance of individual trees to the measurement point from Cottam and Curtis (1956):

$$d = \frac{d_1 + d_2 + d_3 \dots\dots\dots + d_n}{n}$$

Where:

d : Distance of individual trees to measurement points in each plot

n : The large number of trees

(d)2 : Average area/individual, namely the average surface area of land occupied by one individual plant

Species density from Cottam and Curtis (1956)

$$d_i = \frac{n_i}{A}$$

Where:

di : Species density

ni : Total number individual of species

A : Total area of measurements plots

The collected data from community were analyzed using cultural capital theory (Berkes and Folke 1994) by examining traditional ecological knowledge and local institutions in the local community.

Table 1. Standard criteria for damage to mangrove forests

Condition	Criteria	Density (tree ha ⁻¹)
Good	Very dense	>1,500
	Medium	≥1,000 - <1,500
Damage	Rare	<1,000

RESULTS AND DISCUSSION

Mangrove ecosystem in the Valentine Strait coastal area

The research location covered an area of 25,000 square meters divided into two separate mangrove area. Area A, spanning 12,000 square meters, was situated at the coordinates 127° 56' 21.432" E, 2° 56' 31.479" S, and was located a considerable distance from community settlements. Furthermore, Area B was situated near the settlements, covering 13,000 square meters and at the coordinates 127° 54' 17.174" E, 2° 57' 18.026" S. Table 2 presents mangrove conditions at both locations in the Valentine Strait.

Based on the results, the highest density value in mangrove natural area (A) was found at stations I, II, III, and IV, namely *Rhizophora mucronata*, *R. apiculata*, *Avicennia alba*, and *Sonneratia alba* at 1,550, 1,600, 825,

and 575 individuals/m², respectively. The highest species density value in the rehabilitation mangrove area (B) for the dense category was at stations I, III, and IV, namely *R. apiculata*, *R. mucronata*, and *Xylocarpus molucensis* at 2,050, 1,600, and 1,500 individuals m⁻², while the medium category was station II, namely *Bruguiera gymnorhiza* at 1,250 individuals m⁻². The predominated species were *R. apiculata* in both area and *R. mucronata*, while *X. molucensis* was found in mangrove rehabilitation area, as shown in Figure 2. In Pangempang Beach, one species that dominated mangrove ecosystem was *R. apiculata* (Aipassa et al. 2022). The research conducted by Kristiningrum et al. (2019) in the Mentawir Village and Rafiq et al. (2020) in Mandeh Bay of West Sumatra stated that *R. apiculata* and *R. mucronata* dominate in the area.

In the natural mangrove area (A) at each observation station, the density of mangrove species in the very dense category was only found at stations I and II, while III and IV were rare because the natural mangrove area is in the front zone directly facing the sea.

The comparison of mangrove species in the natural (A) and rehabilitation area (B) showed that location (B) was denser, reaching 2,050 individuals m⁻². At this location, it was deliberately planted, hence, the density of mangrove species was higher (denser). It is hoped that the people living around mangrove forests will always maintain and protect the rehabilitation area. Therefore, community must participate in rehabilitating mangrove area that have been damaged.

The Valentine Strait mangrove in the bay is one of the ecosystems with an important role in coastal community of Buano Island, both ecologically and economically. Firdaus et al. (2021) also stated that mangrove provide benefits and services to local community along the coast, particularly fishing community in Lampung Bay. Furthermore, coastal ecosystem of Valentin's Strait also includes karst reefs, seagrasses, coral reefs, and coastal forests, as shown in Figure 2. These ecosystems provide productive natural resources as a source of food and leisure for tourist area. As part of coastal ecosystem, the mangrove ecosystem along the coast of the Valentine's Strait makes a significant contribution. These benefits include physical protection against waves, wind, and storms (McIvor et al. 2012; del Valle et al. 2020).

Table 2. Mangrove condition in the Valentine Strait, West Seram, Maluku, Indonesia at two locations

Station	Species	Species density	Criteria
(A) Natural area (far from community settlement)			
I	<i>Rhizophora mucronata</i> Lam.	1550	Very dense
II	<i>Rhizophora apiculata</i> Blume	1,600	Very dense
III	<i>Avicennia alba</i> Blume	825	Rare
IV	<i>Sonneratia alba</i> Sm.	575	Rare
(B) Rehabilitation area (near community settlement)			
I	<i>Rhizophora apiculata</i> Blume	2,050	Very dense
II	<i>Bruguiera gymnorhiza</i> (L.) Lam.	1,250	Medium
III	<i>Rhizophora mucronata</i> Lam.	1,600	Very dense
IV	<i>Xylocarpus molucensis</i> (Lam.) M.Roem.	1,500	Very dense

Mangrove can protect settlements, buildings, and agriculture against strong winds and seawater intrusion. The forests also play an important role in coastal protection against storms. The capacity to develop their territory in the sea's direction is important in forming new lands. Mangrove serves as a barrier to natural abrasion of seawater and reduces the impact of tsunami waves. Besides having beautiful beaches and rich underwater charm, the Valentine Strait has mangrove tourist destinations with cool nature. Some wildlife (Figure 3) can also be found in the Valentine Strait Mangrove area, such as various birds, i.e., Gosong Maluku (*Eulipoa*

wallacei G.R.Gray 1861), *elang-laut perut-putih* (*Haliaeetus leucogaster* Gmelin 1788), *mandar besar* (*Porphyrio porphyrio* Linnaeus 1758), *sikatan kelabu* (*Myiagra galeata* G.R.Gray 1861), *perling ungu* (*Aplonis metallica* Temminck 1824), reptiles such as *biawak maluku* (*Varanus indicus* Daudin 1802), *soa-soa* (*Hydrosaurus amboinensis* Schlosser 1768), mammals such as *kuskus* (*Phalanger sp.*), and crustaceans such as *kepiting bakau* (*Scylla serrata* Forskål 1775), *udang windu* (*Penaeus sp.*), and mermaids (*Dugong dugon* Müller 1776).



Figure 2. Some mangrove species from Valentine Strait, West Seram, Maluku, Indonesia. A. *Rhizophora mucronata*; B. *Rhizophora apiculata*; C. *Xylocarpus molucensis*; D. Corals were overgrown by mangrove

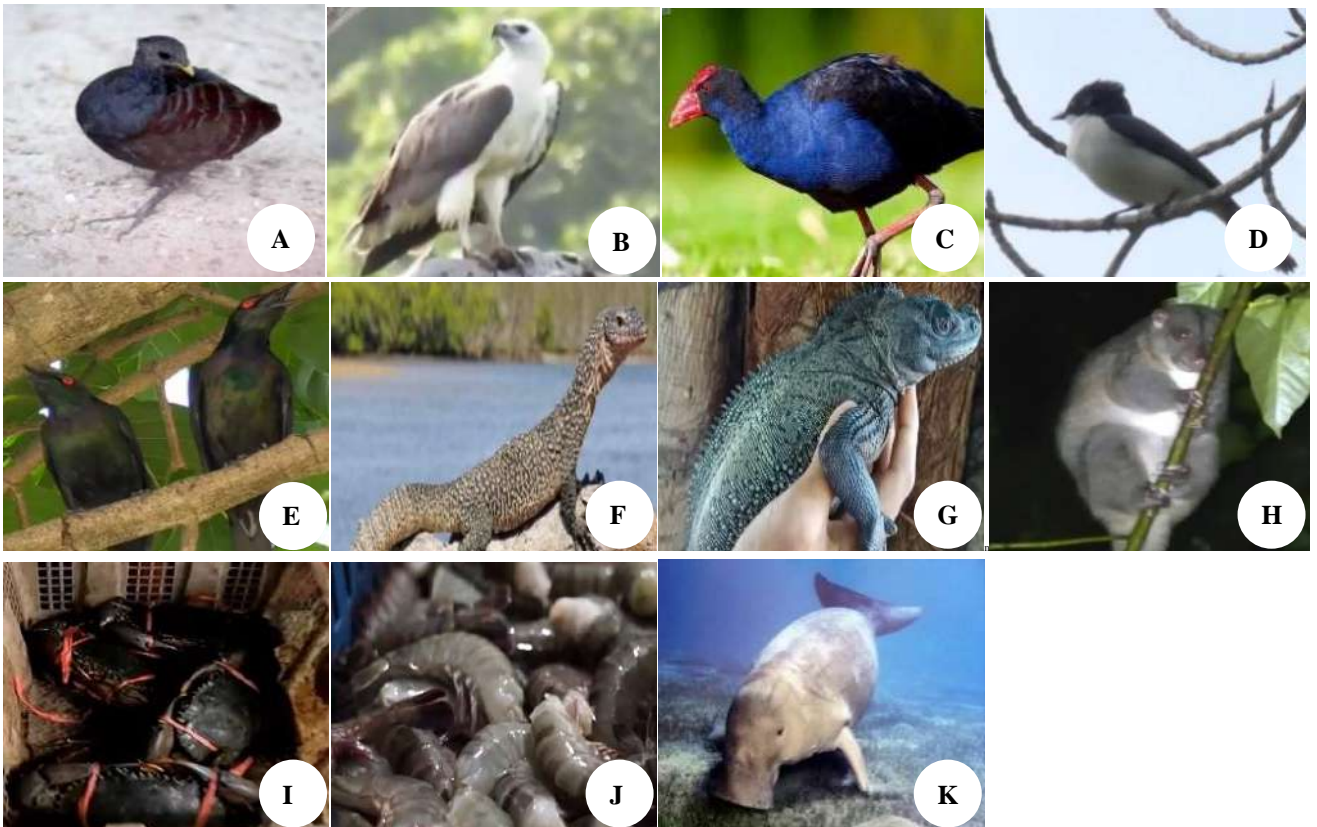


Figure 3. Fauna found in mangrove area of the Valentine Strait, West Seram, Maluku, Indonesia: A. *E. wallacei*; B. *H. leucogaster*; C. *P. porphyria*; D. *M. galeata*; E. *A. metallica*; F. *V. indicus*; G. *H. amboinensis*; H. *Phalanger sp*; I. *S. serrata*; J. *Penaeus sp.*; K. *D. dugon*

Socio-culture

Buano people occupy two main villages in the island's coastal area, divided into North and South Buano. In addition, there are also immigrant community from the Buton tribe from Southeast Sulawesi, who was thought to have migrated to this island 300 years before Indonesia's independence. Migrant community occupy several villages called Petuanan. They were located on the west coast to the north of the island of Buano and have been formed administratively in hamlets.

Socio-economic

The distribution of educational attainment for Buano graduates from junior high school was higher than elementary and high school. Community education is one factor influencing the understanding of mangrove conservation, and the results show that people's education varies greatly. The number of uneducated people was 22.46%, who did not finish elementary school 12.46%, graduated from elementary school 11.98%, junior high school 33.65%, high school 12.66%, undergraduate level 4.36%, and diploma level 1.06%. Meanwhile, for undergraduate level graduates, it was 1.30%, postgraduate 0.05%, and doctoral degrees 0.02%.

Livelihood

Concerning livelihood, 80% of individuals in the Buano island community are fishermen and farmers. Fishermen catch demersal and pelagic fish and only a small proportion practice aquaculture. Fishery production from Buano Island was sold to Seram and Ambon Island. Marine catches were purchased directly by fish traders from the hamlets of Kawa, Pelita Jaya, and Masika and their surroundings on the Seram and Ambon islands. Many people on the island of Buano, especially men, also work as loggers using chainsaws.

Mangrove wood such as *R. Apiculata*, *S. alba*, and *A. alba* was mostly used to burn cajuputi oil refining furnaces. This was also the cause of the reduced density of mangrove species in area near and far from settlements. Logging for firewood has become the main occupation of fishing

community. Firewood was also very important for community, especially for the poor, when the price of fuel oil increased. Since mangrove wood can generate higher heat energy when compared to others, the destruction of the forests continues to occur. According to Sathe et al. (2013), in the Konkan area of India, the residents nearby utilize mangrove as a source of energy. This condition makes the people around the forests always cut down mangrove wood to fulfill their daily needs.

The head of the community institute for the participation in development (LPPM) Maluku, Mr. Piet Wairisal, stated that before the counseling from NGOs (LPPM Maluku) in 2017, mangrove encroachment occurred along the coast of Huhua hamlet, as shown in Figure 4. However, there was biodiversity in this area that needed to be protected, such as Buano Kehicap/Black-headed Monarch (*Symposiachrus boanensis* Bemmell 1939). The environmental impact would be very small because mangrove forests can renew themselves when the logging activities are conducted correctly and only take a small portion each year.

The efforts to prevent mangrove degradation in Huhua Hamlet were performed by increasing the local community's understanding of the functions and roles. The preservation or maintenance of the ecosystems as habitats will impact the maintenance of marine life to support the Buano people's economy and future generations.

Coastal abrasion has resulted in several losses that have predominantly impacted the residents living along the coast due to erosion caused by tidal waves. The environmental quality of fisheries resources has been adversely affected because of the damage inflicted upon the ecosystems and coral reefs, leading to a decline in production. Furthermore, the cutting down mangrove for firewood has led to seawater intrusion into the mainland.

Numerous studies in the past have emphasized the significance of mangrove restoration and the need for effective conservation management with varied perspectives and goals. Ellison et al. (2020) argued that rehabilitated and restored mangrove ecosystems have important ecological, economic, and social values for coastal community.



Figure 4. A. Residential community around mangrove; B. Mangrove timber exploitation around mangrove in the hamlet of Huhua (Photo source: LPPM Maluku 2018)

The people of Buano, individually and in groups, have been motivated to plant the forests by Community Development Participation Institute (LPPM Maluku) since 2017. Community awareness has emerged after counseling by the LPPM Maluku and the desire to obtain better fish catches. Berkes and Folke (1992) stated that community's ability to return the natural environment to its original status after being damaged by exploitation was a cultural capital. In natural resource management, cultural capital refers to factors that provide the means and adaptations for human community to deal with the natural environment. Understanding a society's cultural capital could be an important lesson in conserving natural resources such as mangrove forests.

TEK and local institutions in mangrove conservation

Fundamentally, the culture of the Buano people provides diverse cultural institutions and local wisdom. This wisdom can become an important social capital in the responsible management of natural resources when properly used. The natural resources were sensitive to the value of local knowledge, cultural customs, and belief values.

From a conceptual perspective, there were three categories of local wisdom and their function in community, namely (i) the human relationship with God, or supernatural powers which were thought to have power over life, (ii) human relations with others as a means of solidarity, closeness, and fraternity, (iii) the relationship between the natural environment and humans to live in harmony and sustainability.

Acknowledging the local wisdom deeply rooted in the Buano community is crucial as it encompasses noble values that community has upheld throughout their lives. One of these values is the sustainable protection and management of the environment and natural resources. Berkes (2018) defined local ecological knowledge as a cumulative collection of practices and beliefs developed by adaptive processes and passed down through cultural transmission.

According to interviews and direct observations conducted in the field with the *Kewang*, the *Sasi* tradition has started to fade from memory. However, activities to revive *Sasi* values managed by LPPM Maluku in damaged mangrove area were able to control forests destruction. The utilization of mangrove wood has been significantly limited since mid-2017 due to the prohibition of mangrove logging imposed by the village government and the local community leaders.

Sasi is a limitation against consuming specific resources at a particular period in order to manage sustainable resources. It regulates how community manage forests and marine resources in applying customary punishments to violators of *Sasi* laws. *Sasi* could be a social capital in maintaining the balance between humans and nature. During the implementation, community was prohibited from picking certain fruits and products from the land and sea for a period determined by the customary leader. The role allows increasingly limited natural resources to grow and develop. In other words, biological and vegetable natural resources can be continuously conserved within a

certain period, allowing nature to restore its growth and development to achieve satisfactory results.

Based on interviews with the local community, mangrove are the food source for fish, shrimp, crabs, and clams. Therefore, the mangrove must be properly maintained when marine products are in abundance. For this reason, community voluntarily seeks to preserve mangrove area. Marine products were harvested with the aim of selling or as family consumption to fulfill the family economy. The sea and coast yield may substantially decline when mangrove are absent. In addition, community believed that the mangrove is important in protecting coastal area, especially their settlements, from abrasion and strong winds.

Furthermore, the local community received support through provision of seeds from the Maluku Watershed Management Center (BPDAS) and environmental conservation training as a form of concern for the government and community. During the training, participants consisting of elementary/junior high school/senior high school students who represented the training planted several tree species together. As an organization accountable for forests conservation, the Ministry of Forestry and Environment provides assistance and training to young students as environmental cadres to promote their love and concern for the environment. This training aimed to impart comprehension, motivation, and awareness among young individuals and to instill in them the realization that protecting the environment and planting trees is the responsibility of every virtuous human being.

From discussions with key village community leaders, training on environmental conservation was also provided by NGOs from LPPM Maluku for leaders of traditional institutions.

The methods of local community engagement in mangrove conservation comprise the following: (i) Educating community, who are the beneficiaries of mangrove resources, about the regulations governing life in the village and the use of natural resources. The village's custom was *Sasi*, namely sea (beach) *Sasi*, river *Sasi*, and land (forest) *Sasi*. Various linked parties continue to preserve the mangrove forests. Supervision was carried out by community, such as village institutions (Saniri Negeri and *Kewang*) and families with rights. Saniri Negeri is a custom forum for meetings of various social and customary institutions in Buano, while *Kewang* is a normal position for a traditional leader tasked with overseeing the village's natural resources. According to Uphoff (1986), institutions and organizations can exist simultaneously. Institutions are an organization that forms community groups with good rules to regulate relations between people and the management of the surrounding forest resources. (ii) Community whose source of livelihood is fishermen have the initiative and awareness to plant mangrove. (ii) Community collect organic and inorganic wastes lodged in mangrove roots during floods and high tides. Rubber shoes and plastic mineral water bottles were recycled as a float for seaweed farming.

This description highlights how environmental factors have influenced the integration of community awareness

regarding mangrove in the Valentine Strait. Cultural perception of mangrove as a “tree of life” has significant implications for conservation and emphasizes the importance of promoting community involvement in protecting the environment. This was also pointed out by Salampessy et al. (2015) that community understands cultural capital as an effort to preserve natural resources, especially mangrove. The important role of traditional ecological knowledge of community has strongly influenced conservation of mangrove in Ambon Dalam Bay.

Efforts to manage mangrove forests by community and local government were considered inadequate to maintain and increase the viability of the ecosystem in the Valentine Strait around Huhua, hamlet. For this reason, community should implement management recommendations by collaborating with relevant agencies such as the Agriculture, Forestry, and Fisheries Extension Coordinating Agency and the Maritime Affairs and Fisheries Office of Maluku Province to conduct counseling about the functions and roles of mangrove ecosystems. Furthermore, these institutions should draft village regulations regarding managing mangrove ecosystems, such as prohibiting logging and other activities that negatively impact mangrove area. Rehabilitation and conservation activities are also necessary for mangrove species that grow quickly. The surrounding community must maintain mangrove and increase community participation in managing and utilizing the resources.

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