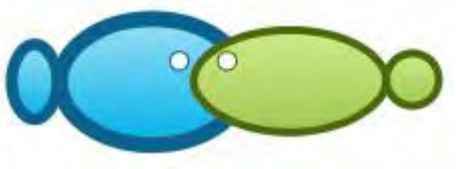

The potential of mangroves in supporting fisheries tourism in Banyak Island, Langkat Regency, Indonesia

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Abstract. This research examines the potential of mangrove ecosystems as fisheries-based ecotourism areas using an ecological approach. This research took place from October 2022 to October 2023 in Pulau Banyak Village, Langkat Regency, North Sumatra Province, Indonesia. Mangrove density data collection was carried out using the 10x10 m^2 quadrat transect method (20 transects), with a distance of 20 m between transects. Observation of aquatic biota was carried out around the mangrove area. It was observed that 10 species of mangroves live in the mangrove forest area of Pulau Banyak village, including: *Sonneratia alba, Avicennia marina, Rhizophora apiculata, Rhizophora mucronata, Bruguiera gymnorrhiza, Lumnitzera littorea, Acanthus ilicifolius, Acrostichum speciosum, Pemphis acidula*, and *Nypa fruticans*. The mangrove forest density condition was a high density, with 1520 ind ha^{-1}. Twelve species of aquatic biota inhabit this area, consisting of 5 species of fish (*Lates calcarifer, Eleutheronema tetradactylum, Chanos chanos, Megalops cyprinoides, Plotosus canius*), 3 species of shrimp (*Metapenaeus ensis, Penaeus monodon, Penaeus merguiensis*), 2 species of crabs (*Scylla serrata, Scylla tranquebarica*), and 2 species of bivalves (*Geloina erosa, Geloina expansa*). This shows that this location has the potential to become a fisheries-based tourism area.
Key Words: importance value index, species density, species richness.

Introduction. Mangrove forests play a crucial role in supporting fisheries by providing habitat for fish and crustaceans, acting as nursery areas for juvenile species, and being a good food source for other fauna (Saragih et al 2022; Wanjiru et al 2023; Bindiya et al 2023). The structural complexity of mangroves, such as dense root systems, provides refuge for juvenile fish from larger predators (Hamzah et al 2023). The presence and extent of adjacent seagrass habitats also interact with mangrove forest structures to shape the abundance and diversity of fish and crustaceans (Das et al 2022). Mangroves act as spawning grounds, foraging, and breeding grounds for fish, shrimp, and crabs, benefiting fishermen. Additionally, mangrove forests provide coastal communities with a major source of food, including finfish, shellfish, and other edible invertebrates, contributing to food security in the area (Saragih et al 2022; Wanjiru et al 2023; Bindiya et al 2023). Conservation and sustainable management of mangrove ecosystems are essential to maintain these important functions and support the livelihoods of coastal communities. One form of mangrove forest conservation in Indonesia is through the concept of ecotourism.

Mangrove ecotourism is the utilization of mangrove environments as sustainable tourism destinations. It involves the conservation and limited utilization of mangrove areas for economic, ecological, and social benefits (Abidin et al 2023). The potential for mangrove ecotourism is assessed based on factors such as mangrove thickness, density, species, biota, tides, and biodiversity (Rifdan et al 2023; Novarino et al 2023). The analysis of mangrove potential helps in identifying the attractions and strengths of a

particular mangrove ecotourism destination. The suitability of a mangrove area for ecotourism is determined by considering ecological, socio-economic, and institutional dimensions (Alsita et al 2023). The development of mangrove ecotourism requires strategies such as supporting mangrove conservation, providing infrastructure, promoting education about the benefits of mangroves, and increasing government commitment to mangrove development (Alsita et al 2023; Ningsih et al 2023). This research will examine the potential of mangrove ecosystems to be used as fisheries-based ecotourism areas using an ecological approach in Banyak Island, Langkat Regency, Indonesia.

Material and Method. The methodology employed in this study was the quadrat transect method. Data on mangroves were gathered by tallying both the quantity and species present in each sample plot, which measured 10x10 m^2 and were spaced 20 m apart (Figure 1).

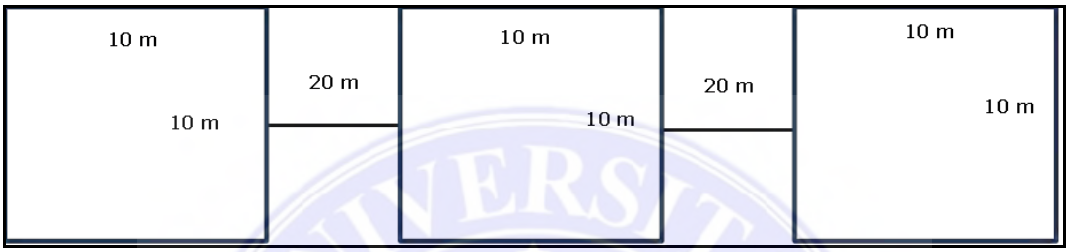

Figure 1. Mangrove observation transect layout.

Collection of data took place from October 2022 to October 2023 in the Banyak Island mangrove eco-tourism area, located in Langkat Regency, North Sumatra Province (Figure 2). Mangrove observations were carried out once a month. Following the installation of transects/plots, leaves, fruits, and roots of mangroves were gathered for each individual species to ascertain the composition of the mangrove community. Identification of mangrove species was carried out using a mangrove recognition guidebook (Noor et al 2006).

Figure 2. Research location.

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Data related to fisheries resources were also collected in this study. Data on the taxa of biota caught were determined by direct observation at the fish landing site, then interviews were conducted with fishermen to ensure that the fish caught were from the waters around the study area, and the species of fish caught were recorded and identified using as reference the Market Fishes of Indonesia (White et al 2013).

Data analysis. Mangrove data analysis was conducted to calculate species density, relative density, species frequency, relative frequency, species cover, relative cover, and importance index. All data were analyzed using formula proposed by English et al (1994) (Table 1).

Table 1

Determined indices (English et al 1994)

Data analysis	*Formula*
Species density (D_i)	N_i/A
Relative density (RD_i)	$N_i/\sum n*100\%$
Species frequency (F_i)	$P_i/\sum p$
Relative frequency (RF_i)	$F_i/\sum f*100\%$
Species cover (C_i)	$\sum BA/A$
Relative cover (RC_i)	$C_i/\sum C*100\%$
Importance Value Index (IVI)	$RD_i+RF_i+RC_i$

Note: D_i - density of the i-th species; N_i - total number of individuals of the i-th species; A - total sampling area; RD_i - relative density; $\sum n$ - total number of individuals; F_i - frequency of the i-th species; P_i - number of sampling plots created; $\sum p$ - total number of sampling plots created; RF_i - relative frequency; $\sum f$ - total frequency of all species; C_i - area of cover of the i-th species; BA - basal area of a species; RC_i - relative species cover; $\sum C$ - total area of cover of all species; IVI - importance value index.

Mangrove density criteria were determined based on the Decree of the Minister of Environment of the Republic of Indonesia No. 201 of 2004 (Table 2).

Table 2

Criteria for mangrove density

Criteria	*Density (ind ha^{-1})*
High	≥1500
Medium	≥1000, <1500
Low	<1000

Results and Discussion. Based on the results of observations, there were 10 species of mangroves identified living on the Banyak islands, Langkat Regency (Table 3). These results are similar to those of Hasan et al (2024), who found 9 species of mangroves living in the mangrove agro-ecotourism area Lubuk Kertang, Langkat Regency. Differences in mangrove species can be seen in Table 3.

Mangrove species that have been identified in northern Sumatra include *Acanthus ilicifolius, Rhizophora apiculata, Rhizophora mucronata, Avicennia marina, Avicennia alba, Avicennia officinalis, Soneratia caseolaris, Soneratia alba, Acrostichum aureum, Acrostichum speciosum*, *Bruguiera parviflora, Bruguiera gymnorhiza, Bruguiera cylindrica, Ceriops tagal, Nypa fruticans, Aegiceras corniculatum*, *Acanthus ilicifolius, Acrostichum sp,* and *Xylocarpus granatum* (Basyuni et al 2021; Nawar et al 2022; Purwoko et al 2023; Hasan et al 2024).

Table 3

Mangrove species in the Banyak Island mangrove ecotourism area, Langkat

Species	*Location 1*	*Location 2*	*Location 3*	*Hasan et al (2024)*
Sonneratia caseolaris	+	+	+	+
Avicennia marina	+	+	+	+
Rhizophora apiculata	+	+	+	+
Rhizophora stylosa	+	+	+	+
Bruguiera sexangula	+	+	+	+
Lumnitzera littorea	+	-	-	-
Acanthus ilicifolius	+	-	-	-
Acrostichum speciosum	+	-	+	-
Pemphis acidula	+	-	+	-
Nypa fruticans	+	+	+	+
Xylocarpus granatum	-	-	-	+
Ceriops tagal	-	-	-	+
Excoecaria agallocha	-	-	-	+

Note: (+) found; (-) not found.

The vegetation density value is 1520 individuals ha^{-1}, within the high-density category. The highest relative density (RD_i) value for *Rhizophora mucronata* is 18.55%, and the lowest RD_i was observed for is *Pemphis acidula*, with 4.93%. The highest relative frequency was observed for two species, *Rhizophora mucronata* and *R. apiculata*, with 19.57% each, while the lowest relative frequency was observed for *P. acidula*, and *Nypa fruticans*, with 2.17% each. Furthermore, the highest relative dominance value was observed for *R. apiculata*, 18.53% and the lowest for *P. acidula*, 2.67% (Table 4).

Table 4

Density, frequency, dominance, and importance value index of mangroves in Pulau Banyak ecotourism area, Langkat

Species	D_i	RD_i (%)	F_i	RF_i (%)	C_i	RC_i (%)	*IVI*
Sonneratia alba	234	15.39	0.8	17.39	0.0000162	17.44	50.23
Avicennia marina	147	9.67	0.6	13.04	0.0000130	13.94	36.65
Rhizophora apiculata	298	19.61	0.9	19.57	0.0000172	18.53	57.70
Rhizophora stylosa	282	18.55	0.9	19.57	0.0000164	17.62	55.74
Bruguiera sexangula	117	7.70	0.5	10.87	0.0000059	6.38	24.95
Lumnitzera littorea	89	5.86	0.2	4.35	0.0000036	3.86	14.06
Acanthus ilicifolius	97	6.38	0.2	4.35	0.0000045	4.81	15.54
Acrostichum speciosum	83	5.46	0.3	6.52	0.0000028	3.00	14.98
Pemphis acidula	75	4.93	0.1	2.17	0.0000025	2.67	9.78
Nypa fruticans	98	6.45	0.1	2.17	0.0000109	11.73	20.36
Total	1520	100.00	4.6	100.00	0.0000930	100.00	300.00

Note: D_i - density of the i-th species; RD_i - relative density; F_i - frequency of the i-th species; RF_i - relative frequency; C_i - area of cover of the i-th species; BA - basal area of a species; RC_i - relative species cover; IVI - importance value index.

The density of mangroves is influenced by various factors such as physical attributes of the coastal environment, including temperature, tidal range, and sediment supply (McKee 1993). Additionally, salinity gradients play a crucial role in shaping mangrove density, with different species exhibiting varying wood densities in response to levels of salinity (Ellison 2021). The distribution and resilience of mangrove forests can be impacted by climate change-induced changes in sea surface density, potentially altering propagule dispersal patterns and reducing forest resilience (Der Stocken et al 2022). Monitoring changes in mangrove canopy density can be achieved through remote sensing

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technology, with water pH identified as a significant parameter affecting mangrove density in specific regions (Virgulino-Junior et al 2020). Understanding these factors is essential for effective mangrove management and conservation efforts.

In addition to the presence of mangrove vegetation, the richness of biota species is also key in developing fisheries-based ecotourism areas. Biota richness is presented in Table 5. Twelve species of aquatic biota are known to live in the mangrove area of Pulau Banyak village in Langkat, including fish, mud crabs, crustaceans, and mollusks (Table 5).

Table 5

Species of aquatic biota found around the mangrove tourism site of Banyak Island village, Langkat

No	*Species*	*Local name*	*Common name*
1	*Scylla serrata*	Kepiting Bakau	Mud crab
2	*Scylla tranquebarica*	Kepiting Bakau	Mud crab
3	Lates calcarifer	Siakap	Barramundi
4	*Eleutheronema tetradactylum*	Ikan senangin	Fourfinger threadfin
5	*Chanos chanos*	Ikan Bandeng	Milk fish
6	*Megalops cyprinoides*	Terubuk padi	Tarpon
7	*Plotosus canius*	Ikan sembilang	Catfish
8	*Metapenaeus ensis*	Udang batu	Brown shrimp
9	*Penaeus monodon*	Udang tiger	Tiger prawn
10	*Penaeus merguiensis*	Udang putih	White prawn
11	*Geloina erosa*	Lokan	Mud shell
12	*Geloina expansa*	Lokan	Mud shell

The diverse fauna in mangrove areas contributes to the ecosystem's richness and productivity (Rajpar & Zakaria 2014). Furthermore, according to Dewiyanti & Sofyatuddin (2012), the bivalve and gastropod species found in mangrove areas include Cerithidae, Isognomonidae, Potamididae, and others, contributing to the diversity and abundance of the ecosystem. Mollusks, specifically gastropods and bivalves, are common biota found in mangrove areas, serving various ecological roles such as detritus consumption and habitat provision (Rifanjani et al 2022).

Conclusions. The condition of the mangrove ecosystem in Pulau Banyak village, Langkat Regency, Indonesia, is very good, with a density of >1500 ind ha^{-1}, as well as IVI values that exceed 50% for *R. stylosa, R. apiculata*, and *Sonneratia alba*. Twelve species of economically valuable aquatic biota living in this ecosystem increase the potential of this area to be used as a fisheries-based ecotourism area.

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Conflict of Interest. The authors declare that there is no conflict of interest.

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Tourism Suitability Index of The Mangrove Area of Pulau Banyak Village, Langkat, North Sumatra: An Ecological Approach

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Abstract

This study aims to obtain data on the suitability of ecotourism areas based on ecological parameters. The parameters observed were mangrove density & thickness, tidal height, mangrove species diversity, and the types of biota that live in it. To calculate mangrove density, the quadratic transect method was used with a size of 10 x 10 m as many as 20 plot pieces. While mangrove thickness is calculated by measuring the outer distance of mangroves towards the mainland. Furthermore, the parameters of biota diversity were carried out by direct observation techniques at the research site. The results of the analysis showed a mangrove thickness of 197.37 metres with a density of 1,520 individuals / ha. There are 10 mangrove species including Sonneratia alba, Avicennia marina, Rhizophora apiculate, R. mucronate, Bruguiera gymnorrhiza, Lumnitzera littorea, Acanthus ilicifolius, Acrostichum speciosum, Pemphis acidula, Nypa fruticans. The average tide height is 1.24 m and 20 species of biota consisting of 3 bivalve species, 1 Gastropoda, 6 fish, 6 birds, 2 shrimps, and 2 crabs. The results of the tourism suitability analysis showed 91% with a very suitable category

Keywords: *Banyak island; Ecological approach; Mangrove ecotourism; Suitability Index*

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INTRODUCTION

Mangrove ecotourism refers to the sustainable utilization of mangrove ecosystems for tourism purposes, combining ecological preservation, economic benefits, and community involvement (Farid et al., 2023; Ginantra, 2023; Novianti et al., 2022; Rifdan et al., 2023; Tjahjono et al., 2022). These ecosystems, rich in diverse flora and fauna, serve as unique attractions for ecotourism, scientific education, and community engagement in conservation efforts (Rifdan et al., 2023). The development of mangrove ecotourism

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involves principles of preservation, protection, and sustainable use, aiming to balance economic gains with environmental conservation (Farid et al., 2023; Ginantra, 2023). Strategies for successful mangrove ecotourism include enhancing infrastructure, promoting intensively, implementing special policies, integrating with local culture, and empowering local communities (Novianti et al., 2022). Sustainable mangrove ecotourism not only benefits the economy but also contributes to ecological preservation and community well-being (Tjahjono et al., 2022). The development of mangrove ecotourism areas cannot be separated from the condition of the ecosystem itself.

The mangrove condition in North Sumatra, particularly in areas like Medan City, Lubuk Kertang Village, and Pantai Labu Subdistrict, faces various challenges and restoration efforts. Studies highlight significant changes in mangrove cover over the years, emphasizing the importance of integrated approaches involving remote sensing, GIS, and AHP (Rahmawaty et al., 2023). Additionally, mangrove rehabilitation efforts through planting propagules and seedlings have shown promising results in terms of survival rates and carbon storage, contributing to ecosystem restoration (Amelia et al., 2023). Evaluating mangrove functionality through macrozoobenthic communities has been proposed as a practical indicator for restoration success, with community assemblages reflecting different management conditions in North Sumatra and Aceh (Basyuni et al., 2022). Furthermore, assessments of water quality and sediment fractions in mangrove areas around North Aceh reveal varying conditions, with some areas showing heavy metal pollution concerns (Harifia et al., 2022). Physical factors like slope, soil, water, tides, and climate play crucial roles in the growth and development of mangroves in the Coastal area of Pantai Labu Subdistrict (Yuniastuti et al., 2019).

Various research related to the development of mangrove ecotourism areas in North Sumatra have been published including (Harahap & Absah, 2022). The research on mangrove ecotourism at Sei Nagalawan Village, North Sumatra, highlights economic, ecological, and social benefits for the community through tourism activities, income generation, and environmental conservation efforts. Ambarita et al., (2018) the research focuses on landscape planning and economic valuation of mangrove ecotourism in North Sumatra, Indonesia, emphasizing spatial planning, economic value assessment, and community benefits. Furthermore (Basyuni et al., 2022) developing community-based mangrove management through eco-tourism in North Sumatra, Indonesia, focusing on enhancing mangrove ecotourism in Langkat and Serdang Bedagai, emphasizing biodiversity, suitability, carrying capacity, and SWOT analysis. However, no publications have been found on the suitability of mangrove ecotourism areas from Pulau Banyak village, Langkat Regency. This research will focus on assessing the suitability of mangrove ecotourism areas based on physical and biological parameters.

METHOD

This research was conducted in Pulau Banyak village, Langkat district, North Sumatra province (Figure 1) from October 2022 to September 2023. Biological parameters observed included the types of aquatic and terrestrial biota, and mangrove density, while physical parameters were tidal height. Mangrove density measurements using the quadratic transect method. 10 x 10 meters transects were made of as many as 20 pieces

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with a distance of 20 meters between transects (Figure 2). Data on mangrove species were taken using the cruising survey method carried out in each transect, where each mangrove species was identified, recorded, and grouped according to its type (Tuwongkesong et al., 2018; Suwardi, 2013). Mangrove trees were identified based on the types of roots, stems, flowers, and fruits using Noor et al., (2006) the handbook of Mangrove Recognition in Indonesia. Mangrove thickness is measured based on the distance from the shoreline to the final limit of mangroves found towards the mainland.

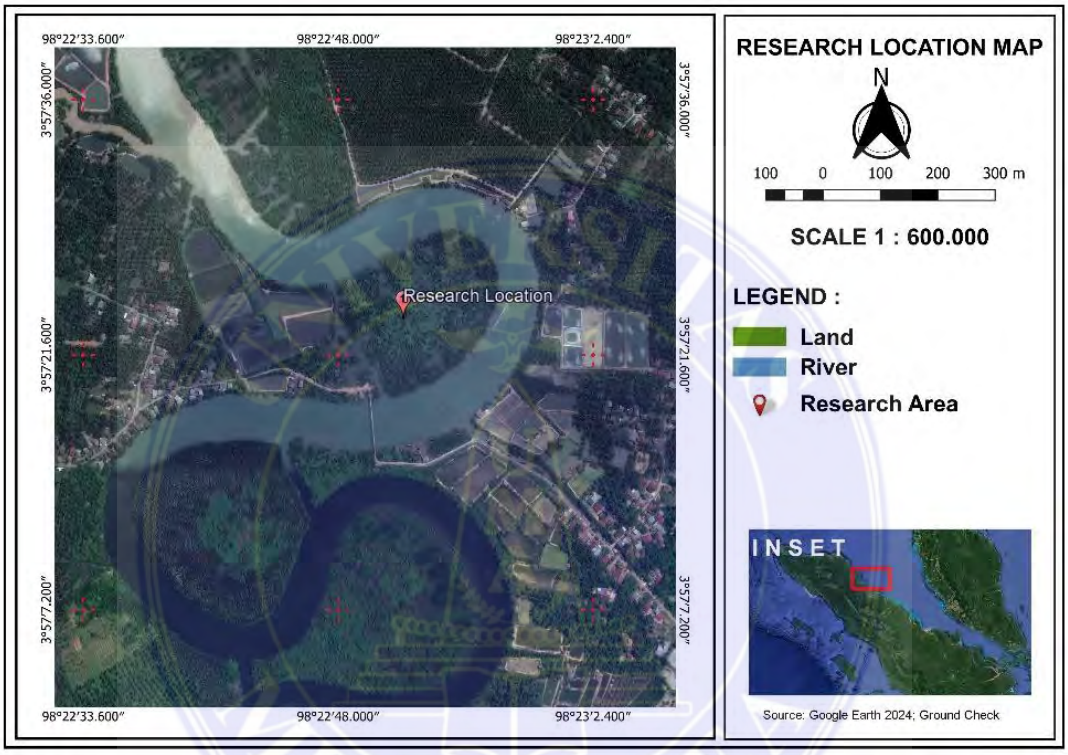

Figure 1. Research location Map

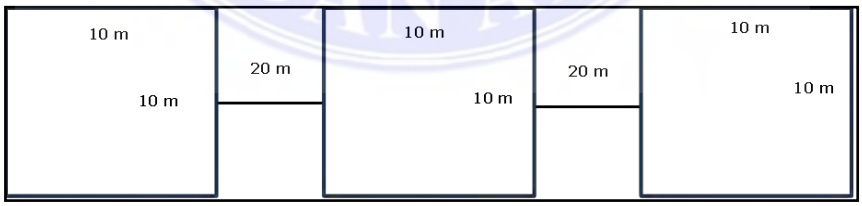

Figure 2. Illustration of quadratic transects

Mangrove biota was observed visually during the study, in addition, fish species were observed based on the catch of fishermen around the study site. Furthermore, physical data form of high tides were obtained from the meteorological and geophysical agency, (BMKG) Medan Station. The overall biology and physical data that has been collected will be used in the ecotourism suitability index analysis.

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Data Analysis

Mangrove density was calculated using the formula by (English et al., 1994) :

$$Di=\frac{Ni}{A} \quad (1)$$

Where :
Di = density of the i-th species
Ni = total number of individuals of the i-th species
A = total sampling area

The ecotourism suitability index was calculated using the formula (Yulianda, 2007)

$$IKW=\sum\left[\frac{N_i}{N_{Max}}\right] x\ 100\% \quad (2)$$

Where :
IKW = Tourism Suitability Index
N_i = The value of the i-th parameter (Weight x Score)
N_{max} = Maximum score (4)

The value of the tourism suitability index obtained is then adjusted to the following categories (Yulianda, 2007):
S1 = Very Suitable, with IKW > 75-100%
S2 = Suitable, with IKW> 50-75%
S3 = Conditionally Suitable, with a value of > 25-50%
N = Not Suitable, with a score > 25%

Assessment of the level of suitability of mangroves is done by using a matrix of the suitability of the area for the coastal tourism mangrove tourism category. Assessment is done based on weighting and the value indicated by the magnitude of the score, which is then done by combining several variables of the difference in value between classes to determine the classification of the suitability of mangrove areas in Pulau Banyak Village, Langkat Regency.

Table 1. Suitability matrix of mangrove tourism

Parameter	Bobot	Category	Skor
Mangrove thickness (m)	0.380	>500	3
		>200-500	2
		50-200	1
		<50	0
Mangrove density ($100m^2$)	0.250	>15-20	3
		>10-15; >20	2
		10-15	1
		<5	0
Mangrove species	0.150	>5	3
		3-5	2
		2-1	1
		0	0
Low tides (m)	0.120	0-1	3
		>1-2	2
		>2-5	1

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Parameter	Bobot	Category	Skor
		>5	0
Biota objects	0.100	Fish, shrimp, crabs, mollusks, reptiles, birds and typical/endemic/rare animals	3
		Fish, shrimp, crabs, mollusks	2
		Fish, mollusks	1
		One of the aquatic biota	0

RESULTS AND DISCUSSION

Mangrove Thickness

Mangrove thickness is measured based on the distance from the shoreline to the final limit of mangroves found towards the mainland. measurement results known as mangrove thickness at the location of this study is 197.37 meters. The results of this study are not much different from the results of research from Tuwongkesong et al., (2018), which was conducted in Tongkaina Village, Bunaken District, Manado City with an average mangrove thickness of 138.65 meters. Furthermore, Tambunan et al., (2023) obtained an average mangrove thickness of 143.3 meters in Budo Village, North Minahasa Regency.

Mangrove Density and Species

There are 10 species of mangroves that live in Pulau Banyak Village, Langkat Regency, North Sumatra. Mangrove density at the research site was known to be 1520 ind/ha or 15.2 ind/100 m^2, with the densest species being *R. apiculata* (298 ind/ha), and *R. mucronata* (282 ind/ha) (Table 2). These results are not much different from those obtained by Hasan et al., (2024) in the Lubuk Kertang ecotourism area, Langkat Regency with the densest type of *R. apiculata* 431 ind/ha.

Table 2. Density Mangrove species in the Banyak Island, Langkat Regency, Indonesia

Species	Density (Ind/Ha)
Sonneratia alba	234
Avicennia marina	147
Rhizophora apiculata	298
Rhizophora mucronata	282
Bruguiera gymnorrhiza	117
Lumnitzera littorea	89
Acanthus ilicifolius	97
Acrostichum speciosum	83
Pemphis Acidula	75
Nypa fruticans	98
Total	**1520**
Density/100 m^2	**15.2**

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Physical factors like temperature, coastal typology, sediment supply, and tidal range influence mangrove density. Human impacts, climate change, and sea level rise can reduce mangrove resilience (Ellison, 2021). Some of the impacts of human activities in the study area include waste generation, illegal logging, and conversion of mangrove land into ponds. Salinity gradient influences wood density in mangrove trees, varying among species, diameter classes, and saline zones, impacting growth strategies and carbon assimilation in response to environmental conditions (Virgulino-Júnior et al., 2020). Furthermore Samsi et al., (2018) Environmental factors and human activities influence mangrove density. Competition for space and nutrients among species also impacts density levels in mangrove ecosystems.

Tides high

The height of the tide was measured 1 time in 1 month during the 12 months of the study. The height of the tide was obtained by subtracting the value of the highest tide minus the lowest tide, so that the average tide in 1 year was 1.24 meters (table 3). This result is not much different from the research Tambunan et al., (2023) in Manado Bay with an average tidal height of 2 meters.

Table 3. Average of low tides in Banyak Island Mangrove ecotourism area during the research conduct

Month	High Tides/HT (m)	Low Tides/LT (m)	(HT-LT)
October 2022	1.87	0.8	1.07
November 2022	1.73	0.89	0.84
December 2022	1.7	1.02	0.68
January 2023	1.7	0.87	0.83
February 2023	1.75	0.8	0.95
March 2023	1.8	0.65	1.15
April 2023	1.91	0.49	1.42
May 2023	1.88	0.43	1.45
June 2023	1.91	0.35	1.56
July 2023	2	0.37	1.63
August 2023	2.03	0.34	1.69
September 2023	2	0.37	1.63
	Average		**1.24**

Muhidin et al., (2020) stated that tidal events in every region on the earth's surface are not always the same, this is thought to be due to differences in the attractive forces of the moon and sun in each region depending on the condition of the underwater form. Tides are one of the physical factors that can affect mangrove ecosystems. Estimates of high and low tidal parameters are needed for tracking activities to take place properly. Masud et al., (2020) stated that mangrove ecosystems will be more difficult to access for tourists if high tides are occurring, but are useful for activities outside tracking such as photography activities otherwise, if the tide recedes tracking activities become easier.

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Object of biota

Biota observed in the mangrove ecosystem area of the Banyak island village comes from groups of crustaceans, fish, birds, crabs, and mollusks (Table 4). The existence of associated biota objects in mangrove ecosystems can be enjoyed directly to provide satisfaction for tourists and become an added value in the mangrove ecosystem area (Sadik et al., 2017). According to Nugroho et al., (2019), flora and fauna in mangrove forests are a combination of two groups, namely: (1) Fauna groups living on land (land and air); (2) Aquatic biota consisting of two types, namely: species that live in water, such as fish and shrimp, and species that live in hard substrates (mangrove tree roots and trunks) and soft (mud), especially crabs, crustaceans, and many other species.

Table 4. Biota object in the mangrove area of Banyak Island village, Langkat Regency

Group	Species	Common Name
Bivalva	*Geloina erosa*	Mud Shells
	Geloina expansa	Mud Shells
	Glauconome virens	Razor Clam
Gastropoda	*Telescopium telescopium*	Mangrove snails
Pisces	*Mugil sp*	Flathead grey mullet
	Lates calcaliver	Barramundi
	Megalops cyprinoides	Indo-Pacific Tarpon
	Eleutheronema tetradactylum	Fourfinger threadfin
	Chanos chanos	Milkfish
	Plotosus canius	Gray eel-catfish
Aves	*Tringa glareola*	Wood Sandpiper
	Centropus sinensis	Greater Coucal
	Streptopellia chinensis	Spotted dove
	Leptoptilos javanicus	Lesser Adjutant
	Corvus enca unicolor	Corvus unicolor
Crustacean	*Penaeus monodon*	Tiger Prawn
	Penaeus merguensis	White Prawn
	Metapenaeus ensis	Brown Shrimp
Arthropoda	*Scylla serrata*	Mud Crab
	Scylla tranqueberica	Mud Crab

Tourism Suitability Index

Based on the results of the suitability analysis, it is known that the mangrove area of Pulau Banyak village in Langkat district is very suitable for tourist sites with a suitability value of 91% (table 5). Other research conducted by Tambunan et al., (2023) shows that the value of suitability for mangrove ecosystems in the coastal areas of Budo Village is 54.6%, with the appropriate category. Furthermore, Tuwongkesong et al., (2018), obtained the suitability index value of mangrove ecosystems on the coast of Tongkaina Village, Bunaken District, Manado City, which is 51.2% with the appropriate category. According to Pratiwi & Muhsoni (2021) this suitability index can be increased in various ways 1) by replanting pre-existing species; 2) by increasing the

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level of mangrove density through mangrove rehabilitation activities; 3) by maintaining the existence of existing associated biota objects; 4) by improving accessibility, such as road improvements to ecotourism sites; and 5) limiting the number of visitors. Meanwhile, for the mangrove area of Pulau Banyak village in Langkat Regency with a very suitable category, only monitoring efforts are needed so that there is no decrease in the index value. Iswahyudi et al., (2019) mention that the Monitoring efforts are very important to support ecotourism activities and support the role of mangrove ecosystems ecologically

Table 5. Suitability Index for Mangrove ecoyourism base on various parameters

Parameter	Bobot	Category	Skor	Result	Bobot x Skor	Ni/ Nmax
Mangrove Thicknes (m)	0.38	> 500	3			
		>200-500	2			
		50-200	1			
		<50	0	50-200	0.38	0.13
Mangrove density ($100m^2$)	0.25	>15-20	3			
		>10-15; >20	2			
		10 s/d 15	1			
		<5	0	>15-20	0.75	0.33
Mangrove Species	0.15	>5	3			
		3 s/d 5	2			
		2 s/d 1	1			
		0	0	>5	0.45	0.20
Low Tides	0.12	0 sd 1	3			
		>1-2	2			
		>2-5	1			
		>5	0	>1-2	0.24	0.12
Biota Object	0.1	Fish, Shrimp, Crab, Mollusk, reptile, Bird and Unic biota/endemic/rare	3	Fish, Shrimp, Crab, Mollusk, reptile, Bird		
		Fish, Shrimp, Crab, Mollusk	2			
		Fish, Mollusk	1			
		One of waters biota	0		0.3	0.13
		∑			2.12	0.91
		Tourism Suitability Index				91%
		Suitability category				**Very Suitable**

CONCLUSION

The mangrove ecosystem area of Pulau Banyak village, Langkat Regency is very suitable to be used as a mangrove ecotourism area, this is because all the key parameters of mangrove ecotourism are in good condition.

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MACROZOOBENTHOS DIVERSITY IN THE FISHERIES MANGROVE ECOTOURISM AREA IN PULAU BANYAK VILLAGE LANGKAT DISTRICT

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ABSTRACT: Mangroves are important ecosystems located in tidal areas and become habitats for various types of biota, including macrozobenthos. Macrozobenthos is a group of animals that inhabit the bottom waters of mangrove ecosystems. This study aims to analyze the diversity of macrozobenthos species in the mangrove ecotourism area of Pulau Banyak village, Langkat Regency, North Sumatra. This research was conducted from October 2022 to October 2023 in the fisheries-based mangrove ecotourism area in Pulau Bayak village, Langkat Regency. The research location was divided into three research stations. Macrozobentos observations were made once a month. Sample collection is done by collecting directly by hand, the samples collected are on the sample map (plot) measuring 1 x 1 meter making as many as 10 pieces for every 100 m2. Data were analyzed using the Paleontological Statistic (PAST) Version 4.0 tool. Parameters studied include diversity index, evenness, species richness, and dominance. Based on the results of the analysis, it is known that the diversity index is in the medium category with a value of 2.4-2.5, while the evenness index is in the high category with a value of 0.91 - 0.92, then the species richness index is in a low category with a value of 2.20 - 2.22 and the dominance index shows that there are no certain species that dominate this ecosystem with an index value close to 0. Thus, it can be concluded that this fisheries-based mangrove ecotourism area is in good condition and can support the lives of organisations associated with mangrove ecosystems.
Keywords: macrozoobenthos, ecotourism, mangrove ecosystem, diversity, dominance.

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INTRODUCTION

Mangrove forests, found along coastlines and river mouths, are characterized by dense vegetation like *Rhizophora apiculata* and *Xylocarpus granatum*, providing essential habitats for macrozoobenthos and serving as feeding, nursery, and spawning grounds for various fauna (Kresnasari et al. 2022; Sari et al. 2022). Macrozoobenthos are organisms that inhabit the bottom of water bodies, including mangrove ecosystems, where they play crucial roles in nutrient cycling and ecosystem health (Destiana et al., 2022; Kresnasari et al., 2022; Saragih et al., 2024; Sari et al., 2022). These organisms, such as gastropods and bivalves, interact with

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their environment in complex ways, serving as bioindicators of habitat quality and responding to environmental changes (Destiana et al., 2022; Sari et al., 2022).

The abundance and diversity of macrozoobenthos in mangrove ecosystems are influenced by environmental factors like water quality, sedimentation, and food availability, making them valuable indicators of ecosystem health and functioning (Kresnasari et al., 2022; Saragih et al., 2024). Macrozoobenthos in mangrove forests play crucial ecological roles by contributing to the decomposition process of mangrove plant litter (Kresnasari et al., 2022), enhancing energy flow and nutrient cycling (Peng et al., 2023), and maintaining the health and functioning of the ecosystem (Checon et al., 2023). These organisms, which include a diverse array of species living in the muddy sediments and among mangrove roots, help stabilize the habitat by their presence and activities (Checon et al., 2023).

Factors influencing macrozoobenthos diversity in mangrove forests include mangrove density, stand age, habitat degradation, and management conditions. Research indicates a correlation between mangrove density and macrozoobenthos density, with a negative relationship observed (Tony et al., 2024). Stand age of mangroves also plays a role, as macrobenthos abundance increases with mangrove stand age, while diversity indices may show negative correlations (Wang et al. 2018). Habitat degradation poses a threat to macrozoobenthos diversity, with decreasing abundance and potential extinction risks in degraded ecosystems (Lismarita et al., 2022). Additionally, the community assemblage of macrozoobenthos is associated with mangrove management conditions, with significant differences observed between planted and natural mangroves, highlighting the importance of restoration efforts in maintaining diverse macrozoobenthic communities (Basyuni et al., 2022; Pan et al., 2021).

Macrozoobenthos in mangrove forests hold significant economic value through their role in supporting ecosystem services. Studies in various locations such as Brebes Regency, Central Java (Sinaga et al., 2019), North Sumatra (Basyuni et al., 2018), and Dumai waters (Sari et al., 2022) have highlighted the abundance and diversity of macrozoobenthos, including gastropods and bivalves. These organisms contribute to the ecological balance, indicating the health of the mangrove ecosystem. The relationship between macrozoobenthos abundance and mangrove density has been emphasized, showing a strong correlation (Nihan et al., 2022). Furthermore, the habitat characteristics that support macrozoobenthos life, such as salinity, temperature, and dissolved oxygen, have been identified as crucial factors (Basyuni et al., 2018). Overall, the economic value of macrozoobenthos in mangrove forests lies in their contribution to biodiversity, nutrient cycling, and supporting local fisheries, which highlights the importance of conserving these ecosystems to obtain sustainable economic benefits. the condition of the mangrove forest of Pulau Banyak village which is overgrown with various types of mangrove species makes this area rich in nutrients that can be utilised by various other organisms for their lives. Thus, it is necessary to conduct research that can provide information related to the diversity of macrozoobenthos species in this area so that it can be used as a basis for future development and protection of mangrove forests.

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METHOD

This study was conducted in a fisheries-based mangrove ecotourism area in Pulau Banyak village, Langkat Regency, North Sumatra Province (Figure 1). Markozoobenthos sampling was conducted in May-July 2023 where observations were made once a month. Markozoobenthos samples were collected using the quadrat method by making a 1 x 1-meter plot with 15 replicates (Figure 2). Samples that have been collected are then washed until clean and put into plastic for identification. Identification of macrozoobenthos species refers to (Abbott & Dance, 2000; Charpenter & Niem, 1998).

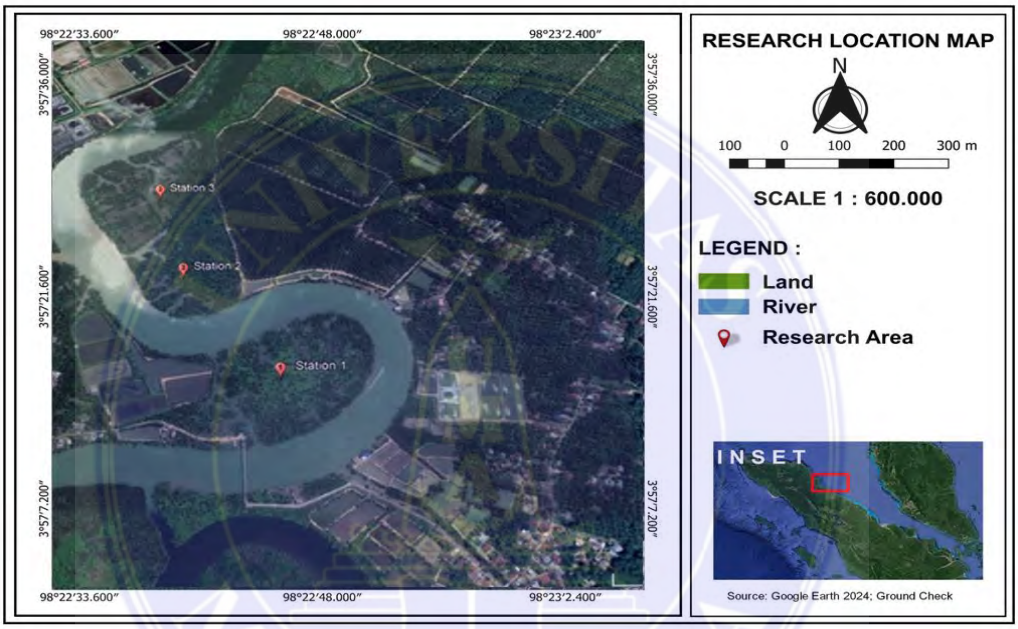

Figure 1. Map Research Location

Research data analysis was carried out using several analysis techniques as follows:

Diversity Index (H')

The calculation of the diversity index is based on the Shannon - Wienner index (Krebs, 1989).

$$H' = -\sum_{i=1}^{s} (pi \ln pi) \qquad (1)$$

Where:
H' = Shannon-Wiener diversity index
S = Number of species
Pi = Number of individuals of each type (i=1,2,3...)
With H' values:
0<H'<2,3,02 = low diversity
2,302<H'<6,907 = moderate diversity
H'>6,907 = high diversity

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Evennes Index (E)

The species evenness index refers to the Pielow evenness indices formula (Ludwigs & Reynolds, 1988) namely:

$$E=H' \ln S \quad (2)$$

Where:
E = (Evennes Index)
H' = (Diversity Index Shannon-Wienner)
S = (Total of species)
With E values:
$0.00 < E \leq 0.30$ = Low
$0.30 < E \leq 0.60$ = Moderate
$E > 0.60$ = High

Margalef Index (R_1)

The species richness index uses the Margalef formula (Magurran, 1988) namely:

$$R_1=\frac{(S-1)}{(\ln(N)} \quad (3)$$

Where:
R_1 = Margalef Index
S = Number of species
N = Total number of individuals observed
Ln = Natural logarithm
With criteria:
Dmg < 3.5 = then the species richness is low,
3.5 < Dmg < 5 = then species richness is medium and
Dmg > 5 = then high species richness

Dominance Index (C)

The dominance index is used to obtain information about the dominating species in a community. The formula is as follows (Odum & Barrett, 2005):

$$C=\sum_{i=1}^{s}\left(\frac{ni}{n}\right)^2 \quad (4)$$

Where :
C = Index of dominance
Ni = value of each species (number of i-th individual)
N = total value of all species (total number of individuals that have been found)

The dominance index value ranges from 0-1. An index of 1 indicates that dominance by one species is very high (only one species is at a station). An index of 0 means that none of the species found dominate.

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RESULT AND DISCUSSION

The results of the identification of macrozoobenthos species in the mangrove fisheries ecotourism area in Pulau Banyak village, Langkat district known there are 14 species consisting of 3 classes namely Bivalvia, gastropods, and malacostraca as presented in Table 1.

Table 1. Macrozoobenthos Species Caught at The Research Site

Class	Species	ST1	ST2	ST3	IUCN Status
Bivalva	*Pharella acutidens*	+	+	+	No data
	Galuconome virens	+	+	+	No data
	Geloina erosa	+	+	+	No data
	Geloina expansa	+	+	+	No data
Gastropoda	*Telescopium telescopium*	+	+	+	Least concern
	Telebralia sulcata	+	+	+	No data
	Neritina turrita	+	+	+	Least concern
	Neritina semonica	+	+	+	No data
	Faunus ater	+	+	+	Least concern
	Cassidula aurisfelis	+	+	+	Least concern
	Cassidula nucleus	+	+	+	No data
Malacostraca	*Scylla serrata*	+	+	+	No data
	Uca forcipata	+	+	+	No data
	Uca vocans	+	+	+	No data

*Note : ST = Sampling station; (+) = Found

Based on Shannon Wiener analysis, it is known that the value of H' ranges from 2.545 to 2.552 in the medium category as presented in Table 2.

Table 2. The Value of The Diversity Index (H') at Each Research Station

Sampling site	H'	Category
1	2.545	Moderate
2	2.552	Moderate
3	2.552	Moderate

The diversity index of macrozoobenthos in mangrove ecosystems varies across different locations and seasons, reflecting the dynamic nature of these habitats. Studies in various regions such as Bagan Asahan Village (Saragih et al., 2024), Lawas, Sarawak (Al-Asif et al., 2023), East Java (Retnaningdyah et al., 2023), Mempawah regency (Destiana et al., 2022), and Aceh Singkil (Octavina et al., 2018) have shown moderate to high diversity indices ranging from 1.49 to 4.37. The diversity of macrobentos in mangrove ecosystems is influenced by various environmental factors, including seasonal variations, habitat degradation, and ecological conditions. Research indicates that macrozoobenthos diversity is affected by the physical, chemical, and biological properties of water, with studies showing moderate diversity indices in different mangrove areas, suggesting stable yet vulnerable ecosystems (Destiana et al., 2022; Saragih et al., 2024). Seasonal changes significantly impact macro-benthos density and diversity, with higher abundance observed post-monsoon due to stable sediment conditions and increased

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food availability, while monsoon periods lead to erosion and higher turbidity, negatively affecting diversity (Khatun et al., 2023). Additionally, habitat degradation poses a threat to macrozoobenthos, potentially leading to decreased abundance and extinction risks (Lismarita et al., 2022).

The value of the evenness index is 0.91-0.92, the species richness index is 2.20-2.22, and the dominance index is 0.083-0.085 as presented in Table 3.

Table 3. Value of Evennes Index, Margalef Index, and Dominance index

Index	Research Station			Category
	1	2	3	
Evannes	0.91	0.91	0.92	high
Margalef	2.21	2.22	2.20	low
Dominance	0.085	0.083	0.083	no one dominates

The type richness index, evenness, and dominance of macrozoobenthos in mangrove ecosystems exhibit significant variability influenced by environmental conditions. In Bagan Asahan Village, macrozoobenthos diversity was classified as moderate (H' = 1.54-2.01), with a stable evenness index (E = 0.76-0.99) and low dominance (C = 0.14-0.31) (Saragih et al. 2024). In contrast, a study in a sub-tropical mangrove estuary revealed a higher density of macro-benthos post-monsoon, with significant seasonal variations in diversity indices, indicating that environmental factors like sediment stability and food availability play crucial roles (Khatun et al. 2023). Additionally, research in Totobo Village found a high diversity index (H' = 3.07) and low dominance (C = 0.01), suggesting a balanced ecosystem (Purnama et al. 2024). These findings highlight the complex interplay between ecological factors and macrozoobenthos community structure, emphasizing the need for ongoing monitoring to understand these dynamics better (Ramadhani et al., 2023; Sari et al., 2022).

The value of the type richness index, evenness, and dominance of macrozoobenthos in mangrove ecosystems is influenced by several interrelated factors. Environmental conditions, such as water quality, sediment characteristics, and food availability, play a crucial role. For instance, studies indicate that macrozoobenthos abundance is significantly affected by total suspended solids (TSS), which relate to food availability, and the overall quality of water and soil, which must meet marine life standards (Kresnasari et al., 2022). Additionally, seasonal variations impact macrozoobenthos diversity and abundance, with higher densities observed post-monsoon due to stable bottom conditions and increased food availability (Khatun et al., 2023). The community structure also varies between rehabilitated and non-rehabilitated mangrove areas, affecting species richness and abundance (Dewiyanti et al., 2021). Overall, these findings suggest that both abiotic factors and habitat management practices are critical in shaping macrozoobenthos community dynamics in mangrove ecosystems (Dewiyanti et al., 2021; Khatun et al., 2023; Saragih et al., 2024).

CONCLUSSION

Based on the research results, it can be concluded that the condition of the mangrove ecosystem in the fisheries-based mangrove ecotourism area is good and balanced, and can support the life of the association organisms in it.

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RECOMENDATION

Further research related to mangrove biota diversity needs to be carried out in other areas, in an effort to develop mangrove ecotourism areas in North Sumatra.

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Analisis Valuasi Ekonomi Hutan Mangrove Sebagai Dasar Pengembangan Kawasan Ekowisata

Economic Valuation Analysis of Mangrove Forest as a Basis for Development Ecotourism Area

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ABSTRAK

Penelitian ini dilakukan selama 2 bulan sejak Juni – Juli 2023 di desa Pulau Banyak, Kabupaten Langkat, Propinsi Sumatra Utara. Tujuan penelitian ini untuk melakukan analisis valuasi ekonomi dari ekosistem mangrove yang nantinya dapat dijadikan sebagai dasar pengembangan kawasan ekowisata. Penelitian ini dilakukan dengan metode survey dan pengumpulan data dilakukan teknik wawancara terhadap masyarakat desa Pulau Banyak baik yang berinteraksi langsung maupun tidak langsung dengan ekosistem mangrove. Jumlah responden dalam penelitian ini adalah 91 orang responden. Hasil penelitian menunjukkan bahwa sebanyak 72% responden berprofesi sebagai nelayan. Hasil analisis valuasi ekonomi menunjukkan bahwa nilai manfaat langsung hutan bakau di desa Pulau Banyak sebesar Rp372,240,000.00 per tahun, nilai manfaat tidak langsung sebesar Rp242,939,008.00 per tahun. Manfaat pilihan sebesar Rp23,787,891.75 per tahun dan manfaat keberadaan dari hutan mangrove ini sebesar Rp3,986,797.5 per tahun. Nilai ekonomi total dari ekosistem mangrove desa Pulau Banyak Kabupaten Langkat sebesar Rp642,953,697.25 per tahun. Dengan kondisi ini hutan mangrove desa Pulau Banyak Kabupaten Langkat dapat dikembangkan sebagai kawasan ekowisata.

Kata kunci: valuasi ekonomi, ekonomi mangrove, manfaat langsung, ekonomi total

ABSTRACT

This research was conducted for 2 months from June to July 2023 in Pulau Banyak village, Langkat Regency, North Sumatra Province. This research aims to analyze the economic valuation of mangrove ecosystems, which can later be used as the basis for the development of ecotourism areas. This research was conducted using a survey method and data collection was carried out by interviewing the community of Pulau Banyak village both directly and indirectly interacting with the mangrove ecosystem. The number of respondents in this study was 91. The results showed that 72% of respondents worked as fishermen. The results of the economic valuation analysis show that the direct benefit value of mangrove forests in Pulau Banyak village is Rp372,240,000.00 per year, the indirect benefit value is Rp242,939,008.00 per year. Optional benefits of Rp23,787,891.75 per year and the benefits of this mangrove forest of Rp3,986,797.5 per year. The total economic value of the mangrove ecosystem of Pulau Banyak village, Langkat Regency is Rp642,953,697.25 per year. With this condition, the mangrove forest of Pulau Banyak village, Langkat Regency can be developed as an ecotourism area.

Keywords: *Economic Valuation*, *mangrove economic, direct value, total economic*

PENDAHULUAN

Hutan bakau adalah hutan intertidal yang terletak di sepanjang garis pantai dan muara sungai, yang tumbuh subur di lingkungan yang bergaram. Hutan bakau terdiri dari berbagai spesies, seperti *Rhizophora* dan *Avicennia*, yang beradaptasi dengan pasang surut air laut dan tingkat salinitas yang berfluktuasi (Sitio et al. 2023). Hutan bakau memiliki fungsi ekologis penting yaitu menstabilkan garis pantai, mengurangi erosi, dan mengurangi dampak badai dengan memecah energi gelombang (Weaver & Stehno 2024). Mangrove juga berfungsi sebagai tempat berkembang biak bagi ikan, kepiting, dan biota laut lainnya, yang mendukung keanekaragaman hayati dan perikanan lokal (Hamzah et al. 2023). Bakau menyerap CO2 dalam jumlah yang signifikan, berkontribusi pada pengaturan iklim dan mengurangi emisi gas rumah kaca (Hamzah et al. 2023). Selain fungsi ekologis hutan bakau juga memiliki fungsi ekonomi.

Hutan bakau memberikan manfaat ekonomi yang signifikan melalui layanan ekosistemnya yang beragam, yang mencakup penggunaan langsung dan tidak langsung (Aye et al. 2019; Ferreira et al. 2022; Widayanti et al. 2023). Manfaat ekonomi langsung berkaitan dengan fungsi mangrove sebagai habitat vital bagi berbagai spesies ikan, yang akan berkontribusi pada hasil produksi perikanan lokal. Menurut Tamsir et al., (2022) Desa Sarawet memperoleh manfaat langsung sekitar Rp 959,494,000 juta per tahun dari sektor perikanan, Selain itu produk kayu dan non kayu yang dihasilkan hutan mangrove mencapai Rp. 4,247,500 juta per tahun. Sementara itu manfaat tidak langsung sebagai penahan abrasi mencapai Rp. 5,920,272,678 per tahun. Meskipun memiliki fungsi ekologis dan ekonomis penting namun hutan bakau rentan terhadap ancaman konversi lahan, oleh sebab itu perlu dilakukan pelestarian melalui konsep ekowisata mangrove.

Penelitian menunjukkan bahwa ekowisata mangrove secara signifikan meningkatkan pendapatan keluarga (Hutahaean et al. 2024). Berbagai penelitian terkait manfaat ekonomi dari kegiatan ekowisata telah dilaporkan seperti, di Desa Budo keluarga yang terlibat dalam ekowisata mendapatkan penghasilan rata-rata Rp. 1.676.666 lebih banyak daripada mereka yang tidak berpartisipasi (Hutahaean et al. 2024). Di Desa Sei Nagalawan, ekowisata telah memberikan manfaat ekonomi melalui penciptaan lapangan kerja dan penjualan produk lokal, sehingga meningkatkan kesejahteraan masyarakat (Harahap & Absah 2022). Penelitian di Talaga Yenelo menunjukkan bahwa pengetahuan ekologi lokal sangat penting untuk pengelolaan mangrove yang efektif, meskipun kesadaran akan kegiatan ekowisata masih terbatas (Fabanjo et al. 2024). Keterlibatan masyarakat dalam ekowisata mendorong praktik pengelolaan yang lebih baik dan pemahaman ekologi (Harahap & Absah 2022; Rifdan et al. 2023), oleh karena itu perlu dilakukan penelitian terkait manfaat ekonomi hutan mangrove di Sumatera Utara untuk mendorong pelestarian hutan bakau melalui pengembangan ekowisata berkelanjutan.

METODE PENELITIAN

Penelitian ini dilaksanakan di Desa Pulau Banyak, Kecamatan Tanjung Pura, Kabupaten Langkat pada bulan Juni – Juli 2023. Penelitian ini dilakukan dengan metode survey dan pengumpulan data dilakukan teknik wawancara terhadap masyarakat desa Pulau Banyak baik yang berinteraksi langsung maupun tidak langsung dengan ekosistem mangrove. Penentuan jumlah responden dilakukan menggunakan rumus Slovin (Burhan, 2010):

$$n=\frac{N}{1+N(e)^2}$$

Dimana, n adalah ukuran sampel, N adalah ukuran populasi dan e adalah standar error (10%).

Berdasarkan data Badan Pusat Statistik (BPS) jumlah kepala keluarga yang tinggal di desa Pulau Banyak sebanyak 1.034, dengan jumlah populasi 1.034 maka jumlah sampel diketahui sebanyak 91,18 (91) kepala keluarga.

Analisis Data

Analisis Valuasi Ekonomi adalah Nilai ekonomi total terdiri dari dua bagian, yaitu nilai kegunaan (*use value*) dan nilai bukan kegunaan (*non-use value*).

Manfaat Langsung (DUV)

Untuk memperoleh manfaat langsung digunakan rumus :

$$\text{DUV} = \sum_i^n = 1 \text{ DUVi}$$

Keterangan:

DUV = manfaat langsung

DUVi = manfaat langsung ke I sampai ke n

i = jumlah manfaat langsung (1, 2, 3, …,n)

Manfaat tidak langsung (IUV)

Untuk menghitung manfaat tidak langsung digunakan rumus:

$$\text{IUV} = \sum_{i}^{n} = 1 = \text{IUV i}$$

Keterangan :

IUV = Manfaat tidak langsung

IUVi = manfaat tidak langsung ke i sampai ke n

i = jumlah manfaat tidak langsung (1, 2, 3,…n)

Manfaat Pilihan (OP)

Estimasi nilai pilihan ekosistem mangrove didasarkan pada nilai keanekaragaman hayati (*biodiversity*) menggunakan metode Benefit Transfer. Hieriey (2009) menyatakan bahwa nilai keanekaragaman hayati hutan mangrove di Indonesia adalah US$ 15 per hektar per tahun. Nilai pilihan hutan mangrove diperoleh dengan mengalikan nilai keanekaragaman hayati tersebut dengan luas hutan mangrove di lokasi penelitian. Nilai ini mencerminkan potensi manfaat yang dapat dioptimalkan di masa mendatang.

Manfaat Keberadaan (EV)

Untuk memperoleh manfaat keberadaan digunakan rumus :

$$\text{EV} = \frac{1}{n} \sum_{i}^{n} = 1 \text{ WTPi}$$

Keterangan :

EV = manfaat keberadaan

WTPi = Kesediaan membayar responden ke i sampai ke n

i = Responden

Nilai Ekonomi Total

Untuk menghitung nilai ekonomi total (*total economi valaue*) dari ekosistem mangrove digunakan rumus sebagai berikut :

$$\text{TEV} = \text{UV} + \text{NUV}$$
$$\text{TEV} = (\text{DUV} + \text{UV}) + (\text{OV} + \text{EV})$$

Keterangan :

TEV = Nilai ekonomi total (*total economi valaue*)

UV = Nilai kegunaan (*use value*)

NUV = Nilai bukan kegunaan (*non-use value*)

DUV = Manfaat langsung (*direct use value*)

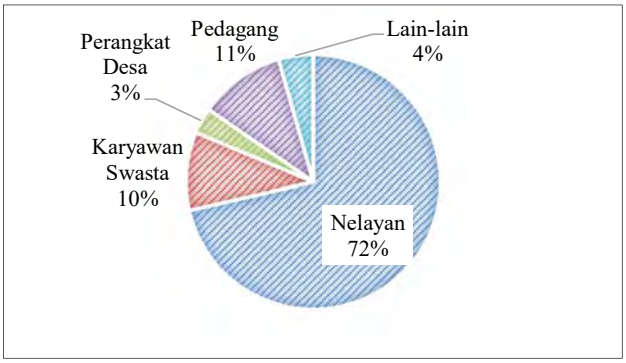
IUV = Manfaat tidak langsung (*inderct use value*)

OV = Manfaat pilihan (*option value*)

EV = Manfaat keberadaan (*existence value*)

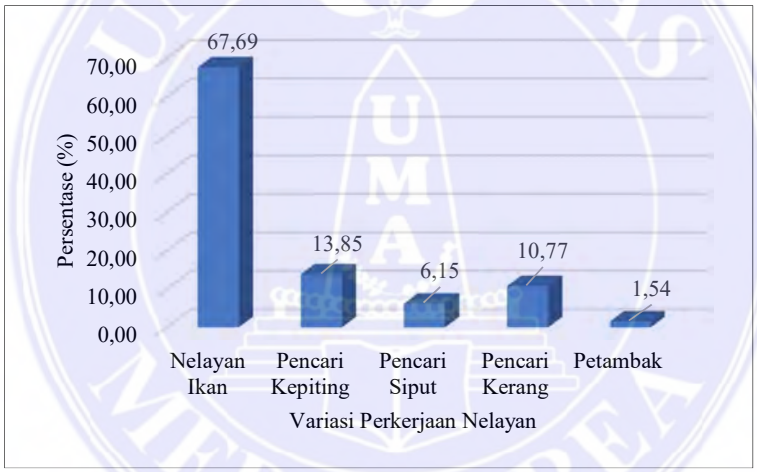
HASIL DAN PEMBAHASAN

Hasil wawancara terhadap 90 responden penelitian diketahui bahwa responden berasal dari beragai latar belakang profesi seperti nelayan, karyawan swasta, perangkat desa, pedagang, serta pekerja serabutan (Gambar 1).



Gambar 1. Grafik Persentase Profesi Responden Penelitian

Berdasarkan hasil wawancara diketahui bahwa mayoritas responden adalah nelayan (72%), pedagang (11%), Perangkat Desa (3%), karyawan swasta (10%), dan pekerja serabutan/lain-lain (4%). Kemudian terhadap 72 % nelayan tadi, dibedakan pada beberapa jenis pekerjaan berdasarkan komoditas utama yang menjadi hasil tangkapan mereka. Hasil wawancara memperlihatkan bahwa terdapat beberapa variasi pekerjaan dikalangan Masyarakat yang berprofesi sebagai nelayan diantaranya, nelayan pencari ikan, nelayan pencari kepiting, pencari kerang, pencari siput-siput bakau dan petambak (Gambar 2).



Gambar 2. Grafik Persentase Variasi Pekerjaan Nelayan

Berdasarkan hasil wawancara terhadap 65 responden yang berprofesi sebagai nelayan, diketahui bahwa pencari kepiting, pencari siput, pencari kerang dan petambak yang berinteraksi langsung dengan ekosistem mangrove, sehingga manfaat langsung yang dihitung adalah manfaat kepiting bakau, kerang, siput bakau dan tambak bandeng, sedangkan manfaat ikan tidak dihitung, karena seluruh nelayan pencari ikan melakukan pekerjaan mereka di selat Malaka bukan di ekosistem mangrove.

Manfaat Langsung

Berdasarkan hasil wawancara diketahui bahwa manfaat langsung yang diperoleh Masyarakat desa Pulau Banyak, Kabupaten Langkat dari ekosistem mangrove adalah, komoditas perikanan bernilai ekonomis seperti, Kepiting, kerang, siput-siput bakau, dan tambak ikan bandeng. Adapun nilai manfaat langsung yang diperoleh dari ekosistem mangrove desa Pulau Banyak Kabupaten Langkat dapat dilihat pada tabel 1.

Manfaat langsung tertinggi diperoleh dari kepiting bakau, yang merupakan komoditas eksport utama dengan total nilai manfaat sebesar Rp213,840,000.00/tahun, dan manfaat terendah dari komoditas siput bakau dengan nilai manfaat sebesar Rp25,920,000.00 per tahun. Hal ini berbeda dengan hasil penelitian (Rujehan et al. 2024). Manfaat langsung dari hutan mangrove di Desa Babulu Laut antara lain kayu, ikan, udang, kepiting, dan rumput laut. Total nilai manfaat langsung

adalah Rp404,069,141,162.00 per tahun. Produk rumput laut memberikan kontribusi pendapatan tertinggi, sedangkan manfaat kepiting memiliki pendapatan terendah. Sementara itu (Rosmawati et al. 2023) melaporkan Total nilai manfaat tahunan mangrove di Desa Moko adalah Rp507,704,732.00 Manfaat spesifik dari ekosistem mangrove di Desa Moko adalah manfaat ikan (Rp 149,064,333.00), manfaat kepiting (Rp230,170,566.00), dan manfaat udang (Rp128,469,833.00). Selanjutnya (Al Hadad et al. 2023) total nilai ekonomi dari ekosistem hutan mangrove di Pulau Waidoba Halmahera Selatan dihitung sebesar Rp170.520.720.104,-/tahun atau Rp.418.014.659,-/ha/tahun. Perbedaan nilai manfaat ini disebabkan adanya perbedaan luasan pada masing-masing lokasi penelitian dan perbedaan harga jual komoditi perikanan di setiap lokasi.

Tabel 1. Nilai Manfaat Langsung Dari Ekosistem Mangrove Desa Pulau Banyak

No	Manfaat Langsung	Nilai rata-rata per Tahun (Rp)	(%)
1	Manfaat langsung kepiting bakau	213,840,000.00	57.45
2	Manfaat langsung siput bakau	25,920,000.00	6.96
3	Manfaat langsung kerang	60,480,000.00	16.25
4	Manfaat langsung tambak bandeng	72,000,000.00	19.34
	Total manfaat langsung	372,240,000.00	100.00

Manfaat Tidak Langsung

Pada penelitian ini nilai guna tak langsung yang dihitung yaitu sebagai penahan abrasi/ pemecah ombak. Pendekatan yang digunakan yaitu *replacement cost* atau biaya pengganti. Nilai guna tak langsung yang digunakan yaitu biaya pembuatan tanggul penahan abrasi atau *break water*. Data pembuatan tanggul penahan abrasi menggunakan pendekatan *shadow price* yaitu memakai standart Kementerian Pekerjaan Umum untuk membangun tanggul penahan abrasi. Pendekatan *shadow price* sangat dibutuhkan jika tidak tersedia data di wilayah penelitian. Nilai manfaat tidak langsung dapat dilihat pada tabel 2.

Tabel 2. Nilai Manfaat Tidak Langsung dari Ekosistem Mangrove Desa Pulau Banyak

Komponen Biaya	Satuan	Jumlah Unit	Harga Satuan (Rp)	Total (Rp)
Penahan abrasi	Per meter	208	5,839,880.00	1,214,695,040.00
Nilai total penahan abrasi per 5 tahun				1,214,695,040.00
Nilai rata-rata penahan abrasi per tahun				242,939,008.00

Manfaat tidak langsung dari ekosistem mangrove secara keseluruhan meliputi penyerapan karbon, pencegahan erosi pantai, mitigasi gelombang, penyaringan air, dan menjadi tempat berkembang biak berbagai spesies (Novitasari et al. 2023; Rahmawaty et al. 2023; Rinika et al. 2023). Mangrove juga memberikan nilai ekonomi, seperti sumber mata pencaharian dan peluang pariwisata (Gultom et al. 2023; Rinika et al. 2023). Namun, kawasan mangrove yang luas di Indonesia mengalami kerusakan yang cepat (Rinika et al. 2023). Upaya untuk menanggulanginya adalah dengan melibatkan seluruh lapisan masyarakat, termasuk akademisi, dalam pelestarian lingkungan (Gultom et al. 2023). Selain itu, inisiatif karbon biru bertujuan untuk menyerap emisi karbon dan mengurangi dampak perubahan iklim (Puspaningrum et al. 2023).

Manfaat Pilihan

Manfaat ekosistem hutan mangrove di Desa Pulau Banyak Kabupaten Langkat dihitung berdasarkan nilai keanekaragaman hayati. Menurut Ruitenbeek (1992), nilai keanekaragaman hayati untuk hutan mangrove di Indonesia, jika keberadaan hutan tersebut memiliki arti penting secara ekologis dan dijaga secara alami, adalah sebesar US $1,500 per kilometer persegi per tahun atau US $15 per hektar per tahun. Dengan nilai tukar rata-rata pada saat penelitian sebesar Rp15,215 per US $, maka nilai manfaat ekosistem hutan mangrove menjadi Rp228,225.00 per hektar per tahun. Berdasarkan metode perhitungan tersebut, manfaat bersih dari ekosistem hutan mangrove di Pulau Banyak, Kabupaten Langkat dengan luas sekitar 104.23 hektar adalah Rp23,787,891.75.

Manfaat Keberadaan

Manfaat keberadaan untuk hutan mangrove di kawasan desa Pulau Banyak diperoleh dengan menggunakan metode CVM (*Contigent Valuation Method*) untuk mengetahui nilai WTP (*Willingnes To Pay*) atau kesediaan membayar dari Masyarakat akan keberadaan hutan mangrove. Pemilihan responden dilakukan secara sengaja (*purposive*) dengan jumlah responden sebanyak 90 orang, dengan nilai kesediaan membayar yang diberikan yaitu berkisar antara Rp5.000 – Rp50.000. Berdasarkan hasil analisis, diperoleh nilai rata-rata kesediaan membayar dari masyarakat (WTP) yaitu sebesar Rp38,250.00,-ha/thn. Sehingga dengan luas hutan mangrove mencapai 104.23 Ha maka nilai manfaat kebaradaan hutan mangrove di desa Pulau Banyak Kabupaten Langkat sebesar Rp3,986,797.5 per tahun.

Nilai Ekonomi Total

Nilai ekonomi total (*total economic value*) dari ekosistem hutan mangrove di desa Pulau Banyak, Kabupaten Langkat merupakan penjumlahan dari nilai manfaat (*use value*) dan nilai bukan manfaat (*non use value*). Hasil penjumlahan dari manfaat langsung dan tidak langsung diketahui bahwa nilai ekonomi total ekosistem mangrove desa pulau Banyak Kabupaten Langkat sebesar Rp642,953,697.25 per tahun (tabel 3).

Tabel 3. Nilai Ekonomi Total Ekosistem Mangrove Desa Pulau Banyak, Kabupaten Langkat

Komponen Manfaat	Nilai Total (Rp)
Manfaat Langsung	372,240,000.00
Manfaat tidak Langsung	242,939,008.00
Manfaat Pilihan	23,787,891.75
Manfaat Keberadaan	3,986,797.50
Nilai Ekonomi Total	642,953,697.25

Nilai ekonomi total ekosistem mangrove di berbagai daerah ditentukan melalui berbagai metode. Di Kelurahan Kawal, Bintan, total nilai ekonomi ekosistem mangrove adalah Rp762.567.136 per tahun, dengan 45% diatribusikan pada nilai pilihan dan 55% pada nilai keberadaan (Khairunnisa et al. 2022). Di Dusun Tanjung Tedung, Bangka Tengah, total nilai ekonomi sebesar Rp14.565.990.100 per tahun, dengan manfaat langsung sebesar Rp5.987.588.750 per tahun dan nilai keberadaan sebesar Rp4.421.300.000 per tahun (Purnamasari et al. 2022). Di Kawasan Taman Pesisir Ujungnegoro-Roban, Batang, total nilai ekonomi sebesar Rp976.779.323 per tahun, dengan manfaat langsung sebesar Rp928.633.000 per tahun dan nilai keberadaan sebesar Rp38.700.000 per tahun (Hirmawan et al. 2020). Perbedaan nilai ekonomi total dari ekosistem mangrove disebabkan berbagai faktor, seperti luasan hutan mangrove, kondisi kerapatan mangrove, serta jumlah responden penelitian dapat mempengaruhi perbedaan hasil.

KESIMPULAN

Ekosistem mangrove Desa Pulau Banyak mampu memberi nilai ekonomi total sebesar Rp642,953,697.25 per tahun dengan luasan hutan 104.23 Ha. Berdasarkan hasil penelitian ini Desa Pulau Banyak sebaiknya memiliki kawasan ekowisata mangrove terpadu, sehingga nilai ekonomi dari ekosistem mangrove dapat lebih di optimalkan.

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PROSPECTS OF FISHERY AND TOURISM INDUSTRY IN PULAU BANYAK VILLAGE LANGKAT DISTRICT

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Abstract

The fisheries development can be integrated with varieties activities in tourism sector. Fisheries tourism is a tourism activity based on fishing activities, such as catching, cultivating, processing, and marketing. Pulau Banyak village is one of the areas in Langkat Regency has fisheries potential that can be integrated with tourism and become a tourist destination. This syudy attempts to explore the profile of tourism activities and develop the product that occur in Pulau Banyak Village. Moreover, a tourism development strategy for Pulau Banyak Village can be formulated. The research was conducted using qualitative descriptive methods. The development strategies was analyzed using SWOT matrix. Data were obtained through observation, interviews, and focused discussions with research respondents. The findings revealed that Pulau Banyak Village as a tourist destination has become a special interest tourism package with a fisheries-themed outbound as the main attraction. It was also supported by the existence of a cultivation pond complex and natural river waters. Fishing tourism products can be developed in Agrotourism Education and Tourist Village Tour packages. The strategy for developing fisheries tourism in Pulau Banyak Village includes; developing thematic and cross-regional based tourism packages, improving the completeness of facilities and accessibility, marketing and promoting attractive and effective tourism products, increasing investment, and strengthening the capacity of tourism managers and existing institutions.

Keywords: opportunities, business, fisheries, tourism

INTRODUCTION

Some tourism experts have been realizing the tourism development by empowering agricultural land in rural areas which has the potential as an alternative tourist attraction. Many studies have been carried out related to the development of tourism based on agricultural resources, called agrotourism. The findings revealed that there has been a shift in tourist interest related to the tourism products. There is a tendency that the tourists want to do various tourist activities in a quiet and natural locations which have fresh air and unique attractions. These rural areas generally have these characteristics. Encountering this phenomenon, it is needed to develop a synergy relationship between tourism and agriculture by forming friendly environment and fair alternative tourism like agrotourism. Agrotourism or agricultural tourism is a series of tourist travel activities that use agricultural sectors from managing the production to obtaining agricultural products in

various systems to expand the knowledge, understanding, experience, and recreation in the agricultural sector (Nurisjah, 2001). The development of agrotourism in rural areas based on local communities will provide many benefits, not only for rural communities but also urban communities to understand and appreciate the agricultural sector. Moreover, it can become an educational atraction. Agriculture and animal husbandry are the pioneer in the development of Agrotourism. From the potential prospect of agriculture and animal husbandry, agrotourism will develop in the future. Indonesian rural areas have a potential agricultural land and livestock, such as in Lamajang Village and Bandung Regency. Agriculture in Lamajang Village has been developing regarding to the rapid growth of livelihoods of the people in Lamajang Village. Most of them make their living as farmers who plan rice, fruit, vegetable and other medicinal plant farmers.

LITERATURE REVIEW

In accordance with Law Number 9 in 2010 concerning Tourism, tourist objects and attractions known as tourist destinations are the main issue or strategic issue in tourism development. Tourist destinations are grouped into natural, cultural and artificial tourism. Besides these three types of tourism, there is another one that requires special intervention and special attention, which is called special interest tourism.

The main tourism attraction is packaged in the form of fisheries-based tourism. This tour provides education to learn about fish farming. It will then be followed by activities in the form of catching or playing with fish as a fun activity (refreshing). Tourism with a fisheries theme can also be combined with other tourism activities, such as exploring the river around the tourist area by boat. Moreover, the tourists can visit to the fish cultivation pond complex where they can learn about fish cultivation or buy seeds if they are interested in cultivating fish at home. There is also a choice of several fishing spots available at several fishing spots, namely along river flows and in fishing ponds. There is also culinary tourism which can complement the ecotourism activities. The tourists or visitors can enjoy the process of fishing found in Pulau Banyak Village.

Tourism development in Pulau Banyak Village can be developed by using a development strategy approach which is explained in several development plans (Sunaryo, 2013). For the development of tourist objects and attractions, they can create several themes according to the character of the objects and attractions. These unique objects and

attractions can be integrated with one another. The thematic development of tourist objects and attractions can be adjusted to the tastes and needs of the tourist or visitor market. The complete development of tourism products can be seen in the following picture:

Figure 1. The fisheries tourism in Pulau Banyak Village still needs development

Tourism development is also conducted using a cross-regional tourism package model approach that combines the diversity of object characters and functions to optimize the development of tourism activities in Pulau Banyak Village. This tour package is created by involving other tourist objects across regions in one unified tourism system. Preparing tour packages also needs to consider the aspects of the convenience and comfort of tourists in enjoying tourism activities, including the characteristics and motivation factors of existing tourists (Mulyani & Wirakusuma, 2016).

METHOD

Research on the prospects on fisheries and tourism opportunities in Pulau Banyak Village can be developed as an object and destination on Sumatera Island. This research attempts to formulate a profile of tourism activities and development in the Pulau Banyak Village area and improve a development strategy. The research was conducted using qualitative descriptive methods (Moleong, 1995). The location of the research is Pulau Banyak Village, Langkat Regency. The research was conducted during March - July 2022. The data used in this research is primary data. The data was obtained directly from the results of in-depth interviews and focus group discussions (FGD) with stakeholders related to the research. Moreover, the information about fishing prospects, tourism activities and documentation of activities was obtained from interviews and direct observations from 20 main actors. Directed discussions were also held with fisheries groups and tourism awareness groups (pokdarwis) to obtain input or information regarding fisheries tourism activities. The secondary data used in the research include fisheries production data, tourist activity data, and other documentary data.

The tourism profile in this research is presented in the form of information data, attractiveness, accessibility, facilities, infrastructure, market aspects, and regional investment. Tourism development is formulated using a thematic approach and regional context. Meanwhile, the development strategy is analyzed using SWOT analysis (Rangkuti, 2006).

RESULTS AND DISCUSSION

The development of tourism activities is an effort conducted in a structured and planned manner to improve the tourist attractions to be marketed or promoted (Yoeti, 2008). The tourism development strategy is formed as a direction and goal to be achieved. The tourism development strategy is described in the SWOT matrix which describes how the external opportunities and threats faced by tourism activities can be adjusted to existing strengths and weaknesses. This tourism development strategy can be seen in the following table:

	Strength	**Weakness**
	- Strategic location between the economy and trade centre. - Fish cultivation is in the area - The existence of a river as fishing area - Fish processing unit develop	- The limited land for developing production scale fisheries areas - Environmental factors (temperature and weather) that are susceptible to influencing

	in society - Access to Pulau Banyak Village is easy and not far from the main road - Tanjung Pura Pulau Banyak Village is known as a cultural and religious tourist destination	fishing activities - New area development investments involve local investors
Opportunity (O)	**Strategy S-O**	**Strategy W-O**
- Tourism and fisheries activities can synergize with each other. - Development of areas that can be cross-sectoral and cross-border. - Potential and special interest travel market	- Development of tourism facilities with a variety of tourist activities. - Development of complete tourism infrastructure based on thematic and cross-regional. - Marketing and promotion through attractive and effective media to the tourist market	- Fisheries development that emphasizes aspects of continuity of products offered to tourists. - Increased investment to complete the facilities and infrastructure of tourism activities.
Threat (T)	**Strategy S-T**	**Strategy W-T**
- The emergence of a variety of new tourist destinations in various regions. - Egos sectoral in government agencies and regional stakeholders	- Increasing the capacity of tourism object managers and community institutions (pokdakan, pokdarwis etc.).	- Strengthening coordination across agencies, development sectors and regional stakeholders;

Tourism supporting facilities (amenities) are supporting facilities that need to be prepared in a tourist area. For example, tourists who come from remote places generally need lodging in the form of hotels, tourist cottages or guest houses. Lodging accommodation in addition to providing added value for homeowners, also provides opportunities for tourists to socialize and get to know the daily life of the local community (Widuri, 2017). The development of fisheries tourism in Pulau Besar Village also requires the availability of adequate amenities for the needs and comfort of visitors or tourists who visit. In special interest tourism, accommodation adapts to what the tourist needs. The facilities that are already available in the Banyak Island such as parking lots, toilets, mosques, and information offices. While the facilities that can be equipped in the existing tourist complex include:

- Entrance gate
- Tourist information in the form of leaflets, brochures, or booklets.
- Information boards and signs leading to attractions.

- Tourist information service system.
- Souvenir shops selling handicrafts/local products.

Besides amenities, another aspect that is also important is accessibility to tourist sites. The improvement of road infrastructure leading to tourist sites cannot be separated from coordination with the local government and related technical agencies, such as the Public Works Agency. The ease of vehicles (modes of transportation) to tourist sites also requires coordination with the local government and related technical agencies, such as the Transportation Agency. The role of the tourism office is also important to participate in providing input that the opening of regional access carried out is included in potential areas for tourism development. These thoughts and considerations can be material and input for local stakeholders.

The development of fisheries tourism can be done in several ways. Things that need to be considered in tourism development are in the form of two aspects, namely the product aspect and the market aspect. For the development of fisheries tourism, more emphasis is placed on the concept of products offered. Although the market aspect is also important to note, the sustainability and sustainability of tourism products are more important than the fulfillment of markets that tend to be dynamic. Tourism development will also be more effective with the support of strengthening institutions that manage tourism activities. Institutions can be formed to support existing tourism activities, include Tourism Awareness Groups (Pokdarwis). Pokdarwis membership consists of tourism actors who have concern and responsibility and act as a driving force to create a conducive climate for the development of tourism in their region and realize Sapta Pesona Pokdarwis moves independently with the source of strength from the village / village itself with all its potential. Pokdarwis also builds itself independently by prioritizing the potential of creativity because they have power over the development of the village / village with all the resources they have. Some objects that have succeeded in developing tourism activities, such as tourist villages spread across Indonesia, cannot be separated from the role of Pokdarwis formed by residents. It was these Pokdarwis that created a huge leap in the development of tourism that could be created in the local region.

The development of tourism and fisheries business can be done in several ways. Things that need to be considered in tourism development are in the form of two aspects, namely the product aspect and the market aspect. For the development of fisheries tourism, more emphasis is placed on the concept of products offered (product driven). Although the

market aspect is also important to note, the sustainability of tourism products are more important than the fulfillment of markets that tend to be dynamic. Pokdarwis moves independently with the source of strength from the village / village itself with all its potential. Pokdarwis also builds itself independently by prioritizing the potential of creativity because they have power over the development of the village / village with all the resources they have. Some objects that have succeeded in developing tourism activities, such as tourist villages spread across Indonesia, cannot be separated from the role of Pokdarwis formed by residents. It was these Pokdarwis that created a huge leap in the development of tourism that could be created in the local region. Pokdarwis is expected to be an agent of change by spurring the role and participation of the community in building the tourism potential of Tidar Dudan village. Local people participation and involvement include bringing innovation and making the appearance of tourist areas more attractive and comfortable (Nawawi, 2013) as well as the fulfillment of the completeness of tourist facilities and the application of Sapta Pesona (Prabowo et al., 2016). Mastery of information and communication technology by tourism actors will also be a strength in building a fishery tourism area in Pulau Besar Village, as well as being an effective means of tourism promotion. The ability of reliable tourism human resources in mastering and managing technology is one of the keys to the success of tourism object development (Utami et al., 2016). Thus, tourism is expected to make a real (significant) contribution to improving the economy and welfare of the local community.

Conclusion

Based on the research that has been done, it can be formulated as follows:

1. Fisheries tourism is a fishery-based artificial tourism that utilizes the existence of fish farming ponds along the river flow, natural river waters and fish processing activities cultivated by local people. The main attraction is outbound fisheries theme with supporting activities in the form of fishing, fish farming and fish processing. Road access to tourist sites is easy to reach, several facilities and infrastructure for tourists are available at the location, aspects of the market that are still dominated by domestic tourists (national) and investments that have not involved outside investors (private).
2. The fishery tourism products development can be packaged in several thematic products, namely outbound tourism, educational tourism, and MICE tourism.

Meanwhile, the development of cross-regional tourism packages can be packaged in Agro Education and Susur Kampung Wisata tour packages.

3. Fisheries tourism development strategy is conducted through several things, namely tourism development with a variety of tourism activities in it, development of completeness of thematic and cross-regional based fisheries tourism infrastructure, marketing, and promotion through attractive and effective media to the tourist market, fisheries development that pays attention to the continuity of products offered to tourists, increased investment.
4. Tourism facilities and infrastructure, increasing the capacity of tourism object managers and existing community institutions and strengthening coordination across development sector agencies and regional stakeholders.

Recomendation

The support for the development of this business does not only come from one or two agencies but is the responsibility of all components and various parties involved in it. Given that the tourism sector is cross-sectoral, its development requires the involvement of various sectors, such as the provision of roads for access, the fulfillment of public facilities (hotels, public transportation and so on) which certainly requires solid cooperation from various authorities. With the prospects and opportunities in the future, tourism in Pulau Besar Village if worked seriously will become one of the special interest tourist destinations and become a driving sector for development in Langkay Regency. Supporting the multiplier effect of tourism that can bring impact to the economic empowerment of local communities will be one of the strengths of tourism development in the future.

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