

Harnessing local wisdom to conserve biodiversity on the southern coast of Gunung Kidul, Indonesia

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Abstract. *Syamsi RN, Rosyida SH, Allysa TN, Hanifah W, Dianti, Sunarto, Nazar IA, Md. Naim D, Setyawan AD. 2024. Harnessing local wisdom to conserve biodiversity on the southern coast of Gunung Kidul, Indonesia. Asian J Ethnobiol 8: 115-121.* Coastal biodiversity is a crucial component of ecosystems. However, it faces significant threats due to land use changes driven by increasing societal needs. Coastal areas are increasingly shrinking due to changes in land use and exploitation of areas such as the misuse of coastal land for fish ponds which should be designated as conservation areas. This situation impacts the sustainability of local communities and the management of resources, highlighting the role of communities in empowering local wisdom. This study aimed to understand the local wisdom of the coastal community in Kanigoro Village, Saptosari Sub-district, Gunung Kidul District, Yogyakarta Province, Indonesia in managing natural resources and conserving coastal biodiversity. The research used qualitative observational methods, including direct interviews with respondents. Data were collected through direct interviews with a total of 74 respondents, aged between 37-55 years, including five key respondents, and through Focus Group Discussions (FGD) on topics such as local wisdom, technological innovation, community participation, threats or challenges, and conservation strategies to understand the community's views on local biodiversity conservation. The results of this study revealed the presence of 17 protected species from 17 families. They identified three traditional customs still preserved today: *labuhan/larungan*, *musim gugur gunung*, and *rasulan*. The community continues to apply conservation principles rooted in local wisdom in their daily activities, such as prohibiting of catching and utilizing protected species, and forbidding the collection or harvesting of sand and coral to preserve these resources. The community plays an active role in preserving the biodiversity of wildlife and the surrounding environment. Local wisdom has the potential to sustain and strengthen ecosystem integrity, while improving the well-being of local communities by maintaining the availability of coastal biodiversity.

Keywords: Coastal biodiversity, coastal communities, conservation, local wisdom

INTRODUCTION

Indonesia has a very high level of coastal biodiversity, with a coastline length of 91,363.65 km in 2018 (Sui et al. 2020). Coastal areas are divided into several aspects, such as mangrove forests, coral reefs, and seagrass beds. Coastal biodiversity is crucial for survival as it can be utilized directly and sustainably. Over time, coastal biodiversity is increasingly threatened, necessitating the development of conservation strategies (Abidin et al. 2021).

Currently, coastal areas face significant threats due to land use changes driven by the growing demand for biodiversity. Coastal areas are shrinking due to land use changes and the exploitation of areas that should be designated for conservation, such as coral reef degradation caused by human activities and illegal fishing or marine animal capture. This will lead to a decline in the quality and quantity of natural resources and affect the survival of all surrounding life forms. The decline in biodiversity indirectly impacts and drives urgent needs, affecting socio-economic aspects (Purnomo et al. 2020). Therefore, conservation and preservation are necessary as sustainable approaches (Ren et al. 2020). The UN has agreed upon preserving, protecting, and conserving biodiversity within

ecosystems and established Sustainable Development Goals (SDGs).

Local wisdom reflects concern for the environment, natural conditions, traditions, or cultures that can fade and be forgotten over time (Marlina and Astina 2020). Local wisdom is closely related to the role of communities in preserving ecosystems, biodiversity, and local cultural heritage. The presence of communities has a vital element of local wisdom values, which are highly diverse (Supriati and Umar 2020). In environmental management, community involvement, particularly local wisdom, is essential as a sustainable action.

In the Kanigoro Village area, there are several coastal areas or beaches, including Pringjono Beach, Nguyahan Beach, Ngobaran Beach, Dadap Ayam Beach, Ngrenehan Beach, Torohudan Beach, and Ngrawah Beach, with three of them being specifically focused on research related to the empowerment of local wisdom in coastal communities. The value of local wisdom is primarily reflected in the presence of social groups applying conservation principles and natural resource management (Jape and Najar 2024). One example is Ngobaran Beach, well-known for its religious tourism, featuring several temples that attract domestic and international tourists. In addition to tourism,

the temples around Ngobaran Beach host several traditional ceremonies annually (Fatikah 2022). Empowering local wisdom in the community is an alternative approach to managing coastal biodiversity with marine potential. Over time, a coastal community has formed that aids all community elements in introducing effective coastal resource management practices, showing care for active and innovative management methods. Support from the local government is also necessary to enhance community management capabilities (Fitriana et al. 2022). The government should develop policy standards for these activities (Rizal et al. 2022).

By understanding traditional knowledge and practices that have proven effective, we can ensure the preservation of important heritage cultural and ecological legacies. This study aims to understand the local wisdom of coastal communities in Kanigoro Village, Saptosari Sub-district, Gunung Kidul District, Yogyakarta Province, Indonesia in managing natural resources and preserving coastal biodiversity.

MATERIALS AND METHODS

Study area

This study was conducted in March 2024 in Saptosari Sub-district, Gunung Kidul District, Yogyakarta Province, Indonesia (Figure 1). The research was specifically carried out in Kanigoro Village, with data also collected from the coastal residents of Nguyahan Beach, Ngobaran Beach, and Ngerenehan Beach. Gunung Kidul District is geographically located between 110°21' and 110°50' E and 7°46' and 8°09' S. The Saptosari Sub-district is approximately 341 meters above sea level and is about 18 km from Wonosari, the capital of Gunung Kidul District. The population of the Saptosari Sub-district is 38,323, with 18,958 males and 19,365 females, covering an area of 46.72 km². Saptosari Sub-district is divided into seven villages: Jetis, Kanigoro,

Kepek, Krambilawit, Monggol, Ngloro, and Planjan (Ilmi 2021).

Research preparation

Research preparation included several stages: creating a list of questions using a spreadsheet, which is then used as a tool during direct interviews for data collection. A set of questions is also prepared for Focus Group Discussions (FGD). Preliminary research on data and the study area was conducted before data collection to ensure that the information obtained aligns with the research objectives. Additionally, preparations for surveying the research location were carried out before field observations.

Data collection

Data were collected through direct interviews and field observations at the research site. The data collection process included interviews and Focus Group Discussions (FGD) to understand community views on local wisdom related to coastal biodiversity. In-depth interviews were conducted at several research locations representing Kanigoro Village, involving 74 respondents, including five key informants (Table 1). The interviews aimed to gather direct data on local knowledge of coastal biodiversity, with respondents selected through purposive sampling based on specific characteristics such as age and occupation (Purwanto et al. 2024). Field observations involved exploring the research locations (Figure 2), with information from respondents used during these observations. This included documenting local traditions and customs as well as rare species to strengthen the data on how biodiversity conditions are influenced by local wisdom.

Data analysis

Data were analyzed descriptively. The obtained data were presented in tables containing information from observations, direct interviews, and FGDs (Dueñas et al. 2021).

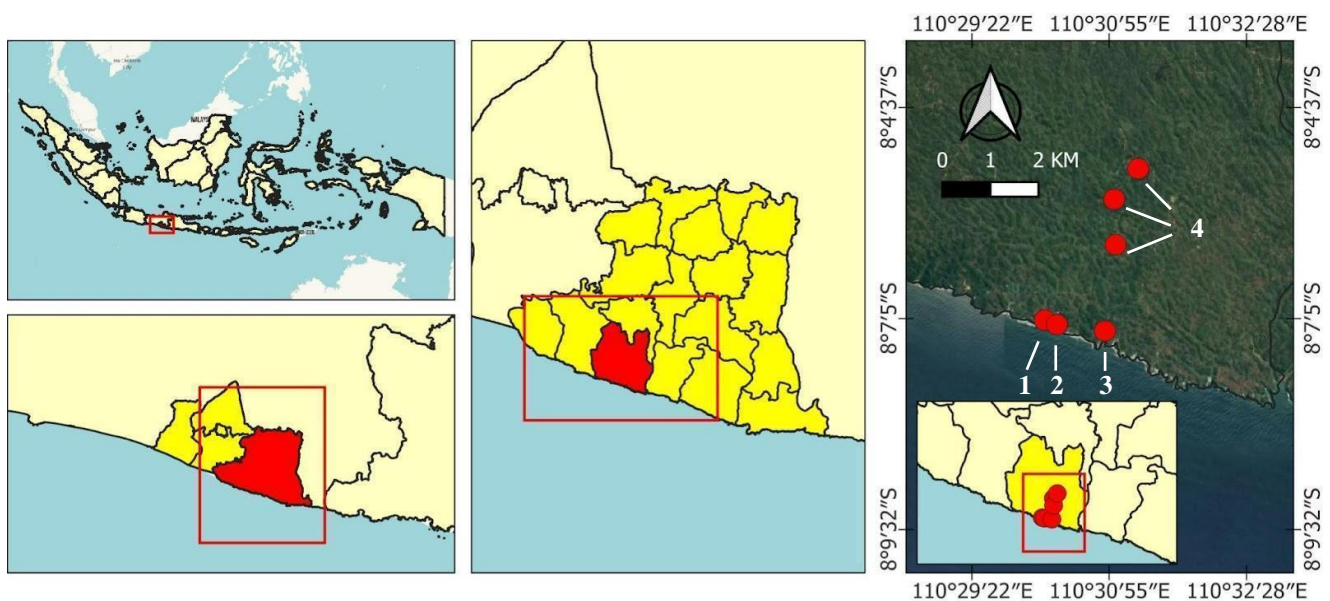


Figure 1. Map of the research area around the coast in Kanigoro Village, namely 1. Nguyahan Beach, 2. Ngobaran Beach, 3. Ngerenehan Beach, and 4. Around the village hall settlement, Saptosari Sub-district, Gunung Kidul, Yogyakarta, Indonesia



Figure 2. Ecosystems of some study areas in Kanigoro Village, Saptosari Sub-district, Gunung Kidul, Yogyakarta, Indonesia: A. Private temple belonging to a resident at Ngobaran Beach; B. Coastal ecosystem at Ngobaran Beach; C. Coastal ecosystem at Ngrenehan Beach; D. Religious site used for tourism at Ngobaran Beach; E. Religious tourism destination at Ngobaran Beach

RESULTS AND DISCUSSION

Respondent demographics

In this study, demographic data were collected from 74 respondents. The majority were 37 to 55 years old, totaling 39 respondents, or 52.7%. This was followed by the elderly age group (≥ 56 years), with 22 respondents, representing 29.7%, and the smallest group was those aged 18 to 36 years, with 13 respondents, or 17.6%. According to Silvano et al. (2020), differences in respondent numbers are influenced by profession, age, and geography. In this study, many respondents were fishermen because the research area is close to the coastal zone, with 33.8% of respondents in this profession. Additionally, a significant number of respondents were farmers and traders, with both professions predominantly occupied by the middle-aged group (37-55 years), representing 20.3% of respondents. Other professions related to the coastal area are listed in Table 1.

Furthermore, most respondents were female, totaling 43 respondents or 58.1%, followed by male respondents, who numbered 31 or 41.9% of the total. This is because female respondents were more frequently encountered at the research site, as they were trading around the beach and participating in beach conservation organizations or groups. These factors explain the significant demographic variability in different regions (Coppock and McClellan 2019).

Protected animals

Based on observations, 17 species from 17 different families are protected by the local community in Kanigoro Village. Table 2 presents the research data, showing several species with the same conservation status according to the IUCN Red List, such as green turtles (*Chelonia mydas* (Linnaeus, 1758)), manta rays (*Manta birostris* (Walbaum, 1792)), monkeys (*Macaca fascicularis* (Raffles, 1821)), whales (*Balaenoptera musculus* (Linnaeus, 1758)), rays (*Mobula* sp.), whale shark (*Rhincodon typus* (Smith, 1828)), all of which have an Endangered (EN) status. This status indicates that these species are at high risk of extinction shortly (Anrozi et al. 2023). In Kanigoro Village's coastal area, some species are rarely found and only appear at certain times (Harjiyatni et al. 2022). In some places, monkeys have already faced extinction due to

deforestation and the conversion of natural habitats into agricultural land, settlements, or other development projects, reducing their natural habitat (Murti and Maya 2021).

Leatherback turtles and red snapper, classified as Vulnerable (VU), risk becoming endangered. Red snapper is still commonly found and distributed in the study area. In contrast, leatherback turtles are only encountered by a few fishermen (Ibad 2023). Additionally, the dwarf gulper shark (*Centrophorus atromarginatus* (Garman, 1913)) is classified as Critically Endangered (CR), meaning it is on the brink of extinction and is rarely found in the study area (Murti and Maya 2021). There are also several species classified as Least Concern (LC), meaning their population and presence are not currently threatened, such as great white egret (*Ardea alba* (Linnaeus, 1758)), pantropical spotted dolphin (*Stenella attenuata* (Gray, 1846)), sea urchin (*Echinoidea* sp.), Malayan krait (*Bungarus candidus* (Linnaeus, 1758)), moonrat (*Echinosorex gymnura* (Raffles, 1822)), lobotes (*Lobotes surinamensis* (Bloch, 1790)), lobster (*Panulirus* spp.). Despite this, these species are protected by the community through measures such as restricting their capture and use to maintain species conservation. Some of these species are still frequently encountered by the local community, with lobster being particularly cultivated as a food source and distributed within the Kanigoro Village community.

Table 1. Demographic data of respondents

Characteristics	Group	Informant	Percentage
Age	Young (18-36)	13	17.6%
	Middle-aged (37-55)	39	52.7%
	Elderly (≥ 56)	22	29.7%
Gender	Female	43	58.1%
	Male	31	41.9%
Occupation	Entrepreneur	5	6.7%
	Farmer	15	20.3%
	Fisherman	25	33.8%
	Housewife	8	10.8%
	Pension	2	2.7%
	Student	4	5.4%
	Trader	15	20.3%

Table 2. Protected animals in the Kanigoro Village area, Saptosari Sub-district, Gunung Kidul, Yogyakarta, Indonesia

Family	Species name	Local name	IUCN status
Ardeidae	<i>Ardea alba</i> (Linnaeus, 1758)	<i>Burung laut (kuntul laut)</i>	LC
Balaenopteridae	<i>Balaenoptera musculus</i> (Linnaeus, 1758)	<i>Paus jeda</i>	EN
Centrophoridae	<i>Centrophorus atromarginatus</i> (Garman, 1913)	<i>Hiu botol</i>	CR
Cercopithecidae	<i>Macaca fascicularis</i> (Raffles, 1821)	<i>Monyet kra</i>	EN
Cheloniidae	<i>Chelonia mydas</i> (Linnaeus, 1758)	<i>Penyu ijo</i>	EN
Myliobatidae	<i>Mobula</i> sp.	<i>Pari</i>	EN
Delphinidae	<i>Stenella attenuata</i> (Gray, 1846)	<i>Lumba-lumba</i>	LC
Dermochelyidae	<i>Dermochelys coriacea</i> (Vandelli, 1761)	<i>Penyu belimbing</i>	VU
Echinoidea	<i>Echinoidea</i> sp.	<i>Bulu babi</i>	LC
Elapidae	<i>Bungarus candidus</i> (Linnaeus, 1758)	<i>Ular weling</i>	LC
Erinaceidae	<i>Echinosorex gymnura</i> (Raffles, 1822)	<i>Landak berbulu</i>	LC
Lobotidae	<i>Lobotes surinamensis</i> (Bloch, 1790)	<i>Ikan kakap batu</i>	LC
Lutjanidae	<i>Lutjanus campechanus</i> (Poey, 1860)	<i>Ikan kakap merah</i>	VU
Myliobatidae	<i>Manta birostris</i> (Walbaum, 1792)	<i>Pari manta</i>	EN
Nephropidae	<i>Panulirus</i> spp.	<i>Lobster</i>	LC
Rhincodontidae	<i>Rhincodon typus</i> Smith, 1828	<i>Hiu lintang</i>	EN
Varanidae	<i>Varanus salvator</i> (Laurenti, 1768)	<i>Biawak air</i>	LC

Note: CR: Critically Endangered, EN: Endangered, LC: Least Concern, VU: Vulnerable



Figure 3. Local wisdom in the form of traditions: A. *Labuhan* or *larungan* at Ngobaran Beach, B. *Gugur gunung* held in the coastal area, C. *Rasulan* held in the coastal area. Sources: <https://jogja.tribunnews.com/>, <https://gunungkidul.sorot.co/>, <https://jogjaholic.com/>

Local wisdom from the community

Local wisdom in the form of traditions

Each beach of this area study has its specific function: Ngobaran Beach is used for Hindu religious practices, Ngrenehan Beach is designated for fishing, where most fishermen dock their boats after fishing, and Ngayahan Beach is designated solely for tourism. Table 3 indicates three local wisdom traditions inherited from ancestors: *Labuhan* or *Larungan*, *Gugur gunung*, and *Rasulan* (Figure 3). These three traditional customs are unique and can attract local and international tourists to visit and learn about the local customs. The preservation of these traditions can positively impact local income and coastal biodiversity (Aminuddin and Burhanuddin 2023).

In Kanigoro Village, traditional customs are still strongly observed. Some customs practiced include *larungan* or *labuhan*, *gugur gunung*, and *rasulan*. *Larungan* is a ritual of floating offerings comprising agricultural products, performed annually on the first of *Suro*. *Suro* is the Javanese new year and is the most important celebration for Javanese people. *Gugur gunung* is a traditional beach cleaning carried out weekly on Fridays by local women. *Rasulan* is an annual tradition in the form of a communal thanksgiving by the Kanigoro Village community.

The community considers the *labuhan* or *larungan* ceremony on the night of first *Suro* as a form of gratitude to Allah S.W.T. (God in Islam) for the blessings and enjoyment of life. This gratitude is expressed through offerings including fruits, vegetables, market snacks, chicken, and even a new set of *kebaya*. *Kebaya* is a type of upper garment traditionally worn by women in Southeast Asia, especially in Indonesia. The *labuhan* or *larungan* ceremony also involves floating gold with the offerings. *Larungan* is also symbolic of cleansing sins and removing bad luck (Dewi et al. 2022). This tradition has been practiced for a long time and is still preserved today, with participation from all age groups. In the context of conservation, the *labuhan* tradition raises public awareness to maintain cleanliness and environmental sustainability around ritual sites, so that the area is indirectly protected from destructive activities such as over-exploitation and tree logging.

The coastal communities of Ngobaran, Ngrenehan, Ngayahan Beaches, and Kanigoro Village also share the tradition of *gugur gunung*, which has been passed down through generations (Afandi et al. 2018). Generally, *gugur gunung* involves village or beach cleaning activities conducted weekly on Fridays. This tradition, primarily led by local women, has been consistently practiced, with its

origins traced back to local PKK women. PKK is an abbreviation for Family Welfare Empowerment, a community organization that empowers women to participate in Indonesia's development. Through *gugur gunung*, the community works together to clean up the environment and prevent damage to nature. This activity contributes to the preservation of biodiversity by creating a cleaner and litter-free environment, especially in areas that are the habitat of animals protected by the Kanigoro community.

The Kanigoro community also observes the *rasulan* tradition, which is held annually and the timing is not specified. *Rasulan* is a rural post-harvest thanksgiving that celebrates the harvest and honors ancestors, teaching respect for the sea as a source of life. *Rasulan* aims to express gratitude to Allah S.W.T. for the blessings and pleasures of life. This tradition involves activities such as communal feasts, village cleaning, a banquet to commemorate an event, ask for blessings, and so on or usually called *kenduri*, recitations, and even *wayang* performances are a traditional Indonesian performing art that is developing rapidly on the islands of Java and Bali for public entertainment. This tradition encourages the preservation of the region and biodiversity, so that the natural habitat of flora and fauna is maintained.

Local wisdom in the form of knowledge

In Kanigoro Village, local wisdom is evident through community knowledge. This knowledge comprises various taboos and prohibitions passed down through generations and still observed by the local community today. Not only are the villagers required to follow these rules, but visitors are also expected to respect and adhere to them while in the village. Many of these regulations significantly benefit the local community by preserving cultural heritage and indirectly protecting the coastal biodiversity (Setiawan and Triyanto 2021). Additionally, enforcing these traditional rules plays a crucial role in safeguarding the ecosystems and environment of Kanigoro Village. These prohibitions and regulations encompass various aspects of life, including behavior and interaction with the surrounding environment, reflecting the local wisdom that the people of Kanigoro Village continue to uphold.

Based on the findings in Table 4, several local traditions have been established in Kanigoro Village. Among these traditions is the prohibition against taking sand from the beach area. This tradition is still practiced today in Kanigoro Village, with the belief that any violation by visitors will bring bad luck. Moreover, this

tradition is an environmental conservation effort to protect the coastal ecosystem. Sand plays a crucial role in protecting the shoreline from erosion and providing habitats for various flora and fauna. Excessive sand extraction can lead to degradation, erosion, and destruction of natural habitats for marine life (Widya 2023). By upholding this tradition, the people of Kanigoro Village strive to ensure that this natural resource remains preserved for future generations and supports environmental sustainability in tourism and other community activities.

Another tradition still in practice is the use of traditional methods for fishing. This tradition is maintained due to its environmentally friendly nature. The use of simple tools like nets and fishing rods (Table 4) helps reduce the exploitation of fish compared to modern equipment, which tends to capture large quantities of fish. This traditional practice helps maintain the balance of fish populations. Cultural and social values are also embedded in this practice, supporting the preservation of marine ecosystems. Despite the lack of technological innovation in Ngobaran, Ngrenehan, and Nguyahan beaches, the community believes that traditional fishing methods effectively conserve the environment and biodiversity (Kutser et al. 2020). Although technology use, such as engines for boats, has evolved, the community's economic and social activities continue to thrive. The local fishing industry meets market demands while preserving traditional practices and limiting the exploitation of newer technologies.

A tradition that remains in place today involves restrictions on fishing on certain days and during specific seasons (Table 4). Fishermen are prohibited from going to sea on *selasa kliwon* and *jumat kliwon* based on a long-standing belief that doing so could result in misfortune. *Kliwon* is the name of the day in *separasar* or also called *pancawara*, a week consisting of five days and used in Javanese and Balinese culture. This tradition indirectly supports marine recovery by reducing overexploitation. Seasonal fishing practices are also rooted in local knowledge of marine life cycles and weather patterns (Pamungkas et al. 2022). These practices ensure that fish populations remain stable and sustainable. Additionally, this tradition emphasizes the importance of the reciprocal relationship between humans and nature, ensuring that marine resources are available for future generations (Hidayat et al. 2024). By adhering to these practices, fishermen support ecological balance and contribute to the economic stability of coastal communities that rely on fisheries as their primary livelihood.

Table 3. Customary traditions in the Kanigoro Village area, Saptosari Sub-district, Gunung Kidul, Yogyakarta, Indonesia

Traditional customs	Type of tradition	Description	Location
<i>Labuhan</i> <i>/Larangan</i>	Cultural	A traditional ceremony involving the washing of offerings, including vegetables, fruits, and other agricultural products, held annually on the first of <i>Suro</i>	Ngobaran Beach, Ngrenehan Beach
<i>Gugur</i> <i>Gunung</i>	Social	The generational tradition of beach cleaning is conducted weekly to maintain the beach's sustainability	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
<i>Rasulan</i>	Religious	Annual post-harvest celebration ceremony that includes a communal feast, village cleaning, cultural performances, and <i>gunungan</i>	Ngobaran Beach

Table 4. Local traditions in the Kanigoro Village area, Saptosari Sub-district, Gunung Kidul, Yogyakarta, Indonesia

Local traditions	Description	Location
Prohibition on taking or removing sand and coral reefs	Keeping sand and coral reefs from being exploited. In addition, the local community has a belief that if anyone takes sand or coral reefs from the beach, even a little, they will be punished by nature	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Catching marine life using simple and traditional methods	Fishing still uses traditional methods with nets and fishing rods	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Prohibited from sailing to catch fish on certain days	The rule prohibiting fishing on tuesday <i>kliwon</i> and friday <i>kliwon</i> for fishermen, if violated, is believed to be disastrous	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Sailing during specific seasons and full moon phases	The community uses pattern and seasonal understanding in sailing, such as not during the dry season or high tide because it is difficult to get fish	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Restrictions on fish harvesting	Fish collection should not be excessive, thus disrupting the fish ecosystem in the sea	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Prohibition on littering	The rule of no littering	Ngrenehan Beach, Ngobaran Beach, Nguyahan Beach
Protection of certain plants	Drini plants (<i>Pemphis acidula</i> J.R.Forst. & G.Forst.) on the coastal cliffs are protected and sacred by the local community for generations	Ngobaran Beach Cliff

Traditions prohibiting littering and protecting specific plants are still observed (Table 4). These practices, common in various communities, help maintain environmental cleanliness and biodiversity conservation (Triarmila et al. 2023). The prohibition against littering positively impacts efforts to prevent pollution that could harm coastal ecosystems. Additionally, the protection of certain plants is based on their ecological and spiritual significance. In Kanigoro Village, these practices help safeguard both the environment and cultural heritage. Some traditions, like the protection of the sacred *drini* plant (*Pemphis acidula* J.R.Forst. & G.Forst.) are specific to Ngobaran Beach. These practices reflect the community's identity and pride in preserving their heritage.

Coastal communities are closely connected to the sustainable use of fishery resources. Local wisdom teaches them to understand natural patterns and seasons, enabling sustainable fishing without damaging ecosystems (Zhang and Li 2023). Understanding these patterns ensures fishermen can maintain productive catches without resorting to harmful practices like bombing or poisoning. Conservation, therefore, is not merely a modern concept but an integral part of the community's way of life and coexistence with nature (Gordon et al. 2021). Conservation efforts should thus respect and accommodate the local wisdom ingrained in the community's life for generations.

The study concluded that the data collected from the coastal communities of Nguyahan, Ngobaran, and Ngrenehan identified 17 protected species from 17 different families. Of these, eight species are listed by the IUCN as endangered, with five species critically endangered. The findings show that the community still maintains local wisdom to preserve coastal biodiversity through traditional practices such as the *labuhan*, *gugur gunung*, and *rasulan* ceremonies. These traditions, passed down through generations, include various rules and prohibitions that contribute to cultural and environmental

conservation in the village. Additionally, traditions like *tumpengan*, village cleanups, communal feasts, and religious gatherings preserve cultural heritage and attract tourists, potentially leading to sustainable tourism, protection of national cultural assets, and enhanced well-being for the local community.

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