

MANGROVE AND MALAY ETHNOCULTURAL APPROACHES FOR CONSERVATION IN DUMAI MUNICIPALITY, INDONESIA

Irwan EFFENDI¹, Dessy YOSWATY¹, Irawan HARAHA², Jupendri JUPENDRI³,
Yufi ADRIANI^{4,*}, Izzatulmilla EFFENDI⁵, Andrizal ANDRIZAL²

¹Faculty of Fisheries and Marine Sciences, University of Riau, Binawidya Campus, Pekanbaru, Indonesia

²Faculty of Law, University of Lancang Kuning, Rumbai Campus, Pekanbaru, Indonesia

³Faculty of Communication Sciences, University of Muhammadiyah Riau, Pekanbaru, Indonesia

⁴Faculty of Psychology, Syarif Hidayatullah State Islamic University, Jakarta, Indonesia

⁵Faculty of Psychology, University of Diponegoro, Semarang, Indonesia id

Abstract

The importance of the mangrove ecosystem extends beyond its physical and biological functions to the social and economic well-being of the surrounding community. This study described the condition of mangrove forests, ethnocultural, and religion approaches for mangrove conservation in Dumai Municipality. The mangrove was observed through 10 sample stations located in 5 districts, namely Sungai Sembilan, Dumai Barat, Dumai Kota, Dumai Timur and Medang Kampai. The mangrove observation station was grouped based on the representativeness of the location. Group 1 was far from residential areas, group 2 was close to residential areas, and group 3 was managed by the community. Data were collected by conducting observations, measurements, interviews and literature studies. Mangroves are still found in all districts on the coast of Dumai Municipality. Sungai Sembilan District has the largest mangrove forest and then followed by Medang Kampai. In three districts (Dumai Barat, Dumai Timur and Dumai Kota) the condition of the mangroves was very poor, almost 100% of which has been converted for housing and public facilities. There were 17 species of true mangrove, and 23 species of associated mangroves. Mammals included the Sumatran tiger and the lack-crested Sumatran langur. Bird species included Prinia familiaris, Copsychus saularis, Rhipidura javanica and Leptocoma calcostetha. While the reptiles found such as Varanus salvator, Emoia astrocastata and Trimeresurus sp. The Islamic religion adopted by local communities contributes to mangrove conservation, starting from their way of life, way of thinking, way of acting and how they care for the environment around them. Malay culture and some local wisdoms were related to strongly to mangrove conservation. Starting from the appreciation of the concept of life, livelihood patterns, forest use patterns, leaving tall stubbles to cutting down mangroves as needed.

Keywords: Culture; Religion; Local wisdom; Ecotourism; Mangrove conservation

Introduction

Mangroves are found growing along coastal areas in the tropics and have several ecosystem services, including fisheries production and nutrient cycling for the world. Degradation of forest and vegetated coastal ecosystem environment has occurred for centuries. These lands are converted into residential areas, public facilities (roads, bridges, ports, schoolhouses, houses of worship, shopping centers and so on) and other industrial and residential needs. The conversion of mangrove forests has noticeably accelerated in recent

* Corresponding author: yufi.adriani@uinjkt.ac

decades. This land conversion is also intended for agricultural cultivation, fisheries and livestock [1, 2].

Mangrove ecosystems are important not just for their physical and biological functions, but also for the social and economic well-being of the populations around them. Mangrove vegetation functions to balance the environment and neutralize pollutants. A mangrove thickness of 200m from the shoreline with a tree density of 30 trees/100m with a trunk diameter of 15cm can absorb about 50% of the energy of a tsunami wave. The benefits of mangroves in the economic field can also be felt directly by the community including firewood, fishing areas, crabs and ecotourism [3, 4].

The world has spent a lot of money and attention on the insertion, rejuvenation, and replanting of mangroves for several reasons. The ecological functions and environmental services of mangrove forests have long been neglected in many areas of the world's mangroves. The high dependence of several layers of society, especially the lower layers, on natural resources from the mangrove forest. Massive loss of mangroves has occurred worldwide leading to widespread coastal erosion, global decline in fishery resources, and other environmental consequences. Some of them already need immediate attention. Mangrove conservation strategies and projects that are successful must address the causes of mangrove loss. Promote local communities' long-term viability through embracing inclusive and participatory decision-making. Fair benefit-sharing procedures are also required, as well as mutually beneficial and trust-based collaboration among stakeholders [5].

The local wisdom that exists in the community (including culture and religion) around the mangrove forest is an important component of community social capital in mangrove conservation. This is evidenced by trust and solidarity, communal and collaborative aspects, as well as empowerment and political aspects [6-8]. This wisdom has many advantages and has been proven to be effective as a tool for unifying the formation of a spirit of togetherness, trust, an open mind, and an attitude of helping others in the midst of society. The values of local wisdom can be used to help shape the character of coastal communities to ensure a better future for mangrove protection [9]. In some areas of Indonesia, local wisdom of coastal communities and knowledge of traditional ecology are important factors and even determine conservation initiatives and mangrove-based ecotourism destinations [10-12].

Dumai Municipality is located on the east coast of Sumatra, Indonesia. Mangroves are found along the coast of this region. The mangrove ecosystem has played a role as a green belt, preventing erosion, and a habitat for various flora and fauna. Some species of mammals, birds, insects and various aquatic animals such as fish, shellfish and snails, shrimp and crabs are found in this ecosystem [13]. This mangrove area is also used as a source of household needs by the surrounding community. As a result, damage to the mangrove ecosystem will have a serious impact on the ecosystem itself and the surrounding community. It is believed that the use of local people's religion and culture can help mangrove conservation programs in this area. This study aimed to describe the condition of mangrove forests, ethnocultural approaches to mangrove conservation.

Research Methodology

Time and places of research

This research was conducted from May to July 2021 in Dumai Municipality, Riau Province, Indonesia (Fig. 1). The condition of mangrove forests was observed through 10 sample stations located in 5 districts, namely Sungai Sembilan, Dumai Barat, Dumai Kota, Dumai Timur and Medang Kampai. The stations were nominated based on the representativeness of the mangrove location. Group 1 is represented by stations that are far from residential areas. Group 2 are the stations that are close to residential areas, while group 3 are the location of a mangrove forest managed by the community (Table 1).

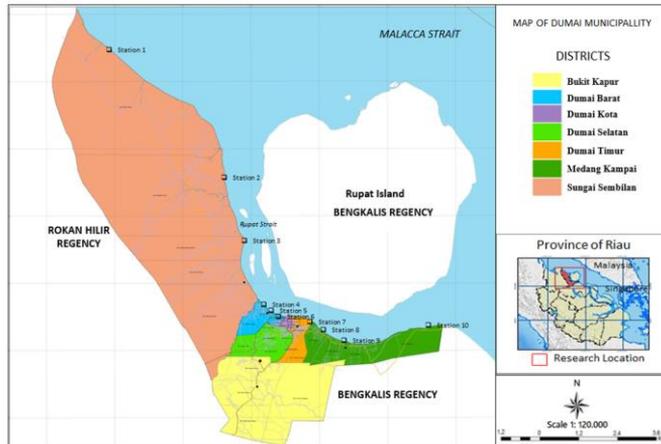


Fig. 1. Research location and mangrove forest observation station in Dumai Municipality

Table 1. Mangrove forest observation station in Dumai Municipality

No.	District	Village	Station	Location of mangrove forest
1.	Sungai Sembilan	Batu Teritip	1	Far from residential communities
2.	Sungai Sembilan	Basilam Baru	2	Far from residential communities
3.	Sungai Sembilan	Tanjung Penyembal	3	Far from residential communities
4.	Sungai Sembilan	Lubuk Gaung	4	Far from residential communities
5.	Dumai Barat	Purnama	5	Near residential communities
6.	Dumai Barat	Pangkalan Sesai	6	Managed by the community
7.	Dumai Kota	Laksamana	7	Managed by the community
8.	Dumai Timur	Buluh Kasap	8	Near residential communities
9.	Medang Kampai	Teluk Makmur	9	Near residential communities
10.	Medang Kampai	Pelintung	10	Far from residential communities

Research design

This research was conducted using a survey method. The researchers directly observed, measured, interviewed structured the respondents using structured and non-structured questionnaires and carried out literature studies.

Respondents

The respondents were selected by purposive sampling method. Respondents interviewed were Dumai Municipality stakeholders who are directly or indirectly related to mangrove development and conservation activities. From the government local government, one respondent was selected from each office, included the Dumai Municipality Environment and Hygiene Agency, Dumai Municipality Marine and Fisheries Service, Tourism, Youth, Sports and Culture Office Dumai Municipality, Dumai Municipality Regional Planning and Development Agency, District Government and Village Government. From the community groups, the respondents were included community leaders, traditional stakeholders and scholar, namely one person for each village and group of leaders. Community groups engaged in mangrove conservation were selected by three respondents per sampling location.

Analysis flora and fauna of mangrove

Each station was assigned a line transect from sea to land with a length of 100 meters. Each station has three line transects, and at each line transect consisted of three plots. The number of individuals for each plot were counted for every species and then differentiated between trees, tillers and seedlings. Mangrove vegetation data collected in the field was used to assess the ecological environment. Identification of mangrove species was carried out by observing and photographing some parts of the mangrove morphology such as roots, stems, leaves, flowers and fruit [14-17].

Fauna identified through observation, interviews with local communities and literature studies from several sources. Included mammals, reptiles, birds and coastal invertebrates. Identification works were carried out by referring to some references [17-20].

Culture and religion for mangrove conservation

Effect of local community religion

The influence of religion adopted by the local community on mangrove conservation were studied through direct observations in the field and in-depth interviews with respondents. Interviews were carried out by following the question guidelines listed in the previously prepared questionnaire and also the interviewer's creations in the field. The list of questions and materials extracted from the respondents was compiled by referring to some references [6, 21, 10].

Influence of local culture

The role and influence of local culture on mangrove conservation was assessed from the respondents who were interviewed in depth (deep interview). Interviews were carried out by following the question guidelines listed in the previously prepared questionnaire. In addition, the interviewer's creative questions according to the conditions in the field were also used. Interview material was extracted from some references [3, 7, 11].

Results

Dumai Municipality's mangrove condition

Dumai Municipality is located on the west coast of Sumatra, Indonesia, at a position between 1° 23'00" - 1° 24'23" North Latitude and 101° 23'37" - 101° 28'13" East Longitude. Dumai Municipality has an area of 1,727.38km² with a population in 2020 of 316.782 persons. Located about 90km from the Capital City of Riau Province, Pekanbaru the area consists of lowlands in the north and some highlands in the south. It has a tropical climate with air temperatures ranging from 21.4 to 36.4°C and has two seasons, namely the rainy season and the dry season.

Mangroves were found in all sub-districts, except in Dumai Selatan District and Bukit Kapur District. Sungai Sembilan District has the largest mangrove forest, and then followed by District of Medang Kampai, West Dumai, East Dumai and Dumai Kota. In Sungai Sembilan District, the area of mangrove forest cover was still relatively high. However, the clearing of land for plantations, agriculture, roads, settlements and public facilities (schools, hospitals, mosques, etc.) has led to the conversion of rove forests. In three sub-districts (Dumai Barat, Dumai Timur and Dumai Kota) the condition of mangroves was very worrying where almost 100% has been converted for residential needs, roads, ports, docks and public facilities in Dumai Municipality. The remaining mangroves were really few and were the result of planted that are maintained by the government and local communities.

From observations of all 10 stations, it can be seen that there are still quite a lot of mangrove species in Dumai Municipality, namely 17 true mangrove species and 23 associated mangrove species (Tables 2 and 3). All of these plant species are still of least concern (LC) or have not been endangered (endangered) according to IUCN. There is one species of *Sonneratia ovate* which is approaching nearly threaten (NT). However, if it is separated by sub-district, per village and per observation station, it will show the condition of damage, at least in the three district mentioned above.

Some of the mammals found in this mangrove forest were permanent and some were only for a certain time. The Sungai Sembilan and Medang Kampai Districts are still areas of the Sumatran tiger which are classified as critically endangered (CE). The lack-crested Sumatran langur and the silvery langur were also found, each with endangered (EN) and nearly threatened (NT) status (Table 4).

Table 2. True mangrove species found in Dumai Municipality

No.	Scientific name	Common Name	IUCN
1.	<i>Avicennia marina</i>	Grey mangrove or white mangrove	LC
2.	<i>Avicennia alba</i>	Api-api putih or white api-api	LC
3.	<i>Bruguiera gymnoriza</i>	Large-leaved orange mangrove	LC
4.	<i>Bruguiera parviflora</i>	Small-Leaved Orange Mangrove	LC
5.	<i>Ceriops tagal</i>	Spurred mangrove or Indian mangrove	LC
6.	<i>Heritiera littoralis</i>	Looking-glass mangrove	LC
7.	<i>Lumnitzera littorea</i>	Black mangrove	LC
8.	<i>Lumnitzera racemosa</i>	Tonga mangrove	LC
9.	<i>Nypa frutican</i>	Nipa or mangrove palm	LC
10.	<i>Rhizophora apiculata</i>	Red mangrove	LC
11.	<i>Rhizophora mucronata</i>	Loop-root mangrove	LC
12.	<i>Rhizophora stylosa</i>	Spotted mangrove	LC
13.	<i>Scyphiphora hydrophyllacea</i>	Greek Scyphiphora	LC
14.	<i>Sonneratia alba</i>	Apple mangrove	LC
15.	<i>Sonneratia ovata</i>	Latin Sonneratia	NT
16.	<i>Xylocarpus granatum</i>	Cannonball mangrove or cedar mangrove	LC
17.	<i>Acrostichum aureum</i>	Leather ferns	LC

IUCN = International Union for the Conservation of Nature. LC = least concern.

Tabel 3. Associated mangrove plant species found in Dumai Municipality

No.	Scientific name	Common name	IUCN
1.	<i>Akasia mangium</i>	Black wattle or hickory wattle	LC
2.	<i>Calophyllum inophyllum</i>	Tamanu or beach calophyllum	LC
3.	<i>Cerbera manghas</i>	Sea mango	LC
4.	<i>Clerodendrum inerme</i>	Glory bower	LC
5.	<i>Derris trifoliata</i>	Karanjvel	LC
6.	<i>Ficus microcarpa</i>	Chinese banyan	LC
7.	<i>Flacourtia rukam</i>	Rukam or governor's plum	LC
8.	<i>Flagellaria indica</i>	Whip vine or hell tail	LC
9.	<i>Gymnanthera paludosa</i>	Climbing vine	LC
10.	<i>Hibiscus tiliaceus</i>	Sea hibiscus or beach hibiscus	LC
11.	<i>Ipomea pes-caprae</i>	Bayhops or beach morning glory	LC
12.	<i>Melastoma septemnerium</i>	Senduduk	LC
13.	<i>Morinda citrifolia</i>	Noni	LC
14.	<i>Pandanus odoratissimus</i>	Odor pandanus	LC
15.	<i>Pandanus tectorius</i>	Beach pandanus	LC
16.	<i>Sesuvium portulacastrum</i>	Shoreline purslane	LC
17.	<i>Spinefex littoreus</i>	Spinifex	LC
18.	<i>Wedelia biflora</i>	Bay Biscayne creeping-oxeye	LC
19.	<i>Stachytarpheta jamaicensis</i>	Jamaica vervain	LC
20.	<i>Terminalia catappa</i>	Indian almond	LC
21.	<i>Thespesia populne</i>	Portia tree	LC
22.	<i>Vitex pubescens</i>	Vitex tree	LC
23.	<i>Collocacia esculenta</i>	Taro	LC

IUCN = International Union for the Conservation of Nature. LC = least concern.

Tabel 4. Species of mammalian found in Dumai Municipality

No.	Scientific name	English Name	IUCN
1.	<i>Presbytis melalophos</i>	Lack-crested Sumatran langur	EN
2.	<i>Presbytis cristatus</i>	The silvery lutung	NT
3.	<i>Macaca fascicularis</i>	Long-tailed macaque	LC
4.	<i>Macaca nemestrina</i>	Southern pig-tailed macaque	VU
5.	<i>Panthera tigris sumatrae</i>	Sumatran tiger	CR
6.	<i>Sus scrofa</i>	Wild boar	LC

IUCN = International Union for the Conservation of Nature. CR = critically endangered. EN = endangered. LC = least concern. NT = near threatened dan VU = vulnerable.

The bird species found at the research site included *Prinia familiaris*, *Copsychus saularis*, *Rhipidura javanica*, *Leptocoma calcostetha*, *Haliastur hindicus*, *Halcyon smyrnensis*, and *Corvus enca*. These birds can be seen directly or heard by the sound of the species. The most common birds found in mangrove areas are storks, which have long legs and include predators such as sea eagles, swallows and fish-eating eagles. Kingfishers and bee-eaters are colorful birds that commonly appear or are seen in mangrove forests (Table 5). Reptile species found at the research site included *Varanus salvator*, *Emoia astrocastata* and *Trimeresurus* sp (Table 6).

Tabel 5. Species of birds found in Dumai Municipality

No.	Scientific name	Indonesian Name	IUCN
1.	<i>Alcedo meninting</i>	Blue-eared kingfisher	LC
2.	<i>Anthreptes malacensis</i>	Brown-throated sunbird	LC
3.	<i>Anthreptes singalensis</i>	Ruby-cheeked sunbird	LC
4.	<i>Arachnothera longirostra</i>	Little spiderhunter	LC
5.	<i>Arachnothera robusta</i>	Long-billed spiderhunter	LC
6.	<i>Copsychus saularis</i>	Oriental magpie-robin	LC
7.	<i>Corvus enca</i>	Slender-billed crow	LC
8.	<i>Egretta garzetta</i>	Little egret	LC
9.	<i>Halcyon chloris</i>	Collared kingfisher	LC
10.	<i>Halcyon smyrnensis</i>	White-throated kingfisher	LC
11.	<i>Haliaeetus leucogaster</i>	White-bellied sea eagle	LC
12.	<i>Haliastur indus</i>	Brahminy kite	LC
13.	<i>Ketupa ketupu</i>	The buffy fish owl	LC
14.	<i>Leptocoma calcostetha</i>	The copper-throated sunbird	LC
15.	<i>Leptoptilos javanicus</i>	Lesser adjutant	VU
16.	<i>Loriculus galgulus</i>	Blue-crowned hanging parrot	LC
17.	<i>Microhierax fringillarius</i>	Black-thighed falconet	LC
18.	<i>Otus lempiji</i>	Sunda scops owl	LC
19.	<i>Pelargopsis capensis</i>	Stork-billed kingfisher	LC
20.	<i>Prinia familiaris</i>	Bar-winged prinia	LC
21.	<i>Psittacula alexandri</i>	Red-breasted parakeet	LC
22.	<i>Rhipidura javanica</i>	Malaysian pied fantail	LC
23.	<i>Spilornis cheela</i>	Crested serpent eagle	LC

IUCN = International Union for the Conservation of Nature. CR = critically endangered. EN = endangered. LC = least concern. NT = near threatened dan VU = vulnerable.

Tabel 6. Reptile species found in Dumai Municipality

No.	Scientific name	Indonesian Name	IUCN
1.	<i>Crocodylus porosus</i>	Estuary crocodile	LC
2.	<i>Naja sp.</i>	Cobra	LC
3.	<i>Python reticulatus</i>	Reticulated python	LC
4.	<i>Varanus salvator</i>	Asian water monitor	LC
5.	<i>Amyda cartilaginea</i>	Asiatic softshell turtle	VU
6.	<i>Emoia astrocastata</i>	Lizard	LC
7.	<i>Macaca fascicularis</i>	Crab-eating macaque	LC

Islam and mangrove conservation

The results showed that the original inhabitants of Dumai Municipality are Malays who are Muslim. Their percentage is quite large (84.89%) and has lived on the coast since their ancestors. They are fishermen, farmers, ranchers and other agricultural businesses. These Islamic values have penetrated into all sectors of their lives. Starting from the way they think, the way they act and the way they care for the environment around them. Islam is a religion that is very serious about preserving the environment. The following are some points that show the relationship between Islam and mangrove conservation in Dumai Municipality.

Islamic view

The results of interviews with some respondents revealed that the understanding of the local community believed that Islam is a religion that attaches great importance to the meaning of planting trees. From this situation, the following opinions, stigmas, mottos and life mottos are formed. "Take care of the mangrove, surely the tree will pray for the good of your life. Take care of your environment, that environment will always pray to God so that your life will always be a blessing." This pattern of life perspective causes almost all levels of society to feel responsible for the preservation of mangrove forests. Thus, it will be relatively easy for the local government to invite its citizens to participate in planting mangroves as a form of their concern for environmental sustainability. Certain events in Islam are used as the right time to invite local people to plant mangroves together (Fig. 2).



Fig. 2. Planting mangroves involves community leaders and scholars

Plant on a good day

The survey results stated that in Dumai Municipality an opinion has developed in the midst of the community which says, "plant on a good day and a good month, surely your life and your family will also be good". Good days and good months can be in the form of the Prophet Muhammad's Birthday, Israk Mikraj, Eid al-Adha and Eid al-Fitr. Moments like this are often used as the right time to plant trees, including mangrove trees of course (Fig. 3).



Fig. 3. Planting mangroves on auspicious days and good months with the community

Plant in achievement

The survey results also show that in Dumai Municipality, teachers who recite the Holy Quran and Islam often become ambassadors for reforestation in coastal areas. They often associate reading and learning the Holy Quran with mangrove planting activities. For example, if someone manages to memorize a letter in the Holy Quran, then he or she makes a vow to plant a mangrove tree. If someone manages to memorize a surah, it is not uncommon for the Holy Quran teacher to tell him or her to plant some mangrove trees. Conditions and situations like this can not be denied will affect the pattern of society will be more concerned about the environment.

Malay culture and mangrove conservation

The results of this study indicated that from a cultural perspective, several local wisdoms show that there are several links between Malay culture and mangrove conservation in Dumai Municipality and its surroundings. The following are some points that show the relationship between Malay culture and mangrove conservation in Dumai Municipality.

Concept appreciation

In the culture of the local community, there is an understanding that "mangrove forest is a place for fish in the sea to spawn, play and find food". So, clearing mangroves means stopping fish from laying eggs and spawning and foraging for food. The next understanding "mangrove fruit is fish food in the sea". This means that if the mangroves are cut down, it means we are killing the fish in the sea and in the end, it will bring misery to the people who fish in the sea.

Livelihood patterns

"Foraging for food on land, catching fish in the sea". This is an expression of the philosophy of life for the people who live on the beach in Dumai Municipality. This expression means they make fields and paddy fields for plant life and raise livestock directed to the land on the mainland. In this way, mangroves forest is minimized to be cut down as livelihoods. This local culture and wisdom have also been used as an opinion, a slogan or even as if it seemed like a myth in the midst of society.

Pattern of sustainable use

Converting mangrove trunks or trees into mangrove charcoal is an attempt by the industry to utilize mangroves. This charcoal is generally used as an export commodity via neighboring Malaysia. This activity has been carried out for a long time, even since the early 19th century (Fig. 4).



Fig. 4. Panglong (manufacture) of charcoal in Dumai Municipality

From this main activity, the author has one particular note, namely that these mangrove loggers usually have certain lands which they cut down gradually from year to year. They claim the logging area as their own and they control and protect it from other mangrove loggers. This land area reaches hundreds or even thousands of hectares. They cut mangroves year after year according to the production target and the logging area for that year. The target continues to be rotated while waiting for the area that previously grew perfectly again. This pattern of utilization is not only aimed at production efficiency but is actually a sustainable use of mangroves.

Leaving a tall stump

The employees of mangrove loggers to make mangrove charcoal generally cut mangrove trees up to the chest of adults. This means that the mangroves are cut down but not too far down but leaving them around 80-100cm from the ground. This tall stump is intended so that later it can sprout and grow back into mature mangroves, which is 3-6 years later. So, they do not need to replant, but enough to expect the shoots to grow back.

Cut as needed

In Dumai Municipality, certain sizes and certain species of mangroves are also used as construction materials. However, the unwritten rule of the wood collectors is that only trees that are cut down are suitable for their size, function and needs. This means that mangrove loggers only cut mangroves that are of sufficient size. Mangrove loggers are generally very careful so that mangrove saplings are not cut or crushed by large trees. This practice has become a tradition and is carried out wisely. This helps to preserve the mangrove forest.

Discussions

Dumai Municipality's mangrove condition

In terms of the number of mangrove species and associates as well as the condition of the flora and fauna of the mangroves, it can be said that the condition of the mangroves in Dumai Municipality is still in good condition. Some researchers [22, 23] mentioned that on the East Coast of Sumatra, there are generally five main mangrove genera, namely *Avicennia*, *Rhizophora*, *Sonneratia*, *Bruguiera* and *Nypa*. However, this conclusion is not true, considering the physical condition, the amount of flora and fauna that exists is only focused in Sungai Sembilan District and Medang Kampai District. Meanwhile, in other districts, the mangroves have been severely damaged. The remaining mangroves are only the result of replanting by community groups.

The main cause of this deforestation is due to the need for housing and public facilities. Another group of researchers [24] stated that the main cause of damage to mangrove forests is human activity where the mangrove forest ecosystem is open access so that it is easy to use for various needs. As a result, mangrove forests experience degradation from time to time. In addition, in some places, the overlapping interests of mangrove forest resources will lead to ambiguity in planning, management, supervision, ownership, making it difficult to manage and even lead to conflict. It is critical to promote the formation and maintenance of social networks for coastal communities through collaboration and faith in local competence and self-organization in order to protect mangroves and improve local livelihoods in a more sustainable manner [25]. However, because to unequal adaptive capacity, limited resources and limited rights for women to access mangrove resources, as well as elite capture and a lack of inclusive decision-making, this may be difficult [26].

Islam and mangrove coservation

Islamic teachings have been deeply embedded in people's lives in Dumai Municipality. Starting from general things to small things and personal human affairs, including of course matters of environmental conservation. Islam always compares something good to a tree. A very interesting parable is that a believer is like a good tree. Islam is their religion and one of

the largest religions in the world, which pays attention to protecting the environment and biodiversity for human well-being and urges the Islamic community to show its support for environmental preservation. Islam is a complete way of life, namely a religion that guides humans in all fields. Prohibit excessive things, injustice and lawlessness both in the form of actions and words. Islam emphasizes the importance of cleanliness, conservation and helps instill a sense of responsibility among people [27-29].

Islam has provided a complete mindset and foundation for life to protect the environment and emphasizes the importance of sustainable use of natural resources. Allah lord of the worlds and Prophet Muhammad paid special attention to protecting the environment and stopping people from destroying the wild. Conservation of nature must always be emphasized because it is a real virtue that Allah asks to be realized. Disturbance in the balance of this natural system will cause damage to nature itself, it can even cause the destruction of human, animal and plant life on earth in the future. Overexploitation of natural resources has created complex problems for life in some places. For example, floods, droughts, pollution, deforestation, climate change, global warming and the extinction of certain animal and plant species [30, 31].

Some Hadith expressions in Islamic teachings state that "it is not a Muslim who grows plants, except that every plant he eats is charity for him, what people steal from it becomes alms for him, what wild animals eat becomes charity for him, what birds eat becomes charity for him, and no one takes from, but it becomes alms for him." In another Hadith Prophet Muhammad also said "if the Day of Judgment has arrived, and the seed or plant is in your hands, then plant the seed or tree. This hadith also shows how Islam as a religion embraced by the community around the research location teaches a pro-environmental lifestyle.

In Islamic teachings, the relationship between humans and other creatures is not a superiority relationship, which places one being higher than another. Even during the war, Prophet Muhammad forbade Muslims to cut down trees. Being the most noble of creatures does not mean that humans can be arbitrary towards other creatures. Of course, humans are allowed to use plants, animals, and others for the benefit of their lives, but that is done according to their needs. The Qur'an and hadith mention the prohibition of wasting water. In verse 31 of Surah Al-A'raf Allah says that humans should eat and drink in moderation and do not behave extravagantly [27, 32].

Local wisdom and mangrove conservation

It is common knowledge that the local wisdom of the local community is an essential part of the community for the benefit of mangrove conservation. The values of local wisdom can be used to shape the character and attitudes of coastal communities towards mangrove forests so that in the future they will be better at preserving mangroves [33]. Local wisdom has the potential to be used as a guide for the values of cooperation, trust, open-mindedness and the spirit of helping each other in society. This can be seen from several aspects, including religion, belief and solidarity, collective and cooperative aspects, as well as aspects of empowerment and politics. This is understandable given the multiple functions of mangrove forests, namely supporting local fisheries, providing valuable ecosystem services that benefit coastal communities, stabilizing coastal land and storm protection [24, 34-36].

The success of mangrove conservation by involving local communities has proven to be successful in many places. For example, in Thailand, Tanzania, Vietnam and Indonesia itself. In Trang Province, Thailand, it is proven that mangrove forests can be managed and conserved by the local community around the mangrove ecosystem [37]. It was also found that the local government of Vietnam has succeeded in managing mangrove forests based on collaboration with the community [38, 39]. This success story was also recorded in mangrove restoration and conservation activities in Tanzania [40].

The Bali Provincial Regulations play an active role in environmental protection and management, social supervision, providing advice or complaints and submitting information or reports solely to increase awareness in protecting and managing the environment, increasing

community independence and empowerment, fostering community capacity and pioneering activities, fostering community responsiveness in carrying out social supervision, as well as developing and maintaining local culture and wisdom in the context of environmental preservation [42-43]. This can be achieved thanks to the community's understanding of the importance of the existence of mangrove forests for their communities. Others [11] reported that in Jaring Halus Village in Langkat, North Sumatra, Indonesia, generally people (85.5%) understand the general benefits of the existence of mangrove forests and in general also believe that mangroves protect the coast (71.4%). They concluded that local wisdom contributed positively in maintaining the existence of mangrove forests in this area.

Conclusions

The results showed that mangroves were still found in all districts located on the coast of Dumai Municipality. Sungai Sembilan district has the largest mangrove forest and is followed by Medang Kampai. In three districts (Dumai Barat, Dumai Timur and Dumai Kota) the condition of mangroves is very alarming where almost 100% has been converted for residential needs, roads, ports, docks and public facilities. There are still quite a lot of mangrove species, namely 17 true mangrove species and 23 associated mangrove species. The mammals found were the Sumatran tiger, the lack-crested Sumatran langur and the silvery langur. Bird species include *Prinia familiaris*, *Copsychus saularis*, *Rhipidura javanica*, *Leptocoma calcostetha*, *Haliastur hindicus*, *Halcyon smyrnensis*, and *Corvus enca*. While the reptiles found between were *Varanus salvator*, *Emoia astrocastata* and *Trimeresurus* sp. The Islamic religion adopted by local communities contributed to mangrove conservation, starting from their way of life, way of thinking, way of acting and how they care for the environment around them. This study indicated that from a cultural point of view, some local wisdoms show that there are some links between Malay culture and mangrove conservation in Dumai Municipality. Starting from understanding the concept, livelihood patterns, sustainable use patterns, leaving tall stubbles to cutting down as needed.

Acknowledgments

The authors are grateful to the Faculty of Fisheries and Marine Sciences, University of Riau - Pekanbaru, Indonesia, Faculty of Law, University of Lancang Kuning - Pekanbaru, Indonesia, Faculty of Communication Sciences, University of Muhammadiyah Riau - Pekanbaru, Indonesia, Faculty of Psychology, Syarif Hidayatullah State Islamic University - Jakarta, and Faculty of Psychology - University of Diponegoro, Semarang, Indonesia for their support to this study.

References

- [1] F.R.Z. Lontsi, P. Tchawa, J.Y. Happy, *Mangrove dynamics near Douala International Airport (Cameroon Coastal)*, **Open Acces Library Journal**, **8**(12), 2021, pp.1-15. doi: 10.4236/oalib.1108184.
- [2] A.A. Benjamin, U.B. Obeten, *Ecosystems restoration strategies for the cross river rainforest zones. Preparing forest stakeholders for the un decade on ecosystems restoration 2021 to 2030*, **Journal of Geoscience and Environment Protection**, **8**(1), 2020. doi: 10.4236/gep.2020.81002.
- [3] A.R. Tolangara, R. Rasyid, *Mangrove conservation based on local wisdom in North Maluku Province, Indonesia*, **International Journal of Science and Engineering Development Research**, **3**(1), 2018, pp. 59-61. <http://www.ijedr.org/papers/IJEDR1801009.pdf>.

- [4] M. Zikra, H. Ikhwan, A.K. Wardhani, *Assessment of mangrove as a natural beach protection in Surabaya Coast, Indonesia*, **International Journal of Conservation Science**, **12**(4), 2021, pp. 1515-1526.
- [5] P.T. Thuy, *Mangrove environmental services and local livelihoods in Vietnam. No. 339, August 2021*, **Center for International Forestry Research (CIFOR)**. doi: 10.17528/cifor/008148.
- [6] A.D. Purwanto, N. Hikmah, A. Aprianto, E. Rahmawati, *Modelling Spatio-Temporal of Mangrove Ecosystem and Community Local Wisdom in Taman Hutan Raya (Tahura), Ngurah Rai, Bali*, **International Journal on Advanced Science, Engineering and Information Technology**, **11**(4), 2021, pp. 1642-1653. doi:10.18517/ijaseit.11.4.11711.
- [7] R. Siburian, *Local wisdom versus mangrove preservation: efforts to maintain the coastal zone of Belitung from damage*, **Jurnal Masyarakat and Budaya**, **16**(1), 2014, pp. 81-112. <https://doi.org/10.14203/jmb.v16i1.44>.
- [8] S. Harto, R.R.S. Sidiq, O. Karneli, *Development strategy mangrove ecotourism based on local wisdom*, **Journal of Social Sciences and Humanities**, **23**(1), 2021, pp. 115-123. doi: 10.24198/sosiohumaniora.v23i1.31315.
- [9] H. Nanlohy, A.N. Bambang, Ambariyanto, S. Hutabarat, *Need to Conservation of Mangrove Ecosystem in Kotania Bay, District of West Seram, Moluccas: An Approach the Local Wisdom and Behaviour*, **International Journal of Marine Science and Ocean Technology**, 2015, pp.150-160.
- [10] P. Purwowibowo, B. Santoso, K. Hendrijanto, S. Hariyono, B.H. Nufus, *Local wisdom for mangrove conservation and ecotourism: Case study from Wringinputih, Muncar, Banyuwangi*, **IOP Conference Series: Earth and Environmental Science**, **485** 2020, Article Number: 012092. doi:10.1088/1755-1315/485/1/012092.
- [11] M. Basyuni, M.A. Rouf, M. Saragih, A.M. Asbi, Y. Yuriswan, *Local wisdom and mitigation action to maintain secondary mangrove forest: A case study of Jaring Halus Village in Langkat, North Sumatra, Indonesia*, **Advances in Social Science, Education and Humanities Research. Proceedings of the 1st International Conference on Social and Political Development**, ICOSOP, 2016. doi.org/10.2991/icosop-16.2017.75.
- [12] M.L. Salamessy, I.G. Febryano, E. Martin, M.E. Siahaya, R. Papilaya, *Cultural Capital of the communities in the mangrove conservation in the coastal areas of Ambon Dalam Bay, Moluccas, Indonesia*, **Procedia Environmental Sciences**, **23**(1), 2015, pp. 222–229. doi:10.1016/j.proenv.2015.01.034.
- [13] D. Yoswaty, I. Effendi, M. Mardalisa, E. Efriyeldi, A.M.M. Makwa, M.F. Dzikri, *The Threat of microplastic waste in Dumai waters, Province of Riau, Indonesia*, **Carpathian Journal of Earth and Environmental Sciences**, **16**(2), 2021, pp. 383-390. doi:10.26471/cjees/2021/016/183.
- [14] R.Y. Noor, M. Khazali, I.N.N. Suryadiputra, **Mangroves Identification Guidelines in Indonesia**, Wetlands International - Indonesia Programme, Bogor, 2006, 220p.
- [15] S. Kitamura, C. Anwar, A. Chaniago, S. Baba, **Handbook of Mangrove in Indonesia – Bali and Lombok**, JICA ISME, 1998. 118p.
- [16] * * *, **Dinas Peternakan, Perikanan dan Kelautan Kota Dumai, Buku Identifikasi Mangrove**, Pemerintah Kota Dumai, Dumai, 2008.
- [17] * * *, **Red List of Threatened Species**, The International Union for Conservation of Nature', IUCN, 2020. <https://www.iucnredlist.org>.
- [18] G.L. Kenneth, **Guide to Identification of Marine and Estuarine Invertebrates**, Wiley-Interscience, A Division of John Wiley & Sons, Inc. New York. USA, 1971.
- [19] W. Giesen, S. Wulffraat, M. Zieren, L. Scholten, **Mangrove Guidebook for Southeast Asia**. FAO and Wetlands International. Dharmasarn Co., Ltd., 2006, 781p. <https://www.fao.org/3/ag132e/ag132e.pdf>.

- [20] E.G. Aragones, J.P. Rojo, F.C. Pitargue, **Botanical Identification Handbook on Philippine Mangrove Trees**, Forest Products Research and Development Institute, Department of Science and Technology, Laguna, the Philippines, 1998. 127p.
- [21] B. Satyanarayana, P. Bhanderi, M. Debry, *A Socio-Ecological Assessment Aiming at Improved Forest Resource Management and Sustainable Ecotourism Development in the Mangroves of Tanbi Wetland National Park, The Gambia, West Africa*, **AMBIO**, **41**, 2012, pp. 513–526. doi.org/10.1007/s13280-012-0248-7.
- [22] M.D. Spalding, F. Blasco, C.D. Field (Eds.), **World Mangrove Atlas**, The International Society for Mangrove Ecosystems, Okinawa, Japan, 1997, 178p.
- [23] A. Soegiarto, *The Mangrove Ecosystem in Indonesia: Its Problems and Management, Physiology and Management of Mangroves*, (Editor: H.J. Teas), W. Junk Publishers, 1984, pp. 69-78.
- [24] B.B. Walters, P. Ronnback, J.M. Kovacs, B. Crona, S.A. Hussain, R. Badola, J.H. Primavera, E. Barbier, F. Dahdouh-Guebas, *Ethnobiology, socio-economics and management of mangrove forests: a review*, **Aquatic Botany**, **89**, 2008, pp. 220–236.
- [25] S. Orchard, L. Stringer, C. Quinn, *Environmental entitlements: Institutional influence on mangrove socialecological systems in Northern Vietnam*, **Resources**, **4**(4), 2015, pp. 903–938.
- [26] S.E. Orchard, L.C. Stringer, C.H. Quinn, *Mangrove system dynamics in Southeast Asia: linking livelihoods and ecosystem services in Vietnam*, **Regional Environmental Change**, **16**(3), 2016, pp. 865–879. <https://doi.org/10.1007/s10113-015-0802-5>.
- [27] F. Al-Banna, *Islam and Environment Protection*, **EcoMENA, Echoing Sustainability in MENA**, 2020. <https://www.ecomena.org/islam-environment>.
- [28] M.A. Salem, N. Hasnan, N.H. Osman, *Some Islamic Views on Environmental Responsibility*, **2012 2nd International Conference on Environment Science and Biotechnology. IPCBEE**, **48**, 2012, pp. 109-113.
- [29] M.H.I. Al Muhdhar, F. Rohman, M.N. Tamalene, W.S. Nadra, A. Daud, B. Bahtiar, H. Irsyadi, *Local wisdom-based conservation ethics of Tabaru traditional community on Halmahera Island, Indonesia*, **International Journal of Conservation Science**, **10**(3), 2019, pp. 533-542.
- [30] R.T. Riatno, *Nature Conservation in Islam: A Study on M. Quraish Shihab's Qur'anic Interpretation*, **Academic Journal of Islamic Studies**, **2**(2), 2017, pp. 193-214.
- [31] E. Kula, *Islam and environmental conservation*, **Environmental Conservation**, **28**(1), 2001, pp. 1-9. doi:10.1017/s0376892901000017.
- [32] M.R. Akhtar, *Towards an Islamic approach for environmental balance*, **Islamic Economic Studies**, **3**(2), 1996, pp. 57-76.
- [33] M.N. Tamalene, M. Henie, I. Almudhar, *System of forest ecosystem by Togutil ethnic group on Halmahera Island, Indonesia: traditional utilization and conservation*, **International Journal of Conservation Science**, **8**(3), 2017, pp. 497-508.
- [34] P. McElwee, H. Tran, *Assessing the social benefits of tree planting by smallholders in Vietnam: Lessons for large-scale reforestation programs*, **Ecological Restoration**, **39**(1-2), 2021, pp. 52–63.
- [35] H. Hendrik, M. Fauzi, T. Ramadana, A. Hendrizal, I. Effendi, *Local Wisdom and Conservation Status of Tor Thai Mahseer Fish (Tor tambroides Blkr) in the Batang Haluan River, West Sumatra, Indonesia*, **International Journal of Conservation Science**, **12**(4), 2021, pp. 1547-1556.
- [36] I.C.A. Sandu, P. Spiridon, I. Sandu, *Current studies and approaches in the field of cultural heritage conservation science. Harmonising the terminology in an interdisciplinary context*, **International Journal of Conservation Science**, **7**(3), 2016, pp. 591-606.
- [37] C. Sudtongkong, E.L. Webb, *Outcomes of state- vs. community-based mangrove management in Southern Thailand*, **Ecology and Society**, **13**(2), 2008, pp. 1-23.

- [38] P.T. Dat, K. Yoshino, *Comparing mangrove forest management in Hai Phong City, Vietnam towards sustainable aquaculture*, **Procedia Environmental Sciences**, **17**, 2013, pp. 109-18.
- [39] T. Pham, T. Vu, D. Pham, L. Dao, V. Nguyen, N. Hoang, T. Hoang, T. Dao, D. Nguyen, **Opportunities and Challenges for Mangrove Management in Vietnam: Lessons Learned from Thanh Hoa, Thai Binh and Quang Ninh provinces**, Occasional Paper 197, Bogor, Indonesia: CIFOR, 2019.
- [40] M.M. Mangora, *Poverty and institutional management stand-off: A restoration and conservation dilemma for mangrove forests of Tanzania*, **Wetlands Ecology and Management**, **19**, 2011, pp. 533-43.
- [41] I. Effendi, N. Nursyirwani, W.P. Panjaitan, D. Yoswaty, M. Ghalib, M.R. Razman, A. Andrizal, *Potency and Development Strategy of Sungai Bersejarah Mangrove Ecotourism, Siak Regency*, **Journal of Environmental Management and Tourism**, **8**(56), 2021, pp. 2272 - 2282. doi:10.14505/jemt.v12.8(56).25.
- [42] A. Redi, T.H. Sitabuana, *The Role of Local Wisdom in Protecting Mangrove Forest in Bali Province. Tarumanagara International Conference on the Applications of Social Sciences and Humanities (TICASH 2019)*, **Advances in Social Science, Education and Humanities Research**, **439**, 2019, pp. 47-52.
- [43] S. Eddy, M.R. Ridho, I. Iskandar, A. Mulyana, *Community-based mangrove forests conservation for sustainable fisheries*, **Jurnal Silvikultur Tropika**, **7**(3), 2016, pp. S42-S47.

Received: February 21, 2022

Accepted: October 11, 2022