Identification of marine ecotourism objects on Pulau Jemur, Riau Province, Indonesia

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Abstract. Marine ecotourism is a form of tourism involving visiting fragments, pristines and relatively undisturbed marine ecosystem areas. Pulau Jemur is a common term for a group of small islands located in the middle of the Malacca Strait, Pasir Limau Kapas District, Rokan Hilir Regency, Riau. This study aimed to identify potential marine ecotourism objects in the area. The research was carried out by recognizing, identifying, observing some marine ecotourism objects on land, in water column, and on the sea floor. Including the beauty, uniqueness and diversity of flora, fauna and other natural phenomenon. It is determined that the potential marine ecotourism objects on the area include; 1) diversity, beauty, and the uniqueness of the species of coastal vegetation. 2) diversity, beauty, and the uniqueness of the animal species on coastal ecosystems 3) some historical objects related to maritime life in the past 4) the beauty and uniqueness of beaches and sea water. 5) diversity, beauty, and the uniqueness of fish species and shallow marine coral reefs. Tourism activities can be in the form of sea sightseeing tour, underwater life boat viewing, snorkeling, diving, swimming, sun bathing, hiking, fishing, joining fishing with fishermen, cooking, eating, etc.

1. Introduction

Ecotourism can be defined as a responsible travel to natural areas that conserves the environment, sustains the well-being of the local people, and involves interpretation and education [1]. Marine ecotourism is a form of tourism involving visiting fragile, pristine, and relatively undisturbed marine ecosystem areas, intended as a low-impact and often small scale alternative to standard commercial mass tourism. In other words a responsible travel to natural areas, conserving the environment, and improving the well-being of the local people [2] [3]. Pulau Jemur is a common name to a group of small islands located in the middle of the Straits of Malacca. The cluster of these islands, also named as Aruah Islands, is completely separate from the mainland both from the mainland of Sumatra and the Malay Peninsula (Figure 1). The distance of Pulau Jemur from the Sumatra mainland to the west is about 15 miles while the distance from Bagansiapiapi, which is south, is around 42 miles. Geographically, Pulau Jemur is in the position of 100°32'35" - 100°34'36" ET and 02°52'24" - 02°53'11" NL.
Pulau Jemur has long been planned to become a marine and fisheries-based tourist destination by the government, both by the Rokan Hilir Regency and by the Riau Province. The goal of this study is to identify potential marine ecotourism objects that might be developed in the future.

![Figure 1. Pulau Jemur or Aruah Islands.](image)

2. Material and Methods

2.1 Data Collection

This research was conducted from January to May 2019. It was carried out by recognizing, identifying, observing some marine ecotourism objects on land, seawater column, and the sea floor habitats.

In mainland, objects observed included; 1) beauty, uniqueness and diversity of vegetation species of coastal vegetation. 2) the uniqueness and diversity of animal species living in coastal ecosystems. 3) historical objects related to maritime life in the past. 4) the beauty and uniqueness of the beach (sand, stone, coral and gravel) and water. 5) the beauty and uniqueness of sea views and the cluster of islands on Pulau Jemur. Whereas in the water column and the sea floors, tourism objects observed included 1) beauty, uniqueness and diversity of fish species and other shallow seas coral reef. 2) beauty, uniqueness and diversity of species of shallow marine vegetation. The research also observed the possibilities of some areas become a sports activities and other physical activities that might be developed as marine tourism objects. For example suitable area for swimming, snorkeling, diving, fishing, cooking, wall climbing and others.

These marine tourism objects were photographed and videotaped. To complete the results of this study, measurements and observations were made on some physical and biological characteristics of this area.

2.2 Data Analysis

All of data were grouped, classified, and analyzed descriptively. Opinion, analysis, correction and suggestion of some experts, tourism communities, government staff and other stakeholders were also collected.

3. Result and Discussion

Administratively, Pulau Jemur is included in Pasir Limau Kapas District, Rokan Hilir Regency, Riau Province. The islands are uninhabited and only a stopover place for fishermen. A post of Indonesian Navy was established for the purposes of observation and navigation. The islands are located in the Strait of Malacca or Ecoregion 12 [4], about 45 miles or 72.4 kilometers from Rokan Hilir Regency capital, Bagansiapiapi, and about 63.5 kilometers from Malaysia.

This island cluster consists of 12 (twelve) small islands with a total area of around 50.780 ha. It is stated [5] that at the highest tide the width of each is; Jemur Island (17,8400 ha), Kalironggo Island
(3.0861 ha), Sarang Elang Island (0.4589), Pandan Island (0.0 ha), Labuhan Bilik Island (8.4470 ha), Tukong Mas Island (0.5158 ha), Pasir Island (1.3270 ha), Batu Adang Island (1.6660 Ha), Batu Berlayar Island (1.6860 ha), Batu Mandi Island (1.2130), Tukong Simbang Island (12.6560 ha), and Tukong Island (1.8910 ha).

Pulau Jemur is actually a group of islands surrounded by coral reefs. It is reported [5] that the area of coral reefs around the cluster of islands was 358,4841 ha at the lowest tide time, namely; Jemur Island (31.3800 ha), Kalironggo Island (39.0229 ha), Sarang Elang Island (0.5081 ha), Pandan Island (3.5940 ha), Labuhan Bilik Island (15.5340 ha), Tukong Mas Island (19.4271), Pasir Island (25,853), Pulau Batu Adang (43.1740), Pulau Batu Berlayar (70.9140), and Pulau Batu Mandi (9.0770).

The results of this study identified four mainland tourist attractions. First, the diversity of beauty, and the unique species of coastal vegetation. This vegetation grows along the coastline and provides shade and cool atmosphere for visiting tourists. In addition, the diversity of existing plants will become a separate tourism object.

Pulau Jemur is overgrown with tropical vegetation, both native to the local island, and brought from other places to the area. It is reported [6] that plants found include ferns (*Cyclosorus aridus*), coconuts (*Cocos nucifera* L.), mangoes (*Mangifera indica*), weeds (*Imperata cylindrical*) and teki grass (*Cyperus rotundus*), keduduk (*Melastoma* spp.), ketapang (*Terminalia catappa*), petai (*Parkia speciosa*), water guava (*Syzygium aqueum*), jackfruit (*Artocarpus heterophyllus*), and oranges (*Citrus* sp.).

Second, the uniqueness and diversity of animal species that live in coastal ecosystems can be polished into special tourist attractions. It is reported by some researchers [6] and [7] that some species of animals in Pulau Jemur, included rock grouse (*Dendrocyna javanica*), coastal sandpipers (*Actitis hypoleucos*) coral egrets (*Egretta sacra*), herons (Ciconiidae), monitor lizards (*Varanus salvator*), sand sea cucumbers (*Holothuria scabra*), mussels (*Asaphis detlorasa*), shrimp (*Panaeus* sp) mud crabs (*Thalassina anomala*) and others. These fauna will provide their own beauty to Pulau Jemur.

Pulau Jemur is also known as Mr. Ku which means Northern Turtles. This name is given according to the fact that this island is indeed a nesting and hatching place for green turtles (*Chelonia mydas*). Their existence also proves that these animals (Figure 2) have been in this area for a long time. In certain seasons, sea turtles will go up to the coast and lay 100 to 150 eggs per male turtle. These turtles will be easily seen and appear on land especially at night [8]. The nursery center and releasing green turtle hatchlings will certainly become a special attraction for tourists.

![Figure 2. Green turtles (*Chelonia mydas*).](image)

Third, some historical objects related to maritime life in the past, were also found in these islands. Pulau Jemur was a strategic location on the Strait of Malacca; during the Second World War. The Japanese built some defense system in these islands. Japanese Cave, Light House Tower. It is belived that such historical place will be attractive to the tourist.
Fourth, the beauty and uniqueness of sloping beaches (sand, rocks, coral and gravel) and water can be the main tourism object of the area. The stretch of beach sand that is white, golden yellow, sloping topography of the beach can be used as a place to sunbathe and sit back while enjoying the beauty and uniqueness of the view of the sea and a group of islands on Pulau Jemur (Figure 3). Bright sea water, clean and calm can also be enjoyed as a place to swim, playing canoe, boat boat and so on.

Deploying reefs on the seabed has become popular in diving management. This practice has been advocated as a means towards meeting both ecological concerns and recreational divers' demands for diversification and themed experiences [9]. The importance of stakeholders understand the island's condition and the urgency of coastal resources, to determine collective action, which leads to sustainable ecotourism on the island [10]. There are five main variables should be emphasized in developing marine ecotourism on the island, including tourist activities, institutions, and economic activities, as well as the quality of human and natural resources.

![Figure 3. Beach of Pulau Jemur.](image)

Ecotourism below sea level is expected to be the main attraction of marine ecotourism in the Pulau Jemur. The beauty and uniqueness and diversity of fish species and other shallow marine reefs in this area are quite charming (Figure 4). A stretch of coral reef was found. Dominated by the family Acroporidae. In addition, it is estimated that the coral reef species are also from families; Agariciidae, Caryophylliidae, Faviidae, Fungiidae, Pectiniidae, Siderastreidae. Coral reefs can be used as marine tourism and fishing grounds for fishermen [11].

![Figure 4. Soft coral of Pulau Jemur.](image)

Around the coral reefs also swim small-sized reef fish. However, the fishermen catch high economic value around this island. The fish caught included; mackerel (*Scomberomorus* sp.), machetes (*Chirocentrus* sp.), fourfinger threadfin (*Eleutheronema* sp.), arid catfish (*Ariidae*), marine congrid eels (*Gnathophis* sp.), ilisha(*Ilisa* sp.), ponyfish (*Leiognathus* sp.), pomfret (*Pampus* sp.) and others. This beauty and uniqueness can be enjoyed through boat viewing, snorkeling and diving.

The beauty of coral reefs seems to be an icon of marine ecotourism. In some places even artificial coral reef are made to increase the tourism attraction of the area. Artificial reefs used as submarine and
dive tour sites receive less fishing pressure from the public, because the high use patterns by dive tour firms preclude much of the fishing activity. Such reefs when used as part of a non-destructive "eco-tourism" dive package provide significantly greater economic return than when used for commercial fishery purposes. If the rationale for artificial reef development is economic gain and a viable tourist industry presently exists, reefs deployed for non-consumptive purposes may provide the best use, especially when fishery resources are in a state of decline [12] [13].

An object of tourism must fulfill the character "something to see". Something that can be seen or interesting for tourist. In other words, the object must have a special attraction to be able to make visitors come to these attractions [14][15].

In addition to enjoying the tourist objects above, some activities can be designed in such a way that they become part of this marine ecotourism as well. For example fishing, fishing experience with fishermen, sea snail harvesting, cooking, and eating. hiking, walking and wall climbing programs can also be run on some locations. A tourism object must meet the criteria of "some thing to do". This means that tourists can do something useful to give a feeling of happiness [15] [16]. This feeling is sourced from recreational facilities in the tourist attraction both through playgrounds, places to eat and other things that have their own characteristics to make tourists feel at home and linger there. Physical activities such as fishing, harvesting cooking and eating seafood can also become a special attraction for tourists [17].

In the Pulau Jemur region, the current of waters is dominated by tidal currents with a speed of around 0.05-0.75 meters/second. The waves occur due to the gusts of wind, which are 0.30-0.60 meters high. Tides occur twice and recede twice a day, which is between -2.0 to 4.0 meters. Salinity ranges from 26.8 - 30.2 ‰.

Security is a factor that must not be forgotten from an ecotourism location. The results of interviews with fishermen, and the inhabitants of these islands, mentioned that in there is no dangerous animals had been found so far, both on land and in the sea.

From the water quality and biological characteristics the waters, it is concluded that this islands is relatively safe and feasible as a marine ecotourism area. Some ecotourism location requirements include clean, natural, free from pollution [18] [19] [20] attractive, beautiful, comfortable from safe from disturbance of marine life [21] and dangerous marine phenomenon [22] [21] [15].

Another feature of the beach on Pulau Jemur is that the atmosphere is quieter and still beautiful. Away from the hustle and bustle of the city. Even though it has a variety of interesting natural potential, the condition of tourist facilities on this island still needs further development. Starting from transportation to the island, telecommunications networks on the island such as the signal tower, cellphone, port and dock are adequate. The area also needed some guesthouses for overnight stays and maintenance of tourist areas and facilities. For example toilets, resting places, culinary services and so on. These supporting facilities must be continuously improved by the government to help attracting tourists to come to the island. When viewed from the side of geographical location, Pulau Jemur is very suitable to be developed into a resort area.

4. Conclusion
The potential marine ecotourism objects on Pulau Jemur include; 1) diversity, beauty, and the uniqueness of coastal vegetation species. 2) diversity, beauty, and the uniqueness of the animals species on coastal ecosystems 3) some historical objects related to maritime life in the past 4) the beauty and uniqueness of beaches and sea water. 5) diversity, beauty, and the uniqueness of fish species and shallow marine coral reefs. Tourism activities can be; sea sightseeing tour, boat viewing, snorkeling, diving, swimming, hiking, fishing, joining fishing with fishermen, etc. It is recommended to the government and the private sector to start marine ecotourism activities on Pulau Jemur.
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