Impact of Coral Reef Damage Due to Tourism Activities in Karimunjawa National Park

Rizal Akbar, M. T. S. Sri, Warto, Wiwik

Abstract.

Tourism in Karimunjawa National Park is one of Central Java Province's main tourist sectors. Every year, tourists visiting the Karimunjawa Marine National Park always increase. The domestic and regional market has driven the development of the Karimunjawa Islands as a tourist destination. It is promoted as a spot for diving and snorkeling, with the community participating as a provider of tour operator services, tour guides, and accommodation. Tourist visits that increase yearly raise concerns about the sustainability of tourism activities for the ecological sustainability of coral reefs. This paper aims to determine damage to coral reefs in Karimunjawa National Park due to tourism activities.

1 Introduction

Tourism is a fast-growing industry in Indonesia. In addition to natural resources, Indonesia also has good tourism potential that can be developed from nature, history, and human resources. According to the Minister of Tourism, based on the version of The World Travel & Tourism Council (W.T.T.C.), Indonesia has the ninth (9) highest tourism growth globally. Tourism also includes the classic industry and souvenirs. Most countries develop tourism activities to: expand employment opportunities and business fields as well as state foreign exchange income, introduce national culture, maintain the personality of national culture and foster a sense of love for the homeland, encourage regional development while still paying attention to environmental sustainability.
The importance of local communities that including cultural aspects both in the damage [22]. Degraded coral reefs are -

along natural economic attractiveness, reef fish, and ability to maintain their structure as a breakwater, social and

in example, changes in dead coral reefs will be overgrown by algae, in addition to changes
closely related to existing diversity. They can even change the dominant type of coral reef;

experience pressure and are vulnerable to causing d

managed area on

has made this area designated as a protected area of the Karimunjawa National Park

biodiversity ecosystem is 69 hard corals (Ordo Scleractinia) and three non
Karimunjawa Islands is 54.6%. The number of hard corals that makeup the
areas, with a live coral
ecosystem in the Karimunjawa Islands are found in almost all island

high productivity, economic, and ecological value to the environment and humans around

and snorkeling with community participationas

encouraged by the domestic and regional markets and promoted as a destination for diving

Dewandaru sand on its beaches with coral

Marine National Park [1] are; high biodiversity, especially in coral reefs, mangroves, and

and

ecosystem value)

and

regulated

past

naturally relatively undisturbed, with a genuinely objective intention to see, study, and

industry environmental

are not only oriented to the present but also future generations related to economic, social,

employees, tourists, and those who do not know th

harmony

some of the critical aspects of ecotourism are: the number of visitors is limited or

Tourism activities are carried out by utilizing coral reef areas; coral reefs will always

Coral reefs are tropical ecosystems

in the Karimunjawa Islands have tourism potential and are supported by a National Park,

that are found in Indonesian waters. Its existence has

Some of the critical aspects of ecotourism are: the number of visitors is limited or

Ecotourism, or ecotourism according to Pendit (2006), is a trip or visiting an area that is

Concerns

Karimunjawa National Park is productive water with ha

Tourism activities are carried out by utilizing coral reef areas; coral reefs will always

that

Decree

of 111,625 hectares divided into waters of 110,117.3 hectares and 1,507.7 hectares

An area

high biodiversity, especially in coral reefs, mangroves, and

and

and

that

will also

from

that

growth

needs

tourists,

high

utilization rates [25].

2

cover range of 7-69%

that
Tourism operators always meet the needs of tourists in carrying out tourism activities [3, 28].

2 Method

The observation locations were carried out on 3 (three) islands representing the protection zone (marine), the utilization zone (maritime tourism), and the outer zone of the Karimunjawa National Park area. For completeness of data in order to represent sampling points on an island, secondary data was collected from existing research results. The Manta Tow method before setting the sampling point was also carried out to ensure the accuracy of the resulting data. The Manta Tow method is a coral reef observation technique using an observer behind a motorized boat using a rope as a link between the boat and the observer. With a fixed-speed boat passing over the coral reefs with a towing time of 2 minutes, observers will see several objects that pass and the value of live and dead coral cover. The observed data is recorded in the data table using category values or integer percentage values.

For additional information on observing this, it can also be observed and recorded the percentage of sand cover and coral fractures as well as other objects (Kima, Diadema, and Acanthaster) that are seen in the observation, all depending on the purpose of the observations to be carried out [24].

3 Results and Discussion

Karimunjawa Island and Kemujan Island have natural resources and socio-cultural, economic, and institutional characteristics because they are coastal areas used for tourism activities. With the development of tourism in the region, several changes have occurred. Along with the increasing number of tourists who come to Karimunjawa yearly, it continues to impact society and the environment.

Snorkeling tourism activities cause damage to coral reefs. This is caused by the long reach of tourists' feet with the use of fins either accidentally or intentionally can touch the reefs, and the mixed sediments can cover and bury coral reefs [5]. The stirred sediments can also interfere with the growth and reproduction of corals [17].

Fig. 1. Tourist activities stepping on coral reefs

In addition to fins, tourists can also potentially damage coral reefs through the equipment used, holding, sitting, standing, and stepping on corals [20, 23] these behaviors are usually carried out by novice tourists [5, 27]. Physical contact caused by tourists has different impacts on different coral organisms [13]. Coral polyps with massive lifeforms in receiving damage are cumulative. The percentage of damage depends on the amount of friction received. In contrast, coral polyps in branching lifeforms depend on the strength received immediately. If the whole colony is considered, damage to branching lifeforms can be catastrophic cumulative number of broken branches [14], [19], [20].
Damage to coral reefs in the three tourist spots was in the form of partial colony death, eroded coral colony surfaces, the damage occurred in massive, digitated, encrusting coral lifeforms, and broken coral branches. Eroded surface coral colonies tend to cause pathogen invasion and increase mortality [9, 14], whereas the number of partial deaths of coral colonies on a reef can represent the condition of coral reef health to high stress, and can illustrate the process of changing dynamics in corals [6].

Indirectly, tourism operators also have the potential to damage coral reefs, such as mooring boats on massive reefs, because the number of boats operating simultaneously exceeds the capacity of the mooring buoy, selecting areas in tourist spots that can be reached by fins tourists and operators who are passive or do not reprimand against tourist behavior that has the potential to damage coral reefs, and even participate in stepping on corals when carrying out underwater photos and tourist supervision. Feeding fish by tourists facilitated by tourism operators can have positive or negative impacts, such as changes in the abundance, habits, and size of fish in certain species, attracting fish with great aggression, or helping small fish populations [16, 18, 31]. Fish behavior can also change in the face of the environment, which is a part of adaptation, or even changing the food chain, in carrying out tourism activities. Feeding fish can give a distinct impression to tourists, and for tour operators is also an effort to serve and attract tourists in the hope that visitors have the desire to return to visit tourist sites.

Fig. 2. Tourist Activities Holding Coral Reefs

Fig. 3. (a) Physical contact of the tour operator in mooring the boat to the reef, (b) Mooring Buoy at the snorkeling spot

The total damage to coral reefs in the Karimun Jawa Islands is Rp. 11,175,979.69 per square meter per year due to human activities in the northern coastal waters of Java. This emerged from the results of the 2019 D.D.R.F. (Drive Demand Research Fund) Research on Valuation of Coral Reefs Ecosystem Ecological Services in Karimunjawa National Park conducted by a research team from L.I.P.I. and the Faculty of Fisheries and Marine Sciences.
4 Conclusion
References


A. K. Jaelani, I. G. A. K. R. Handayani, Isharyanto, J. P. Hawkins, C.M. Roberts, Effects of recreational SCUBA diving on possible effects of human activities for the ecological sustainability of coral reefs. Tourism activities in Karimunjawa National Park, Indonesia, where the damage to coral reefs is still frequent by tourists, and physical contact at the three snorkeling spots occurs due to boats. Damage to coral colonies in tourist spots in partial phases shifts to welfare state. International Journal of Advanced Social Science, Education and Humanities Research, 6(2), 358-359


P. Chabanet, M. Adjeroud, S. Andréfouët, Y.M. Bozec, J. Ferraris, J.A. García-Díazon, effects of recreational SCUBA diving on possible effects of human activities for the ecological sustainability of coral reefs. Tourism activities in Karimunjawa National Park, Indonesia, where the damage to coral reefs is still frequent by tourists, and physical contact at the three snorkeling spots occurs due to boats. Damage to coral colonies in tourist spots in partial phases shifts to welfare state. International Journal of Advanced Social Science, Education and Humanities Research, 6(2), 358-359

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Pardede, R.Sulisyati, Mulyadi, dan Y.Syaifudin. 2010. Status Ekosistem di Taman
Nababan MG, Munasik, I.Yulianto, T. Kartawijaya, R. Prasetia, R.L. Ardiwijaya, S.T.
of C. N. Weng, Conservation, reefs T. Lingkungan Undang Karang R. Berbasis
A. Biological experimental A. Rouphael, G. J. Inglis, Take only photographs and leave only footprints? : an
Management, environmentally responsible practices within the scuba diving industry, Environm
Rostaing, J. R. Turner, Recreational diving impacts coral reefs and adopting
R. C. Roche, C. V. Harvey, J. J. Harvey, A. P. Kavanagh, M. Mcdonald, V. R. Stein
Economics Model Based on Resources and Local Wisdom, International Journal of Business
Studies, activity tourism: a case study of diving in Egypt, Inter
M. Pendit, Tourism Management, M. P. Lentz, Effects of fish feeding by
H. Marpaung, M. Kay, J. Liddle, Great flat, A. Kerugian
-