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Threats Caused by Marine Ecotourism Activities in Payar Island Marine Park, Malaysia

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Abstract:

Marine ecotourism is a form of tourism that enables tourists to experience an underwater ecosystem. However, it is obliged to be consistent with the principles of sustainable development. It is perceived as an opportunity to help regenerate coastal communities indirectly involved in ecotourism programs. Malaysia, a country surrounded by sea, offers an incredible underwater ecosystem. This country has practiced marine ecotourism as sustainable tourism by propagating eco-awareness and economical alternatives to depleting the underwater ecosystem. Unfortunately, despite the enthusiasm for promoting marine ecotourism as sustainable tourism, there is a lack of awareness of the conservation of marine living resources. This situation has become increasingly common, causing the authorities to close the areas that have suffered ecosystem damage for conservation work. Thus, this study evaluated the threat factors caused by ecotourism activities in Payar Island Marine Park. The qualitative method was used through on-site observations and in-depth interviews with professionals and experts from various agencies related to the development, conservation, and management of Payar Island Marine Park. The main findings showed that the primary threat came from the carrying capacity aspect, representing 60%. Meanwhile, tourists' lack of awareness and the lack of enforcement by the authorities were both 20%. The findings will be essential reference data and guidelines for conservation programs that aim to reduce the significant threats to marine life and resources around Payar Island. By doing so, the preservation work related to marine life and resources will be more effective. This will enhance the awareness and consideration of the authorities, local communities, and tourists and maintain ecotourism activities sustainably.

Keywords: awareness, marine ecotourism, marine park, sustainable tourism, threats to marine life.

马来西亚巴雅岛海洋公园的海洋生态旅游活动造成的威胁

摘要:

海洋生态旅游是一种让游客体验水下生态系统的旅游形式。但是，它必须符合可持续发展的原则。它被认为是一个机会，可以帮助间接参与生态旅游计划的沿海社区再生。马来西亚是一个四面环海的国家，拥有令人难以置信的水下生态系统。该国通过宣传生态意识和消耗水下生态系统的经济替代方案，将海洋生态旅游作为可持续旅游业进行实践。不幸的是，尽管人们热衷于将海洋生态旅游作为可持续旅游来推广，但对海洋生物资源的保护却缺乏认识。这种情况变得越来越普遍，导致当局为了保护工作关闭了生态系统遭到破坏的地区。因此，本研究评估了巴雅岛海洋公园生态旅游活动造成的威胁因素。定性方法是通过现场观察和深入采访来自与巴雅岛海洋公园开发、保护和管理相关的各个机构的专业人士和专家进行的。主要调查结果表明，主要威胁来自承载能力方面，占60%。同时，游客缺乏意识和当局执法不力的比例均为20%。调查结果将成为保护计划的重要参考数据和指南，旨在减少对巴雅岛周围海洋生物和资源的重大威胁。这样做，与海洋生物和资源有关的保护工作将更加有效。这将提高当局、当地社区和游客的意识和考虑，并可持续地维持生态旅游活动。

关键词: 意识、海洋生态旅游、海洋公园、可持续旅游、对海洋生物物的威胁。

1. Introduction

The International Ecotourism Society has defined ecotourism as traveling responsibly to natural areas, conserving the environment, and sustaining local people's well-being; it also involves interpretation and education (The International Ecotourism Society, 2015). In other words, ecotourism is also called sustainable tourism. This form of tourism refers to uniting conservation, communities, and sustainable travel (Fauzi & Misni, 2017, 2018a). Additionally, ecotourism is one example of environmental conservation. According to Conserve Energy Future (2020) and Fauzi and Misni (2018b), ecotourism is intended to provide opportunities to help local communities improve their quality of life. The International Ecotourism Society (2015) has highlighted some principles associated with ecotourism. Ecotourism principles are non-consumptive and non-extractive, and they create an ecological conscience that maintains eco-centric values and ethics concerning nature. These principles minimize the physical, social, behavioral, and psychological impacts on ecotourism (Youmatter, 2020).

Ecotourism is one of the fastest-growing sectors globally (Fauzi & Misni, 2018a; Orbis Research, 2020). In Malaysia, ecotourism has already played a significant part in generating economic development and is the second most crucial industrial sector (Fauzi & Misni, 2018a; Chin et al., 2000). According to Abdullah et al. (2019), one of the main attractions in the ecotourism market industry is marine parks. Additionally, marine ecotourism is involved in marine parks. Marine ecotourism is a form of tourism enabling tourists to explore and experience underwater ecosystems (Aziz et al., 2019). However, marine parks face widespread threats with declining fish stocks, the exploitation of breeding grounds, the loss of marine life habitats, the destruction of coral reefs, habitat degradation, and water quality degradation (Chong et al., 2010). Thus, the activities of marine parks must be consistent with sustainable development principles. Marine parks are perceived as an opportunity to help regenerate coastal communities indirectly involved in ecotourism programs (Tien et al., 2020).

This paper studies one of the well-known marine parks in Malaysia, Payar Island Marine Park (PIMP),

located in Kedah State, Peninsular Malaysia. Currently, PIMP is open to the public, offering fantastic underwater species, excellent and unique habitats. However, because an uncontrolled number of visitors come every year, the physical structure of PIMP is not in such a good condition as before, and some zones need to be closed for conservation work. This study was conducted to evaluate the threats due to ecotourism activities. The island is in a remote marine area and can only be visited by boat. There is no infrastructure to overnight, and site observation can only be done during the daytime. The island's management is primarily under the Kedah State Fisheries Department, located far away in Alor Star, Kedah, in Peninsular Malaysia.

There is a lack of studies concerning the current threats faced by PIMP and the management/conservation plan related to current events. As a natural gazetted Malaysian marine park, it is vital to maintain it sustainably. Once damaged, the aquatic species and their habitat, such as corals, need 7-12 years to recover. Thus, this study was conducted to find the principal causes that have threatened the natural and physical conditions of PIMP. Furthermore, it will propose ecotourism activities at PIMP in line with the concept of the conservation plan suggested collectively by experts and professionals in this field and the departmental work needed to manage the island directly.

2. Literature Review**2.1. Ecotourism Activities in Marine Parks**

National Geographic (2020) encyclopedia defined a marine park as a marine protected area (MPA). In comparison, the International Union for Conservation of Nature (IUCN) (2020) and Ahmad (2009) have stated that an MPA is any area of intertidal or subtidal terrain, together with its overlying water and associated flora, fauna, historical and cultural features. It is preserved by law or other effective means to protect part of or all of an enclosed environment. Thus, the primary goal of an MPA is to provide an area for protecting and conserving marine resources and habitats. It functions as a management tool, aiding the drive towards sustainability in the fishing industry

(Yacob et al., 2007). According to Ahmad (2009), the main objectives of marine parks in Malaysia are to conserve and protect the biological diversity of the marine community and its habitats.

Marine parks typically have different zones, allowing numerous recreational activities such as boating, snorkeling, scuba diving, and sportfishing. Moreover, these parks may include no-take zones that prohibit extractive activities such as fishing, mining, and drilling (National Geographic, 2020). Simultaneously, the public's involvement in ecotourism raises awareness of the importance of marine biodiversity (Garrod & Wilson, 2003). Malaysia has practiced marine ecotourism as a form of sustainable tourism by widely propagating eco-awareness and economical alternatives to depleting its underwater ecosystems. Exposure to marine park conservation works has become the focus of the community (Islam et al., 2014).

2.2. Underwater Ecosystem Significance in Malaysia

Malaysia is a maritime country surrounded by seas that offer an incredible underwater ecosystem. WWF-Malaysia (2020) stated that Malaysia spans more than 19° of longitude, with an extensive 4,675-kilometer-long total coastline bordering four major bodies of water. The four major water bodies are the Straits of Malacca, the Sulu Sea, the South China Sea, and the Andaman Sea. Furthermore, all these seas form an integral part of the ecological Coral Triangle (WWF-Malaysia, 2020; Zainal, 2020). The marine biodiversity in Malaysia is globally significant from various points of view. This Coral Triangle is a rich marine ecosystem with nearly 600 species of corals and over 2,000 species of fish (Zainal, 2020; United Nations Development Programme, 2010).

Zainal (2020), as cited in WWF-Malaysia (2020), claimed that the coral reefs in Malaysia Marine parks have an economic value of MYR 2.3 billion. At the same time, the ecotourism market industry, which can increase the number of MPAs in the country, generally involves marine parks. For instance, the Fisheries Department declared that PIMP had collected MYR 2.3 million in conservation fees from 102,700 visitors in 2018. Hence, this area has the potential to generate MYR 174 million a year. Unfortunately, despite the enthusiasm for promoting marine ecotourism as sustainable tourism, there is a lack of awareness of the conservation of marine living resources. This situation has become increasingly common, causing the authorities to close the areas that have suffered ecosystem damage for restoration and conservation works.

Lim (1998) and Misni et al. (2017) outlined that the need for a strategy to sustain tourism development and maintain visitor satisfaction without endangering the park's ecological environment is a concern matter to the authorities. Therefore, this study evaluated the threat factors due to ecotourism activities in PIMP. Furthermore, this study was also intended to enhance

the awareness and consideration of the authorities, the local community, tourists, and the marine park operator. Subsequently, this study's significance is to recognize the appropriate approach to use in conservation/management, concentrating on the significant actions/enforcement required to maintain the Marine Park's value. In Malaysia, marine parks have been established by the Fisheries Act 1985, under Part IX–Marine Parks and Marine Reserves (Sections 41–45). The protected area of the sea is zoned and located around two nautical miles from the shore at the point of the lowest low tide (Kaur, 2007). Forty islands in Malaysia have been gazetted as marine parks (Salleh et al., 2010). The functions of marine parks include the conservation of resources, environmental protection and management, habitat restoration and rehabilitation, the promotion of awareness, education, conservation, and research.

3. Problem Statement

Ecotourism activities have negative impacts on marine life. PIMP is the only marine park located on the west coast of Peninsular Malaysia, between two seas, Malacca Straits and the Andaman Sea. The clash between these two strait bodies makes the marine ecosystem unique and exciting to visit. Each year, more than 100,000 tourists, including foreigners, visit PIMP. The main attraction in PIMP involves recreational water activities, such as picnics, round-island trips, snorkeling, and scuba-diving. The growing presence of tourists each year also contributes to negligent social behaviors like excessive rubbish and vandalism (Samsudin & Mohamad, 2013). These social problems have further added to the causes of pollution in marine ecosystems and threaten marine life.

It has been reported that in 2010, the damage to corals was estimated between 60% and 90%, which happened in PIMP alone (Majid, 2010). In 2010, the Department of Marine Parks of Malaysia (2020) had taken drastic action by closing the affected areas to minimize human aggravated stress on the corals. The department must limit the number of visitors to PIMP from 400 to 200 daily during the closure. The closed areas are the PIMP Center and the famous Coral Garden. No snorkeling and diving activities are allowed in these areas.

4. Methodology

A qualitative methodology was used to conduct this study. The methods of collecting primary data were divided into two phases. The first phase was the field measurement, undertaken through observational methods at the marine site (Murphy & Jenkins, 2010). In the second phase of the data collection, in-depth interviews with professionals and experts were carried out. The data collection and site location were determined based on several factors.

4.1. The Study Location

In 1994, Payar Island was the first place designated as a marine park by the Malaysian government. It is the only marine park located on the west coast of Peninsular Malaysia (Yeo, 2004).

PIMP is situated off the coast of Kedah between Langkawi Island and Penang Island (Figure 1). PIMP is approximately 19 nautical miles south of Langkawi Island, 32 nautical miles north of Penang, and 15 nautical miles west of Kuala Kedah. This location was chosen for the study mainly because the overcrowded tourist presence has affected the reputation of PIMP. Because of this, several dive sites have had to be closed due to the severe damage to marine life. This has occurred because of the ecotourism activities conducted in the area. The ecotourism activities conducted in the area involved scuba diving, snorkeling, picnicking, and island hopping. The island, however, is uninhabited. Therefore, no threat factors from the local settlements were found.

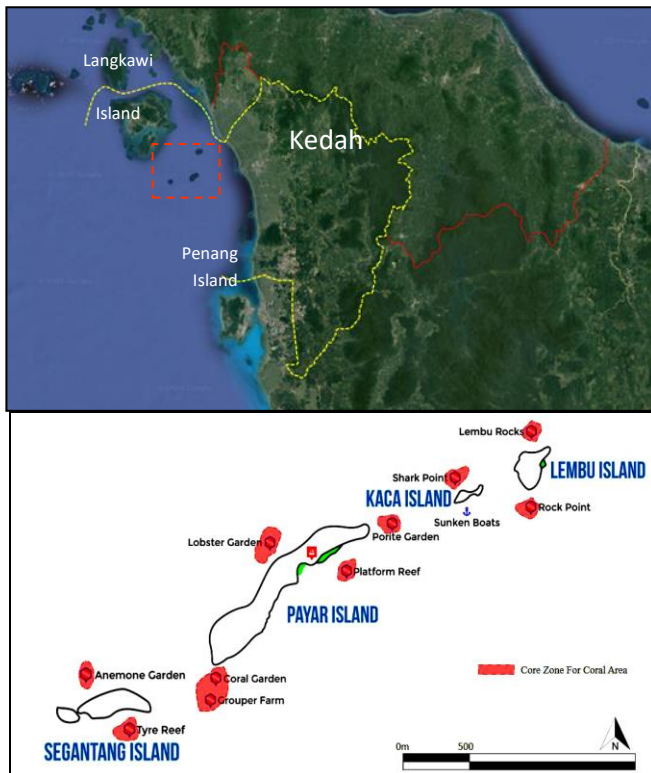


Figure 1. Key plan of the study area (above), and site plan of the study area, PIMP with the core zone for coral (below)

4.2. Site Observation

Throughout this study, the term 'site observation' refers to viewing and recording the natural resources of marine life, together with the actions and behaviors of tourists in PIMP. The site observation was conducted in April 2019. Photographic images and videos recorded the existing condition of the study area. The existing condition of ecotourism activities was recorded from when tourists arrived at PIMP by speedboat until they returned to the Kuah jetty. The marine life condition was also recorded to identify the actual status of the marine life and the existing threats in PIMP. The elements observed in PIMP were the movement trends

of the tourists, ecotourism activities, facilities provided, equipment that belonged to tourists and operators, and the total number of visitors per year. The site observation categorized the threat factors that could be found in PIMP.

4.3. In-Depth Professional and Expert Interviews

In the second phase of collecting data, in-depth interviews were carried out. The interviews were focused on the professionals and experts who contributed to the management and conservation program in PIMP. This study focused on the conservation/management of the Marine Park and its threat factors with the involvement of professionals and experts from various government and private agencies. The management of the PIMP is highly technical and specialized to meet the objectives of its establishment.

Seven qualified professionals and experts from various agencies related to the development, conservation, and management of PIMP were interviewed. Table 1 shows the selected qualified professionals and experts who provided the specifically required data. The interviews with the experts on PIMP ecotourism activities were conducted from September 14 to September 18, 2019.

Table 1. Qualified professionals and experts with the special required data

Agencies/Expert	Data Obtained	Number
Officers/Director at Kedah State Fisheries Department	<ul style="list-style-type: none"> Management and conservation plan related to PIMP Number and percentage of visitors who visited PIMP in the last five years 	2
Directors of Travel Agencies	<ul style="list-style-type: none"> The number of tour operators who carry out activities on the island The assets that are used to take tourists to PIMP and for the recreational activities 	2
Head of Dive Masters	<ul style="list-style-type: none"> Opinions and views to identify the types of threats to marine life 	2
Institutional/Researcher	<ul style="list-style-type: none"> Opinions on the condition at PIMP 	1

The purpose of conducting the in-depth interviews was to gather and compare different perspectives, opinions, and knowledge from all different backgrounds of expertise. Open-ended questions were used to get the relevant responses and statements required in each interview. The recorded interview sessions and data were translated into accurate transcripts and coded based on the research indicators. The transcript documents were analyzed, and the results are shown in charts, graphs, or tables. The findings that displayed and described the existing threat factors and the conditions of PIMP were validated with the results from the observation using photographic images.

5. Findings and Discussions

There are four islands within the jurisdictional area of PIMP: Payar Island, Lembu Island, Kaca Island, and

Segantang Island (Kementerian Air, Tanah dan Sumber Asli, 2019). The area of study was focused on the main island, Payar Island. Payar Island is a primary island that can offer a complete visit to the marine park. In addition, between the four islands in PIMP, Payar Island is the largest, with an area of 31.2 hectares and an approximate length of 1.75 kilometers (Kementerian Air, Tanah dan Sumber Asli, 2019). The islands are located between 6.050°-6.070°N and 100.025°-100.045°E (Figure 1). Four sandy beaches, each approximately 100-150 meters long, can be found on Payar Island, and the entire island is covered by dense forest/vegetation (Yacob, 2009).

5.1. Ecotourism in PIMP

The natural beauty of the marine life around PIMP is the main factor that attracts tourists to enjoy flora and fauna. This natural element is also supplemented by the Department of Fisheries Malaysia's human-made facilities for the convenience of tourists. Besides, the location of PIMP is open all year round and secured from the monsoon. PIMP is protected from the strong wind of the Indian Ocean by the island of Sumatra, Indonesia. The group of islands in PIMP constitutes one of the few coral reef areas found off the west coast of Peninsular Malaysia. This is because of PIMP's location within the coral triangle. The type of coral reef in PIMP is a fringing reef. The coral fringes off the islands shelter a vast diversity of marine flora and fauna. Furthermore, many species of fish can be observed underwater.

PIMP is known for its diverse marine life. Ten locations with a rich diversity of corals form the nucleus of marine life, including fish, squid, and shrimp. This area has been used as the core zone to ensure that the marine biodiversity in this area is not affected by fishing activities. The core zone area often becomes a research sample area for higher education institutions locally and abroad. It is also a focal point for tourists undertaking organized scuba diving activities. Figure 1 illustrates the Core Zone for the Coral Area in PIMP, areas that offer activities such as fish feeding, which has become a major tourist attraction during snorkeling trips.

Payar Island is an uninhabited island designated as a marine park in 1994 by the government through the Department of Marine Parks of Malaysia (2020). At that time, some areas of Payar Island had been developed with tourism facilities, such as an information center, jetty, gazebo, and public toilet. There were also proposals to build accommodation for tourists, such as chalets and other facilities, but the project had to be canceled due to the limited access to clean water. According to the Department of Marine Parks of Malaysia (2020), in 2015, after 21 years of operation as a marine park, the same Department took the initiative to upgrade the existing tourism facilities for the convenience of the increasing number of yearly visitors.

5.2. Ecotourism Activities in PIMP

As PIMP was a gazetted Marine Park, the government built facilities and amenities for the convenience of the public so they could enjoy and experience nature. The distance between the Kuah jetty and Payar Island is approximately 35 kilometers, which takes an hour and 30 minutes by ferry. Tourist admission to PIMP from the Kuah jetty is generally from 10.00 a.m. to 3.00 p.m., depending on the sea conditions. Usually, the tour operator uses a ferry that can accommodate up to 300 people at once. As the Payar Island jetty is being upgraded, the ferries must anchor 200 meters from the coastline, near the pontoon built at Coral Beach. Small boats are used to transport tourists from the ferry to the coast.

There are two main sites on the island. They are the Marine Park Centre area, which is currently closed for upgrading works, and a 50 x 15-meter floating pontoon moored off the beach, known as the Langkawi Coral pontoon (Yeo, 2004). The coral pontoon can accommodate up to 250 people at once. The Marine Park Centre occupies a small area of 0.6 hectares and a beach approximately 100 meters long. Picnic tables and benches are provided at the beach, limiting the available space. Two toilets are provided at the Marine Park Center, and there are two nature trails on Payar Island. The everyday ecotourism activities conducted at PIMP are picnicking, snorkeling, and scuba diving. The main package that operators carry out at PIMP involves snorkeling and scuba diving, including ferry services from the Kuah jetty, lunch, and safety equipment for snorkeling and scuba diving activities. According to Kementerian Air, Tanah dan Sumber Asli (2019), one of the most exciting activities is watching marine mammals and fish, for which PIMP is part of the migration route. Usually, the migration of fish and marine mammals from the northern hemisphere to the southern hemisphere and vice versa occurs in February and then August. They migrate to warmer climates to breed.

5.3. Visitors to PIMP

Table 2 displays the tourist arrival numbers to PIMP from 2013 to 2018. The number of tourists was consistent, i.e., above 100,000 a year, which contributed to ecotourism in PIMP.

Table 2. Visitor arrivals to PIMP, 2013-2018

Year	Type of Visitors		Total
	Domestic	International	
2013	43,933	95,907	139,840
2014	40,159	82,716	122,875
2015	39,561	72,189	111,750
2016	33,702	91,730	125,432
2017	28,594	82,126	110,720
2018	25,312	76,655	101,967

These data indicate a decreasing trend of domestic tourists and dominant but inconsistent international tourist numbers. The declining trend in tourist entry was likely due to the renovation work at PIMP's main jetty

and information center. Changes in the decline of tourists from 2016 to 2018 can be seen.

5.4. Experts Involved Directly in Ecotourism Activities

The results and analysis of the in-depth interviews with related professionals and experts can be divided into three main sections. These sections are based on a) general understanding of the marine park and ecotourism, b) programs and activities in PIMP, and c) threat factors encountered in PIMP. The data are presented graphically to show the importance of the threat factors encountered in PIMP.

5.4.1. The Interpretation of Marine Parks

Marine Parks are a government endeavor to ensure that Malaysia's ocean areas are protected from pollution and habitat damage and that no extinction of local marine species occurs in the future. Public exposure to the need for environmental protection, especially for marine life, is one of the marine parks' objectives. All the professionals and experts interviewed have an adequate understanding of the marine parks, especially PIMP. Their understanding can be divided into government gazetted areas, conservation, and recreational areas. Figure 3 shows their understanding of marine parks, especially PIMP. Based on their understanding, the activities that promote the name of PIMP are ecotourism-based and involve the public. However, the management and conservation activities in this area were very low and undesirably poor. The fundamental objective of gazettement of the marine park in PIMP to create awareness among the public is unattainable.

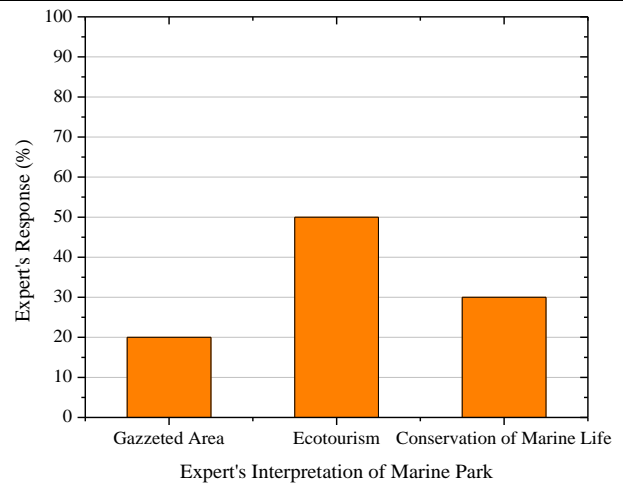


Figure 3. The responses from experts' on the interpretation and understanding of marine parks, particularly PIMP

Awareness among tourists regarding the objectives of the marine park establishment is deficient. It was found that the promotion of PIMP only covers the beauty of flora and fauna in the marine areas and does not refer to conservation and preservation issues. The experts' interpretation and understanding of PIMP are illustrated in Figure 3.

5.4.2. Programs and Activities in PIMP

Some professionals and experts agreed with the drafted and released action plan based on the interviews. The content of the drafted action plan contains all the activities undertaken in PIMP that should be connected with an awareness of nature. These should involve activities that are educational and appreciative of the environment. Unfortunately, awareness activities are not currently emphasized directly. The recreational activities in the park have also been found to be like those of any other beach area. None of the parties who acted as moderators introduced the marine park objectives, mission, and vision in PIMP. Meanwhile, Fisheries Act 1985 Part IX section 41(1E) stated that the authorities should regulate recreational and other activities in such areas or parts to avoid irreversible damage to the local environment.

However, the action mentioned above has not been implemented. The Kedah Department of Fisheries (DOF) does not closely monitor all public activities. The public is free to carry out activities, regardless of the positioning of authority officers in the recreational area. Therefore, enforcement is less effective. Civilians who intentionally or accidentally damage the coral or take, remove or own any aquatic organism while feeding the fish around the coastline of PIMP are committing offenses under the Fisheries Act 1985.

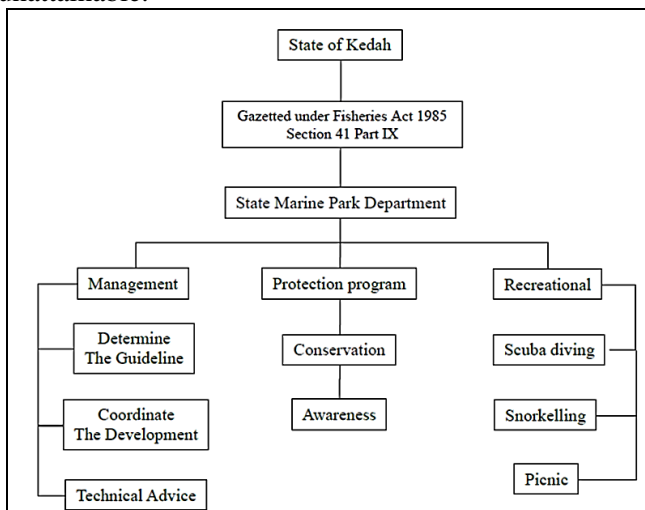


Figure 2. Conceptual diagram represents the understanding of the gazetted marine park by experts in PIMP

Additionally, based on the results of the interviews, it can be concluded that as many as 50% of the experts stated that visitors know PIMP only as a marine park area for marine recreational/ecotourism activities. Meanwhile, the conservation activities and gazetted areas in the marine park still receive less exposure.

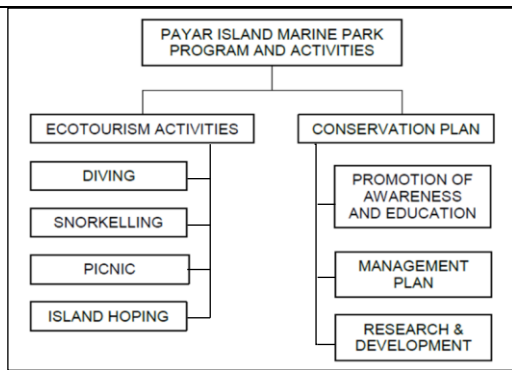


Figure 4. Summary of ecotourism activities in PIMP in line with the conservation plan suggested by experts

Figure 4 summarizes the results from the interviews concerning the programs and activities at PIMP. The two critical elements specified by the experts were ecotourism activities and conservation plans. All the experts agreed with the elements presented, but ecotourism is more prominent than conservation. On average, they noted that ecotourism activities are more attractive in PIMP because of its beauty and unique marine biodiversity. Besides, Langkawi Island is the leading free-duty island for tourist arrivals. Activities that involve conservation are more complicated and require more expertise. Funding is also an issue due to the complicated conservation work that requires high accuracy, complex technology, and high expenditure.

5.4.3. The Threat Factors of PIMP

Based on the interviews, not all the professionals and experts were aware of the closure since 2010 of two dive sites. Although the main reason for the dive sites' closure was severe coral bleaching due to the El Nino phenomenon, human factors also need to be considered, as PIMP is a focus of tourists' activity throughout the year. There is no day in the year when PIMP is closed to the public so that marine ecosystems can be restored. The attitude of tourists in PIMP has also become a significant cause of damage to marine biodiversity. Negligence and incompetence in handling equipment while scuba diving and snorkeling result in tourists inadvertently damaging coral reefs, which are a source of food and shelter for the marine life in the surrounding PIMP. Irregular dumping by tourists is also a source of beach contamination. Marine life dies due to plastic waste being dumped into the sea and mistaken for food.

Besides that, its year-round monsoon-free status is one reason why PIMP has become a preferred destination for tourists. The increasing number of tourists has become a significant problem in PIMP as the coastline could not accommodate so many tourists any longer. PIMP is currently experiencing major renovations that began in 2015. However, due to the delays in completing the central infrastructure providing all the public facilities and amenities, the formerly 300-meter-long beach has now been reduced to nearly 165 meters for tourist use. The density of visitors in this

area has led to less efficient surveillance and enforcement by Fisheries Authority.

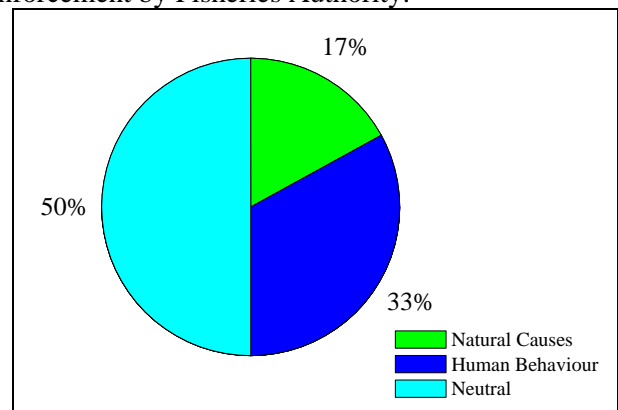


Figure 5. Experts' alertness on dive site closing since 2010

Figure 5 shows the analysis derived from the in-depth interviews with the professionals. It was found that only 17% of the experts knew the main reason for the two dive sites being closed since 2010. According to the interview with the DOF officer, the leading reason for this was the El Nino phenomenon, when the increased seawater temperatures caused severe damage to the corals in the Coral Garden and Wangi Bay. The increase in seawater temperature by 2°C to between 28 and 29°C damaged the coral between 60 and 90%. Meanwhile, 33% of the experts stated that the closure of the dive sites was because of human behavior due to a lack of awareness of using the marine resources sustainably. Another 50% of the experts had no idea about 2010, as they had not been involved in tourism on Langkawi Island.

Based on the overall results of the interviews, 60% of the experts stated that the primary issue contributing to the environmental pollution in PIMP is the carrying capacity. Data analysis of visitor entry numbers to PIMP reveals small changes in the annual trends between 2013 and 2018 (Table 2). Restrictions on recreational space and the lack of public facilities, especially toilets, sewage, and solid waste disposal, create a significant threat to the coral reefs in PIMP. The authorities responsible for managing marine parks, especially the DOF, should take proactive measures to limit tourist entries to PIMP to minimize the adverse effects on the marine environment. However, there are efforts to improve the quality of infrastructure and facilities in PIMP by upgrading and increasing the number of existing facilities to accommodate the presence of tourists.

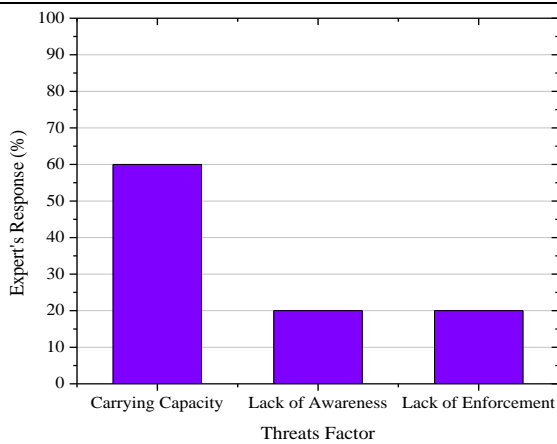


Figure 6. The threat factors of ecotourism activities in PIMP

While Figure 6 shows that the lack of tourist awareness is the cause of the threat of extinction of and damage to marine biodiversity at PIMP, with a result of 20%, it is the responsibility of the authorities and tour operators to ensure that every tourist is exposed to environmental protection awareness, as shown in Figure 6. No briefing session on rules and regulations was conducted for tourists either at the Kuah jetty entrance, on the ferry during the voyage to PIMP, or on the Payar Island coast. The tour operators also do not inspect items being taken by tourists when leaving Payar Island. Such inspections are needed to ensure no flora and fauna are taken from PIMP. Hence, tour operators must cooperate with the authorities to help and control the tourists' behavior when they are present in the PIMP area and before the natural ecosystem disappears forever.

The lack of enforcement from the authorities has become a significant issue in marine parks, especially in PIMP, resulting in 20%. Through the observations carried out on-site, the authorities did not seem to monitor the ecotourism activities conducted by the tourists. The tourists felt that they were free from the authorities' monitoring to perform any ecotourism activities. It could be seen that some tourists took corals away from PIMP. It was also found that the authorities did not inspect tourists during their departure from PIMP. The level of awareness of each authority officer and staff was also low. Frequent changes of positions held by the department officials and staff have resulted in fewer introduction and learning sessions on marine life and awareness.

6. Conclusion

The overall findings obtained from this study are significant. It was found that the three major threat factors of ecotourism activities in PIMP are carrying capacity, a lack of tourist awareness, and a lack of enforcement by the authorities. Carrying capacity is a significant threat factor representing 60% due to ecotourism activities throughout the year. Carrying capacity directly refers to the excessive numbers of visitors every year compared to the size of the island,

which the species and habitat cannot support in the long term.

The research findings are essential as reference data and guidelines for conservation programs that reduce the significant threats to marine life and resources at PIMP. The authorities, especially the Kedah DOF, as those responsible for managing marine parks, should take proactive measures to limit the entry of tourists to PIMP to avoid adverse effects on the marine environment. Besides that, the DOF should provide several noticeboards and place them clearly in areas of public interest to enhance tourists' awareness of the need for environmental protection. Furthermore, inspections and monitoring by the authorities of tourists' ecotourism activities should also be improved. Only then, the work to preserve marine life and resources will be more effective due to the awareness and consideration of the authorities, local communities, and tourists and the sustainable maintenance of ecotourism activities.

6.1. Scientific Novelty

The scientific novelty in this study is the discovery of three main threat factors that influence directly and indirectly the current conditions of PIMP. These are dominated by the carrying capacity of visitors and activities related to the highly sensitive marine park environment, followed by the lack of awareness among tourists and the lack of enforcement by the relevant authorities. Moreover, the environmental phenomenon, the El Nino event, has also contributed to the damage. These factors have resulted in significant marine life damage by as much as 90% to corals and their surrounding habitat in two dive zones since 2010. Currently, the area is closed for conservation works and to minimize the human-aggravated stress on the corals. The authorities must limit carrying capacity by decreasing by half (to around 200 daily) the number of visitors to other zones in PIMP during the closure.

The authorities involved, such as the DOF, who act as the park administration, must enforce the objectives, mission, and vision of the marine park in PIMP clearly to all stakeholders, including visitors, all the time. This refers to Fisheries Act 1985 Part IX section 41(1E), which states that the authorities should regulate recreational and other activities in such areas or parts to avoid irreversible damage to the local environment. The activities in PIMP are ecotourism-based and directly involve the public/visitors. Currently, the management and conservation activities in this area are very low and poor. The stakeholders must realize the fundamental objective of gazetted the marine park in PIMP while creating awareness among the public. Figures 3 and 4 illustrate the concepts of the administration work hierarchy in PIMP, using the current act to monitor the activities and management/conservation program and create awareness among the visitors.

7. Limitations and Further Study

The scope of this study only covers ecotourism activities in PIMP and its existing threats. The threats directly influenced the physical planning and conservation of the underwater park. Future studies should identify the visitors carrying capacity of the environment of PIMP. Determining the suitable carrying capacity of the island will protect the island and its surroundings by maintaining its aquatic natural resources and contributing to long-term sustainable ecotourism.

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Authors' Contributions

The first author worked on the preparation of collecting data and writing this paper, while the co-author participated fully in collecting on-site data and writing the results and analysis of the study.

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