

## Student Perception towards Coral Reef Damages in Tunku Abdul Rahman Park

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**Abstract:** This research was conducted to identify the student perception towards coral reefs damages in Tunku Abdul Rahman Marine Park, Sabah. The main objective for this study is to identify the level of student awareness towards coral reefs damages issue and the tourism activities that contribute to the coral reef damages. The questionnaire was used as a research instrument and the participants of this study were 157 recreational resort management students of public institutions in Malaysia. The data for this study was analyze using IBM Statistical Package for Social Science (SPSS) Version 23. The study found that 70.1% respondent were aware about the coral reefs damages issue. The result of this study shows that illegal fishing activity has the highest mean score with 4.14 that contribute to the coral reef damages, meanwhile the usage of sunscreen product has the lowest mean with 3.51 score. The outcome of this research will educate students about the importance of maintaining coral reefs. This research also aimed to bring awareness to the public and tourists regarding the effect of the tourism activities towards coral reefs. The findings of this study are expected to help the government to enforce the law, while monitoring tourism development and activities that affect the coral reef damage. It also could be proposed to the tourism players to improve and apply the green concept in any tourism activities in the future.

**Key Word:** Coral reef; Damages; Awareness; Tourism Activity; Marine Ecosystem

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### I. Introduction

Tourism industry is one of the major contributors to the country income and economic development. In Malaysia's tourist expenditure contributes the highest of 86,143.500 MYR in 2019. [1] Tourism activities such as sports and recreational tourism, ecological tourism, agricultural tourism and foster home programs, cultural and heritage tourism, and educational and health tourism contributed to socio - economic development through export earnings, job creation and business opportunities as well as infrastructure development [2][3]. The growth of the tourism industry has led to the increase of demand for tourism development and activities. [4] However, although the arrival of tourists can contribute to the socio-economy, it also brings negative effects such as pollution, widespread sale of liquor, development of irregular business premises, traffic congestion, lack of parking and sanitation [5].

In Malaysia, coral reefs are one of the main attractions for tourists to visit our country. The development of these asset has given abundance of opportunity to the government as well as private sector that involved in tourism industry. While in Sabah, marine tourism is the most highlighted activity amongst all, especially the world known diving site Sipadan Island which attracted tourist from many countries. Tourist attraction such as Tunku Abdul Rahman Park (TARP) is one of the most frequent places visited by tourists. This place has been almost 'overuse' or over commercialized and has encountered the same concern of coral reef destructions. Besides, TARP heavily affected by runoff and debris from the city and local rivers and frequently damaged by ghost gill nets and illicit fishing. [6] Water activities offered on the island such as sea walking, jet skiing, scuba diving and snorkeling are most likely threatening the coral reef and the surrounding. [7] Due to increase of tourist demand, it leads to the mass tourism activities that has threaten the beauty of coral reefs. Without proper management and guidelines, it surely gives negative impact such as pollution, unstable development, congestion overload and cleanliness issues. Thus, this study was conducted to identify the student perception towards coral reef damage in Tunku Abdul Rahman Marine Park, Sabah. The main objective for this study is to

- identify the level of awareness towards coral reefs damages issue.

- identify the tourism activities that contribute to the coral reef damages.

## **II. Literature Review**

### **Tourism**

Individuals who voluntarily leave their own normal surroundings to visit another place are referred to as tourist and in 1981, Worldwide Network of Tourism Experts (AIESR) and the Tourism Society in Cardiff was organized International Conference on Leisure Recreation Tourism; Tourism can be defined as a particular activity, selected by choice, and undertaken outside the local surrounding [8].

In the middle of the 1980s, the Malaysian government places a high priority on developing the tourism industry and the Ministry of Culture, Art and Tourism was established in 1987 upgraded to the Ministry of Tourism in 2004 [9]. According to Malaysia Tourism Statistics, Malaysian received tourist arrival as 25.95 million in 2017, 25.83 million in 2018, and 26.10 million in 2019 but received approximately 4.33 million tourist arrivals due to Covid-19 outbreak, which resulted in travel restricted worldwide [10].

According to annual statistics report presented in publication were obtained from the Domestic Tourism Survey, 2019 show that Sabah listed as one of five states that recorded the highest domestic visitor arrival. Based on official tourism website of Sabah, this state shows a good number of international and local visitor that is 3,879,413 visitor arrivals in 2018, increased in 2019, which are 4,195,903 visitors but only received 977,460 arrivals for 2020 due to Covid-19 [11]

### **Tunku Abdul Rahman Park as Sport Water Attraction**

Sabah is a destination with many iconic tourist attractions, such as mountains, island, culture, and traditions as well known for its beaches, rainforest, coral reefs and abundant wildlife, much of it within parks and reserves besides the famous of Sipadan and Mabul Island as diving destination.

Kota Kinabalu is the capital of Sabah as the main entry point, is the gateway to the state's iconic tourist attraction includes the Tunku Abdul Rahman Park which consisting of five islands [12]. The Park spread over 4,929 hectares and named after Malaysia first Prime Minister, Tunku Abdul Rahman is located in Gaya Bay which 3 Kilometers offshore from Kota Kinabalu, which gazetted in 1974 as Sabah's second national Park [13]. According to writer through New Sabah Times, the islands tour to the Tunku Abdul Rahman Park (TARP) in Kota Kinabalu is the most popular destination by tourist from China, Taiwanese and Korean [14].

Tunku Abdul Rahman Park consists of five islands; Gaya, Manukan, Sapi, Sulug and Mamutik were well known for water sports activities. Various adventure sport activities offered at Tunku Abdul Rahman Park such as scuba diving and snorkeling especially at Manukan and Sapi Island. Besides that, Sapi Island also a popular destination for sea walking among local and international tourist.

### **Student Awareness towards Coral Reefs Damages Issue**

The coral reef ecosystem has many biological, ecological and economical functions to the universe and many organisms use this ecosystem for shelter, food and home for many marine organisms and together perform a diverse a rich ecosystem [15]. The main cause of coral reef damage in outline is caused by non-anthropogenic (changing of ecological, natural factors) and anthropogenic (human activities) factors [16]. It's supported by other study, the coral reef, as an ecosystem, is highly susceptible to changes in the surrounding environment, including human activity, and recovery takes a long time [10].

Most environment issues such as coastal ecosystem and forest destruction, mostly caused by human daily action and environmental issues have long been the foremost concern for today's society, and they are only getting more complicated as time goes on [17]. Factors that contributing of damage to coral reef are: (1) poor coastal construction management; (2) marine activities such as damage from anchoring; (3) illegal logging and land use changes; (4) overfishing activities, disturbing the food chain in the coral reef ecosystem; (5) the use of bombs and poisons in fishing activities; and (6) global climate change [10]. Practice safe and responsible during participate in water sport especially diving, snorkeling and sea walking is important to avoid any harmful or coral reefs damage.

### **Tourism Activities that Contribute to the Coral Reef Damages**

According to statistics of World Tourism Organization (WTO), there are 5-7 million active certified divers worldwide [18],[19] and the rapid development diving tourism activities has concentrated on tropical areas because of the clear ocean water, warm temperatures, and the existence of various biological and geophysical features of coral reefs that provide scuba diving spots [19]. Malaysia is one of the world's most popular scuba diving location for its rich marine environment, located in the Valley of Indo-Pacific and attract tourist to visit this country by the existence of a variety of marine biodiversity as well as a group of islands with beautiful beaches, clear waters and quite hot scuba diving [20].

Various positive effect can view from this activity such as job opportunity, contribution to government revenues and can further seen through the contribution to local people economy. However, scuba diving activities has its own negative impact and study found that scuba diving activities contribute to the destruction of coral reefs. Even though diving provides economic opportunities for many developing coastal communities, the potential for dive impacts to contribute to the damage of coral reef is concern at heavily dived areas [21]. Recreation diving has been shown to cause coral reef degradation in a variety of ways and coral reefs are harmed by divers by fin impact, sediment stirring, reef tramping, kneeling on and touching benthic organism, while hitting coral with loose dive gear [22]. The finding revealed that the higher number of tourist scuba diving locations has a more serious detrimental impact on the damage and destruction of rocks and coral reefs [20].

Snorkeling involves swimming over the surface of water with a mask (or goggles), a snorkel (a shaped breathing tube) and generally swim fins or flippers. As one of popular water activity among tourist, snorkeling does not necessitate any specific training, costly equipment and strong physical effort.

Diving and snorkeling activities has the potential to have direct impact against coral reef degradation and some destructive behavior like stepping on a breaking coral raises fracture in parts of coral branch, foliose, tabulate, digitate and *Millepora* [23]. In addition, researcher also state that the damage can found from snorkeling activities such as scratches, cuts, broken and destroyed. Diving and snorkeling impact on coral physical damage was analyzed and found the correlation between coral physical damage and the annual mean diver and snorkeler numbers [24]. Fin kicks were the most potentially harmful behavior with the reef in both the baseline and experimental group where fins lengthen a snorkeler's legs, allow snorkeler to get closer to the reef [25]. Researcher also notes that snorkelers (especially beginners) were frequently unaware that their fin had contacted the reef while maneuvering around the water.

Sea walking us a type of activity that allows a person to walk at the ocean's bottom and see marine life closely. This fun and safe activity for tourist to enjoy the underwater world and close enough to touch fishes and enjoying the coral. Lack of study according to sea walking activities that can be one of the potential impacts against coral reef due to this activity are not widely offer in tourism line. However, only permitted trails shall be used, with an appropriate distance from any coral field to prevent and harmful to coral according to site activity.

Several countries provide own guideline for operators, monitors and helmet divers must take all necessary precautions to ensure that the marine ecosystem is not harmed. For example, government of Mauritius provide guidelines for this activity such as (1) there should be no coral removal, breaking, translocation or introduced; (2) no marine organism, alive or dead, should be brought to the site; and (3) the hose used to provide breathing air should not harm corals or other marine animals [26]

Coral reefs are ecosystems with a high diversity of species that serve as natural habitats and coral reefs are communities of organism live on the seafloor and in the form of limestone ( $\text{CaCO}_3$ ) that is strong enough to withstand the sea's waves [27]. This diverse ecosystem, however, is very susceptible to environmental change, such as a changing of climate, ocean acidification and other anthropogenic impact [15]. The term anthropogenic sometimes used in pollution context caused by human activity such as infrastructure development, business, agriculture industry that may affect environmental change.

Anthropogenic stressors include two indicators such as physical human impact which is measured by the amount of damage to coral reefs caused by human activities such as anchors, tours or bomb and potential land-based sources of pollution by considering the possibility of human activity affecting water quality [28] [29].

Fishing tourism is a leisure activity in which angler take tourism out to sea on fishing vessels to go fishing [30]. The transformation of fisheries to tourism has become a worldwide trend and it arises mostly due to a decline in conventional fisheries' income, prompting angler to seek alternative sources of income by participating in marine tourism activities [30].

Micro plastic contamination is main contributor by fishing activities and due to the advantages of plastic in modern fishing activities over traditional used natural materials [31]. Non-biodegradable plastics made for the most lost fishing gear, which can sink to the sea floor or float around in currents and it may remain undiscovered until it appears on coral reefs, beaches, and other coastal habitats [32]. In addition, during dive survey around Koh Tao, a small island in the Gulf of Thailand, they discovered that when stony corals contacts with lost fishing gears, their skeletons and soft tissues are quickly harmed and found that branching corals were commonly in contact with the gear [32]. In other studies, in the central coast of Manabi-Ecuador found that entanglement of nets and fishing gear as a key driven in the process of the fracturing and fragmentation of coral [33]. Besides that, illegal fishing is a worldwide problem and insufficient management and enforcement have resulted in depletion of reef species and ecosystem destruction especially when they are using fish bombs that destroyed coral reef.

Sunscreen have been used to protect against sunburn for over 30 years, but the incidence of skin cancer continues to rise [34]. In addition, writer also mention that sunburn protection as measured by the sun protection factor (SPF) is currently the only intentionally recognized endpoint for evaluating sunscreen efficacy. According

to writer, the release of sunscreen product commonly used by tourist to protect their skin from the harmful effects of UV radiation into seawater can have negative impact on tropical coral, causing extensive and rapid bleaching [35].

Benzophenone-3 (BP-3; oxybenzone) is a sunscreen lotion and personal care product ingredient that protects against the harmful effects of ultraviolet light [36]. Oxybenzone is a phototoxicant, which means that its negative effects are exacerbated in the presence of light and either in the dark or light, oxybenzone changed planulae from a motile to a deformed, sessile state. In response to increasing oxybenzone concentrations, planulae exhibited an increasing the coral bleaching rate [36]. Hawaiian recently enacted legislation prohibiting the use of two major ingredients; oxybenzone and octinoxate where the main active ingredients is an estimated 70-80% of sunscreen [37]. These ingredients commonly found used in sunscreen have been studied for their potential to harm the coral.

### III. Methodology

The study entailed quantitative analysis of 157 respondents which are recreational resort management students of public institutions in Malaysia. The questionnaire divided into two parts. Part A is question related with demographic while part B comprises question related with level of student awareness towards coral damages image issue and tourism activities that contribute to the coral reef damages. Frequency and mean analysis were used for data analysis by using SPSS version 23.

### IV. Findings

#### Demographic Profile

	Frequency	Percent	Valid Percent	Cumulative Percent
Valid Male	77	49.0	49.0	49.0
Female	80	51.0	51.0	100.0
Total	157	100.0	100.0	

Table 4.1 Gender

Table 4.1 shows the basic information for 157 respondents' gender consisting of the students who have been visited Tunku Abdul Rahman Park. 49% of the respondents is male students while 51% is female respondents. The average age of the students is between 19 to 21 years old.

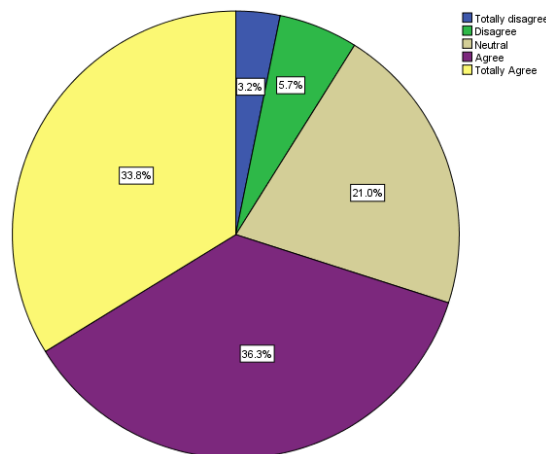


Figure 4.1 Awareness Towards Coral Reefs Damages Issue

Figure 4.1 shows the respondents awareness towards coral reefs damages issue. Research finding shows that most of the respondent totally agree and agree with 33.8% and 36.3% respectively. 21% answers neutral and only 5.7% and 3.2% disagree and total disagree with the statement. Based on the explanation, it shows that most of the students aware on the issue and this respond to the first objective of the study.

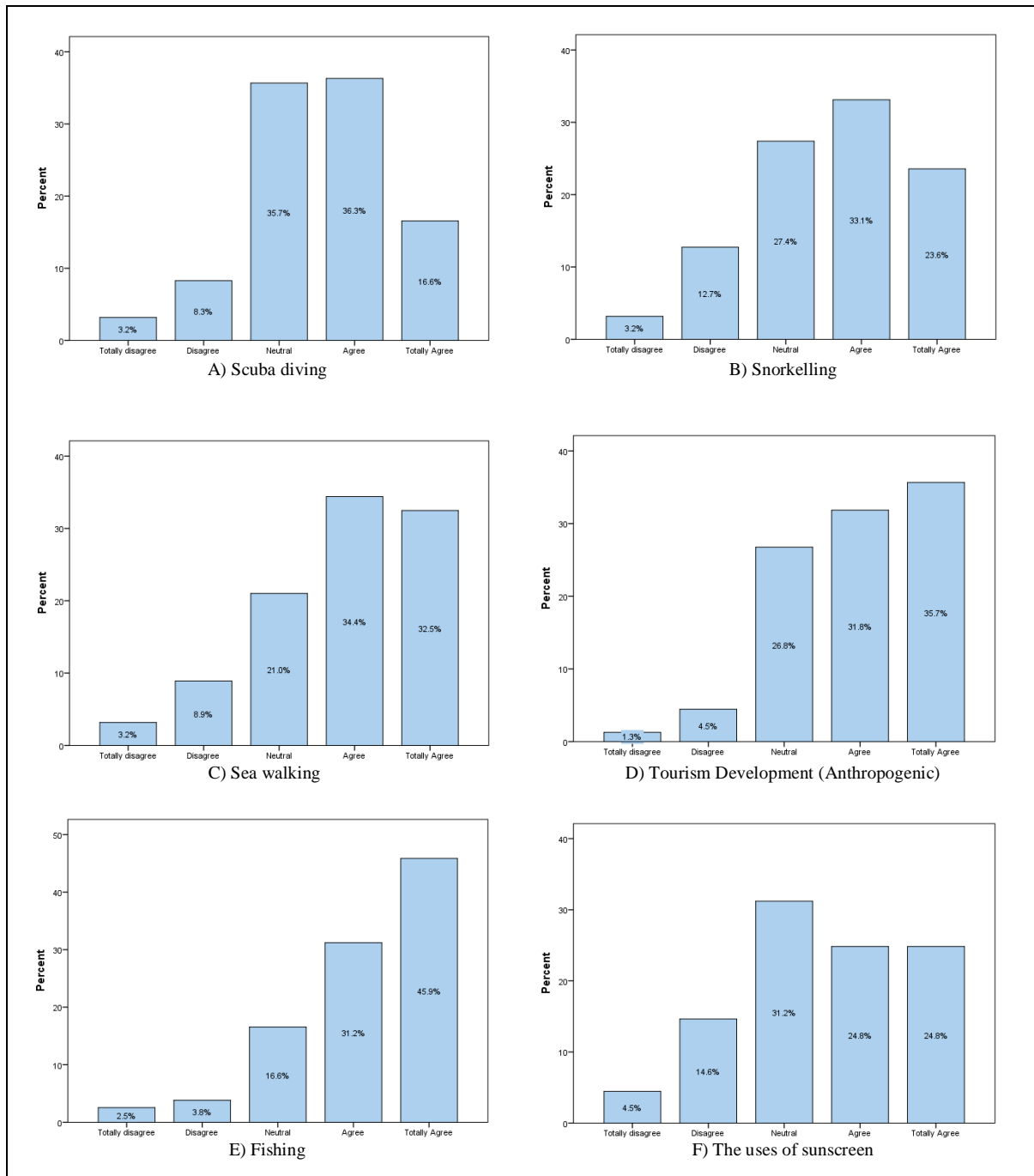


Figure 4.2 Activity that affects the damages of coral reef

Figure 4.2 show 157 respondents' knowledge on different types of activity that affects the damages of coral reef. For scuba diving activity, 16.6% respondents totally agree and 36.3% is agree with the statement. Meanwhile, 35.7% choose to be neutral on their answers and 8.3% and 3.2% disagree and totally disagree respectively. Respondents also totally agree that snorkelling activity affects the damages of coral reef by 23%, 33.1% agree, 27.4% neutral and 12.7% and 3.2% disagree and totally disagree respectively. More than half of the respondents which is 32.5% totally agree and 34.4% agree that sea walking activity affects the damages of coral reef, 21% choose to be neutral, 8.9% disagree and 3.2% totally disagree. For tourism development, 35.7% totally agree, 31.8% agree, 26.8% neutral, 4.5% disagree and only 1.3% respondents totally disagree that the activity affect coral damages. Fishing activity also contributed to damages of coral reef as almost half of the respondents which is 45.9% totally agree, 31.2% agree, 16.6% neutral, 3.8% disagree and 2.5% totally disagree. As for the uses of sunscreen, both response 24.8% totally agree and agree and more than 31.2% neutral. Meanwhile 14.6% disagree and only 4.5% totally disagree that activity affects the damages of coral reef.

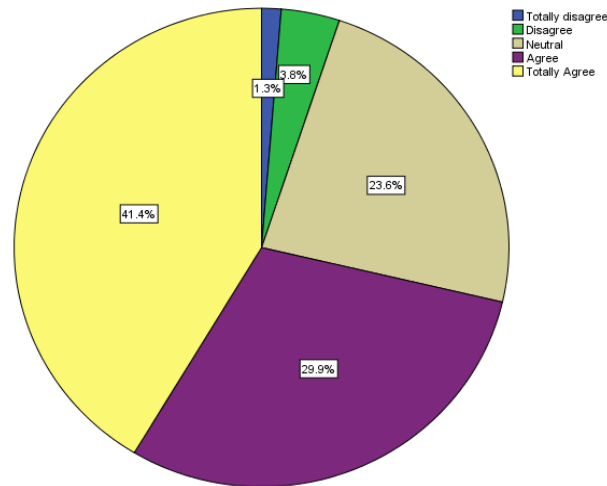


Figure 4.3 Impact of Coral Reef Damages Affects Tourist Arrivals

Figure 4.3 shows the respondents’ response on the impact of coral reef damages will affect tourist arrival at Tunku Abdul Rahman Park. Nearly half which is 41.4% totally agree, 29.9% agree and 23.6% neutral with the statement while only 3.8% and 1.3% disagree and totally disagree respectively.

**Descriptive Statistical Analysis**

	N	Mean	Std. Deviation
Scuba diving activity affects the damages of coral reef	157	3.55	.970
Snorkelling activity affects the damages of coral reef	157	3.61	1.078
Sea walking activity affects the damages of coral reef	157	3.84	1.077
Tourism development (anthropogenic) activity affects the damages of coral reef	157	3.96	.960
Fishing activity affects the damages of coral reef.	157	4.14	.997
The uses of sunscreen activity affect the damages of coral reef	157	3.51	1.147
Valid N (listwise)	157		

Table 4.2 Mean and Standard Deviation Score

Other than analysis by using frequency, researcher also used descriptive statistical analysis to find the mean and standard deviation. To answer the second research question on the tourism activities that contribute to coral reef damages in Tunku Abdul Rahman Park, an analysis of mean scores and standard deviations was conducted. Table 4.2 showed mean and standard deviation score for activities that affect damages of coral reefs. Fishing activities show the highest mean 4.14 with .997 standard deviation. Second highest mean is tourism development (anthropogenic) activities with mean 3.96 with .960 standard deviation. The third and fourth highest mean are sea walking and snorkelling activities with mean 3.84 and 3.61 with 1.077 and 1.078 standard deviation respectively. Second lowest mean is scuba diving activities with mean 3.55 with .097 standard deviation. The lowest mean is the uses of sunscreen with standard deviation 1.147. The interpretation for the mean score will be according to Table 4.3.

Mean Score	Interpretation
1.00 - 1.80	Very Low
1.81 - 2.60	Low
2.61 - 3.40	Medium
3.41 - 4.20	High
4.21 - 5.00	Very High

Table 4.3 Interpretation Score Mean (source: Creswell, 2011)

## **V. Discussion**

Overall, the results of this study showed that 70.1% of respondents were aware of the coral reefs destruction issues. In general, the student awareness towards tourism activities as a possible threat to coral reef is shown to be at a high level of awareness. Majority of the respondent were aware of the tourism activities such as scuba diving, snorkeling, sea walking, fishing, anthropogenic and the usage of sunblock product could threaten coral reef. These finding were parallel with the finding with the pass study shown that ecotourism activities as a possible threat of coral reefs including walking on coral reefs, boat driving, dumping of garbage and other waste into the sea, the use of soap during shower in the beach and land reclamation. [38] The finding also in line with the finding by the researcher pointed out that the tourism activities especially ignorant tourists (especially local tourists); unscrupulous tour operators, hotels and others are destroying corals. [39] Most of the problems that threaten coral reefs are the direct and indirect result of human activities both on land and in the marine environment. [40] Author [41] found that tourism activities as one of the main factors in coral reef decline in Peninsular Malaysia These finding also consistent with the finding by research conducted by Barker and Roberts which concluded that tourism activity such as scuba divers can substantially damage coral reefs. [42]. Tourism activities are found to threaten coral reefs when tourism management fails to be implemented sustainably. [43]

Although majority of the respondent were aware of these issues, the study also discovered a low awareness level within the respondent. Respondent were unaware of the coral reef destruction issues and uncertain about the impact of tourism activities would have towards the coral reefs. Despite the existence of uncertainty within the respondent, a study by the author [44] shown otherwise, whereby they found that intensive site use in reef-based tourist activities significantly reduces the overall health of corals. Locations that often become the focus of diving tourists carries a more serious negative impact on the damage and destruction of coral reef. [45] However, the finding from previous study found that negative effects occurred regardless of the intensity of visitation from tourism activity. [46]

The study found that illegal fishing has the most impact on coral reef destruction. This practice not only affects the environment, but also threatens the entire ecosystem and will leave long-term bad effects. [43] These finding also in line with the finding of the previous study that found destructive fishing practices such as trap fishing with bottom fish pots made from iron wire are also one major threat to coral reef degradation. [47] Accidental grounding of boats and anchor damage also significant threat to coral reef ecosystem.[40] In general, destructive fishing practices was one of major threats for coral development.

Meanwhile, the study had also discovered the usage of sunscreen has the lowest mean score compared to other tourism activities. However, the mean reading was high at ( $M = 3.51$ ,  $SP = 1.147$ ). These indicate that the usage of sunscreen could threaten coral reef in the long run. Since TARP is located in a typically warmer climate, the frequency of tourists using sunscreen is very high. According to the authors [48] estimated annual emissions of 4,000 to 6,000 metric tons of sunscreen in coral reef areas have the potential to expose underwater ecosystems to harmful chemicals. The constant usage of sunscreen will result in increased of sunscreen pollution as it washed off into the ocean. There are many studies and strong evidence that some sunscreens ingredients, especially oxybenzone, are harmful to corals if concentrations in water are high. [49] The growing of tourism due to coral reef as a large tourist attraction means lots of sunscreen exposure to the reef and could bring harm to the coral. [50]

## **VI. Conclusion**

The primary aim of this study was to identify the student perception towards coral reef damages in Tunku Abdul Rahman Park. From this study, it can be concluded that the level of awareness among respondent was at high awareness level. This study indicate that illegal fishing has the most impact on coral reef destruction. Meanwhile the usage of sunscreen was the lowest factors. Although it was the lowest factors the mean reading was high which indicate this factor could contribute and threaten the coral reef. This study also found that the damaging of coral reefs will affect the number of tourist arrival to the marine park in the future. This finding proves that sustainability of the coral reefs plays a crucial role in attracting and maintaining the arrival of tourist to this place Without proper control and effort of sustaining the attractions, this place could turn out to be worse.

Finding of this study could possibly contribute to the students' understanding about the coral reefs current conditions as they are the future tourism player, this could be a significant knowledge for them. The finding shows that illegal fishing was important factor to the threat of coral reef. Therefore, awareness at the community levels is extreme efficient as it may help to change the behaviour of coral reefs users in sustaining these ecosystems. The study suggests the authorities to put significant attention and play their roles by coming up with proper guidelines, policy implementation and enforcement. More importantly, government must not do it alone but involve all service provider including the hotels and resorts, tour operators, tourist guides, and most of all the locals

## References

- [1]. Tourism Malaysia. Receipts to Malaysia. Available from: <http://mytourismdata.tourism.gov.my/wp-content/uploads/2020/03/Arrival-Receipts-Jan-Dec-2019.pdf>
- [2]. Jamaludin, Md.J. Pembangunan pelancongan dan impaknya terhadap persekitaran fizikal pinggir. *Malaysian Journal of Environmental Management*, 2009;10(2): 71-88.
- [3]. Ghosh, Proshanta & Datta, Debajit. Coastal tourism and beach sustainability – An assessment of community perceptions in Kovalam, India. *GEOGRAFIA Malaysia Journal of Society and Space*. 2012; 8: 75-87.
- [4]. A.N.A Anuar, A. Habibah J.Hamzah, Mohd Yusuff Hussain & A.Buang. Dasar pelancongan di Malaysia: Ke arah destinasi mesra pelancong. *Akademika*. 2012; 82(3): 79-91
- [5]. Ibrahim, Johan Afendi and Abdul Razak, Norhanim and Ahmad, Mohamad Zaki. The impact of tourism development on beach destination: Case study of Cenang Beach, Langkawi. In: *Persidangan Kebangsaan Ekonomi Malaysia ke VII (PERKEM VII)*, 4-6 June 2012.
- [6]. Townsend, Ditch. First comprehensive list of the coral reef fishes of Tunku Abdul Rahman Park, Sabah, Malaysia (Borneo) *The Journal of Biodiversity Data*. 2015; 11(7): 1762 doi:<http://dx.doi.org/10.15560/11.7.1762>
- [7]. Praveena, S.M., Siraj, S.S. & Aris, A.Z. Coral reefs studies and threats in Malaysia: a mini review. *Rev Environ Sci Biotechnol* 2012; **11**: 27–39. <https://doi.org/10.1007/s11157-011-9261-8>
- [8]. Camilleri, M. A. *The Tourism Industry: An Overview*. In *Travel Marketing, Tourism Economics and the Airline Product Cham*, Switzerland: Springer Nature. 2018; Chapter 1, pp. 3-27
- [9]. Habibi, F. The Determinants of Inbound Tourism to Malaysia: A Panel Data Analysis. *Current Issues in Tourism* 2017; 20(9), 909-930
- [10]. Tourism Malaysia. Tourist arrival & receipts to Malaysia. Available from: <https://www.tourism.gov.my/statistics>
- [11]. Sabah Tourism Board. Retrieved from: <https://www.sabah tourism.com/destination/tunku-abdul-rahman-park/>
- [12]. Kler, B. K. Nurturing Sense of Place: Twenty Years of Tourism Development in Sabah, Malaysia. *Proceedings of the 6th International Conference of the Asian Academy of Applied Business (AAAB)*
- [13]. Sabah.Park. Retrieved from: <https://www.sabahparks.org.my/tunku-abdul-rahman-park>
- [14]. Mu, Paul. TAR Marine Park Top Attraction, 13 September 2018. Retrieved from: <https://kepkas.sabah.gov.my/tar-marine-park-top-attraction/>
- [15]. Hudatwi.M and Umroh, U. Comparison of Live Coral Cover in Central and South Bangka. *Jurnal Kelautan Tropis*. 2018); 21(1), 37-40
- [16]. Uar, N. D., Murti, S. H., & Hadisusanto, S. Kerusakan Lingkungan Akibat Aktivitas Manusia pada Ekosistem Terumbu Karang. *Majalah Geografi Indonesia*. 2016; 30(1), 88-96
- [17]. Yapanto, L. M., & Modjo, M. L. Assessing Public Awareness Level on the Preservation of Coral Reefs (The Case Study in Biak Numfor, Papua, Indonesia). Copyright@ EM International. 2018; 24(4)
- [18]. Garrod, B & Gossling, S. *New Frontiers in Marine Tourism: Diving Experiences, Sustainability, Management*. 2008
- [19]. Mapjabil. J. Pelancongan Berasaskan Selam Skuba Di Pulau Mabul Sabah. *Scuba Diving-Tourism Based at Mabul Island, Sabah. Persidangan Kebangsaan Ekonomi Malaysia ke V (PERKEM V), Inovasi dan Pertumbuhan Ekonomi, Port Dickson, Negeri Sembilan. Prosiding PERKEM V, JILID 2*. 2010; 15 – 17 Oktober 2010
- [20]. Mapjabil. J., Yusoh, Mohamad & Hussin, Rosazman & Ibrahim, Mohd & Mat Som, Ahmad Puad & Som, Mat. *Dive Tourism: Transformation and Implications on the Fisherman Community in Mabul Island, Sabah, Malaysia*. 2016
- [21]. Roche, R. C., Harvey, C. V., Harvey, J. J., Kavanagh, A. P., McDonald, M., Stein-Rostaing, V. R., & Turner, J. R. *Recreational Diving Impacts on Coral Reefs and the Adoption of Environmentally Responsible Practices within the SCUBA Diving Industry*. *Environmental Management*. 2016; 58(1), 107-116
- [22]. Tynyakov, J., Rousseau, M., Chen, M., Figus, O., Belhassen, Y., & Shashar, N. Artificial Reefs as a Means of Spreading Diving Pressure in a Coral Reef Environment. *Ocean & Coastal Management*. 2017; 149, 159-164
- [23]. Muhidin, Yulianda. F dan Zamani, N.P. Dampak snorkeling dan Diving terhadap Ekosistem Terumbu Karang Impact of Snorkeling and Diving to Coral Reef Ecosystem. *Jurnal Ilmu dan Teknologi Kelautan Tropis*. 2017; Vol. 9, No. 1, Halaman 315-326
- [24]. De, K., Nanajkar, M., Mote, S., & Ingole, B. Coral Damage by Recreational Diving Activities in a Marine Protected Area of India: Unaccountability Leading to ‘Tragedy of the Not So Commons’. *Marine Pollution Bulletin*. 2020; 155
- [25]. Webler, T., & Jakubowski, K. Mitigating Damaging Behaviors of Snorkelers to Coral Reefs in Puerto Rico through a Pre-Trip Media-Based Intervention. *Biological Conservation*. 2016; 197, 223-228
- [26]. Department of Environment, *Environmental Guideline on Undersea Walk*, 2017. Retrieved from: [https://environment.govmu.org/Documents/env\\_guidelines/29/23\\_Undersea\\_walk.pdf](https://environment.govmu.org/Documents/env_guidelines/29/23_Undersea_walk.pdf)
- [27]. Rina, I., Soemarno, K. Z., & Raka, W. D. G. Coral Reef Condition with Chaetodontidae Fish as the Indicators in the Waters of the Samber Gelap Island of Kotabaru, South Kalimantan. 2020
- [28]. Maynard JA, Mckagan S, Raymundo L, Johnson S, Ahmadi GN, Johnston L, Houk P, Williams GJ, Kendall M, Heron SF. Assessing Relative Resilience Potential of Coral Reefs to Inform Management. *Biol Conserv*. 2015; 192:109–119
- [29]. Minsaris, L.O.A., Damar, A., Imran, Z., & Madduppa, H. The Potential Relative Resilience of Coral Reefs in Wakatobi as a Sustainable Management Foundation. *Journal of Coastal Conservation*. 2019; 23(6), 995-1004
- [30]. Chen, C. L., & Chang, Y. C. A Transition beyond Traditional Fisheries: Taiwan's Experience with Developing Fishing Tourism. *Marine Policy*. 2017; 79, 84-91
- [31]. Dowarah, K., & Devipriya, S. P. Microplastic Prevalence in the Beaches of Puducherry, India and Its Correlation with Fishing and Tourism/Recreational Activities. *Marine pollution bulletin* 2019; 148, 123-133
- [32]. Ballesteros, L. V., Matthews, J. L., & Hoeksema, B. W. Pollution and Coral Damage Caused By Derelict Fishing Gear on Coral Reefs around Koh Tao, Gulf Of Thailand. *Marine pollution bulletin*. 2018; 135, 1107-1116
- [33]. Figueroa-Pico, J., Tortosa, F. S., & Carpio, A. J. Coral Fracture by Derelict Fishing Gear Affects the Sustainability of the Marginal Reefs of Ecuador. *Coral Reefs*. 2020; 39(3), 819-827
- [34]. Poon, T. S., Barnetson, R. S., & Halliday, G. M. Prevention of immunosuppression by sunscreens in humans is unrelated to protection from erythema and dependent on protection from ultraviolet A in the face of constant ultraviolet B protection. *Journal of investigative dermatology*. 2003; 121(1), 184-190
- [35]. Corinaldesi, C., Marcellini, F., Nepote, E., Damiani, E., & Danovaro, R. Impact of Inorganic UV Filters Contained in Sunscreen Products on Tropical Stony Corals (*Acropora* spp.). *Science of the Total Environment*. 2018; 637, 1279-1285
- [36]. Downs, C. A., Kramarsky-Winter, E., Segal, R., Fauth, J., Knutson, S., Bronstein, O., & Loya, Y. Toxicopathological Effects of the Sunscreen UV Filter, Oxybenzone (Benzophenone-3), on Coral Planulae and Cultured Primary Cells and its Environmental



- Contamination in Hawaii and the US Virgin Islands. *Archives of environmental contamination and toxicology*. 2016; 70(2), 265-288
- [37]. Raffa, R. B., Pergolizzi Jr, J. V., Taylor Jr, R., Kitzen, J. M., & NEMA Research Group. Sunscreen Bans: Coral Reefs and Skin Cancer. *Journal of Clinical Pharmacy and Therapeutics*. 2019; 44(1), 134-139
- [38]. Mohamad Saifudin Mohamad Saleh and Nik Norma Nik Hasan, Ecotourism and Coral Reef: Analysis of Coral Reef Conservation Awareness among Stakeholders in Perhentian Island, Malaysia, *American Journal of Tourism Management*, 2014; 3(1A): 7-12. doi:10.5923/s.tourism.201401.02
- [39]. N. W. Chan, Ecotourism and Environmental Conservation in Small Islands in the East Coast of Peninsular Malaysia, *Malaysian Journal of Environmental Management*, 2009; 10 (2): 53-69
- [40]. Hussein A. El-Naggar. Human Impacts on Coral Reef Ecosystem, *Natural Resources Management and Biological Sciences*, Edward R. Rhodes and Humood Naser, IntechOpen, 2020. DOI:10.5772/intechopen.88841. Available from: <https://www.intechopen.com/chapters/68635>
- [41]. Mohamed, B., Yusof, Y., Hussin, A.Z., and Abdullah, A., Tourism impact on aquatic ecosystem: a review. In. Proc. Kustem 3rd Annual Seminar on Sustainability Science and Management, Kuala Terengganu, Malaysia. 2004; 496-499.
- [42]. Barker, N and Roberts, C., Scuba diver behaviour and the management of diving impacts on coral reefs. *Biological Conservation*. 2004;120:481-489. 10.1016/j.biocon.2004.03.021.
- [43]. Mamat, Maharam & Yaacob, Maisarah & Safei, Mawar. Kemusnahan Batu Karang: Analisis Cerpen "Kami Akan Mati, Lin". Seminar Antarabangsa Pendidikan Bahasa, Sastera, Dan Budaya Melayu Kedua 2019 (SAPBaSBuM2), 2019;503-517. Available from: [https://www.researchgate.net/publication/333235296\\_KEMUSNAHAN\\_BATU\\_KARANG\\_ANALISIS\\_CERPEN\\_KAMI\\_AKAN\\_MATI\\_LIN](https://www.researchgate.net/publication/333235296_KEMUSNAHAN_BATU_KARANG_ANALISIS_CERPEN_KAMI_AKAN_MATI_LIN)
- [44]. Lamb, J. B., True, H. D., Pirom Aragorn, S., & Willis, B. L., Scuba diving damage and intensity of tourist activities increases coral disease prevalence. *Biological Conservation*, 178, 88–96. doi:10.1016/j.biocon.2014.06.027
- [45]. Jabil Mapjabil , Mohamad Pirdaus Yusoh , Rosmiza Zainol, Implikasi sosioekonomi pembangunan pelancongan penyelaman skuba terhadap komuniti pulau di Malaysia: Satu tinjauan awal, *Malaysia Journal of Society and Space*. 2012;8(5):26-38.
- [46]. Siringong, Sarawut & True, J.D. & Piromvarakorn, S., Number of tourists has less impact on coral reef health than the presence of tourism infrastructure. *Songklanakarin Journal of Science and Technology*, 2018; 40:1437-1445. Doi:10.14456/sjst-psu.2018.175.
- [47]. Putra SA, Syari IA, Akbar H *et al*. Human activities and persistent coral reef degradation in Gaspar Strait, Bangka Belitung Islands, Indonesia [version 1; peer review: 3 approved with reservations]. *F1000Research*. 2018;7:1962. doi:<https://doi.org/10.12688/f1000research.16519.1>
- [48]. Danovaro, R., Bongiorni, L., Corinaldesi, C., Giovannelli, D., Damiani, E., Astolfi, P., et al. Sunscreens cause coral bleaching by promoting viral infections. *Environ. Health Perspect*. 2008;116: 441–447. doi:10.1289/ehp.10966
- [49]. AK Mohiuddin, (2019). Sunscreen and Suntan Preparations. *ARC Journal of Pharmaceutical Sciences (AJPS)*, 2009; 5(2):8 – 4 4. doi:<http://dx.doi.org/10.20431/2455-1538.0502002>
- [50]. Downs, C. A., Woodley, C. M., Lichtenfeld, Y., Pennington, P., Loya, Y., Kushmaro, A., Bronstein, O. Toxicological effects of the sunscreen UV filter, benzophenone-2, hanon planulae and in vitro cells of the coral, *stylophora pistillata* [electronic resource]. *Ecotoxicology*. 2014;23(2):175-191.

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