Tourism Sea Activities that Cause Damages Towards Coral Reefs in Sembilan Islands

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ABSTRACT

Coral reefs are considered as one of the attractions for the tourists who want to learn more about the elements of the seas that are rich in various types of marine creatures. In Malaysia, there are numbers of places that have been known as the most prestigious spots for divers or snorkelers to feed their eyes on coral reefs watching, such as Sipadan Island, Mabul Island, Kapalai, Pom Pom, Island, Mataking Island, and the list goes on. However, these best islands are located in the Eastern part of Malaysia, Sabah. The interests of international tourists who love experiencing such activities, are only limited and diverted to the state only, as the islands stated above are actually famous for their proper maintenance and conservations, in keeping the authenticity of their natural island characteristics, such as the beaches, the activities run in the territory, as well as the environment of the islands themselves like the carrying capacities which are well controlled. Hence, the contributions of such actions had led to a proper conservations of the coral reefs, as a result of well efforts of sustainable tourisms practices done by the local communities and the authorities in such places. However, such cases are not happening to the islands in the western part of Malaysia. Opposite attributes can be seen clearly and widely spread both to the tourists and the local communities as well. The prides of the states who own the islands of Redang, Tioman, Pangkor and Perhentian, have been experiencing their declines in receiving tourists, especially by those who love to dive and snorkel. Such a thing happens as the islands stated, have been almost like 'overused' or over commercialized with no proper controls and efforts of sustaining the attractions. Thus this study was done in order to seek for the causes of the coral reef destructions in Sembilan Islands in Pangkor, to regain the fame of the destination, as well as to come up with ideas of efforts which should be taken into considerations in order to practice the sustainable tourism approaches toward the place.

The references are based on previous researches (secondary data). The findings have been analyzed and could be proposed to the tourism players of such places to improve their management in the future.

INTRODUCTION

Coral reefs are also known as the “rainforests of the sea.” It is one of the most important marine assets that need to be protected. It is highly productive and considered to be as a valuable marine resources and home to thousands of marine species. They provide key resources for coastal populations such as food, shoreline protection and stabilization, and economic benefits from tourism (Barrania Ahmed, 2010). In other words, they provide habitats and food sources for countless organisms under the sea and reef-based tourism/ecotourism is a major source of livelihood for various coastal communities. The economic values of coral reefs are important, from direct use to indirect use and non use value (Caser, 2000). Coral reef can be direct use such as being main attraction for snorkelling activity or scuba diving. As an example
for the indirect, coral reefs are considered as an external ecosystem support such as being the habitats for fishes.

According to the Caribbean Environment Programme, the coral reefs bring in USD100,000 to USD600,000 in its tourism industry, while in Hawaii, they estimate to have direct economic benefits of USD360 million per year. The same goes to Belize, according to National Oceanic and Atmospheric Administration (NOAA), the coral reef and mangrove associated tourism contributed an estimated USD150 million - USD196 million to their national economy. While in Indonesia and the Philippines it is estimated at USD1.6 billion and USD1.1 billion in every year respectively for coral reef benefit.

In Malaysia, coral reefs have also been a major attraction for tourists to visit our country. Redang Island, Tioman Island and Perhentian Island are among the best to do snorkelling activity. It is estimated that coral reefs contribute MYR2 billion in every year to the economy. The development of these assets has given an opportunity to the government and the private sector that are involved in this industry.

Recently there have been many issues about the coral reefs decline. Places of islands such as in Belize, Hawaii, Caribbean and the list goes on, had encountered the same concern of coral reefs destructions. According to The Star newspaper, it was stated that, Malaysia’s coral reefs in several islands are already in the critical phase, which could turn out to be worse if conservation and sustainable efforts are not implemented.

This paper focuses on Sembilan Islands in Pangkor, Perak. Sembilan Islands are among the best places to have recreational activities such as snorkelling, diving, leisure fishing and the list goes on. However due to some unknown main causes, which are worsen by pollutions, Sembilan Islands are facing a major problem of declining coral reefs, in terms of quantities and qualities, which can be simplified as, extinction.

There are many tourism activities that can cause coral reefs to damage or die. All factors can be hazardous impacts towards these species. Coral reefs in Southeast Asia are often threatened by activities such as over fishing, coastal developments, and climate changes that keep increasing (Burke et al., 2002). The Sembilan Islands’ coral reefs are also usually threatened by tourism sea activities such as scuba diving, snorkelling, cruise trips, irresponsible tourists and the list goes on. This study was aimed to find out the truth of which activities that contribute to the damages, as well as to identify the main cause that results to the destructions that had happened towards the coral reefs in Sembilan Islands. The findings will be helpful to reduce and to control the problem in preventing it to become worse. At the same time, efforts can be done in order to protect coral reefs through conservations so that they will remain as valuable assets of the marine industry while it continuously contributes chances to generate revenues to the economy, by applying sustainable tourism practices.

In the next 30 years, more than half of the world’s coral reefs may be destroyed if current degradation continues unabated (Wilkinson, 2000). Coral reefs are facing the decline because of several factors. These precious marine assets are in a decline around the world as a result of a number of anthropogenic related factors such as global warming, overfishing, pollution, and even tourism activities (Hughes, 2003). Recreational tourism activities do cause impacts towards coral reefs. A study (Hawkins, 1999) on the effects of recreational scuba diving found that divers often caused coral breakages and abrasion on all types of corals. Although many case studies and researches had been done in overseas about the coral reefs decline because of pollutions, there is no such study or research has ever been conducted in Malaysia.

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Thus, this study intends to investigate the types of tourism sea activities that cause damages towards the coral reefs and which tourism sea activity causes the most damages the coral reefs in order to determine which tourism sea activities had been contributing to the coral reefs decline in Sembilan Islands, Pangkor, in the state of Perak.

![Image: Study framework of the causes of damages towards coral reef.]

**THE SEMBILAN ISLANDS, PANGKOR**

The Sembilan Islands consist of a cluster of nine islands; Pulau Agas, Pulau Payong, Pulau Nipis, Pulau Rumbia, Pulau Lalong, Pulau Saga, Pulau Buluh, Black Rock and White Rock, which are located some 20km from the coast of Perak (Lumat) and 15km south of Pulau Pangkor off the west coast of Peninsular Malaysia, in the Straits of Malacca. It is considered to be one of the last outstanding important coral reef areas on the West coast of Peninsular Malaysia. Due to their potential biodiversity value, their strategic location suggests that they could also be important in maintaining biological connectivity between reef areas on the West coast. They are well thought-out to be an appropriate site for the defence and shelter as well can be called as a Marine Managed Area. It is such a progress that it would not simply keep the biodiversity of the island’s reefs, but possibly will also improve the tourism potential (Reef Check Malaysia, 2012).

During the past, the islands have been a trendy tourism destination, for snorkelling and diving as fine as leisure fishing. However, more recently their popularity has declined as the quality of the reefs has declined, impacted by development of tourism facilities on Pangkor and industrial facilities on the mainland nearby, as well as shipping in the Straits of Malacca. The constant development, if not well handled, could have grim implications for the upcoming health of coral reefs around the islands, intimidating their ecological value and economical potential. In exact, future industrial developments at Teluk Rubiah (iron ore plant) and Lumut (LNG terminal), as well as further tourism development on
Pangkor (Teluk Segadas) could have major impacts on the islands if manufacture and operations are not managed in order to reduce ecological impacts (Reef Check Malaysia, 2012).

**METHODOLOGY**

**Data Collection From Previous Research Journals**
The methods of implementing this research had extremely been crucial in order to make sure that all the data and information which were to be collected to be valid, and usable and reliable. Journal articles of previous researches related to coral reefs destructions had been used as references to seek for the information that supported the ideas of the identification of the causes that contributed to such a problem that had already happened in islands in other parts in the world, which is similar to the parameter of this research which is in Sembilan Islands, in Pangkor.

**Information Verification**
As to verify the findings based on the previous related researches conducted in mostly overseas, for references, the researchers seek for assistance of clarifications by Reef Check Malaysia regarding the real situations that had been happening in the area the research parameter. Interview session was conducted with Mr. Aaron Tam, the Communication Officer as well as the representative from Reef Check Malaysia, an international non-profit organization that had been formed and dedicated to conservation of coral reefs, worldwide. Information regarding the tourism activities and the actual occurrences that are involved in the destructions of coral reefs in the territory of Pangkor was clarified.

Based on the interview, it was concluded that tourism sea activities in the area were among the causes of the decline of the coral reefs in Sembilan Islands. In this case, activities such as snorkelling and scuba diving that were always unethically conducted turned out to be the manipulative variables of such problem to occur.

**FINDINGS**

**Tourism Activities that Cause Damages on Coral Reefs**
As it is known, human activities have been noticeably changing reef systems for decades, scientists have found it difficult to recognize the baseline for what a reef should look like (Knowlton and Jackson, 2008). Bryant et al. (1997) study that a global inventory of Earth’s coral reefs estimates that already nearly 60 percent are at risk due to the actions of humans. Then, many researcher found that the threats to coral reefs and reef species damage are climate change and coral bleaching, pollution, disease, coastal development and runoff, trade in coral and live reef species, overharvesting, ship groundings and anchor damage, marine debris and trash, aquatic invasive species and oil and gas exploration (Bellwood et al., 2004; Briggs, 2005; Friedlander et al., 2005; Hodgson, 2000).

According to NOAA (2009), Climate change, overfishing, and pollution are the three main threats of concern to current coral reef conservation efforts. A study by Hughes this precious resource is in decline around the world as a result of a number of anthropogenic related factors such as global warming, overfishing, pollution, and even tourism (Hughes 2003). Besides that, according to Wafar et al. (2000) the major pressure on the coral reef ecosystem comes from industrial development, development of ports and offshore moorings and pollution from large cities. Anthropogenic impacts due to human activities have degraded the coral reef habitats and reduced the coral cover by more than 50 per cent of most reefs.
In Southeast Asia, coral reef also increasingly threatened by, coastal development, overfishing and climate change (Burke et al. 2002). Many of these and other studies have discussed the need for future research to examine which one causes more impact and why some recreationists and tourists engage in these depreciative behaviours and if these individuals understand and care about the fragility of reefs and other aspects of the marine environment (e.g. Leujak & Ormond, 2007; Rouphael & Inglis, 2002; Uyarr, Watkinson, & Cote, 2009). There are many tourism activities that cause impacts towards coral reefs. In Hawaii more than 80% visitors engage in recreation activities in the state’s coastal and marine area with the majority of these individuals participating in scuba diving (200 000 per year) or snorkelling (3 million per year) when visiting Hawaii (Hawaii DBEDT, 2002; Van Beukering & Caser, 2004).

Snorkelling and diving give direct physical impacts and has been the subject of extensive study and is relatively well documented in the literature. The damage inflicted by divers and snorkelers consists mostly of breaking fragile, branched corals or causing lesions to massive corals. Most divers and snorkelers cause little damage, only a few causes much damage. This statement is supported by Tissot and Hallacher (2000) found that one of the tourism activities, which is scuba diving, increased the potential for trampling and deleterious environmental consequences such as coral breakage at Kealakekua Bay. Many researcher studies that scuba diving and snorkelling have empirically demonstrated can cause environmental damage to coral reefs and related coastal resources (e.g., Barker & Robert, 2004; Dinsdale & Harriot, 2004; Rodgers & Cox, 2003; Tratalos & Austin, 2001).

Training and briefing of divers and snorkelers will greatly help to reduce negative impact towards coral reefs. Fishing and collecting include in direct impact to coral reefs. This can contribute to over-exploitation of reef species and threatening local survival of endangered species. Collecting of marine souvenirs by tourists is probably insignificant but there still is a market for marine curio in response to a certain tourist demand. The demand can definitely be decreased by increased awareness. Jackson (2001) expressed their opinion that, the increase in human activity on these islands likely has many effects.

One anthropogenic reef disturbance is over fishing, where humans have fished down the trophic levels of reefs, leading to trophic cascade effects and a permanent alteration of reefs away from their pristine state. The same goes to Chazottes (2002), the effects of overfishing can amplify other anthropogenic effects on reefs. This can be seen with eutrophication of coral reefs, where increased nutrients from agricultural runoff causes increased algae growth that can be unchecked because of the fishing depleted stocks of herbivorous reef organisms. The last report in “Reefs at Risks revisited” (Burke et al. 2011) stated that overfishing as the major local threat affecting 55% of reefs, through an increase in commercial fishing and heavy trawling (particularly in the Gulf of Aqaba, Kotb et al. 2008).

Approximately 30% of households in Hawaii, for example, had at least one person who participated in recreational fishing in 2004 (QMark, 2005). At a recent meeting on the global status of coral reefs, overfishing was deemed one of the three most serious threats to reefs (Moberts, 1993).

Anchor is one of the problems that make coral reefs damage badly. Physical damage from anchors and especially boat groundings can be severe. Anchor damage is further depend on the type of coral community and proportional to the size of the boat (i.e. weight of the anchor and length of anchor chain). Recovery of coral damage from boat groundings is very slow. Anchor damage can be avoided to a large extent by installing permanent moorings, designating anchorages and providing adequate information on anchoring and mooring.
A study by Jameson et al. (2007) that compares four coral sites exposed to mass tourism with a site that is fairly unexposed (all located near Hurghada) finds that all four of the sites suffered from physical damage reflected in consistently having a lower frequency of hard coral (especially Acropora coral), higher percentage of algae and higher percent of soft coral. This coral reef damage was primarily a result of anchor and diver damage and dynamite fishing (Jameson et al. 2007; El Gamily et al. 2001).

Studies conducted from many researchers found that damage from anchors and vessels grounding on reefs now represents the most immediate threat to reefs in some locations, e.g., in the Florida Keys and U.S. Virgin Islands. Early published reports of reef destruction from anchors and groundings include those by Davis (1977), Gittings et al. (1988), S. H. Smith (1988) and S. R. Smith (1985).

In a 1985 the survey from people ten Caribbean islands (or island groups) out of a total of 26 reported anchor damage or boat groundings as causes of reef decline (Rogers, 1985). People from 20 islands also responded to a follow-up questionnaire in 1996, and all of them listed boat damage as a problem on their reefs. Anchor damage was the most frequently cited cause of reef degradation overall (R. Dunsmore, pers. comm.).

Although many of the stresses that are causing degradation of coral reefs worldwide appear to be beyond our control, we do have the ability to reduce physical destruction from careless operation of boats and ships (Bulletin of Marine Science, Vol. 69, No. 2, 2001). Indirect impacts relate to the development, construction and operation of tourism infrastructure as a whole (resorts, marinas, ports, airports, etc.). Coastal development and the construction and operation of related tourism infrastructure cause increased runoff and sedimentation. Sedimentation is generally considered one of the main reasons for reef degradation. Increased sediment loading of coastal waters increases turbidity, reduces light levels and leads to stress on corals, usually expressed by “bleaching” of corals.

Another leading cause of overall reef decline and a tremendous threat to the future heath of coral reefs is global warming (Hughes 2003). Corals are stenothermic organisms, with a narrow temperature tolerance. This limits coral growth to waters in a narrow temperature band, and provides a large negative selection pressure with temperature changes of only a few degrees (Glynn 1973).

Tourism Activities that Cause Damages On Coral Reefs of Sembilan Islands

In this case of Sembilan Islands, there are many tourism activities that can be done here. Among the activities includes; scuba diving, snorkelling, fishing, and cruise trips. In this area, the most popular diving sites are the Light House and White Rock /Black Rock. It is a popular site for divers during monsoon season in the East Coast.

At some of these diving sites, it is possible to see mimic octopus, juvenile bamboo sharks, seahorses, nudibranchs, juvenile yellow boxfish, juvenile blue ringed angelfish, butterfly fish, long finned bannerfish, blue ringed angelfish, groupers, tuna and trevallys. Aside from those, there are many types of coral reefs that can be found here, including large and small nudibranchs, staghorn coral, big nudibranchs, tube coral, whip coral, barrel sponges and vibrant soft corals.

Sembilan Islands are also known as the angler's paradise. Many locals head out in the weekends for a fishing trip. Every year in Sembilan Islands, there is a competition named “Pulau Sembilan Fishing Safari”, organized by Perak State Fisheries Department. This event also becomes tourism event and conjunction
with the Visit Malaysia Year 2007. By having shorter cruise the visitor can encircling the island, than drop by at one of the beaches for picnic lunch, dip into the water for snorkeling and watch the sunset cruising.

In the past, Sembilan Islands have been a popular tourism destination, for diving and snorkeling as well as recreational fishing. However, more recently the coral popularity has declined as the quality of the reefs has declined. According to Reef Check Malaysia it is due to the impacts by development of tourism facilities on Pangkor and industrial facilities on the mainland nearby.

Besides that, shipping trips in the Straits of Malacca also contributes to the damage of coral reef. Continued developments, that are not well managed, could have serious implications for the future health of coral reefs around the islands, threatening their ecological value and economical potential. In particular, proposed industrial developments at Teluk Rubiah (iron ore plant) and Lumut (LNG terminal), as well as further tourism development on Pangkor (Teluk Segadas) could have significant impacts on the islands if construction and operations are not managed in order to minimize environmental impacts, which could also contribute to the destruction of the island's coral reefs.

In particular, proposed industrial developments in Teluk Rubiah (iron ore plant) and Lumut (LNG terminal), as well as further tourism development in Pangkor (Teluk Segadas) could have major impacts on the islands if construction and operations are not managed in order to minimize environmental impacts.

**Scuba Diving - The Main Cause of Coral Reef Destuctions**

Ecotourism often is promoted as an ecologically-friendly use of natural resources, however if it is not managed carefully, it can cause negative impacts to the ecosystems. In Pangkor Island, minimal government involvement in regulating recreational diver behavior has led to local scuba diving promoters being mainly responsible for promoting diver behavior that reduces damage to the reef ecosystem. Waterbased recreational activities are fast gaining popularity in the country. Sales of watersports equipment (including leisure crafts, scuba diving and sports fishing equipment) totaled RM 20 million in 1992 and RM 30 million in 1993. Corporations marketing these goods expect their 1994 sales to exceed that of the previous year (Business Times, 1 June 1994). This can be made as an indicator that such activities have long gained their fame in the country among the tourists who love to engage in island activities.

Coral reefs related to tourism are on the rise worldwide, as the number of people learning to scuba dive increases every year (Davis and Tisdell, 1995; Barker and Roberts, 2004; Davenport and Davenport, 2006). As the price of diving gear is decreasing, reefs are becoming more accessible, and facilities are improving, encourages more people to engage in such an activity. Consequently, ever-increasing numbers of people are visiting coral reefs (Hawkins and Roberts, 1993). Corals at sites with high diving intensities may become chronically damaged by divers kicking, touching, standing, trampling, and increasing sedimentation on the reef (Hawkins and Roberts, 1993; Barker and Roberts, 2004).

Divers can cause breakage, tissue abrasion, and mortality of coral colonies (Zakai and Chadwick-Furman, 2002; Hasler and Ott, 2008).

The most direct way that humans physically interact with coral reefs is through recreational scuba diving. Because of this commonly engaged activity, regulation of divers’ behaviour on reefs is of the utmost
importance. Recreational divers have already caused extensive negative impacts on coral reef ecosystems, although scuba diving is often claimed and promoted to be as a true “ecotourist” activity.

As an example of a case study, divers in the Eilat, Israeli Red Sea, contact live coral substrate as many as 25 times during a 45 minute dive (Zakai and Chadwick-Furman 2002). While this number may seem small by itself, when this contact rate is multiplied with the 250,000-300,000 divers that visit this reef area in a single year, the resulting contact rate per reef area is staggering (Zakai and Chadwick-Furman 2002).

While each contact between diver and coral does not necessarily lead to the death of the coral, it contributes to an overall deterioration in coral health (Hawkins et al. 1999). The majority (as much as 80%) of diver-coral contacts are unintentional (Barker and Roberts 2004). Such contacts typically arise from the inexperience of the diver and/or a lack of understanding that their actions can cause harm to corals (Barker and Roberts 2004). Addressing this issue is the responsibility of the local governments and dive agencies or businesses that establish the facilities and programs whereby divers are able to visit these reefs.

A few studies conducted, focused on diver impacts to reefs in the Florida Keys, despite widespread interest in coral reef conservation worldwide. The earliest publication on recreational diver impact in Florida was almost 30 years ago on reefs in Biscayne National Park (Tilmant & Schmahl 1981). The research authors concluded that recreational diving was a good source of income for the area, and that parks should encourage more divers because there was no apparent harm to the reefs. However, this conclusion was made during a period when diving rates were possibly low enough to cause little damage, so it is not surprising that it differs from the conclusions of more recent studies.

Little information existed on the Florida Keys to challenge these 30-year-old findings. Talge (1992) found that 4-6% of total live coral cover in Florida was touched by divers on a weekly basis, and concluded that this did not cause permanent harm to the corals, in contrast to more findings on coral reefs worldwide (Plathong et al. 2000, Zakai and Chadwick-Furman 2002, Barker and Roberts 2004). Another study conducted by Camp and Fraser (2012) found that divers in the Key Largo area exhibit behaviors that negatively impact coral reefs, and that various environmental education tools and strategies could be effective in mitigating these diver-coral contacts.

However, no published studies in nearly two decades have determined variation in amounts of broken and sediment corals on reefs in Florida, and related them to estimated frequencies of recreational diving on each reef. With recent global increases in the climatic, biological, and human-induced factors affecting coral reefs, an updated analysis of recreational diver impacts on Florida reef corals is needed. As a conclusion of the findings, generally, we can conclude that it is proven that diving is the main cause of sea tourism activities that cause destructions on coral reefs in islands of all over the world. In this case of study, the same problem that has been happening at Sembilan Islands in Pangkor, might be also caused by the same variable as well and there is a possibility that the subject of this research is not exemption, while other non-tourism activities that also contribute destroying the corals, at the same time.

**Snorkelling - The Main Cause of Coral Reef Destrucions in Sembilan Islands**

In Sembilan Islands, the case is twisted whereby scuba diving is not the main cause that has contributed to the destructions of coral reefs. However, we found that snorkelling was the worst tourism sea activity...
factor that often caused damages. This finding contradicts the results of other previous researches that had been conducted in other islands in the world such in the Red Sea of Egypt, California, Kealakekua Hawaii, Gujerat, Bonaire Marine Park in Caribbean, and the list goes on.

"Unethical snorkelling lessons conducted by both licensed and unlicensed instructors were the culprits, snorkelers who came to snorkel, were not taught well and thorough of the right ethics to snorkel, as well as the do's and the don'ts" (T.Aaron, 2012). It was concluded that, there have been too many instructors that do not follow the guidelines, of teaching the tourists the right practices to do when they snorkel. These incomplete knowledge equipped rookie snorkelers tend to destroy the corals, by touching them, holding onto them as supports while taking photos, purposely cracking the species as they think it would bring no harms at all.

In a nutshell, as this research's independent variables had been verified by an acknowledged organization, (Reef Check), we strongly agree that although most coral reefs destruction cases that had happened in many islands around the world were often caused by scuba diving activities, it did not apply to the scenario in Sembilan Islands.

This dimension (diving) happened to be the second factor, as snorkelling tops the chart of being the actual main cause instead. In other words, the final result of the second objective of this research had successfully been found out. Snorkelling is undoubtedly the main tourism sea activity factor that influences the damages of the coral reefs in Sembilan Islands, Pangkor.

CONCLUSIONS

From the research that has been conducted, it is found and argued that there are generally a few factors consists of tourism sea activities that cause damages towards the coral reefs in the cluster of Sembilan Islands, and they are scuba diving, snorkelling, fishing, and cruise trips.

Apart from that, the study proves that the main tourism activity that caused the greatest damages on the coral reefs is snorkelling. Since snorkelling is a simple activity and it is very famous among the tourists who travel to Pangkor, thus it encourages many to experience, but with no proper practices practiced, the reefs had to pay for the price. The more tourists come for snorkelling, the more destructions it would be to the coral reefs in Sembilan Islands.

Our suggestion is that the authorities should play their roles by coming up with guidelines of limiting the number of the tourists to engage in snorkelling at a time or per day. Monitoring the carrying capacity is the main key. The authorities can decrease the number of tourists who come for snorkelling, as well as other tourism sea activities and it will help to sustain the coral reefs.

Apart from that, the coral reefs in the region of the Sembilan Islands are measured to be in moderately fine situation, given that there are significant local impacts like pollution, sedimentation and so on. As for that, we suggest that the area need to be gazetted as protected areas, so activities posing significant threats to reefs such as collection of corals, fish and reef fauna, trawling and anchoring on reefs are prohibited.
On top of that, it can help the corals in the Sembilan Islands appear to be growing and reproducing well despite the turbid waters in the area. After all, the visual price of the reefs might be enhanced and the biodiversity worth sheltered.

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