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RESEARCH ARTICLE

Assessing visitor preferences and willingness to pay for Marine National Park Hikkaduwa: application of choice experiment method

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Abstract: Eco-tourism all over the world is threatened by the fact that the coral reefs and associated ecosystems are in a process of disappearing at an accelerated rate due to several natural and anthropogenic causes. In this context, the Marine National Park Hikkaduwa (MNPH), one of the four marine national parks in Sri Lanka, that features a fringing coral reef with a high degree of biodiversity, reports a decreasing trend in visitation mainly due to a condition of coral bleaching caused by an El Nino effect. Unfortunately, the regeneration of the corals is found to be slowed by continuous anthropogenic activities. Against this background, the research focuses on investigating how visitor behaviour changes with the degraded situation and what avenues are available to attract more visitors to ensure benefit flows. In this concern, visitor preferences regarding the quality of the habitats and other facilities and their significance were analysed under a conditional logistic regression model. Further, a choice experiment was carried out with a randomly selected group of 200 visitors to diagnose their response to the present condition of the coral reef, the beach, and the facilities provided. Under a conditional logistic model, it was discovered that the condition of the coral reef is an important attribute that answers the question of why visitors are not willing to pay if the corals are bleached and broken. It was also discovered that the visitors are willing to pay LKR 322.52 if they are provided with new boats and new safety jackets. The results indicate that benefit flows could be enhanced with the restoration of coral ecosystems and the improvement of the physical infrastructure. Overall, the research attempts to establish that the standard maintenance of the coral reef along with high-quality visitor welfare facilities to match visitor preferences will positively impact all types of payment compliance issues with regard to the visitors.

Keywords: Coral reef, choice experiment, willingness to pay.

INTRODUCTION

It is observed that coral ecosystems in the world deteriorate due to natural causes and anthropogenic activities (Hynes *et al*., 2018) such as water warming, pollution, ocean acidification, overfishing, and physical destruction to the corals, and coral bleaching occurs due to stress caused by light, temperature, and nutrients. The flow of ecosystem service benefits (Barbier, 2012) of corals, especially in relation to eco-tourism, is currently suboptimal due to their degradation, and the value depreciation it causes (Arin & Kramer, 2002; Gaylard *et al*., 2020). It is observed that climate change also tends to accelerate their degradation process (Carlson & McCormic, 2015). Some believe that managerial improvements are crucial to ensure the restoration and enhancement of economic and other benefits of the coral reefs. An environmental valuation of the degraded coral ecosystems (Laurans *et al*., 2013; Parsons & Thur 2008; Cesar & Beukering 2004; Ahmed *et al*., 2007) is meant to provide a useful source of information in this concern.

Sri Lanka is no exception in relation to the marine resource degradation experienced by other countries around the world. Although the island nation is endowed with a rich form of marine biodiversity especially coral diversity, many areas are under severe pressure due to the combined impact of human overexploitation, coral habitat destruction, pollution, and general neglect (Rajasooriya, 2005). The importance of marine biodiversity needs to be understood in terms of its economic contribution

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to the local tourist industry, the third largest foreign revenue source to the economy, plays an important role in Sri Lanka's foreign earnings, (Sri Lanka Tourism Development Authority, 2019), with the record of its annual growth being approximately 22% for the past four years (Sri Lanka Tourism Development Authority, 2019).

In this context, the Marine National Park of Hikkaduwa, which contains a fringing coral reef of high degree of biodiversity, attracts prominence in the context of eco-tourism. The area was declared as a wildlife sanctuary in May 1979 and then upgraded to a nature reserve in August 1988. Further, it was established as a national park in 2002 with an extension of the land area (Department of Wildlife Conservation - DWLC, Personnel Communication). Since then, it has been contributing to the national income through the revenue earned from the entrance fee and boat service, being the main tourist destination in the southern coast of Sri Lanka. Considering the threat of deterioration, the marine park is faced with, the paper presents its research issue, conceptual framework, and literature review, focusing mainly on the environmental valuation of degraded marine ecosystems, and subsequent sections covering the methodology, the results achieved, and a discussion leading to the conclusions drawn.

The research problem and the objective

The Marine National Park Hikkaduwa (MNPH) is reported to be showing a declining trend of visitation (DWLC, 2019) mainly due to the issue of coral bleaching that was noticed for the first time in 1998 as a result of the El Nino effect (Rajasooriya, 2005). Since then the regeneration process of corals has been very slow due to continuous anthropogenic activities in the MNPH surroundings (Rajasooriya, 2005). The Department of Wild Life Conservation (DWLC) has taken certain steps to rehabilitate the degraded corals by replanting them. The next issue in the venue that discourages visitation is that the infrastructure facilities for visitor use are at a minimum level although the Hikkaduwa Urban Council has provided a washroom complex. Although the management of visitor-generated wastes are currently being handled by the DWLC and the Urban Council, there are shortages of labour and other resources affecting the cleanliness of the beach. The boat services are being operated by the private sector but their safety conditions are monitored by the DWLC. How the visitors perceive the site quality in the presence of the degraded situation of the corals is yet an un-researched area in Sri Lanka. In addition, visitor preferences for site facilities also form an unexplored research area. It is also worthwhile to investigate avenues available to attract more visitors in managing a degraded tourist attraction to ensure a boost in the ecosystem service flows.

Conceptual framework

As the Marine National Park Hikkaduwa holds the value of a non-market good or environmental service, the research was conducted as a choice experiment (CE) based on the random utility model (RUM)/utility maximization model (Lancaster, 1966) originally developed by McFadden & others (McFadden,1974) to analyse behavioural choices among mutually exclusive alternatives (Haab & Mc Connell 2002). As the RUM is an attractive modelling strategy since it can model the choice of one out of many recreational sites, it is adopted in this research mainly because it can deal with choices that individuals could make. Although different kinds of sampling schemes are possible such as exogenous sampling (random or stratified sampling) and choice-based sampling, as this research concentrates on a recreational analysis, a common choice-based sample is taken for the purpose of on-site sampling.

After the problem was identified, the survey design was made in three steps. First, information about the present situation was obtained and the target population was identified, and then choice cards were established. One of the attributes was defined as price or cost with an intention to obtain data on the visitor's willingness to pay (WTP). Then a marginal utility estimate model was used to estimate the WTP of the respondents for any changes in the given attributes. Once the attributes and their levels were decided, several scenarios were constructed, including the attributes with their respective levels in the changing values, enabling the participants to select alternatives out of the presented options.

LITERATURE REVIEW

Coral ecosystems are subjected to extensive valuation studies globally from the ecosystem service perspective and most of them are reported from the United States, Southeast Asia Caribbean and a few from the South Pacific region (Laurans *et al*., 2013; Pascal *et al*., 2016; Elliff & Kikuchi, 2017). In this context, benefits obtained from flood protection in a global context are studied by Beck *et al*. (2018), Beck *et al*. (2016) and Storlazzi *et al*. (2017), and the recreational value of coral reefs are studied by Brander *et al*. (2007) by using a meta-analysis. Further, Seenprachawong (2016) assesses the economic value of the coral reefs in Thailand while Spalding *et al*. (2017) estimate the global value of coral reef tourism, and Robles-Zavala & Reynoso (2018) estimate the recreation benefits in Mexico. Holstein *et al*. (2019)

assess ecosystem services provided by Mesophotic coral ecosystems, Putri *et al*. (2020) assess coral reef health in the nature recreation park based in Indonesia. Yeo (2004) estimates the recreational value of coral reefs in a Marine Park in Malaysia and Oleson *et al*. (2020) develop an ecological economic model of coral reef recreation based on Hawaii.

The economic values of the degraded coral habitats focus on degradation resulting from local as well as global threats. Lane *et al*. (2013) estimate coral mortality and bleaching for three major US locations and calculate the economic values of changing coral cover, using a benefit transfer approach. Their results suggest that a reduced global emissions scenario would provide a substantial benefit to shallow water coral reefs by delaying or avoiding potential future bleaching. Similarly, Persons & Thur (2008) value the changes in the quality of coral reef ecosystems in the Bonaire National Marine Park in the Netherlands. They assume a hypothetical degraded situation and calculate per-person welfare loss per annum. Further, Van Beukering *et al*. (2010) calculate the total economic value (TEV) of Bermuda's coral reefs while Carr & Mendelsohn (2003) and Van Riper *et al* (2016) recommend the need for conservation policies for Great Barrier Reef based on its value (consumer surplus) to protect it from global warming, mining, overfishing and water pollution.

Based on the results of valuation studies, different authors recommend different policy tools for reversing coral degradation. For example, Seenprachawong (2003) assesses the coral reefs at Phi Phi islands in Thailand and mentions how the current threats due to rising maritime traffic, improper fishing methods, and unsustainable tourism activities could be minimised and how its value could be enhanced. Based on an estimated consumer surplus, the study recommends doubling the entrance fee and charge an additional fee for those who wish to see corals. Further, Ahmed *et al.* (2007) calculate the recreation and conservation benefits of the coral reefs in the Philippines, in order to prevent threats to the corals from the current utilisation patterns and introduce a consumer surplus value. The study highlights the role of advocacy, education, and awareness campaigns that may increase the visitor's willingness to pay (WTP) for the management of coral reefs. Notably, Rani *et al*. (2020) assess Saint Martin's coral island in Bangladesh, whose coral reef had been deteriorated due to fishing, anchoring boats, and discharging wastes by tourists, and indicate the net present value of the benefits from all the available resources focused on a 25-year time frame. The study proposes that the government should produce a new management plan for sustainable utilisation of the valuable resources concerned. Eventually, Chen *et al*. (2015) evaluate the economic damage caused by climate change and increased carbon dioxide concentrations on the global coral reefs. They have estimated the resultant loss in terms of economic value based on a meta-analysis of the recreational and commercial value of the reef cover.

It is reported that El Nino, which occurred in 1998, led coral mass bleaching and a loss of tourism income for many Asian countries. In this regard, Cesar (2000) points out that it caused a 30-50% of coral mortality in the Philippines and the potential loss for their national economy over the period 2000-2025 was estimated as US$ 1.5 million. Accordingly, losses in tourism and welfare revenues in Sri Lanka due to the coral bleaching were estimated at by 2000 - 2025 is US$ 2.2 million (Westmacott *et al*., 2000).

Regarding coral reef deterioration, Wilson *et al*. (2010) claim that climate change-associated impacts contribute to coral cover declines and lead to the elimination of many coral fish species which are an important source of protein-rich food for coastline inhabitants. The lost producer surplus from commercial fishing precipitated by coral bleaching of the Great Barrier Reef is calculated as US$ 0.4 billion (Oxford Economics, 2009). Further, Westmacott *et al*. (2000) estimate that the financial damage due to coral bleaching which took place over a 20-year period until 1997 was over US$ 8 billion; that due to coastal erosion was US$ 2.2 billion; that due to tourism loss was US$ 3.3 billion; and that due to fishery loss was US$1.4 billion.

The previous studies adopt a range of valuation methods in valuing coral degradation. In this concern, Ngazy *et al*. (2004) estimate the demand for recreational scuba diving in Zanzibar using the contingent valuation method (CVM), in order to identify the impact of coral bleaching on tourism. Further, Carr & Mendelsohn (2003) use the travel cost method (TCM) to estimate the annual recreational benefits of the Great Barrier Reef, which is meant to prevent, the adverse impacts of global warming, mining, overfishing, and water pollution. Subsequently, Ahmed *et al.* (2007) use TCM and CVM to estimate recreational and conservation benefits of the coral reefs in the Lingayen Gulf, Bolinao. It is mentioned that the corals are at a threat due to overfishing as well as illegal fishing methods such as blast and cyanide fishing. Further, Christie *et al*. (2015) use CE to value the benefits derived from two coral ecosystems in the Caribbean which degraded due to agriculture run-off, sewage, overfishing and bad

fishing practices and they mention that an economic valuation of marine ecosystem service will be used to plan marine conservation policies that maximise the welfare benefit. Wattage *et al*. (2011) use CE method to conserve deep sea corals in the Irish waters which are faced with a threat due to the expansion of the Irish deep-water fishery that uses trawls fitted with vigorous rock-hopping gear under a risky technique very destructive to coral habitats. Similarly, Parsons & Thur (2008) also report on conducting a choice experiment study to value a coral reef ecosystem for scuba divers in the Caribbean.

Regarding Sri Lanka's coral reefs, the ecosystem services at the Kalpitiya bar reef is valued as LKR 53 million per year (Senarathne *et al*., 2015); that of the Pigeon Island National Park, as LKR 60 million per year (Jayaratne *et al.*, 2016); that of Hikkaduwa National Park, is LKR 6135.48 million (Rathnadeera, 2002); and the estimated recreational value of the Hikkaduwa National Park is calculated at the rate of LKR 1300 per local visitor (Jayasekara *et al.* , 2019).

The above review provides evidence of valuation attempts on coral degradation and the associated economic losses in several countries. Similarly, Hikkaduwa which used to be a biodiversity-rich destination about three decades ago, now experiences reducing numbers of visitors over the years due to coral bleaching (DWLC, Personnel Communication). There has been some effort to replant corals in the HMMP and improve the site quality. Yet, in the several valuation studies on the coral habitats carried out in Sri Lanka, a research gap appears in the potential enhancement of the values of the degraded sites when they are redesigned by rehabilitating the degraded areas and improving other aspects of the recreational experience. The site quality, especially the quality of the corals and the quality of the recreational infrastructure, are important parameters in determining visitor preferences.

METHODOLOGY

Research design

The research considers that the first step in conducting a CE is to identify different attributes, along with their status and trends. In order to establish those important attributes, focus group discussions (FGDs) and key informant interviews (KIIs) were conducted in the study area. Initially, a pilot test was held to conceive a general idea about setting questions. The list of the selected attributes and the associated levels are presented in Table 1.

Regarding the monetary attribute, a monthly payment in Sri Lankan Rupees was finally selected among other possibilities such as willingness-to-accept payment, or willingness to spend time. This kept the exercise simple and generic. The attributes and their levels were determined after conducting the focus group discussions (FGDs) with the stakeholders and the key informant interviews (KIIs).

In order to create various choice scenarios to be used in the discrete choice experiment (DCE), first a statistical design was developed to generate random alternatives and they were organized in several choice tasks, amongst which the respondents were enabled to choose their most preferred alternative. The statistical design for the CE was generated using the SPSS 21 software. The number of random alternatives in each choice task was set to two, with a third fixed alternative corresponding to the status quo. An orthogonal main effect design was

Table 1 : Attributes and their levels

Attribute	Level
Quality of coral reef	Healthy; 50% bleached; completely bleached and broken
Quality of the beach	Clean; clean except for some polythene thrown here and there; not clean
Replanting	Corals are replanted, a plan to replant underway; no plans to replant
Boat quality	New boats less than 1 year old; Boats between 1 to 5 years old; boats more than 5 years old
Availability of facilities	Many facilities (visitor center, changing rooms, toilets) available; Only basic facilities (such as toilets) available; Facilities not available
Payment (LKR)	1000, 500, 100, 50

used and blocked into nine different versions (blocks) of three choice tasks. Orthogonality was assumed, with a design that ensured that the individual estimates of the respective attributes and levels were independent of each other. Each block (with 3 choice cards) was shown to 20 respondents, and they had to pick one card out of four choice cards. In the cards, the condition of the coral reef, the level of pollution, the plans to replant, the condition of the boats, the availability of facilities, and the monitory contribution was presented.

Several field tests and reviews were conducted in order to make sure that the questions were clear and understandable. The survey included several sections aimed at collecting extensive information on the socio-economic background of the respondent and their household, their use of marine ecosystems (and those by their households), their perception of the preservation issues and the choices made during the discrete choice experiment (DCE) section. An example of a choice set is depicted in Table 2.

Data collection

The data collection was done from June to August 2019, covering the target population of the survey, that was the visitors to the Hikkaduwa Marine National Park in 2019 whose total number was recorded as 12,321 (DWLC). There a random sampling method was used to select 200 respondents which represent 1.7% of the annual visitor arrival, and they were interviewed using a standard questionnaire.

Calculating marginal payment compliance or willingness to pay

When at least one attribute is measured in financial terms, the MWTP can be traced as the ratio of two parameters, holding others constantly, provided that both attributes are statistically significant. The MWTP is the ratio of the coefficient of the attributes of interest and that of the price coefficient (Can & Alp, 2012).

Let the initial state of the utility be V0, the new state be V1, and the coefficient of the cost attribute be βc. Then, the MWTP is derived from an equation as follows:

$$MWTP = \beta_c^{-1} ln \frac{\{\sum_i \exp(|vi^1\}}{\{\sum_i \exp(vi^0\}}$$

By letting βk represent the coefficient of any attribute, the above equation of WTP can be stated as follows:

$$MWTP = -\frac{\beta_K}{\beta_c}$$

Table 2 : An example of a choice card used in the visitor survey

Attribute	Option A	Option B	Option C
Quality of reef	Healthy	Bleached and Broken	50% bleached
Level of pollution	Clean except for some polythene here and there	Clean	No proper garbage management system
Level of coral restoration	No replanting	Plan to replant	Corals are being replanted
Quality of the boats	Boats older than 5 years(old)	boats in between 1 to 5 years old	New boats less than 1-year-old
Availability of facilities	Only toilets	No facilities	Visitor Information Centre and changing rooms and toilets available
Expected payment	LKR 1000	LKR 100	LKR 500

RESULTS

This section of the paper presents the results of data analysis.

Visitor's perceptions of disturbances to the ecosystem

According to Figure 1, 71% of visitors considered that the existing number of boats is not too many, and 22%, that it is too many and a disturbance to nature. Seventy-one percent (71%) believed that trampling of corals does not prevail while 22%, that it does. Among the respondents, 75% complained that dropping boat anchors on the corals is not a problem, and 17% did not. Fifty-three (53%) percent reported that non-biodegradable garbage was not seen on the beach and 40% social that it was on the beach. Sixty-nine percent (69%) of the visitors revealed that they did not see fishing nets on the reefs, and 24%, revealed that they did. Regarding beach pollution, 42% of the visitors claimed that they did not notice any beach pollution while majority 52% claimed that they did. This reflects the level of degradation that has happened and the need for a robust conservation strategy.

Visitor perception of the environment

Several questions were asked from the visitors, to figure out their perceptions of the environment. The information elicited thereby appears as follows. 1). When asked whether they had been aware of the

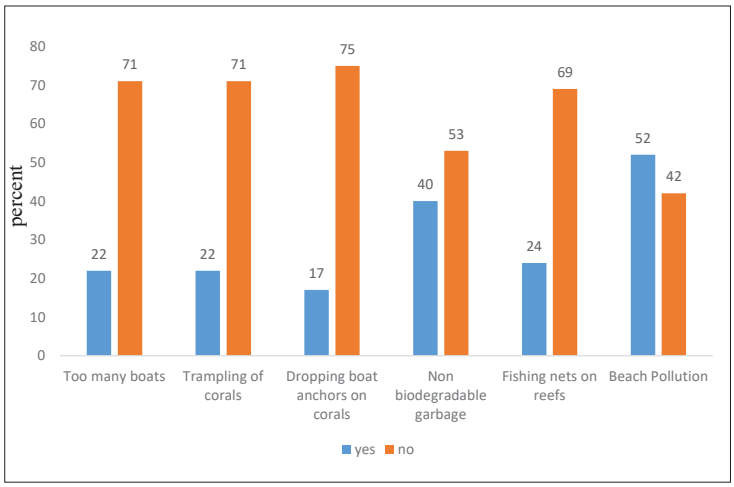

Figure 1: Visitor perception of the disturbances to the ecosystem

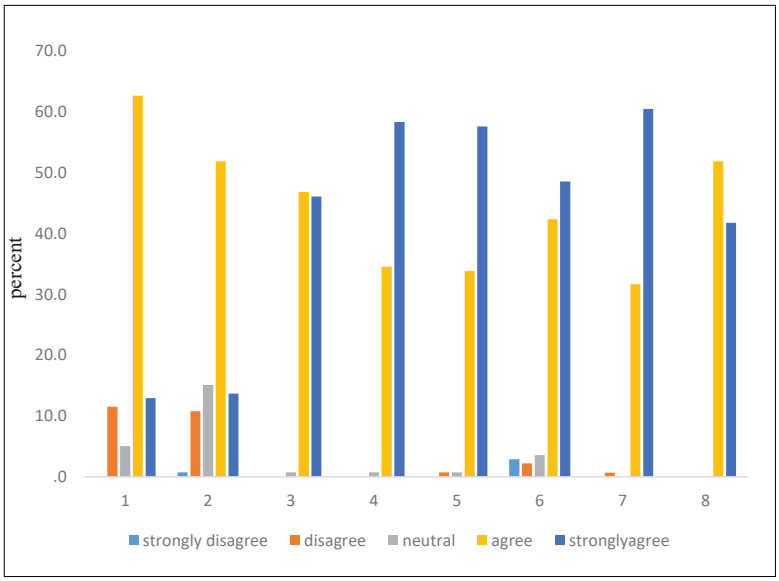

Figure 2: Visitor's perception of the environment

place before participating in this survey, approximately 76% answered, "yes". 2) When asked whether they had known about rare fish species, 51.8% answered "yes", and 13.7% "yes, very much". This implies that this is a common destination for watching rare fish species. 3) When asked whether the visitors admire the beauty of the nature, 93% respondents introduced themselves as nature lovers and only 0.7% remained neutral. 4) When asked whether Sri Lankans have a responsibility for the protection of the marine environment in the protected area and its surroundings, 93% admitted it. 5) When asked whether the Sri Lankan government must do more to preserve the marine environment, 91.4% answered "yes". 7) When asked whether fishing should be banned in the surrounding area, 90.8% of the respondents agreed, and 5.1% disagreed, and, asked whether the venue should be protected for their children and for the future generation, 92% agreed and 8% strongly agreed. 8) Finally, when asked whether the park should be protected because it represents a unique and fragile ecosystem which has a right to exist, 52% of the respondents agreed and 42% strongly agreed. The perception questions and the results are given in Figure 2.

Analysis of choice experiment results

A conditional logistic regression was done in obtaining the choice (represented by the cards that were selected by the respective participants) as the dependent variable and in obtaining the response to other variables (represented by the quality standards of the environmental and the facilities available) healthy coral reef, bleached and broken coral reef, clean beach, no proper management of beach, corals being replanted, no replanting of corals, new boats with safe jackets, old boats and no safe jackets, facilities available, facilities not available and contribution, in Table 3 as independent variables. The model is statistically significant with a 95% probability level ($P<0.05$). Further, a pseudo R2 value of 45.56% is received, indicating that 45% of the variation in the dependent variable (choice) can be explained by the independent variables.

According to Table 3, regression equation for the respondents can be presented as,

choice = -0.0021413 - 15.22608 bleached and broken corals - 14.66015, clean beach -1.421534, no proper management of beach + Replanting of corals 15.78736 + 16.41247, no replanting of corals + 0.6906052 new boats and safe jackets available.

According to Table 3, the availability of healthy coral reef variable is not significant at the 95% confidence level. However, bleached and broken corals reef variable is significant. The value of the coefficient is negative, which implies that when the corals are bleached and broken visitors value becomes less important compared to the 50% indicator on the bleached and broken corals. The signal given by the negative coefficient is that people have considered a 50% indicator of the bleached and broken corals and broken corals is more important compared to the other two options.

As explained in pg. 189, marginal payment compliance or marginal willingness to pay is the negative of the proportion of between the coefficient of the attribute and the coefficient of the contribution.

MWTP for bleached and broken corals = -(-15.22608/-0.0021413)
= LKR-7111

The marginal willingness to accept (MWTA) value for bleached and broken corals is LKR 7111 and it implies that the visitors are not willing to pay to visit the national park if the corals are bleached and broken. This ultimately implies that the condition of the coral reef is considered an important aspect according to the visitor's perception. Further, the decreasing number of annual visitors also provides a signal that the deterioration of coral quality over time has reduced the number of visitors.

The variables of clean beach and no proper management of beach are both significant at a 95% confidence level and have negative coefficients. This implies that these two options are less important compared to the clean beach except for some polythene strewn here and there, which is the most preferred option. The marginal willingness to pay for the clean beach is calculated as follows;

MWTP for clean beach = -(-14.66015/-0.0021413)
= LKR -6846

Therefore, MWTA for the clean beach is LKR 6846 and MWTP for no proper management of beach is calculated as follows;

MWTP for no proper management of beach = -(-1.421534/-0.0021413)
= LKR -664

Therefore, the MWTA remains, if the beach is not properly managed, as LKR 664. It reveals that the visitors prefer a moderately clean beach to a perfectly

clean or not properly managed beach. This states that the visitors are more concerned about the quality of corals compared to the other facilities available in the national park.

The visitors prefer new boats with safe jackets compared to old boats less than 5 years with safe jackets because new boats with safe jackets have a positive coefficient with a p value less than 0.05 (significant at a 95% probability level). MWTP for new boats with safety jackets is LKR 322.52 and it is calculated as follows;

MWTP for new boats with safe jackets = -(0.6906052/-0.0021413)
= LKR 322.52

The result implies that visitors are willing to pay this amount for new boats with safety jackets and that they are satisfied with better-quality boats. The worst option is the old boats with no jackets which are not significant. This also implies that the visitors are concerned about having a better recreational experience with safety. Therefore, in order to attract more visitors better quality

Table 3 : Results of the Conditional logit Regression

Attributes and Interactions	Conditional logit model coefficient	P value
Healthy coral reef	0.2227638 (0.5313)	0.675
Bleached and broken coral reef	-15.22608* (1.1710)	0.000
Clean beach	-14.66015* (1.1075)	0.000
No proper management of beach	-1.421534* (0.4730)	0.003
Corals being replanted	15.78736* (1.2681)	0.000
No replanting of corals	16.41247* (1.2681)	0.000
New boats with safe jackets	0.690605* (0.26885)	0.010
Old boats and no safe jackets	-.2974127 (0.6587)	0.652
Facilities available	-.3670738 (0.5613)	0.513
Facilities not available	-.1643107 (0.2930)	0.575
Contribution	-.0021413* (0.00005)	0.000
Log likelihood	-111.17446	
Pseudo R2	0.4556	
Sample size	200	

Note * P value <0.05, ( ) standard error

boats with safe jackets should be provided. This also provides important implications for park management.

The results also reveal that visitors do not consider the availability of facilities as an important aspect since both attributes (facilities available and facilities not available) are not significant.

DISCUSSION AND POLICY IMPLICATIONS

There are similar studies carried out in the international arena, Wattage *et al.* (2011) show the use of a multinomial logit model to test banned trawling is a feasible option. Accordingly, three variable parameters, area, activity, and cost were tested. The cost attribute was found insignificant (i.e., the management and monitoring cost for calculating payment compliance or the willingness to pay (WTP) value that had been designed as a payment of an additional yearly tax contribution per person towards the maintenance of the protected marine area in the U.K). Further, Glen *et al.* (2010) mention that the attribute of additional annual tax contribution was not a significant determinant of preference in his study. However, in this study, the contribution is considered significant (p value 0.0000) as it ultimately depicts that more people in developing countries are willing to pay for the preservation of natural resources than those in developed countries.

Glenn *et al.* (2010) use a conditional logit model to analyse the Irish public support for the designation of protected marine areas to protect the Lophelia reefs. In this study, it is significant that the protection of all areas where corals are supposed to exist is preferred over the status quo of protecting all currently identified coral reefs with a positive coefficient (+1.16258) and that bleached and broken coral reefs has a negative coefficient (-15.22608). This highlights the importance of protecting coral reefs globally.

Both Wattage *et al.* (2011) and Glenn *et al*. (2010) reject trawling as a fishing method that should be banned to protect corals with significant positive coefficients. In the focus group discussions, it was mentioned that dynamiting is similarly a destructive fishing method that is being practiced despite prohibition by law (Fisheries and Aquatic Resources Amendment Act No. 4 of 2004 of Sri Lanka).

Can & Alp (2012) derive a pseudo R2 value of 0.087 while, according to Hensher *et al.* (2005), pseudo R2 values between 0.2 and 0.4 are considered a decent fit. Louviere *et al.* (2000) consider this range as an extremely good fit, evaluating a pseudo, R2 value of 0.4556 as a valid model.

Ahmed *et al.* (2007), have mentioned that willingness to pay (WTP) values (in absolute terms and as a percentage of income) for the conservation of coral reefs at Bolinao was very low among domestic tourists. This reveals that the preservation of natural resources and the environment may not be an immediate priority among the local travellers among the socio-economic considerations in developing countries such as the Philippines.

Rani *et al*. (2020), based on a study carried out on St. Martin's Island, Bangladesh state that tropical coral reefs provide a large number of ecosystem services to the local economy in various ways. However, without any sustainable use practices and proper conservation methods over the last couple of decades, many tropical coral reef ecosystems have been damaged due to the overuse of the resources. This situation applies to Hikkaduwa coral reef as well. Therefore, the main policy recommendation made in this paper is that the government should produce a conservation and management plan for the restoration of the degraded coral ecosystem. Further, it has been proved from this study that visitors are more concerned about the health of the coral reef so that policymakers should concentrate on strategies that are capable of preserving corals.

The ratio between the total number of visitors and the income from the Marine National Park Hikkaduwa has been showing a declining trend over the past years. It can be highlighted in this research that the needs of the visitors are the condition of the boats and the quality of the coral reef rather than the cleanliness of the beach. These are good signals for the policymakers and this place can be developed further to attract more visitors focusing increased revenue generation.

Following Can & Alp (2012), a multinomial logit model was used to analyse the choice experiment data and the results show that the local residents and the foreign tourists are willing to pay 18 US$/month and 16.6 US$/tour, for the improvement of the water quality. In the Sri Lankan context, so far, research has not been carried out, on water quality aspects. Therefore, research projects with similar objectives would be much appreciated in the Sri Lankan context as well.

Further, it was disclosed in the FGDs that the solid waste that gets accumulated in the national park is mainly from the visitors and is jointly disposed of by

the Department of Wildlife Conservation (DWLC) and the Urban Councils (UC). The explanation given by the UC on this reveals that there are not enough staff to engage in garbage disposal activities. Therefore, it is mandatory to equip respective institutions with the necessary resources to ensure the sustenance of a better-managed national park.

Moreover, the main state stakeholders associated with the Marine National Park Hikkaduwa are the DWLC, Coastal Conservation Department, Road Development Authority, Irrigation Department, UC. In addition, there are private parties who operate boats. There should be proper awareness and delegation of authority among these stakeholders in order to manage the park in a visitor-friendly way.

A breakwater has been built by the Harbour Corporation a few miles away from the National Park, and it has resulted in the accumulation of a large heap of sand in the coral reefs. It is reported that many valuable corals are being extinct after the construction (FGD). Therefore, it is necessary to have made a proper environmental impact assessment policy to be followed before making any changes to the natural environment.

In addition, wastewater canals are being diverted to the sea in the Hikkaduwa area, resulting in sea pollution. There should be a proper screening method for the wastewater being discharged into these canals, in order to protect the corals in the sea.

The policymakers can use these results to guide the management of the park in a more sustainable way and to increase the revenue earned by the national park.

CONCLUSIONS

This research attempts to investigate changes in visitor behaviour with regard to the degraded situation of the coral reef precipitated by natural and anthropogenic reasons. The condition of the coral reef is considered an important aspect of life by visitors. It was evident that the visitors prefer the quality of the corals compared to other facilities available in the park. Further, the visitors are moderately concerned about the cleanliness of the beach and they are more concerned about the condition of the boats to have a better recreational experience. This indicates the importance of building infrastructure facilities in order to compensate for the lost natural capital.

The present study adopted a choice experiment to value the environmental amenities of a marine park which is under continuous pressure from natural and manmade degradation such as climate change, marine pollution, and species loss. That is why it is argued that it is mandatory to bring strict, yet applicable environmental policies focused on the conservation of the park. It is expected that research findings of the present study will assist decision-makers in developing management strategies to overcome the current environmental problems of the national park.

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END NOTES

1. Total economic value is aggregation of the use and non use values provided by a given ecosystem.
2. Consumer surplus is the excess of social valuation of product over the price actually paid.
3. Willingness To Pay is maximum price customer is willing to pay for a product or service.
4. Sustainable utilization is using resources without compromising the needs of the future generations.
5. Meta-analysis is examination of data from a number of independent studies of the same subject, in order to determine overall trends (Perman *et al*., 2003).

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