Journal of Environmental Management 182 (2016) 436–445

Contents lists available at ScienceDirect

Journal of Environmental Management

journal homepage: www.elsevier.com/locate/jenvman

Research article

Funding conservation through use and potentials for price discrimination among scuba divers at Sipadan, Malaysia

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ARTICLE INFO

Article history:
Received 28 November 2015
Received in revised form
2 June 2016
Accepted 12 July 2016
Available online 10 August 2016

Keywords:
Choice experiment
SCUBA diving
Fee
Price discrimination policy

ABSTRACT

The protected coral reefs off the coast of Malaysia receive numerous tourists, while also being as fishing grounds. These joint environmental pressures raise the need for additional costly conservation measures. It is natural to consider the potential for expanding the 'user pays' principle, already implemented in the form of various user fees. This study explores the potential for price discrimination among scuba divers at Sipadan in Malaysia. The study applies a choice experiment to estimate scuba divers willingness to pay higher user fees for avoiding decreases of or getting improvements in environmental and recreational aspects of the diving experience. We investigate how sensitivity to fee size and hence willingness to pay vary with suitable selected characteristics of divers. We find potentials for a third degree price discrimination strategy exploiting higher willingness to pay among foreign divers (45%), male divers (16%) and people who has visited Sipadan several times (25%). Thus, revised pricing structures could significantly increase funds for the preservation of Sipadan.

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1. Introduction

Protected areas are established for enhancing biodiversity conservation and to provide other ecosystem services to society (de Groot et al., 2002). It is also not uncommon that protected areas form an important basis for the nature-based tourism industry relying on the qualities and attractions of the natural settings to attract customers (Costanza et al., 1997). As demand for these uses of protected areas grows, so does the pressure from anthropogenic effects exacerbated by market failures and weaknesses in official institutions and programs (Costanza et al., 1997), including poorly defined or protected property or use rights of the local population (Mendes, 2003).

The pressures and damages to protected areas imply a need for compensating conservation measures to sustain environmental benefits (Wunder et al., 2008). This raises the issue of how and to what degree such conservation activities should be financed, and the debate largely discusses two sources, namely government funding in some form and user fees in various forms, often in combination (Wunder et al., 2008). Dranove (1988) argued that goods of public interest should be funded by communities and governments. This line of thinking also provides an argument for opposing access fees and favoring free entrance to protected areas (Sharifi-Tehrani et al., 2013; O'hagan, 1995).

Arguments in favor of e.g. access fees for recreational users include the observation that as long as resource users do not pay the true social costs of their activities, their demand for these activities will be too high from a social point of view (Cessford, 2000; Manning, 1999). This turns the discussion to what the appropriate fee is (Wu and Zhang, 2012; Van Sickle and Eagles, 1998) and how fee schemes can be implemented and managed (Cullen, 1985; Rosenthal et al., 1984). Apart from being an instrument to address the demand and hence control the pressures from users, the fees can themselves form a source of revenue to fund conservation activities, improve visitors' experiences (Schwartz and Lin, 2006; Schwartz et al., 2012) and cover in part operational costs of the protected areas (Clarke and Ng, 1993).

User fees are sometimes set well below the amounts that visitors are willing and able to pay, yielding minimal revenues often well below operational costs (Laarman and Gregersen, 1996). Such cases make conservation efforts sensitive to critique (Goodwin et al., 1997)

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http://dx.doi.org/10.1016/j.jenvman.2016.07.033
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especially when protected areas face competing forms of economically attractive land uses (Inamdar et al., 1999). In particular, policies in e.g. developing countries and emerging economies may favor programs and land uses that have tangible economic outcomes to accommodate economic development needs.

The introduction of higher access fees for protected areas is generally aimed at supplementing smaller government budgets (Chung et al., 2011) and raising revenue above operational costs is not a typical goal for protected area management operations and pricing schemes. In line with this finding, the studies showed that while some protected areas (e.g. Plitvice National Park, Croatia and Bonaire Marine Park, Dutch Caribbean) were financially self-sustaining (Movcan, 1982; Dixon, 1993) many others (e.g. Uluru (Ayers Rock) National Park and Kosciusko National Park, Australia) recouped only 80% of management costs from user fee revenues (Lindberg and Enriquez, 1994; Driml, 1994). Uncommonly high entrance fees at Galapagos National Park and in Rwanda's gorilla viewing tourism generated significant revenues (Lindberg and Enriquez, 1994). In the case of private protected entities (e.g. Sugud Islands Marine Conservation Area, Malaysia and Tubbataha Reef National Marine Park, Philippines) fee revenues covered approximately 30%–50% of management costs (Teh et al., 2008; Subade, 2007).

The design of new fee structures would benefit from information about the recreational users' preferences for access to the conservation area in question. In particular, information about heterogeneity in willingness to pay (WTP) for such an access is useful for designing fee structures as it allows e.g. third degree price discrimination (Varian, 1992). This strategy exploits preference heterogeneity to ask different user groups different prices for the access right, where groups are known to differ in WTP and can be identified and verified with ease and reliability by the seller of access.

We applied a stated preference method to investigate heterogeneity in WTP among scuba divers for access to and conservation status of Sipadan, a diving site in Malaysia. We uncover systematic elements of heterogeneity that may form a basis for third degree price discrimination. These elements include socio-demographic characteristics suitable for legitimate price discrimination strategies. The specific questions investigated and discussed are:

(i) How does general WTP for access to and conservation quality of Sipadan vary with respondents' socio-demographics?
(ii) Based on the identified heterogeneity in WTP, what are the potential for price discrimination schemes?

Earlier studies on finance mechanisms for marine protected areas have addressed the potential for access fees to alleviate environmental and equity issues (Pascoe et al., 2014), and different access fee schemes are practiced at Bunaken National Marine Park and Komodo National Park, Indonesia (Peters and Hawkins, 2009; Emerton et al., 2006) and at Tubbataha World Heritage Site, Philippines (Tongson and Dygico, 2004).

Our study is not the first to discuss price discrimination and similar strategies in relation to ecosystem services and conservation efforts. An early contribution is Wilman (1988) who applied Ramsey Pricing when investigating allocation and revenue problems related to outdoor recreation resources. Third degree price discrimination has been analyzed for recreational users in Costa Rica's protected areas (Alpizar, 2006). It has been discussed also for conservation and ecotourism (see Lindberg, 1991) and used by Chase et al. (1998) when analyzing the impacts of introducing a differentiated entrance fee policy at national parks in Costa Rica.

The contribution of our study is the use of the choice experiment (CE) method as an *ex ante* method to investigate the systematic variation in recreational users WTP for scuba diving access. We show how CE application can inform on potentials for a third degree price discrimination scheme. Our results suggest there is potential for such mechanisms, where a two-tier pricing system could be applied with foreign divers paying higher fees, whereas discounts can be allocated to female divers and newcomers relative to male divers and people who have visited before.

2. The case study of Sipadan in the Celebes Sea

Sipadan is located off the east coast of Sabah, Malaysia.[1] It is a part of the Coral Triangle Network (WWF, 2012) which was established as a marine park in 2004, and has received more than 40,000 scuba divers, annually (Sabah Park, 2014a). Surveys show that the scuba divers have high satisfaction rates and highlight the island's marine biodiversity (Musa, 2002). Sipadan offers a large number of coral reefs and home to more than 400 species (Sabah Park, 2016).

Sipadan faces anthropogenic impacts from litter pollution, unsustainable fishing activities, and reef degradation (Prabhakaran et al., 2013; Environmental Conservation Department, 2001), whereas the pressure from visitors is currently controlled by daily scuba diving quotas limiting visitor numbers to 120 per day. In Malaysia, most marine protected areas receive funding from federal or regional budgets. However, these funds may be too limited to address the different environmental pressures appropriately. Therefore, a financial mechanism in the form of access fees to marine protected areas was established with the Fee Act 1951 and the Fee Order (Marine Park Malaysia) of 2003. The fees are known as conservation fees and have ranged from Ringgit Malaysia (RM) 2 (USD 0.53) for students, school children, retirees, and senior citizens (55 year and above) up to RM5 (USD 1.34) for adults. No price differences between local and foreign visitors have been implemented (Department of Marine Park Malaysia (2012)). These charges are channeled into the Marine Park and Marine Reserve Trust Fund to finance management purposes of the Marine Park Centres and to provide basic facilities for the convenience of visitors.

Sipadan is managed by Sabah Parks; a statutory body under the Ministry of Tourism, Culture and Environment Sabah with the objective to ensure protection of Sipadan as a heritage for current and future generations (Sabah Parks, 2014b). Scuba diving visitors to Sipadan pay the Sipadan Permit daily fee (RM40/USD 12) that allows for four dives a day. Some divers stay longer in the area in effort to apply for multiple permits, but there is no guarantee for getting more due to the daily quota and other divers (e.g. new arrivals) are also given the opportunity to dive. The fee level was a result of negotiations between Sabah Parks and a group of tour operators. Like other marine protected areas in the country, the management of Sipadan struggles to secure adequate funds for managing and protecting the marine areas (Dharmaratne et al., 2000). Hence, the continued pressures on the sustainability of Sipadan have initiated exploration for new possibilities to secure revenue to cover costs and implementation of new conservation activities. Therefore, establishing a new fee structure may have a role in raising revenue, for management and conservation purposes which could include compensating local communities for halting destructive fishing practices (Depondt and Green, 2006).

3. Theory: the rationale and practice of price discrimination

The fundamental idea in price discrimination is to sell different units of the same service or good at different prices to different

[1] The coordinate is 4°07′02.2″N 118°37′40.0″E, and a public map at https://goo.gl/maps/8ZeykNzzVP32.

consumers, with the aim to increase total revenues (Tirole, 1988; Varian, 1992). To be able to discriminate among customers, a seller has to be able to *i*) identify the different categories of customers who are to be charged different prices, *ii*) legally, socially and culturally discriminate legitimately among the customers and *iii*) ensure that price discrimination is not undercut through e.g., resale or similar. While different variables may fulfill point *i*) e.g., age, gender, race and weight are all fairly observable and verifiable, not all of these variables may easily fulfill point *ii*) e.g., it may be illegal – in the context – to price discriminate on the basis of race or gender. Preventing resale can be an issue, e.g. in the case of quantity discounts or similar, but in many cases, it is not a challenge. This includes our case, where diving permits are personal and where transfers to others are not easy and not meaningful. In our study we select a set of variables fulfilling *i*)-*iii*) and evaluate if there is empirical basis for price discrimination among the scuba divers on this basis.

The concept of discrimination was coined by Pigou (1920). There are three main kinds of price discrimination, and we investigate third degree price discrimination.[2] In this form of price discrimination, the different (groups of) customers are charged constant prices for each unit they buy, but the prices differ across the customers (groups) (Machlup, 1955). This is a common and well known form and includes e.g., discounts for students or the elderly, higher access fees for men than for women at certain night clubs and similar. Technically, the virtue of third degree price discrimination is to exploit the heterogeneity in customer groups' marginal utility of a good and hence the sensitivity to price of their demand. The more (or less) sensitive an identifiable group is to price, the lower (or higher) a price individuals of that group will be charged for the same units. Third degree price discrimination is also known as group pricing (Belleflamme and Peitz, 2010; Phillips, 2005, 2005; Shapiro, 1999).

The different pricing of access for nationals and foreigners' access to national parks and the like is often termed two-tier pricing and is essentially a variant of third degree price discrimination (Laarman and Gregersen, 1996) and has been implemented in several countries including Kenya, Costa Rica, and Peru. Typically, the price discrimination concerns different (lower) fees to be charged to national tourists relative to international tourists (EFTEC, 1999; Lindberg, 2001). The same strategy is practiced in Thailand (Depondt and Green, 2006), but it is currently not a common approach in Malaysia.

4. Methodology and data

4.1. Survey design

The first version of the survey design was developed over three months on the basis of information obtained from several meetings with focus group and experts consultations (e.g., marine wardens and tourist operators), and a pilot study among the scuba divers, which was conducted January–February of 2013. This informed the selection of attributes describing the environmental and recreational qualities that the scuba divers find important for their diving experiences and that Sabah Parks finds relevant for resource management. With this basis, the questionnaire was further developed and improved in several iterations over the next almost a year until data collection.[3]

The CE part of the questionnaire consisted of six choice tasks, which each included five attributes describing the current as well as two alternative potential states of the Sipadan environment. In each choice task, the scuba diver was asked to pick their preferred option among these three alternatives, of which one was always the current management and permit fee level at RM40 (USD12), whereas the two other alternatives varied on the attributes as determined by the experimental design. An example of such a choice task is presented in Fig. 1. By making each six of these choices, the respondents reveal their relative preferences and trade-offs across the different attributes and their levels, which allow for econometric estimation at population level. In Fig. 1 for example, the respondent's choice between the two alternatives shown with an RM80 cost, the trade-off concerns whether lower coral cover and fish diversity will be accepted against fewer divers and less litter pollution. Suppose the following table represents the only management option available for Sipadan in your future visit. Please cross (x) one option that you prefer in the shaded column.

The five different attributes are presented in Table 1. The first of the attributes is the litter pollution levels in Sipadan's water. Under current management, litter pollution is noticeable at Sipadan and in the surrounding waters, but the possible scenarios include that litter pollution becomes significantly noticeable at diving sites. Alternatively, litter pollution levels could be reduced, at a cost, to become unnoticeable. The second attribute is the daily number of scuba divers, where the two different alternative levels are 150 divers and 90 divers per day. The third and fourth attributes concerns the coral cover (relative to original) and fish diversity in Sipadan (relative to assessed maximum for these habitats). Approximately 75% of coral reefs remain intact and around 56% of the potential coral reef fish species live in Sipadan (WWF, 2012). This forms the basis for the current management levels of roughly 70% and 50% for these attributes, which alternatively could be reduced or increased with 20% points relative to the current level. The final attribute included in the design is the user fee (i.e., the Sipadan diving permit). Six levels of the user fee were selected and ranged from RM40 (USD12) to RM640 (USD198).

The selection of choice sets used was generated using the NGENE software, resulting in a D-efficient design with a D-error of 0.000663. In this design, twelve choice sets were created and distributed to two blocks in two questionnaire versions containing each six choice sets. The CE exercises were followed by a total of 32 follow-up questions on e.g. recent and past experiences, reasons behind divers' preferences and socio-demographics. Respondents were informed about the relationship between diving attributes and future management of Sipadan.

4.2. Data collection

Between January and February 2014 we interviewed 507 respondents resulting in a total of 3042 choice observations. Data were collected on the island Mabul (where divers at Sipadan stay because Sipadan is not permitted to accommodate tourists) using a systematic, random sampling, where once an interview were completed the next diver to approach was selected randomly. With this method, the survey targeted representativeness of the sampled population in terms of gender and age (above 18 years). Almost all divers approached agreed to an interview, where out of 512 questionnaires distributed, 507 were returned (with complete answer), thus

[2] First degree price discrimination, or perfect discrimination, involves the seller exploiting the downward sloping demand curve at the level of each individual, extracting for each sequential unit the maximum WTP for that unit effectively capturing all welfare. The second degree price discrimination is often based on aspects of the sale itself, and includes e.g., quantity rebates, loyalty programs or similar.

[3] We include the full questionnaire as online Supplementary Content.

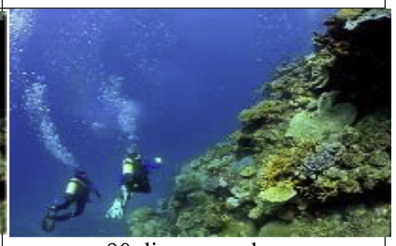
Attribute	Current management	Alternative I	Alternative II
Litter pollution			
	Medium	High	Low
Number of divers			
	120 divers per day	150 divers per day	90 divers per day
Coral cover	70% of live coral covers	90% of live coral covers	50% of live coral covers
Fish diversity	50% of total fish species diversity Occasionally see sharks	70% of total fish species diversity Frequently see sharks	30% of total fish species diversity Rarely see sharks
Daily Permit Fee	RM 40	RM 80	RM 80
YOUR CHOICE	❑ SQ	❑ 1	❑ 2

Fig. 1. An example of a choice set.

Table 1
Current and possible future levels of environmental attributes. RM refers to Ringgit Malaysia. RM3.18 is equivalent to 1USD. Attributes marked by * were derived from WWF (2012).

Management practice	Current	Levels and expected sign of parameters (+,−)	Policy tool
Sipadan permit (Access fee to dive in Sipadan)	RM40/diver/day (USD12)	RM40, RM80, RM160, RM240, RM320, RM640/diver/day (USD12, 24, 50, 74, 100, 198).	Fees may be raised to increase efforts to reach one or more environmental management goals
Number of divers (Daily access quota to Sipadan)	120 divers/day	90 (+), 120, or 150 (−) divers/day	The number of divers may be lowered or increased depending on diver preferences
Coral cover* (Coral covers available for viewing during diving activities in Sipadan)	70% coral cover	50% (−), 70% or 90% (+) coral cover	Destructive fishing practices, e.g. with explosives, threaten coral reefs. Funds from permits may provide incentives for communities to decrease destructive fishing practices.
Fish diversity* (Fish species diversity available for viewing during diving activities in Sipadan)	50% of total fish diversity in the Indo-Pacific region	30% (−), 50%, or 70% (+) fish diversity (of total fish diversity in the Indo-Pacific region)	Unsustainable fishing practice reduces fish diversity. Funds from permits may provide incentives for communities to reduce the unsustainable fishing practice.
Litter pollution (Litter visible at diving sites, floating freely in water, at the seaside or lying at the bottom)	Litter pollution is at medium level (noticeable at Sipadan and the surrounding areas)	High (litter may become significantly noticeable, −) Medium level of litter pollution, or Low (litter may become unnoticeable, +)	Possible measures are the allocation of more litter bins and using permit funds to pay locals for litter collection efforts.

resulting in a response rate of 99.02%. The sampled population includes divers who were granted permits, had been to Sipadan and had not been sampled earlier. Divers were interviewed post diving to secure that diving attributes were present in the respondents' memory. We interviewed divers at the different locations such as at the beach, cafes, and jetties. The questionnaire and interview were administered in English for all respondents as a majority of the respondents were foreign divers. Thus, there is no treatment bias caused by local divers fluent in the same language as the interviewers. The interviews were conducted in the morning (from 9.30 a.m. to 12.30 noon) and in the afternoon (from 2 p.m. to 5 p.m.).

4.3. Selecting potential variables for price discrimination

Information about each of the scuba divers, their travels and diving experiences were elicited during the interviews and it is

from these we select the questions suitable for use in our analyses of price sensitivity. In Table 2 we present descriptive statistics for a selected set of these questions. Note that we select only variables that fulfill the three conditions explained in Section 3 on the conditions for effective and legitimate price discriminations. The answer to some of these questions, e.g. gender, was binary by nature and others have multiple answer options. However, for inclusion in the econometric models each of these variables were defined as dummy variables, which had practical interpretation for use in price discrimination, e.g. what age limit should be used for getting senior prices. The description of this coding is in the rightmost column of Table 2. In our analyses, these dummy variables are interacted with the fee attribute, which in accordance with the assumptions underlying the econometric model is treated as a linear variable assuming constant marginal utility over the presented price range (Wooldridge, 2013).

We use the "club member" variable to investigate if organized divers have higher WTP for access than others. The variable "Diver has visited more than once" separates newcomers from others and allows us to investigate if experience with Sipadan affects WTP, and e.g. if the second permit could be priced differently. The variable "Divers less than 50 years old" allow us to investigate for effects of age, separating the main bulk of younger divers from older divers. The age threshold was selected on basis of the distribution in the sample, which reflected that diving is an activity that generally attracts younger people. The inclusion of the "male" variable examines the WTP effects of gender. The variable "Foreign diver" allow us to test for a potential WTP gap between Malaysian and foreign guests. Other variables that were suitable as a basis for price discrimination but proved statistically irrelevant included e.g. if respondents were students or not, if they were under some age limit, if they were visiting in groups (if verifiable and controllable) and thus are not reported here.

4.4. Econometric specifications and tests

The discrete choice methods, which include the applied CE, rely on the Random Utility Model (RUM) framework of McFadden (1974) for estimation and interpretation. The framework assumes that the utility an individual derives from the consumption of a good is the sum of the utility the individual derives from the attributes of that good (Dellaert and Lindberg, 2003; Swait and Louviere, 1993). Only part of what generates utility can be observed and hence some part remains unobserved and random from the analyst's point of view. The utility that individual i derives from alternative j is written as:

$$U_{ij} = V_{ij} + \varepsilon_{ij} = \beta'_{ij} X_j + \varepsilon_{ij} \quad (1)$$

U_{ij} denotes the utility of alternative j for individual i, V_{ij} is the systematic utility of alternative j, X_j represents the vector of attributes of consumption alternative j, whereas β' is the vector of parameter values related to these attributes. The random component of utility is captured in the random error component ε_{ij} .

Within the RUM framework it is assumed that the probability of an individual i choosing an alternative j over another alternative k is influenced by the characteristics of the alternative (Kemperman et al., 2000; Louviere et al., 2000). Thus the probability of an individual choosing an alternative j over alternative k, is:

$$P(U_{ij} > U_{ik}) = P(V_{ij} + \varepsilon_{ij} > V_{ik} + \varepsilon_{ik},\ \forall\ j \neq k) \quad (2)$$

Using the standard conditional logit model assuming the error term is independently and identically distributed (IID) and follows a Gumbel distribution (extreme value type 1), and collecting all the attributes that affect utility for alternative j or k and individual i in a vector x_{ij} and all the utility weights in a vector described by β the conditional logit model (CLM) can be written as:

$$P_{ij} = \frac{\exp(\beta \prime x_{ij})}{\sum_k^K \exp(\beta \prime x_{ik})} \quad (3)$$

To accommodate the possibility that preferences for specific parameters vary in the population we employed a random parameter logit model (RPLM) as it enhances model flexibility and explicitly accounts for parameter heterogeneity (Train, 2009). When preferences for each component of x_{ij} varies within the population, we can describe it by a density $f(\beta)$, so that the choice probability in the RPLM is the mixture of the logit function evaluated at different values of parameters β within $f(\beta)$.

$$P_{ij} = \int \frac{exp(\beta \prime x_{ij})}{\sum_k exp(\beta \prime x_{ik})} f(\beta)\ \mathrm{d}(\beta) \quad (4)$$

Within this econometric framework, we evaluate our research question by testing the hypothesis that the elements of x_{ij} containing the interaction terms between the fee variable and the group identifiers of Table 2 have non-zero parameters in β. We used the statistical software of LIMDEP 10 NLOGIT 5.0 (Econometric Software, Inc., Plainview, NY, USA) to estimate both model types.

5. Results

We first present the results of a CLM estimation including the interaction terms linked to our research question. We found that one parameter of the main effect variables (the Coral Reef cover attribute) was sensitive to the inclusion of an alternative specific constant (ASC). The ASC parameter captures in part the valuation of the current management scenario relative to any other alternative, as the parameters of the omitted (current) levels of the attributes are confounded with this. It is therefore potentially correlated with

Table 2
Description of the variables and its values.

Variables	Mean	Standard deviation	Definition
Trip characteristics			
Club member	0.08	0.27	0 = Diver does not belong to a dive club; 1 = Diver belongs to a dive club
Divers have visited more than once	0.13	0.34	0 = Diver is visiting Sipadan for the first time; 1 = Diver has visited Sipadan more than once
Socio-demographic variables			
Divers less than 50 years old	0.97	0.16	0 = Diver's age is 50 or more; 1 = Diver's age is less than 50 years old
Male divers	0.58	0.49	0 = Diver is a female diver; 1 = Diver is a male diver
Foreign divers	0.91	0.28	0 = Diver is domestic diver; 1 = Diver is an international diver

the remaining dummy coded attributes variables and levels, which likely explain the difference between the models including or excluding the ASC.

In Table 3, we find that in both models, the main effect attributes for fee, litter, number of divers, coral cover and fish diversity all have parameters significantly different from zero, and in Model 1 all have the expected signs. The parameters correspond to the β-vector of the model in Equation (1). In Model 2, all main effect parameters are again significant and have the expected sign, except that the parameter of the 50% coral reef has a somewhat surprising positive parameter. Apart from this, the results show that on average scuba divers are willing to pay less for access permits, if litter problems increase, but pay more if they decrease. Divers will also pay to reduce crowding at the site, and will pay less if crowding increase. They will pay more for an increase in the coral cover, and will pay less for decreased fish diversity. In Model 2, the parameter for increased fish diversity is not significant.

Turning to the fee interactions, we note, that these are not sensitive to the inclusion of the ASC. Out of five interactions, four interactions have parameters significantly different from zero in both models, and the parameters appear stable, though possible unobserved scale variation is not accounted for across the models. The results suggest that people, who have visited Sipadan before have a higher WTP than newcomers. Male and foreign divers have higher WTP than women and national divers respectively. There is only a weak indication of people above 50 having a lower WTP compared to younger.

The CLM assumes that all respondents in the sampled population share the same preference structure regarding the main effects, and we estimate this subject to the standard errors shown. In Table 4 we relax this assumption and present the results of the RPL model. In this model, we have allowed preference heterogeneity for all main attributes describing the good. Specifically, we assumed that these are normally distributed. The mean and standard deviation of the distributions describing the parameters are shown in the second and fourth column of Table 4. Overall, this model has a considerably better fit than the CLM alternatives in Table 3, with considerable improvements in both ρ^2 and log-likelihood. Note that all standard deviation parameters are significant.

Turning to the main effects, we see that including preference heterogeneity changes the overall results to some degree, but not much in a qualitative sense. On average, respondents still dislike litter pollution, and in spite of considerable heterogeneity the bulk of the sampled population shares this preference albeit to a varying degree. Again, more divers are not preferred, whereas the respondents are more divided when it comes to fewer divers. It may be that some divers prefer company, and the mean preference parameter is not different from zero. The scuba divers are also quite in agreement that more coral reefs are preferred and less fish diversity is not preferred. They are more divided on the issue of higher fish diversity, and we find the same result on less coral, although weaker.

Capturing part of the preference heterogeneity in the standard deviations and the large number of interaction parameters reduce the significance levels of the fee interaction terms of interest here, from 1%–5% level in Table 3 to 5%–10% significance level for Table 4, but results remain in line with Table 3. With that the general pattern remains, and shows that foreign scuba divers, which are quite a large group, are less price sensitive and therefore have a higher WTP as indicated by the right-most column of Table 4. The results also provide some indication that male divers and those who have visited the diving site before have a somewhat higher WTP than females and newcomers. Thus, the qualitative results are robust to this specification.

Finally we present divers' WTP estimates based on the Delta method in Table 5. All values are well above the current fee level and the highest values are for avoiding decreases in fish diversity and higher levels of litter pollution. We see the pattern preference for the groups affect the estimated WTPs.

6. Concluding discussion of the potentials for price discrimination

The aim of this paper has been to investigate systematic patterns in heterogeneity of WTP for access to Sipadan between different identifiable groups of divers, to be able to assess if a potential for price discrimination exist. We focus on this last part in the discussion, and refer readers interested in a deeper analysis of the environmental attributes to Emang et al. (2015).

We verified differences in price sensitivity across meaningful socio-demographic groups, and hence there is a scope for price discrimination strategies. We note that all the three characteristics

Table 3
Estimation results using Conditional Logit Models.

Attributes and interactions	Model 1 (without ASC)		Model 2 (with ASC)	
	Parameter	Std. err.	Parameter	Std. err.
Fee	−0.00609***	0.00107	−0.00409***	0.00110
ASC − constant			1.09632***	0.17149
Low level of litter pollution	0.26539***	0.08466	1.20716***	0.17070
High level of litter pollution	−1.70717***	0.11144	−0.62300***	0.19999
90 divers/day	0.33133***	0.09426	−0.11748	0.11732
150 divers/day	−0.97044***	0.09727	−0.87366***	0.09739
50% coral cover	−0.40645***	0.12390	0.55157***	0.18971
90% coral cover	0.49773***	0.11125	1.13723***	0.15103
30% fish diversity	−0.92852***	0.13235	−1.43270***	0.15402
70% fish diversity	0.64058***	0.14183	−0.29973	0.19953
Fee X club	0.00070	0.00047	0.00071	0.00047
Fee X divers have visited more than once	0.00076**	0.00036	0.00075**	0.00036
Fee X divers less than 50 years old	0.00158*	0.00090	0.00154*	0.00089
Fee X male divers	0.00061**	0.00025	0.00063**	0.00025
Fee X foreign divers	0.00131***	0.00047	0.00131***	0.00047
Model statistics				
Log-likelihood	−2709.52		−2688.66	
Adjusted rho-square, ρ^2	0.1261		0.1327	
K	14		15	
AIC	5447.0		5407.3	

"***", "**","*" denote statistical significant at 1%, 5%, and 10% level, respectively. All variables are dummy coded (1 = yes, 0 = no), except fee which is linear.

Table 4
Estimation results using Random Parameter Logit Model.

Attribute and interactions	Parameter mean	Std. error	Std. dev.	Std. error	Higher WTP ratio
Random parameters					
Low level of litter pollution	1.74075***	0.23162	1.36529***	0.13695	
High level of litter pollution	−1.87062***	0.36915	1.90973***	0.30008	
90 divers/day	−0.30394*	0.17081	1.19106***	0.22319	
150 divers/day	−1.41971***	0.15496	0.94729***	0.20147	
50% coral cover	0.69738***	0.26223	1.09565***	0.25994	
90% coral cover	1.74453***	0.21103	0.66616***	0.16985	
30% fish diversity	−2.34239***	0.24381	1.81301***	0.22035	
70% fish diversity	−0.39778	0.27453	0.92524***	0.17625	
Nonrandom parameters					
ASC	1.33409***	0.22343			
Fee	−0.00513***	0.00178			
Fee X club	0.00097	0.00075			
Fee X visiting more than once	0.00101*	0.00056			25% higher WTP
Fee X less than 50 years old	0.00198	0.00149			
Fee X male divers	0.00069*	0.00039			16% higher WTP
Fee X foreign divers	0.00159**	0.00075			45% higher WTP
Model statistics					
Log-likelihood	−2468.89				
Adjusted rho-square, ρ^2	0.2056				
Pseudo R-squared	0.2612				
K	23				
AIC	4983.8				

"***", "**","*" denote statistical significant at 1%, 5%, and 10% level, respectively. Higher WTP Ratio is calculated as (beta_fee/(beta_interaction_fee + beta_fee)). All variables are dummy coded (1 = yes, 0 = no), except fee (continuous variable).

Table 5
Marginal WTP estimates for the three.

Attributes	Mean WTP all population	WTP for the specific groups		
		Visiting more than once	Male divers	Foreign divers
Low level of litter pollution	339.23** (77.2; 601.2)	422.87** (30.83; 814.90)	391.80** (54.50; 729.11)	490.90** (17.11; 964.70)
High level of litter pollution	−364.54*** (−632.28; −105.81)	−454.41** (−840.63;-68.19)	−421.04** (−755.00; −87.07)	−527.52** (−987.94; −67.11)
90 divers/day	−59.23 (−142.57; 24.11)	−73.83 (−185.76; 38.10)	−68.41 (−168.82; 32.00)	−85.71 (−219.13; 47.71)
150 divers/day	−276.67*** (−471.60;-81.74)	−344.88** (−641.29; −48.47)	−319.55** (−573.08; −66.01)	−400.36** (−756.66; −44.07)
50% coral cover	135.90 (−13.23; 285.04)	169.41 (−38.35; 377.16)	156.97 (−26.73; 340.66)	196.66 (−52.31; 445.63)
90% coral cover	339.97*** (87.47; 592.47)	423.781** (43.79; 803.77)	392.65** (66.00; 719.31)	491.96** (32.36; 951.56)
30% fish diversity	−456.48*** (−786.93; −126.03)	−569.02** (−1070.79; −67.24)	−527.22** (−956.21; −98.23)	−660.56** (−1265.23; −55.89)
70% fish diversity	−77.52 (−205.49; 50.45)	−96.63 (−266.26; 73.00)	−89.53 (−242.59; 63.53)	−112.18 (−314.07; 89.72)

"***", "**","*" denote statistical significant at 1%, 5%, and 10% level, respectively. WTP is valued in RM/diver, at 95% confidence interval (in parenthesis) and the exchange rate is RM3.18 = 1USD.

which appeared to affect price sensitivity are all of a form which can be controlled for using information already collected, e.g., from passports, and by keeping a joint log book at the permit sales. The remaining characteristics do not appear to affect price sensitivity and are discussed more briefly. It is evident from Table 2, that the three groups with a higher WTP are not negligible, which provides a good fundament for revenue raising pricing strategies, when compared to the estimated mean WTP of these groups in Table 5.

6.1. Club membership

As in many other outdoor activities, scuba divers organize into organizations and clubs (Schuhmann et al., 2013). At Sipadan, however, only a small group of scuba divers are members of diving clubs and we find no statistically significant difference between the WTP of members of diving clubs and the general population of divers. In some cases, club memberships are used as a basis for price discrimination, e.g. as a basis for loyalty discounts. There may, however, also be cases where one could argue for higher prices for club members, e.g., if they have a higher WTP for being sure to enter diving sites as a group, which may require or may not require additional coordination effort on behalf of the seller or organizer. In Sipadan, an example could be diving clubs wanting to go diving together, i.e., being on the same boat, rather than being separated and spread among other divers. It might not be easy to measure and determine if specific divers are in fact members of clubs. This is private information among the divers, which cannot be revealed at reasonable effort or with reasonable instruments by the suppliers. Thus, also from that point of view, these variables hold little potential for price discrimination.

6.2. Divers visiting more than once vs newcomers

Our results show that divers who have visited Sipadan before (a month ago or in previous seasons) are willing to pay approximately 25% more than the rest of the population. This is as expected, exactly because they have returned and revealed a larger demand at current prices (Kyle et al., 2003). Their WTP reflects their experiences and impressions gained during earlier visits (Edwards, 2009; Dharmaratne et al., 2000; Uyarra et al., 2010). While it is often customary to reward the kind of loyalty that the repeated visits suggest with lower prices or additional services (Tanford et al., 2011), this would imply lower revenues in this case and run counter to the argument of third degree price discrimination.

However, the opposite of the finding is that newcomers or first time visitors, who have never been to Sipadan before have a lower

WTP. Rewarding newcomers with a discount is not an uncommon price discrimination strategy. First time consumers are likely to be more sensitive to price as they have little experience with the good, and providing introduction offers is a very common pricing strategy (Varian, 1992) for e.g. newspapers, tele-products and many other services. Of course, as newcomers constitute a large group here, to be revenue enhancing such price discrimination strategy must be implemented in a way where a new fee structure offers lower introductory fees for newcomers (not necessarily lower than current fees) and higher fees for divers whose passports and names have been registered in the logs before. The fact that hotels and park managements are allowed to ask for passport numbers and identification might enable to observe this variable with accuracy.

6.3. Divers less than 50 years old and male divers

Price discrimination strategies based on age usually involves reduced fees for children, students or older people. In the case of scuba diving activities at Sipadan, the two former groups did not prove relevant, and also the "older" group has to be defined fairly young to have a reasonable size. However, the interaction between this socio-demographic variable and the fee attribute did not have a parameter estimate significantly different from zero. This indicates that the group of people above the age of 50 does not have a WTP different from the remaining divers, and as they constitute only around 3% of the sampled population there is little basis for a price discrimination strategy raising prices more for people below 50.

Turning to the issue of gender differences in price sensitivity, the results in Tables 3 and 4 suggest that male divers have a statistically significant and modestly higher WTP (16%) compared to female divers, cf. Table 5. The difference may, however, be relevant to exploit as the male population constitutes approximately 58% of the diver population. Asking higher prices for male than for female participants in activities is not an uncommon phenomenon in e.g., various night clubs and sports clubs, where the service providers may benefit from attracting a gender balanced customer basis (Theuman, 1985). This recreational diving activity may be no different in that matter. Thus, it is worth considering a differentiated fee structure based on gender where female divers pay relative less than male divers. As pointed out earlier, controlling this price discrimination variable is practically easy and feasible and can be done legitimately as it is an accepted practice in other businesses. It remains of course an open question whether gender based price discrimination is likely to be accepted by the diving community itself. There is, as yet, no clear evidence on such reactions, and a more direct assessment may require a trial and error real application in the case area.

6.4. Foreign vs national divers

The numerically largest, significant parameter for price sensitivity was found for foreign divers. Foreign divers appear to be willing to pay more than 40% extra for scuba diving fees than national Malaysian divers. As foreign divers also constitute more than 90% of the diver population, this suggest ample scope for a revenue enhancing revision of the scuba diving fee structure where nationals are offered a discount relative to foreigners. This kind of third degree price discrimination is well-known and a fairness argument can be made that foreign divers do not pay taxes in Malaysia and hence do not participate in covering the governmental part of the Sabah Parks' budget, yet they enjoy the benefits of the area (Lindberg, 1991). Again, the information needed to enforce such a price discrimination approach is readily at hand. An example of such a system can be seen in Thailand, where foreign tourists pay a larger fee than local visitors (Depondt and Green, 2006).

Our study is not the first to find a higher WTP among foreign users or beneficiaries compared to national ditto in conservation case. A contingent valuation study by Yacob et al. (2009) in Redang Island Marine Parks showed significant differences in WTP values, where domestic tourists had WTP equal to RM7.84 (USD2.08) and international tourists had a WTP of RM10.63 (USD2.83). A study by Yeo (2004) at Payar Island Marine Park also found a marked difference between mean WTP, as domestic tourists' WTP was only RM9.40 (USD2.50) whereas international tourists stated their WTP at RM19.50 (USD5.18).

6.5. A word on caveats

The main caveat of this study is that it relies on stated preferences, which may make data susceptible to hypothetical biases that would not occur in e.g. a real field experiment. Nevertheless, our findings here are quite predictable by theory and existing evidence from other contexts, which strengthen the likely external validity of our findings. A specific word of caution is in place regarding the extrapolation from our sample to the entire diver population visiting Sipadan, say over a year. The sampling of respondents took place over two months in January and February 2014. Generalizing our results to the entire diving population rests on an assumption that the total population of divers is not significantly different from those who visited these months. As we were unable to access detailed information about e.g. all visitors' country of origin, we cannot control this assumption. However, our sample consists of a large number of nationalities and in combination with theoretical arguments as to why one could expect higher WTP from foreigners with higher income (compared to the local) and from repeat visitors we thus predict that the qualitative signals found in this paper is likely to be valid beyond the sample, though the exact sizes may differ.

Our study is unable to say if introducing price discrimination may increase or decrease environmental pressures as a function of changes in the diver populations' composition. Offering lower prices to first time visitors might result in a higher share of new divers. In general less experience, lack of diving competency and skills, may cause significant damaging contact on coral reefs (Walters and Samways, 2001) including disturbance on benthic sediment that indirectly suffocates the coral polyps (Zakai and Chadwick-Furman, 2002) or through body and equipment contacts that directly injure life coral (Barker and Roberts, 2004; Leujak and Ormond, 2008). Thus, prior to the implementation of a new pricing strategy, it seems pragmatic to consider these aspects, perhaps through behavioral surveys (Ong and Musa, 2012).

6.6. Concluding remarks

Conservation programs and management authorities are often under tight financial constraints making counter measures targeting the environmental impacts hard to finance and implement. This is one of the conservation through sustainable use is advocated in policy. It relies on the idea that if local communities and governments are able to derive sufficient financial benefits from conservation efforts, they will actively sustain it.

We investigated the potential for raising revenue from scuba diving tourism at Sipadan, one of Malaysia's most visited diving areas, by evaluating the potential for price discrimination among scuba divers buying permits. We applied a choice experiment to estimate scuba divers willingness to pay higher user fees for avoided decreases or improvements of environmental and recreational aspects of the diving experience at Sipadan. We investigated how

sensitivity to price and hence willingness to pay vary with observable characteristics. We found potentials for a third degree price discrimination strategy exploiting higher willingness to pay among foreign divers of more than 40% compared to national Malaysians. Also male divers had a higher willingness to pay as did people who had visited before. These results indicate new potentials for authorities to increase funding for conservation by redesigning the existing fee structure. The findings of our study might not be isolated to the waters surrounding Sipadan or Malaysia alone, but could potentially be applied in many comparable tourist destinations and our approach could be applied to explore opportunities for third degree price discrimination.

Acknowledgements

The authors acknowledge the Ministry of Education of Malaysia and Universiti Putra Malaysia for financial assistance. Our gratitude also goes to Dr. Syamsul HM. Afandi for advice, thank you to the research group of Responsible Rural Tourism Network and Ministry of Higher Education's (Malaysia) Long Term Research Grant Scheme (LRGS) Programme [Reference No.: JPT.S (BPKI) 2000/09/01/015Jld.4 (67)] for financial assistance during preliminary visit and to Sabah Parks for research permit approval. Many thanks to all scuba divers who participated in the pilot study and survey interviews held from January to February of 2013 and 2014. The authors also acknowledge the support of the Danish National Research Foundation for the Centre for Macroecology, Evolution and Climate (Grant number DNRF96).

Appendix A. Supplementary data

Supplementary data related to this article can be found at http://dx.doi.org/10.1016/j.jenvman.2016.07.033

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