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Valuing recreational and conservation benefits of coral reefs—The case of Bolinao, Philippines

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Abstract

The recognition of recreational and conservation benefits of coral reefs globally provides a sound economic rationale for their management. The value of recreational and conservation benefits of coral reefs along the Lingayen Gulf, Bolinao, Philippines is evaluated using travel cost and contingent valuation methods, respectively. Empirical results generated consumer surplus valued at PhP10,463 (US$223) per person per annum or potential net annual revenues to the local economy worth PhP220.2 million (US$4.7 million) from an estimated 21,042 visitors to Bolinao in 2000. However, willingness to pay (WTP) values (in absolute terms and as a percentage of income) for the conservation of coral reefs at Bolinao that were elicited are low, particularly among domestic tourists. This implies that preservation of natural resources and the environment may not be an immediate priority among local travelers due to socio-economic considerations in developing countries, such as the Philippines and the public goods nature of the recreational services provided by coral reefs. These results have further implications for determining the values of coral reefs to support public investment for their conservation and management. The roles of advocacy, education, and awareness campaigns have been highlighted to create a larger WTP for the management of coral reefs.

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1. Introduction

Coral reefs are among the most vital, diverse, and productive of the marine ecosystems that provide goods and services and perform numerous coastal protection functions [1,2]. The recognition of recreational and conservation benefits of coral reefs globally has provided a sound economic rationale for their management in recent times [3–5]. In the Philippines, coral reefs are primarily valued for its food security benefits. They comprise about 10% of the protein intake per Filipino, 8–20% of total fish harvest, and as much as 70% of total fish catch in numerous small islands across the country [6–8]. Also, local communities along the coastal areas, particularly those in the lower income levels, depend on coral reefs as an important source of employment, income, and tourism revenues [8–11]. In addition, coral reefs act as natural breakwaters that shield against coastal erosion and protect villages located near shorelines from the impact of strong waves. Moreover, coral reefs are shelter to numerous and diverse marine organisms and provide research, education, and esthetic services that benefit millions worldwide [1,2,8,10–15].

However, despite these wide range of benefits, coral reefs are among the most threatened marine resources in the Philippines. Surveys conducted during the past two decades have shown that more than 75% of the estimated 27,000 km^2 of coral reefs in the country have been degraded due to human activity and only 24.8% are in good to excellent condition with coral cover between 50% and 100%[1] [16,17,11,13,18]. Deterioration in the physical conditions of these resources has resulted in huge losses in fisheries, tourism, and coastal protection values estimated conservatively at US$1.35 billion annually in 1996, with local fishing villages and tourism establishments hit the hardest [11,19].

A case in point is the Bolinao coral reefs in Pangasinan, which directly support approximately 50,000 fisher folk and an additional 20,000 engaged in fishery-related occupations, such as selling fish and making shell craft, and their family members who depend on their earnings for survival [20,21]. Over the past decade, the combined effects of overexploitation from continued expansion of fishing effort, open access, and the absence of any significant policy instruments and management intervention that protect coral reefs from irreversible damage have seriously threatened their existence.

Although the Philippine Constitution of 1987 states that fisheries and other natural resources are owned by the State and provide for protection by the State, open access nonetheless generally prevails due to the generally 'non-competitive, non-excludable, and non-divisible' nature of marine resources [1,22]. In the case of coral reefs for example, the absence of clearly defined property rights provides no effective mechanism for the exclusion of newcomers or the control of fishing effort. Thus, resource users treat coral reefs as public goods and have every incentive to utilize the resource as soon and as much as possible before others do. Short-lived resource rents accrue to various resource users, encouraging entry into the industry and increased level of effort, which eventually lead to the dissipation of resource rents and environmental degradation [1].

In addition to market failure, the problem of coral reefs stems in part from the unclear delineation of management responsibility of marine and coastal resources in the country, which has moved back and forth between the local authorities and the central government

[1]The remaining coral reefs are classified as follows: 23.5% in poor condition with 0–24.0% coral cover and 51.7% in fair condition with 25.0–49.9% coral cover [13].

[23]. During the pre-colonial period, for example, barangays[2] had control over coastal resources, but authority transferred to the central government, with policy formulation and implementation coming from the top, during the Spanish regime [24]. Some jurisdictional authority was granted to local municipalities during the American period, but policy formulation and general management remained under central control. It was only with the enactment of Republic Act 1991 (RA 7160)[3] that primary control over marine and coastal resources was formally returned to local government units.

Several earlier studies on Bolinao warned about the pressures from current utilization patterns and recommended a number of mitigation measures to avoid irreversible damage to the coral reefs. For example, McManus et al. [25] suggested reducing fishing effort by 60% to achieve optimal sustainable yield, eliminating illegal fishing methods, such as blast and cyanide fishing, establishing marine reserves, and formulating a tourism regulatory committee to monitor the level of utilization activities, among others. However, to date, very few measures have been taken to manage coral reefs effectively.

The case of coral reefs in the country is a classic example of market and government failure. Economic valuation can help address these issues by providing much-needed information on the benefits from coral reefs, the social costs of their degradation, and/or loss, and the true costs of extractive activities and other uses. By putting actual figures in this form, valuation can help raise the awareness of stakeholders and decision-makers in making informed choices between various options and promote sustainable resource use and management [1,2,5,15,26,27].

2. The study area

Located in the northwestern tip of the Luzon Island, the municipality of Bolinao covers an area of about 23,320 ha, of which 8000 ha are coral reefs (mostly fringing coral reefs) from the northern side of the Santiago and Dewey islands and off the northern mainland from barangay Patar to barangay Arnedo [28]. Almost half of the land area (10,991 ha) is dedicated to agriculture.

The main sources of income in Bolinao include farming, fishing, small-scale, and cottage industries, e.g., salt, fishing paste, and dried fish making, shell craft, etc., with fisheries accounting for 31% of total employment in a municipality with a population of 53,127 [29,25]. Coral reef resources are mainly utilized for food both for home consumption and trade. Other extractive and marketed uses of the resource and their main beneficiaries are summarized in Table 1.

Recreational activities related to the Bolinao coral reefs include swimming, sailing, snorkeling, and scuba diving. Because the tourism industry is currently at its gestation stage, with the exception of tourist accommodation facilities, commercial establishments related to aquatic recreation (e.g., dive shops) are non-existent. However, local businessmen believe that in the future, dive shops and other tourist-related services are likely to prosper. Thus, Bolinao presents an ideal study site on economic valuation in view of its tourism potential and its established reputation as an important fisheries location for scientific and other types of research.

[2]Refers to a community of around 50–100 families.

[3]Otherwise known as the Local Government Code of 1991.

Table 1
Uses of the Bolinao coral reef resources

Reef resource	Use/purpose	Beneficiary
Seaweeds	Food: salad vegetables, flavoring, garnish	Local consumers
	Source of industrial products: additive in food industry, raw materials for agar production	Local industries; export to the US
	Source of livelihood	Local coastal communities
	Liquid fertilizer and soil conditioners	Export market
Invertebrates	Food: 26% of the total landed catch consumed by families in the coastal areas	Domestic and local consumers
Sea urchin		Export market
Sea cucumber		
Lobsters		
Mollusks		Shell craft industry
Shells		
Fin fishes	Food	
Grouper		Aquarium trade
Surgeon fish		

Source: (McManus et al. [25]; Juinio-Menez et al. [30]; Trono [31]).

3. Research methodology

This study utilized both the travel cost method (TCM) and the contingent valuation method (CVM) to estimate the benefits from the Bolinao coral reefs. TCM and CVM are the most widely utilized economic valuation methods for measuring the recreation or tourism values from coral reefs [4]. TCM is first used to derive the demand and consumer surplus by local and foreign tourists for recreational visits to the Bolinao coral reefs. Although entrance or user fees may not be charged, the value that visitors attach to their recreational experience in Bolinao can be approximated by the cost of travel or travel time [32–35]. The underlying principle behind the TCM is the direct relationship between distance and number of trips made to the recreational site, i.e., more trips will be taken from an area close to the recreational site than otherwise. This is illustrated in Fig. 1, which shows Bolinao and the travel zones around it. Implicit in this figure is that travel costs increase with distance traveled and that fewer trips to the recreational area will be taken as travel costs increase. Inasmuch as travel costs represent a payment (price) for acquiring a visit (commodity) to a site, it can be used as a proxy for market price. On the other hand, quantity is represented by the number of visits to the site. By plotting the information on travel cost against the number of trips taken, a pseudo-market trip demand curve (TDC) that measures the economic value of the recreation site can be traced out (Fig. 2). Variants of the original travel cost technique described above have been developed to model the various complexities of recreational behavior.[4]

[4]See [36,37] for details.

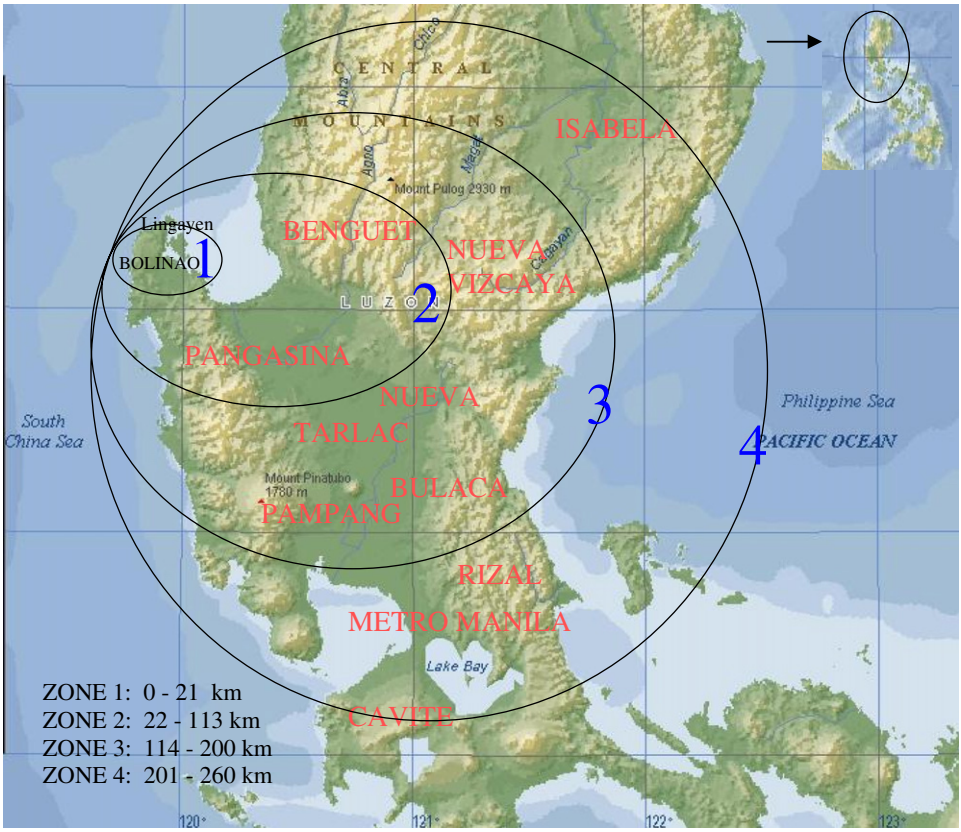

Fig. 1. Travel zones around the Bolinao coral reef area.

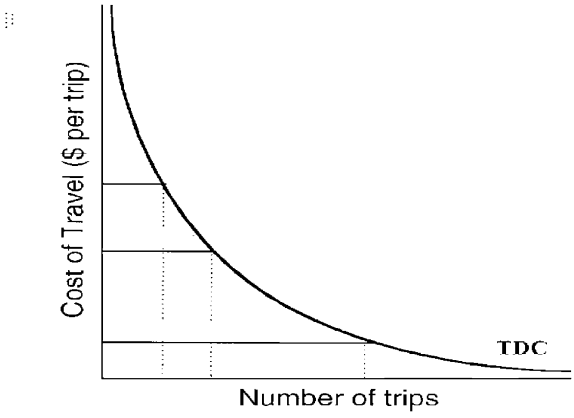

Fig. 2. Trip demand curve.

The TCM has also been used to estimate the consumer surplus associated with various types of recreational sites, such as marine, national, and agricultural parks. Consumer surplus is the marginal benefit derived from a recreational experience. It is the difference

between the utility value of visiting a recreational site or the maximum amount that visitors are willing to pay for the enjoyment of the place and what they actually paid.

Several studies utilized TCM to measure the demand and/or consumer surplus attached to coral reefs. The common denominator in all these studies is the large potential net benefits from coral reefs or the huge impending losses from their degradation. For example, using TCM, Mattson and DeFoor [38] derived recreational values from diving, sightseeing, and snorkeling at the John Pennekamp Coral Reef State Park and the adjoining Key Largo National Marine Sanctuary amounting to US$47.6 million for 1984–1985. A similar study by Hundloe [39] using TCM on the Great Barrier Reef Region elicited net values in the amount of AU$106 per year over and above travel expenditures for both local and foreign tourists. The study also inquired about consumer surplus related to the preservation of the coral reefs in their current condition and reported willingness to pay (WTP) values from a contingent valuation survey estimated at AU$6 million per year. Pendleton [3] evaluated diving experience at the Bonaire Marine Park and reported consumer surplus valued at US$19.2 million per year or net present value amounting to US$179.7 million based on a 20-year time period and a discount rate of 10%. Carr and Mendelsohn [40] extended earlier studies on the Great Barrier Reef by using two alternative recreation demand functions (i.e., log-linear and polynomial) and actual travel cost for international travel studies to measure recreational reef value. Regression results showed that the polynomial model provided a better fit and had more significant coefficients compared with the log-linear functional form. Given an estimated 2 million annual visitor count, total recreational value of the reef is estimated between US$700 million and US$1.6 billion per year.

It was only in recent years that valuation studies on coral reefs in developing countries finally caught up. All studies conducted thus far were based in Southeast Asia, which are considered as the richest but the most severely threatened among the reef ecosystems worldwide [20,21]. Based on both TCM and CVM, coral reef tourism benefits were estimated by Seenprachawong [4] for the Phi Phi Islands, Thailand. Consumer surplus from travel cost survey data generated substantial economic revenues from recreational activities, such as diving, snorkeling, and fishing valued at US$1.75 million per year for domestic visitors and US$203.66 million per year for international visitors. Assuming that the total revenue stream from recreational values remains constant at US$205.41 and using a real interest rate of 5%, the net present value of recreational benefits from coral reefs at the Phi Phi islands is worth US$3.16 billion. The same is true with coral reef preservation benefits based on the CVM, which showed sizeable WTP responses from tourists valued at US$496 million per year. In Vietnam, the recreational value of the coral-surrounded Hon Mun Islands, was evaluated by Pham and Tran Vo [41] using TCM. Annual recreational values using individual TCM extracted less than half (US$8.7 million) of the zonal TCM estimates of US$17.9 million.

Since the results of the TCM include all of the attributes attached to a recreational experience in Bolinao in general, CVM was employed, similar to that by Hundloe et al. [59] and Seenprachawong [4], in order to account for benefits accruing exclusively from coral reefs. In particular, visitors were surveyed through to determine their WTP to prevent further degradation of the Bolinao coral reefs. Consistent with utility maximization theory, a visitor expresses his/her WTP based on the benefit he/she expects to receive for keeping the reefs at its current state [42]. Following a dichotomous choice survey format, if a 'yes' response is elicited for an initial amount P_1, a second question is then asked to find out if

he/she would be willing to pay a higher amount P_2. If the response to P_2 is 'no,' then P_2 is greater than the individual's maximum WTP. The maximum amount quoted by each respondent is assumed to be the value that an individual attaches to coral reef preservation. However, unlike in the TCM, where only the non-extractive recreational use value of coral reefs is included, the CVM estimates both use and non-use values from coral reefs [4].

3.1. Theoretical framework

The TCM relied on the analogy between travel costs and market prices until the 1970's when more general models of individual behavior, such as the household production function, established a link between travel cost and individual utility maximizing behavior [43–45]. According to this approach, the household can be viewed as a producer who purchases market inputs, supplies labor, and produces commodities, which it then consumes and derives utility from, either directly from the purchase of a particular good or in combination with other purchased goods and time.

3.1.1. Individual trip demand

Individual trip or first-stage demand (V/Pop) is expressed in terms of the number of visits to the Bolinao coral reefs from a given point of origin and modeled as a function of travel costs (TC) and a vector of demographic variables (**X**)

$$V/\text{Pop} = f(\text{TC}, \mathbf{X}), \tag{1}$$

where V is the number of visits to Bolinao and Pop is the population at the point of origin. Predicted visitation rates are then obtained by simulating different levels of travel cost as an indicator of user fees and then generating the expected visitation rate by feeding the simulated user fees into the trip demand equation.

3.1.2. Aggregate trip demand

An aggregate or second-stage demand equation (TV_j) at entry fee level j ($j = 1,\ldots,\text{l}$) is estimated by regressing the expected number of visits on the different price levels (P_j)

$$\text{TV}_1 = f(P_j). \tag{2}$$

The Marshallian (uncompensated) consumer surplus (CS_j)[5] is computed by estimating the area under the aggregate demand curve (TV_1) between P_0 and the maximum price P_C (otherwise known as the choke price) where demand falls to zero

$$\text{CS}_j = \int_{\text{P}_0}^{\text{P}_\text{C}} f(P_j)\text{dp}. \tag{3}$$

3.1.3. Tobit model

A Tobit model is developed to handle censored dependent variables such as WTP. The maximum likelihood estimation for the Tobit model is used in lieu of OLS, which does not distinguish between qualitative differences censored and uncensored [46–48].

In general, the vector that contains the observed values of the dependent variable y is assumed to be distributed logistically, such that the closer the value of a bid price P is to

[5]Carr and Mendelsohn [40] point out that there is only a small difference between the consumer surplus estimates derived from the Marshallian (uncompensated) and Hicksian (compensated) demand curves.

zero, the higher is the probability of a 'yes' response. The probability distribution of a 'yes' response traces out a cumulative density function (CDF). The area under the estimated CDF gives the expected value of the mean WTP to preserve the quality of the Bolinao coral reefs. The mean WTP can then be aggregated over the number of visitors per year to estimate the potential amount of coral reef protection funds.

3.2. Empirical model

3.2.1. Individual trip demand

Trip demand is modeled as a function of travel cost, education, age, and income. The log–log functional form is utilized based on its statistical significance, low variance, and economic plausibility of the estimated coefficients. Refinements to the model were made to enhance model specification. Variables with grossly insignificant *t*-values, such as education and age were dropped from the final trip demand specification. The resulting equation is given by

$$V_i/\mathrm{Pop}_i = \exp(\alpha)\mathrm{TC}_i^{\beta}\mathrm{Y}_i^{\gamma}, \tag{4}$$

where Y_i is average income of visitors from origin i. This TDC can be used to predict responsiveness of visitation rates to changes in entry fees or population densities at the origin, for example. The TCM assumes that hypothetically increasing travel costs simulate visitors' WTP for recreation at different entry fee levels.

3.2.2. Willingness to pay

Using a Tobit model, the responsiveness of WTP for coral reef preservation is tested against demographic variables, such as age AGE, educational attainment DED, employment status DEMP, monthly income INC; number of visits to Bolinao NVIS; rating of coral reef conditions in Bolinao RATE; number of days spent for recreation RDAY; travel cost COST; and attitude towards the imposition of user fees DFEE. Categorical data are specified as dummy variables. These include DED for college graduates and above, DEMP for respondents who are currently employed, and DFEE for respondents who think that it is unfair to charge user fees to support reef management and preservation.

3.3. Data

A two-part survey was pre-tested and carried out by the World Fish Center at various resorts in Patar, Bolinao, Pangasinan during the months of March–May 2000.[6] A total of 92 respondents participated in the on-site survey. The first part of the survey included questions on the demographic profile, reasons for visiting the site, and demand for recreation. Participants were asked about the purpose of the trip, number of persons included in the trip, length of stay, number of visits made to the recreation site, point of origin, and expenditures incurred during the trip. The travel cost survey along with

[6]According to the resort owners in the area, the tourist season in Bolinao is divided into two: March–April where visitors consist mostly of local folks or tourists from the US, and November–February where visitors from Europe predominate.

supplementary data obtained from various sources provided the information to estimate demand for recreation.

To standardize information on the different variables utilized in the study, distance was measured as the straight-line distance (in kilometers) between the point of origin and Bolinao. On the other hand, travel cost was computed as roundtrip distance between the point of origin and Bolinao, multiplied by a constant per kilometer cost based on 1999 Vehicle Operating Costs information from a report by the National Center for Transportation Studies [49]. Annual per capita income was estimated from the wages and salaries statistics obtained from the [50] for the occupation categories indicated by the respondents.

The second part of the questionnaire was designed to examine closely visitor's awareness of coral reefs and their WTP for their protection and sustainable utilization in Bolinao. Respondents were provided with background information on the importance of coral reefs and their conditions based on the percentage of coral cover (e.g., excellent, good, fair, and poor). They were then shown pictures of the Bolinao reefs and were asked to choose the condition that best applies to Bolinao. This was followed by a brief background on the importance of resource management in promoting environmental improvements or preventing degradation of coral reefs and their financing options, such as user fees, after which WTP questions were elicited following a dichotomous choice format. To complete the contingent valuation survey, the relevant payment mechanism for carrying out a hypothetical resource conservation program was asked as a final question.

4. Results and discussion

4.1. Sample characteristics

The socio-economic characteristics of respondents are shown in Table 2. Majority of the respondents were in their mid-twenties to mid-thirties, college graduates, and professionals. People in this age category with this level of educational attainment and professional background are likely to be aware of environmental issues. However, survey results as reflected in their WTP values and discussions with respondents reveal that environmental concerns were low in their priority list.

4.2. Travel cost estimates

4.2.1. Individual trip demand

Estimation results of the trip demand equation are shown in Table 3. The log–log function is highly significant and provides a decent fit of the regression. The individual coefficients conform to the expected signs and were found to be significantly different from zero. Visitation rate is negatively correlated with travel cost, consistent with the underlying assumption that the higher the cost of a trip, the lower the visitation level. Income level likewise shows a negative effect on the number of visits made to Bolinao, i.e., as income increases, less visits are made. One possible explanation is that the Bolinao area is considered inferior compared to other coral reef sites in the Philippines. Thus, when income increases, visitors tend to visit reefs that are in better condition or more up-scale resource-based recreation sites.

Table 2
Socio-economic profile of survey respondents

Variable	Percentage
Age	
19–25	22
26–35	30
36–45	24
46–55	13
56 and above	10
No response	1
Educational attainment	
Elementary level	1
Elementary graduate	4
High school level	4
High school graduate	13
College level	17
College graduate	48
Vocational level	3
Graduate studies level	3
Graduate studies graduate	5
Occupation	
Self-employed	10
Administrator	8
Agricultural	8
Clerical	2
Professional	33
Sales workers	4
Service workers	11
Others	25

Table 3
Individual trip demand equation

Variable	Coefficient estimate
Intercept	37.1465** (2.17)
Cost of travel	−1.7614*** (−11.96)
Income	−3.1615** (−2.07)
Number of observations	92
R-squared	80%
F-statistic	72.64***

t-values are in parenthesis.
**Significant at the 5% probability level.
***Significant at the 1% probability level.

4.2.2. Aggregate trip demand

Aggregate demand estimates presented in Table 4 show that the trip demand equation appropriately captured the inverse response of visitation rate to changes in user fees. In general, resource managers can expect reduced visitor participation (quantity consumed)

Table 4
Aggregate demand equation

Variable	Coefficient estimate
Intercept	5.9541*** (30.67)
Price	−0.0004*** (−20.05)
Number of observations	92
R-squared	53
F-statistic	401.97***

t-values are in parenthesis.
***Significant at the 1% probability level.

to increases in user fees (price). In addition, changes in user fees also affect consumer surplus, i.e., increases in user fees decrease the area under the demand curve above the appropriate price level. Thus, net benefits to visitors are highest when user fees are nominal or non-existent.

4.2.3. Consumer surplus

The function derived by integrating the aggregate demand equation shown above over a range of prices showseconomic benefits accruing to visitors of the Bolinao coral reefs valued at PhP 962,660 (US$ 21069) or an average consumer surplus of PhP 10,463 (US$229). Based on crude visitor count of 21042 in 2000,[7] annual aggregate consumer surplus generated by recreationists visiting the Bolinao coral reefs is about PhP 220.2 million (US$ 4.8 million).

4.3. Contingent valuation estimates

Demographic variables, such as AGE, DED, and DEMP had no significant impact on WTP for improved coral reef quality in Bolinao as shown in Table 5. This is consistent with findings in the economic literature where the influence of these variables on WTP environmental services is not conclusive. Thus, an earlier valuation study conducted on by Leeworthy and Bowker [51] on non-market benefits of the Florida Keys find AGE to be both a positive and significant determinant of WTP, while Parker et al. [52] found a positive, but insignificant correlation of AGE with WTP on the value of snorkeling visits to the Keys. Although these studies lend some support to the direct relationship between age and WTP, most studies (e.g., [53–55]) highlight the negative relationship between these two variables probably due to the income constraint faced by the elderly or those close to retirement [53].

Income is a significant variable in the analysis, consistent with the findings of the travel cost regression reported earlier in the study and the Tobit regression by Parker et al. [52]. High-income respondents put a premium on environmental improvements compared with their lower-income counterparts, suggesting that income is a major constraint among lower-income groups in valuing natural resource and environmental services. However, as

[7]Based on information provided by 11 resort operators on visitor count equal to 5845 from the last week of March–May 2000. Assumes that during the peak months from November to April, visitor count is twice (2338) than that of other months (1169).

Table 5
Tobit regression for willingness to pay

Variable	Coefficient estimate
Intercept	−50.5207 (37.6067)
AGE	−0.2104 (0.4798)
DED	13.6824 (11.9600)
DEMP	14.3968 (21.6469)
INC	0.0100*** (0.0034)
RDAY	2.1268** (1.0728)
Number of observations	63
Log likelihood	−306.7842639

Standard errors are in parenthesis.
**Significant at the 5% probability level.
***Significant at the 1% probability level.

with demographic variables, there seems to be no consensus on the economic literature as to the sign and importance of income on environmental concerns [53].

The number of days spent for recreation is likewise a positive and statistically significant explanatory variable for WTP, presumably because of its strong links to income. Visitors who spend more time on recreational activities at the reefs are more willing to pay for improvements in reef quality, which are likely to benefit them directly by increasing the utility that they derive from their recreational experience.

Evaluating the Tobit regression at the sample mean of the independent variables yields a predicted individual WTP value equal to PhP20.46 (US$0.45) per visit or PhP73.17 (US$1.60) per year, approximately 0.04% of the average annual income among survey respondents. Aggregating across total visitor count per year yields potential user fee revenues totaling PhP1.54 million (US$33,695.9) that can be utilized to partially finance improvements in reef quality.

It is worth noting that the mean WTP value quoted by local respondents per visit (PhP25.01 or US$0.55) is roughly 38% below the mean WTP value of foreign respondents of PhP40.33 or US$0.88. This disparity in WTP seems lower than expected, given the higher income of foreign tourists and their better ability to pay compared with their domestic counterpart. In addition, since a foreign tourist has already spent a substantial amount on travel cost and has come a long way to visit Bolinao, the additional amount that they would be willing to pay to improve on his/her vacation experience should be valued substantially more than a local resident. This suggests that the type of visitors in Bolinao is either low-end backpackers or resident expatriates and guests with low reef expectations/demand.

Low WTP for natural resources is not unusual in developing countries where daily survival is the immediate priority and not so much environmental concerns. Some of the respondents explicitly mentioned that household income could be better spent on food or their children's education than towards conservation while others found it completely unacceptable to pay for the preservation of the Bolinao coral reefs since they did not consider the resource as their property and therefore should not be held liable for its protection. In fact, only 35.4% (23) of the respondents thought that resource users (through user fees) or the general public (through taxes) should bear the cost of public

resource maintenance while a sizeable proportion (29.2%) believed that government should be held liable for environmental preservation pursuits.

This brings to the fore another important aspect of natural resource-based recreation services. The free rider problem that characterizes public goods[8] is a result of the non-excludability nature of this type of service, whereby intended beneficiaries are reluctant to contribute the corresponding user charges, since the service will be provided to them regardless of whether they pay the required fees. This behavior comes with the thinking that they can avail of the service without the financial obligation attached to it.

5. Conclusions

Coral reef values in Bolinao are estimated in terms of the recreational benefits and the use and non-use values attached to their conservation. Empirical results using the TCM show that visitors derive an average net economic value of PhP10,463 (US$229) that is above their average expenditure on recreation. Using 2000 figures on visitation rate as base, the annual net economic value from recreation in Bolinao is expected to reach PhP 220.2 million (US$ 4.8 million). Strong demand and the high value attached to recreational services in the area lend support to the importance of coral reefs and the provide justification for their conservation. After all, the realization of these potential revenues can only be made possible through effective reef management measures that ensure healthy reef conditions for a sustained period of time.

On the other hand, results of the contingent valuation survey elicited low WTP attached to reef quality improvements valued at PhP20.46 (US$0.45) per individual per visit or PhP1.54 million (US$33,695.9) per year, probably due to the low socio-economic status of respondents and the free rider problem attached to public goods. Although the current capacity to raise revenues by charging visitors user fees, especially among domestic tourists, to finance conservation efforts of the Bolinao coral reefs may be limited, economic valuation provides the necessary initial step in putting a price to coral reefs. By giving value to these important but endangered resources means that coral reefs can no longer be treated as free goods that are subject to abuse. Thus, part of the strategy for sustainable reef management should include massive advocacy and education campaign to increase awareness and understanding of the importance of coral reefs to increase the values and promote responsible stewardship of these currently under-priced resources. Moreover, since both the recreational demand and WTP for coral reef preservation are determined by income, future studies should further explore the relationship between environmental services from coral reefs and income possibly thru the empirical application of elasticities or an inverted U-shaped Kuznets curve, among others, similar to what was done by (Hökby and Söderqvist [57]).

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[8]Defined as goods that exhibit two characteristics: (1) non-rivalry in consumption, i.e., an individual's consumption does not prevent others from using it; and (2) non-excludability, i.e., it is impossible to prevent others from experiencing the benefits [56].

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