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High School Students' Conservation Values for Coral Reefs in Sagay Marine Reserve, Negros Occidental, Philippines

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ABSTRACT

Studies on economic valuation rarely involved the youth in decision making. This study considered the youth, particularly high school students, as the respondents of the survey. The study may prove to be critical in considering the opinions and recommendations of the youth who may become environmental stewards of the future. Through stratified and systematic random sampling, 400 respondents were chosen from five public high schools in Bacolod City to determine their willingness to pay (WTP) for the conservation of the coral reefs in Sagay Marine Reserve. Data was gathered from 80 students per school through a group administered survey. High school students are willing to contribute resources and do volunteer work for conservation activity. The total WTP of the students amounted to Php 3,156,894.02 per month. The selected mode of payment was through student government collection. The top reasons for their decision to pay were: existence values, altruistic motive, and bequest value. The factors that affect the students' WTP were bid price, household size, monthly income and perceived importance. This study amplified the roles of the youth in the conservation of natural resources. Indeed, the youth can be a valuable resource capital for coral reef conservation.

Key words: *economic valuation, willingness to pay, high school students, Sagay Marine Reserve, coral reefs*

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INTRODUCTION

The Philippines lies in one of the most biogeographically diverse areas in the world. The location of the country is the foundation of the diversity of various flora and fauna especially when it comes to shallow water marine life, which reach the peak of its species diversity (*Whittaker 1975; White and Trinidad 1998*). It has a coral reef area of 25, 060 km2, makes up 8.81% of the world's total coral reef area (*Spalding et al. 2001*). As of 2014, there is a total of 915 coral reef associated fish species and more than 400 scleractinian coral species, 12 of which are endemic to the Philippine seas (*Bureau of Fisheries and Aquatic Resource 2014*) There are more than one million small-scale fishers who directly rely on coral reefs for livelihood (*BFAR 1997 as cited by Alcala 2001*) that contribute almost US$ 1.1 billion to the Philippine economy annually (*WWF 2015*).

Coral reefs ecosystem is considered highly diverse and productive because they provide various ecosystem services that benefit mankind (*Spurgeon 1992*) such as being a source of income from tourism, fishing, and medicine in addition to protecting coastlines from erosion, flooding, and storm damage (*World Resources Institute 2009*). However, coral reef conditions have suffered large decline in the past years. *Cesar et al.* (*2003*) reported that 27% of the world's total coral reefs are already degraded. In the Philippines, several studies have conveyed that coral reefs are deteriorating. *Licuanan and Gomez* (*2000*) argued that despite the increased effort in awareness, only 4.3% of the total coral reefs in the country is in excellent condition, with Visayas reefs at most risk.

The destruction and overexploitation of reef system could then lead primarily to loss of economic potential because of declining fish catch, weakening tourism, alarming coastal erosions, and decreasing local revenues (*White et al. 1994*). Recent studies have pointed out human induced climate change as the major contributor to the continuous decline of coral reefs. *Cesar et al.* (*2003*), *Mulhall* (*2009*) and *WWF* (*2015*) have unanimously stated that increased water temperature which could lead to coral bleaching has severely affected the coral reefs since they cannot survive in very high temperature.

Another reason that contribute to the degradation of natural resources such as coral reefs is the lack of information on their economic values. This lack of information can further translate to a hindrance in formulating appropriate economic policies and programs such as coral reef conservation programs. Furthermore, youth's perspective in resource valuation and in policy making is seldom considered. Youth comprise nearly 30% of the world population. Economic researches should also include the youth in their valuation studies as recognition to the fact that the youth is also a significant part of the society. *Agenda 21* (*1992*) recognizes that the long-term success of the sustainable development goal is critical to the youth's involvement in environment and development decision-making and in the implementation of programmes. The agenda emphasizes that the specific interests and voice of the children need to be taken fully into account in the participatory process in the environment and development in order to safeguard the future sustainability of any actions taken to improve the environment.

The establishment of marine protected areas (MPAs) either in the form of fish sanctuaries, reserves, parks, or protected seascapes has been the frontrunner of the Philippines when it comes to coastal resource management. As of 2012, the total MPAs declared in the country is 1500, with 12 of these declared under the National Integrated Protected Areas System (NIPAS) Act of 1992 and the rest under municipal laws and ordinances (*The Coral Triangle Atlas 2012*). However, only a number of MPAs are considered 'effective'. One of the MPAs under the NIPAS Act is Sagay Marine Reserve (SMR), a 32,000-hectare marine protected area in northern Negros Occidental. Sagay Marine Reserve is one of the biggest marine reserves in the country and known for its abundant marine resources and biodiversity. There are 31 genera of scleractinian corals and 151 reef fish species recorded in the area. It is important that these resources must be valued in order to achieve environmental sustainability for the fisheries and economic livelihood depending on it. To assess the total value of a resource, economic valuation must be employed to help policy makers in creating rational decisions in managing resources such as coral reefs.

MATERIALS AND METHODS

The Study Sites

The locale of the good being referred to, which is the conservation of coral reefs in this study, is Sagay Marine Reserve, located at 1Â°0'59"N and 123Â°29'E, in Sagay City, north of the province of Negros Occidental (**Figure 1**). Sagay Marine Reserve is about 32,000 hectares of municipal waters declared as a marine protected seascape in 1995 by virtue of Proclamation Number 592 under the National Integrated Protected Areas System (NIPAS) Act. It comprises the islands of Molocaboc, Molocaboc Diut, Matabas, and Suyac including Carbin, Macahulom, and Panal reefs and other surrounding reefs. It also includes the coastal barangays of Himoga-an Baybay, Old Sagay, Taba-ao, Bulanon, Molocaboc, and Vito. Sagay City is considered one of the major fishing sites in the province. It is home to 500 hectares of mangroves, 33 species of true mangroves, 10 species of seagrass, around 3,000 hectares of seagrass beds, 78 species of macro benthic algae, 60 genera of hard, black, and soft corals, 5 species of giant clams, 4 species of marine turtles, invertebrates such as abalone, pearl oysters, nylon shells, and blue crabs; giant fruit bats in mangrove areas, and 5 species of marine mammals such as the endangered dugong (seacow). A Protected Area Management Board (PAMB) under the Sagay Marine Reserve Office of the city manages the reserve (*SMR Office 2012*).

Since the study uses Contingent Valuation Method in estimating non-use values for coral reefs conservation, the respondents were selected from an offsite location or community, i.e Bacolod City, the capital city of Negros Occidental (**Figure 1**). Bacolod City has the most number of high schools in the province and using this locale helped the study in finding out the conservation values of high school students through their willingness-to-pay for the coral reefs in SMR. Sagay City is 84 kilometers away from Bacolod via land transportation. Travel may take about one and a half hours (*SMR Office 2012*).

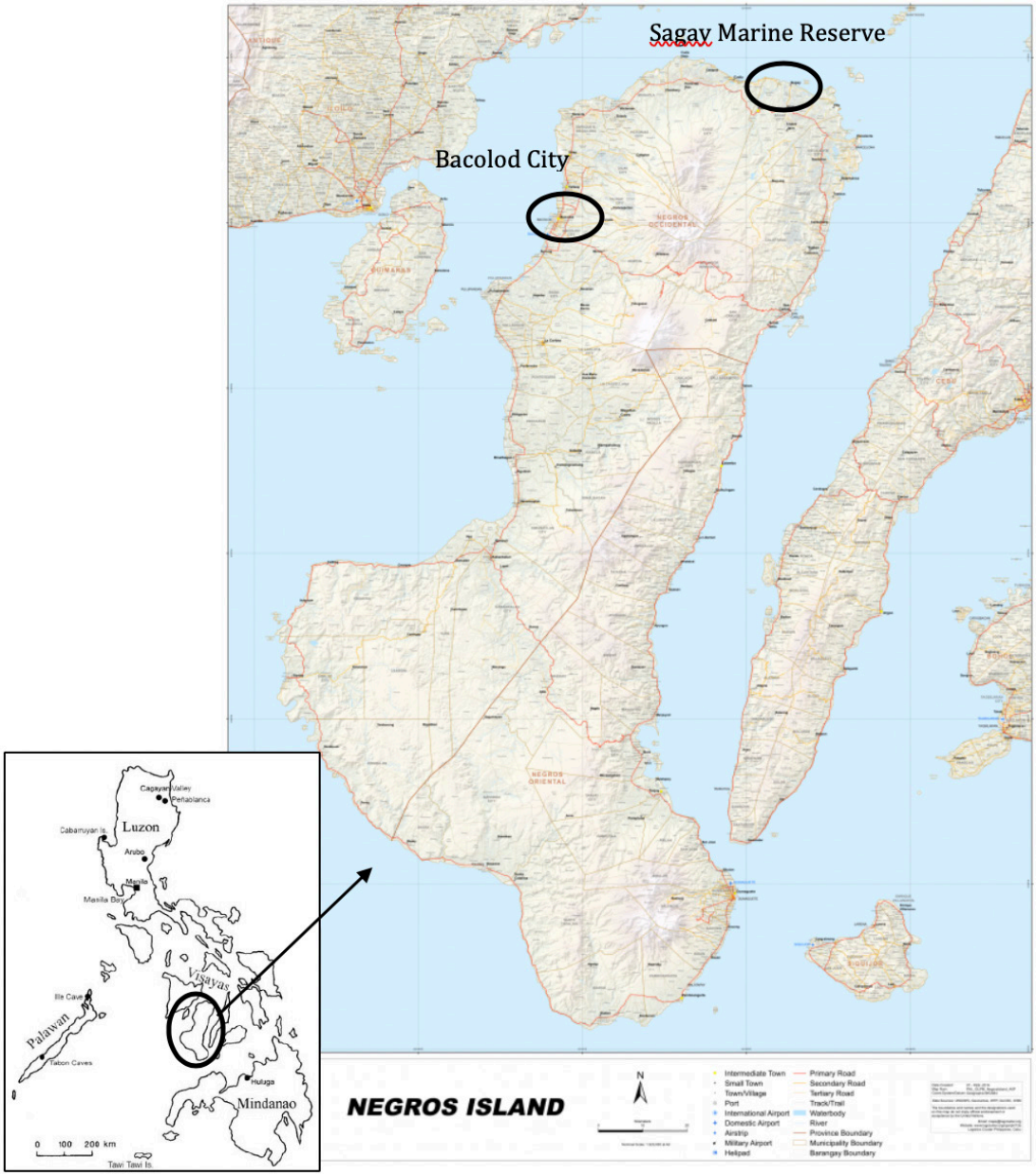
Sampling Method

From the data provided by the Department of Education Division of Bacolod City, there were 22 public high schools with a total of 28,346 students in Bacolod City (S.Y. 2015 – 2016). The sample size of 379 was obtained using Cochran's formula:

$$n_0 = \frac{z^2 pq}{d^2} = \frac{1.96^2}{4(0.05)} = 384$$

$$n = \frac{n_0}{1 + \frac{n_0}{n}} = \frac{384}{1 + \frac{384}{28{,}346}} = 379$$

For uniformity of number of respondents per bid price the sample size was set at 400. Five out of 22 public schools were then randomly selected from which the respondents were chosen from. A multi-staged stratified random sampling was used to divide the sample size into



Source: *World Food Programme Logistics Cluster* (*2014*).

Figure 1. Map of Negros Occidental showing Bacolod City, the sampling site of the respondents and Sagay Marine Reserve, the site of coral reefs being valued.

different strata, i.e each school was further divided by year level and then by sex. Each school had 80 respondents with 20 respondents per year level (10 female and 10 male students). The respondents were sampled using systematic sampling with a random start, with replacement from the list of students provided by the school.

Empirical Model

The study used contingent valuation method (CVM) to determine the willingness to pay (WTP) of high school students for conservation of coral reefs in SMR by presenting a hypothetical conservation program. The researchers obtained the monetary value of the coral reefs by conducting a pre-test survey in a selected high school in Bacolod City. The pre-test included open-ended CVM format that determined the bid prices and mode of payment that is acceptable to most respondents.

The WTP of the high school students was derived using a model that includes the following variables:

$$WTP = f(X1, X2, X3, \ldots X7)$$

Where:
WTP – Willingness to pay for coral reef conservation

X1 – bid price
X2 –household size
X3 – year level
X4 – knowledge index
X5 – perceived importance of coral reefs
X6 – sex
X7 – monthly allowance

The willingness to pay of the public high school students of Bacolod City were determined through the collective data gathered from the survey questionnaire that include the variables affecting their WTP. These are: bid price, household size, high school year level, knowledge index through administered test, perceived importance of coral reefs, sex, and monthly allowance.

Student respondents were given a chance to read a concise background on coral reefs and the SMR conservation program. The students were then asked if they have the capacity and how they can help in the conservation of coral reefs in SMR. A question was also posed regarding their willingness to participate in conservation activities.

The questionnaire also included a ten item knowledge index, which ask respondents to identify whether the items listed were true or false. This part of the survey tested the knowledge of the respondents regarding some facts about coral reefs.

Respondents were also instructed to circle one number between 1 to 5 that will represent the level of importance they give to coral reefs, with 1 as "not important" and 5 as "very important". They were then asked for their reason/s to their answer.

A group -administered survey was used to gather data from schools selected from the population. The group is composed of randomly selected students from a specific year level from the selected schools in the population. A protocol for a group-administered survey was constructed in order to ensure that the data is collected in an unbiased, organized and systematic way.

Estimation Technique

The dichotomous, close-ended CVM was used in the final survey to estimate WTP of high school students. The WTP formula used in the study is a modified form of Hanemann's model (*Hanemann 1984*) as cited in *Subade* (*2005*), in order to be appropriate for the high school respondents. The indirect utility (V) function was derived from the price (P), income (I), socioeconomic characteristics (S), and the quality of the good (Q). The function is denoted as: V (P, I, S, Q). When the respondent was asked whether he/she would be willing to help in the conservation of coral reefs in SMR, the respondent will answer "yes" if:

$$V(M-P,Q^1,S) > V(M-0,Q^0,S) \quad (1)$$

Equation 1 shows that the respondent will only answer "yes" if the utility derived from improving the quality of coral reefs in SMR (Q^1) and the paying price (P) is higher than the utility derived from not improving the quality (Q^0) and not paying the price (P). Therefore, the probability of the respondent saying "yes", if V(P,M,Q,S) is the observable component of the utility, can be expressed as:

$$Prob\,(Yes) = Prob[V(M-P,Q^1,S) + \varepsilon_1 > V(M-0,Q^0,S) + \varepsilon_0] \quad (2)$$

where ε_i is an observable component of the utility. Now, assuming that the random variable ε_i follows a logistic probability distribution, the equation can be written as:

$$Prob(Yes) = \frac{1}{1+e^{-\Delta}} \quad (3)$$

$$where\ -\Delta = V(M-P,Q^1,S) > V(M-0,Q^0,S)$$

Thus, the non-use benefit of the hypothetical market, that is, to conserve the coral reefs in SMR, is defined as:

$$V(M-WTP,Q^1,S) > V(M-0,Q^0,S) \quad (4)$$

With a linearly specified indirect utility function V(M – P, Q, S), as *Haneman* (*1984*) as cited by *Subade* (*2005*) showed, then

$$Log\left[\frac{Prob\,(Yes)}{1-Prob(Yes)}\right] = \alpha_0 + \beta_1 P + \beta_2 Q + \sum \beta_i S_i \quad (5)$$

Logistic regression with the use of Gretl, an econometric software, estimated the parameters α_0 and β_i. To compute for the mean maximum WTP for the conservation the following formula was used

$$Mean\ WTP = \frac{1}{\beta_1} \times [\ln(1 + e^{(\alpha_1+\beta_2 Q+\sum\beta_1 S_1)})] \quad (6)$$

This study applied two approaches in analyzing the valuation question – the Turnbull estimator and the logit model. According to *Haab and McConnell* (*1997*), as cited by *Ahtiainen* (*2007*), for estimating WTP the Turnbull approach is well suited as it avoids the complexity of statistical analysis of parametric models. But for analyzing the effects of the variables and testing the model, the logit model is more suitable.

The Turnbull WTP formula (similar to the studies of *Ahtiainen 2007, Le Hoa and Thi Y Ly 2009*) was defined as:

$$Mean\ WTP = \sum_{j=0}^{M} t_j \left(P_j - P_{j+1} \right)$$

Where t_j – bid prices, j=0
M – number of bid prices
Pj – change in probability of Yes per bid prices

Social WTP was determined by multiplying the mean WTP to the population of high school students in Bacolod City:

Social WTP = mean WTP x Population of high school students

Scenario Design and Elicitation Format

The respondents were informed of what coral reefs are, their benefits, importance, and the threats to coral reefs. Pictures of coral reefs were also shown during the survey to help the students visualize the situation and therefore, make an informed decision on the hypothetical market presented as follows:

"Considering the situation above, SMR conservation basically is protecting the coral reef areas from poachers, illegal fishers and other sources and causes of corals or coral reefs destruction. This includes law enforcement through Bantay Dagat patrols together with the local government unit (LGU) office of Sagay which all need labor payments, subsistence support, fuel support and other utilities needed to sustainably protect the reserve. Suppose, in order to sustain the conservation of SMR, and assure regular conservation funding, contributions Negros residents shall be collected, aside from the budget allocation that Sagay LGU provides."

This was then followed by the elicitation format with the assigned bid price already written on the space provided:

"With the situation above, will you be willing to pay ____ pesos per month (or ___ annually) to be collected by the school's student council, as your contribution to the conservation fund until you graduate, in order to conserve and protect the coral reefs in Sagay Marine Reserve."

RESULTS AND DISCUSSION

Socio-Economic Profile of Respondents

The group-administered survey was conducted in five randomly selected high schools namely, Bacolod City National High School, Emiliano Lopez National High School, Paglaum Village National High School, Generoso Villanueva Sr. National High School, and Mandalagan National High School. Each school has 80 student respondents that took part in the survey. Due to some oversight in answering the WTP question, the researchers only considered 399 respondents.

About 50.1% of the total respondents were female and the rest were male. Each year level has 100 respondents except for Grade 10. The average monthly allowance of each student amounted to PhP 1,013.76. The average household size is 6 (**Table 1**).

Conservation Program and WTP and Donate-in-Kind Questions

The general trend is fewer "YES" answers as the bid price goes up, which is consistent with the demand theory, except for the bid price of PhP 500 that has more respondents willing to pay for the conservation than the bid price of PhP 300 (**Table 2**).

As a calibrator, after answering the WTP question, student-respondents who said "yes" were asked of their level of certainty to further verify the validity of their positive response (**Table 3**). Various studies (*Ready et al. 2010, Welsh and Poe 1998; Loomis and Ekstrand 1998; Ready et al. 2001; Berrens et al. 2002*) found out that unsure respondents tend to answer "yes" to a dichotomous contingent valuation (CV). This is considered to be the reason for much of the hypothetical bias in dichotomous values. Hence, to minimize such bias, dichotomous CV "yes" responses are to be recoded based on the level of certainty, that is, those "yes" with low

Table 1. Socio-demographic profile of student respondents.

Student Profile (N=399)	Mean	Standard deviation
Sex Male -199 (49.9%) Female – 200 (50.1%)	0.50	0.50
Year Level Grade 7 – 100 Grade 8 – 100 Grade 9 – 100 Grade 10 - 99	2.50	1.12
Monthly allowance Min – Php 115.00 Max – Php 5,750.00	PhP 1,013.76	PhP 727.89
Household size	6.08	1.96

Table 2. Willingness to pay for conservation of coral reefs in Sagay Marine Reserve.

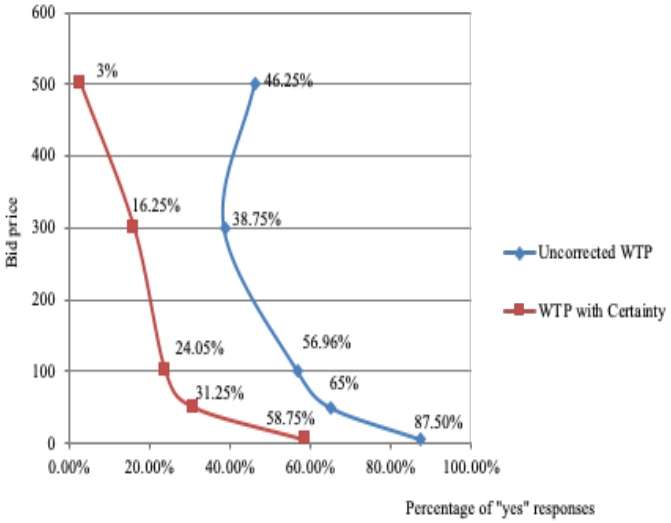
Bid Price (PhP)	Yes	No	Total
5	70 (87.5%)	10 (12.5%)	80
50	52 (65%)	28 (35%)	80
100	45 (56.96%)	34 (43.04%)	79
300	31 (38.75%)	49 (61.25%)	80
500	37 (46.25%)	43 (53.75%)	80
TOTAL	235	165	399

certainty where changed to "no" response and only those with high level of certainty where considered "yes" (*Champ et al. 1997; Johannesson et al. 1998; Champ and Bishop 2001; Ready et al. 2010*). In this study, only the respondents who answered "yes" with certainty level of 8 to 10 were considered "yes", similar to the study of *Subade and Francisco* (*2014*), while the rest where turned to "no" response. Moreover, *Subade and Francisco* (*2014*) asserted that the number of "yes" responses will decrease when certainty is taken into consideration (**Figure 2**).

It should be noted that after adjusting WTP with certainty, the trend now follows complete monotonicity in accordance to demand theory, that is as bid price goesup, the number of "yes" answers decrease.

The top three reasons of respondents for their willingness to pay for conservation were for existence value (I care for the fishes and other marine organisms that live in the coral reefs), altruistic motive (I want to conserve it for all the people that greatly depend on coral reefs primarily for food and livelihood, and also for others to be able to enjoy the goods and services coral reefs provide), and bequest value (I want to conserve it for the future generations).

Respondents who indicated their unwillingness to pay for the conservation were also asked to indicate their reasons. The three major cited reasons for non-willingness to pay of the 164 "no" responses, are as follows: (1) I do not have extra money to contribute,



Note: The number inside the graph is the corresponding percentage of "Yes" responses.

Figure 2. Graph showing increase in the percentage of "yes" responses for willingness to pay as bid price decreases.

(2) The local government could just ask to the higher government for additional funds) and (3) I believe that no matter how much the government planned to conserve the coral reefs, they will not be successful because the residents of the coastal areas are the number one reason why the resource is depleting. Respondents whose reasons for non-willingness did not include the reason of inability to pay were considered as "protest bids".

Several studies (*Subade and Francisco 2014; Ahtiainen 2007; Le Hoa and Thi Y Ly 2009*) have treated protest bids by excluding them in the analysis. *Bateman et al.* (*2002*), *as cited by Ahtiainen* (*2007*) defined protesting where the respondents do not report their true values for the good in question, thus, they either have a zero value or very high value for the good, which is unrealistic. *Ahtiainen* (*2007*) also argued that protest votes should not be included in the analysis since it is notpossible to know know the true value of the respondent for the good. In addition, *Subade and Francisco* (*2014*) asserted that these protest votes were not actually non-zero "no's" but only respondents objecting or rejecting how the CV question was presented, or may be just undecided. In

Table 3. Distribution of level of certainty among YES answers.

Bid Price	1	2	3	4	5	6	7	8	9	10	No Answer	Total
5	2	1	0	1	8	5	6	5	5	36	1	70
50	4	0	1	1	11	7	3	10	6	8	1	52
100	3	0	3	1	9	4	6	6	4	9	0	45
300	3	0	1	1	6	4	3	2	2	9	0	31
500	2	2	1	2	6	8	4	8	1	2	1	37
Total	14	3	6	6	40	28	22	31	18	64	3	235

this study, 54 respondents were identified to have protest bids. These were incorporated in model 3 (Protest) and model 4 (Protest+Certainty).

Aside from monetary contribution, the respondents of this study were also questioned if they would be willing to donate in kind and would be willing to volunteer, as an alternative manner of support in the conservation of coral reefs in SMR. There are 362 (90.5%) respondents who were willing to donate in kind. The goods cited by the respondents are food, clothes, medical supplies, books, slippers and potable water. The students think that these goods will be of great use for conservation activities.

There are also 369 (92.5%) respondents who were willing to volunteer or give time for conservation. Majority of these respondents wanted to volunteer for two hours for every environmental activity. These activities include but not limited to coastal clean-up, coral reef rehabilitation, campaign against illegal fishing activities, information dissemination and fund raising activities.

Parametric Regression Results

Logit regression was used to analyze the data gathered from the respondents. The software GRETL and SPSS were used to estimate the values (**Table 4**).

The certainty of respondents' "YES" answers and scenario rejecters were also considered in the regression of the data. Inclusion and exclusion of these data depend on the model being considered and thus affects regression results (**Table 5**).

There were four models used in the study. The first model (Original) was derived using data including the scenario rejecters. The WTP data in this model is not adjusted to the level of certainty. The second model (Certainty) includes the scenario rejecters and WTP is adjusted to the level of certainty. The third model (Protests) excludes the scenario rejecters, thus having 345 observations only and WTP is not adjusted based on the level of certainty while the fourth model (Protest+Certainty) excludes scenario rejecters and incorporates the level of certainty. The scenario rejecters or "protest bids" in this study are classified by identifying the reasons for non-willingness to pay that exclude economic or financial justification.

Table 4. Definition of variables used in logit regression.

Variables	Definition
BID PRICE	bid price (willingness to pay for coral reef conservation) in Philippine peso
SEX	sex of respondent
YRLVL	year level of respondent
MONTHLY_ALLOW	monthly allowance of respondent
HH_SIZE	size of household of respondent
KI_SCORE	knowledge index score
PRCVD_IMP	perceived importance of coral reefs

Only the bid price (Bid price) and monthly allowance (Monthly_Allow) were significant in all four models (**Table 5**). Household size (HH_size) and perceived importance (Prcvd_Imp) were also significant but only in models 2 and 4, as well as the year level (YrLvl) but only in models 1 and 3.

Among the four models, Model 4 (Protest+Certainty) was the preferred model to use for estimating the mean WTP. In this model, protest votes were excluded and the certainty level was taken into account, hence, the regression performed produced more realistic and reliable results. Model 4 (Protest+Certainty) has four statistically significant variables, these are the bid price, monthly allowance, perceived importance, and household size.

The negative sign of the bid price implies that an increase in price lowers the probability that the respondent would be willing to pay for the conservation of coral reefs in SMR, as expected based on the demand theory. Monthly allowance, on the other hand, has a positive impact to the willingness to pay of the respondent, such that higher allowance means respondent is more willing to pay for the conservation. The positive sign of the variable perceived importance denotes that the willingness to pay of the respondent for the conservation of the coral reefs increases as higher importance is given to the said resource. On the other hand, a negative sign was also anticipated for the household size since a bigger family equates to a more expenses, thus a respondent would not likely to pay for the conservation. The factors that significantly affect their willingness to pay are bid price, perceived importance, household size, and monthly allowance.

Mean Willingness to Pay Estimates

Using the coefficients from the regression results, Hanemann's formula (*Hanemann 1984*) was used to compute for the mean WTP. Using the fourth model, the mean WTP was computed as follows:

$$Mean\ WTP = \frac{1}{-0.0037} \times \left(\ln\left(1 + e^{(-1.5043+(0.0890\times 0.5)+(-0.1062\times 2.49)+\cdots)}\right)\right) = 166.74$$

The coefficient of the constant was added to the

Table 5. Regression Results of the four models.

Variables	Model 1 Uncorrected	Model 2 Certainty	Model 3 Protest	Model 4 Protest+Certainty
Constant	-0.6615 (0.9556)	-2.0060 (1.0941)*	0.0536 (1.0876)	-1.5043 (1.1394)
Bid Price	-0.0034 (0.0006)***	-0.0042 (0.0008)***	-0.0029 (0.0007)***	-0.0037 (0.0008)***
Sex	-0.1361 (0.2196)	0.0923 (0.2356)	-0.2075 (0.2449)	0.0890 (0.2422)
YrLvl	-0.2230 (0.1011)**	-0.1183 (0.1085)	-0.2088 (0.1110)*	-0.1062 (0.1098)
Monthly_Allow	0.0009 (0.0002)***	0.0004 (0.0002)***	0.0008 (0.0002)***	0.0003 (0.0002)**
HH_Size	0.0713 (0.0571)	-0.1367 (0.0638)**	0.0496 (0.0630)	-0.1509 (0.0655)**
KI_Score	0.0641 (0.0791)	0.1247 (0.0915)	0.0152 (0.0883)	0.0968 (0.0931)
Prcvd_Imp	0.1155 (0.1546)	0.3087 (0.1799)*	0.1499 (0.1741)	0.3080 (0.1862)*
No. of observation	399	399	345	345

product of the coefficient of all the variables (except for the bidprice) and their mean values in the subscript 'e'. However, due to the long equation because of multiple variables, only the coefficient of the constant and the variables sex and year level were shown in the equation. The same formula was used to other models to get the mean WTP.

For non-parametric estimation of mean WTP for model 4, the Turnbull estimation was used The first and second columns present the lower bound and the upper bound of the intervals (**Table 6**). Values in the third column are the "yes" probability of the upper bound amounts while the fourth column shows the change in "yes" probability from one bid price to another. The estimates in the fourth column indicate that 37.33% are willing to pay between PhP 0 – PhP 5, and 28.42% are willing to pay for PhP 5 – PhP 50. The same interpretation can be made for the rest of the values.

The Turnbull WTP was estimated by the adding the product of columns 1 (lower bound) and 4 (change in density). The mean willingness to pay (model 4) calculated with the Turnbull lower bound estimator is PhP 111.37. The same procedure was used to other models to obtain their corresponding Turnbull WTP.

As stated in the previous chapter, the Turnbull estimate is the most suitable for estimating the mean WTP (**Table 7**). Independent of the true underlying distribution, the Turnbull estimate provides more conservative lower bound estimates on willingness to pay for all non-negative distributions of WTP (*Haab and McConnell 2003 as cited by Subade 2005*). This study applied the same concept and used Turnbull WTP of model 4 to solve for the social WTP.

The total social benefits from the conservation of coral reefs in SMR, using the model 4 estimate, amounted to PhP 3,156,894.02 per month (**Table 8**). The collection from the high school students could amount to PhP 31,568,940.20 in one academic year (10 months) through student government collection. The computed amount is large enough to start a conservation program for the coral reefs in SMR. At present, high school students has no participation to any programs bestowed for coral reef conservation. Thus, if the hypothetical conservation program is to be implemented the amount would be enough to cover the monthly costs. Moreover, facilities or equipment that will monitor and help improve the health of the coral reefs may be purchased.

To confirm the affordability of the computed monthly mean WTP, the monthly allowance of those willing to pay were plotted against the mean WTP. This implies that a PhP 111.37 monthly collection for the conservation program of coral reefs in SMR is doable for the respondents given their average monthly allowance of PhP 1,013.76 (**Figure 3**). The WTP of the students constitute to about 11% of their monthly allowance.

Table 6. Turnbull WTP showing the lower bound and upper bound of the intervals.

Lower bound (a)	Upper bound (b)	Prob (YES) (c)	Change in Density (d)	(a) x (d)
0	5	0.6267	0.3733	0
5	50	0.3425	0.2842	1.4210
50	100	0.2676	0.0749	3.7450
100	300	0.2097	0.0579	5.7900
300	500	0.1875	0.0222	6.6600
500	500+	0	0.1875	93.75
		Total	1	111.37

Table 7. Willingness to pay estimates of four models.

	Model 1 Original	Model 2 Certainty	Model 3 Protest	Model 4 Protest+Certainty
Mean WTP	404.96	132.51	554.39	166.74
Turnbull WTP	232. 11	67.55	283.96	111.37
No. of Observations	399	399	345	345
Yes response to WTP	235 (58.9%)	116 (29.07%)	234 (67.83%)	116 (33.62%)

Table 8. Social willingness to pay of high school students' monthly contribution for coral reef conservation.

No. of High School Students in Bacolod City (Population) (a)	Turnbull WTP (b)	Social WTP (a) X (b)
28,346	111.37	3,156,894.02

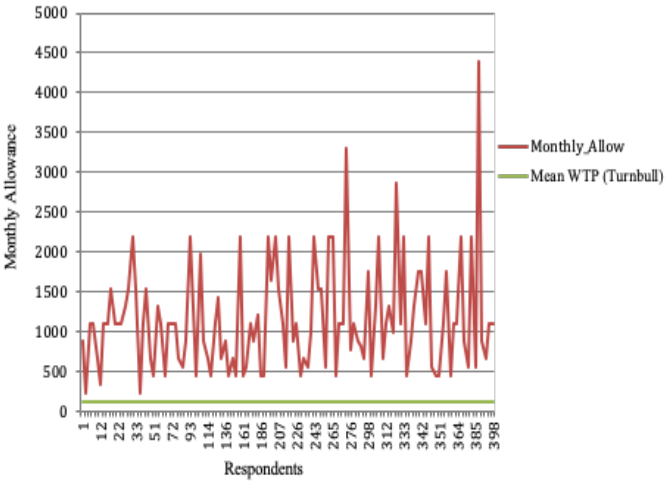


Figure 3. Monthly allowance vs mean willingness to pay of sampled high school students.

CONCLUSION AND RECOMMENDATIONS

The high school student's willingness to pay to conserve the coral reefs in SMR amounted to PhP 111.37 per month or PhP 1,113.7 per school year (10 months). This value is based on the fourth model, which is adjusted to the level of certainty and excluded protest bidders. Total social WTP amounted to PhP 1,061,356.1 per month or PhP 10,613,561.0 per school year based only on the percentage of respondents willing to pay (33.62%). However, if we consider thetotal number of high school students in Bacolod City, the social WTP would amount to PhP 3,156,894.02 per month or PhP 31,568,940.20 per school year. Still, a considerable amount of respondents (67.38%) were not willing to pay for the conservation of coral reefs.

The school is an important setting where the youth can learn about the importance of conserving natural resources and practice environmental stewardship through various activities. This study has found out that the youth can be a valuable resource capital for coral reef conservation. The youith have the willingness to pay and donate in-kind for conservation programs. The youth can also be a source of manpower because they have the willingness to volunteer and to use social media as a venue to increase awareness about the benefits that coral reefs provide and the threats that face this important natural resource. This study has amplified the role of the youth in conservation.

The Department of Education may promote partnership with SMR office to increase awareness of students about coral reefs and its conservation. With the support of the school administration environmental school organizations may be encourage to actively participate and get involved in coral reef conservation activities. The activities should be geared towards maintaining a healthful coral reef ecosystem for the present and future generations The school may also integrate in their curriculum a course on coastal resources and management to help shape the consciousness of the youth regarding the importance and preservation of the environment.

The LGU with the support of other organizations may also create and implement appropriate policies that may benefit the SMR and the surrounding communities. Proper zoning and regular budget appropriations could really help in the efficient implementation of conservation programs that would safeguard and enhance the state of coral reef resource in SMR. The WTP of high school students may also be tapped to finance conservation programs.

Finally, there is a need to employ and redefine the protocols used in the group administered survey as a method to collect data in various valuation studies considering that there were hardly any economic researches that utilize group administered surveys. Private schools must also be considered in future research on conservation values of high school students.

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