Fisherfolks' Willingness-to-Pay for the Conservation of Atulayan Bay Marine Protected Area in Sagñay, Camarines Sur, Philippines

JESAM

ABSTRACT

The Atulayan Bay is one of the established Marine Protected Areas in the Philippines in 1993 by virtue of Municipal Ordinance No. 93-001. Use of illegal fishing method and declining fish catch were the problems identified in the area. This study estimated the value of the benefits in conserving the marine resources in Atulayan Bay Marine Protected Area in Sagñay. The survey was conducted on February-March 2019 with 110 Atulayan and 225 Nato fisherfolks. The willingness to pay of the fisherfolks was estimated using the contingent valuation method. The parametric (logit regression) and non-parametric (turnbull) estimation were used to calculate for their willingness to pay to conserve the Atulayan Bay MPA. The estimated average willingness to pay per month of fisherfolk for the parametric estimation of Atulayan and Nato were PhP* 91 (US$1.72) and PhP 179 (US$3.39), respectively, and for the non-parametric estimation, PhP 86 (US$1.63) for Atulayan and PhP 27 (US$0.51) for Nato. The significant factors affecting the willingness to pay of Atulayan fisherfolks were income and bid level while for the Nato fisherfolks were age, income and bid level. The estimated willingness to pay values are a useful basis for the possible amount of tax that will be collected monthly from the registered fisherfolks by the municipal office for the conservation of the Atulayan Bay Marine Protected Area.

Joela Mizchelle A. dela Vega[1*]
Canesio D. Predo[2]
Leonardo M. Florece[1]
Marisa J. Sobremisana[1]

[1] School of Environmental Science and Management (SESAM), University of the Philippines Los Baños, Laguna

[2] College of Forestry and Natural Resources (CFNR), University of the Philippines, Los Baños, Laguna

*Corresponding author: jadelavega2@up.edu.ph

Key words: *Willingness to pay, Marine Protected Area, Contingent Valuation Method, Atulayan Bay, parametric estimation, non-parametric estimation*

INTRODUCTION

A marine protected area (MPA) is any specific marine area that has been reserved by law or other effective means and is governed by specific rules or guidelines to manage activities and protect the entire, or part of, the enclosed coastal and marine environment (*Miclat and Ingles 2004*). Without effective management, protected areas are unlikely to achieve the high expectations the conservation and development sectors have for them (Fox et al. 2014). To protect coastal and marine habitat and to sustain fisheries, over 1000 marine protected areas (MPAs) have been established in the Philippines (*Samonte et al. 2016*). It has increasingly become a popular tool for coastal resource management in the country and around the globe (*Cabral et al. 2014*). MPAs in the country are classified in two governance levels which are the nationally established MPAs and locally established MPAs. A common Philippine MPA model established by the municipality is a marine reserve with a fish sanctuary or "no-take" zone, marine reserve is an area where fishing and other activities are allowed while fish sanctuary or "no-take" zone is a region where all extractive practices are prohibited (*Ballad and Shinbo*

2016). Fishing methods normally permitted in designated MPA areas or zones are the following: hook and line using traditional equipment; throw nets and gill nets with mesh size large enough to allow the escape of small juveniles of larger fish; traps that are place and maintained without disturbance to coral; and reef gleaning in ways that do not overturn or break corals, stir up sediments or crush corals while walking (*Post 2016*).

One of the established MPAs in the Philippines in 1993 is the Atulayan Bay MPA located in Sagñay, Camarines Sur. The Atulayan Bay MPAs was established by virtue of Municipal Ordinance No. 93-001, as one of the coastal resource management strategies for resource protection and habitat regeneration (*Bradecina 2008*). Atulayan Bay is situated in the western side of Lagonoy Gulf, which is the biggest fishing ground in the Bicol region with an area of 3,000 km². This gulf covers the three provinces of Bicol, namely, Albay, Camarines Sur and Catanduanes. Atulayan MPA covers 470.16 ha covering coral reefs. The reef is narrow sloping shelf plunging as a steep wall into a sandy substrate in the

deeper portions (*Atrigenio et al. 2012*). Various corals are in the reef ridge of Atulayan Bay MPA. Coral bommies and rock formations are plentiful in the area, supporting to high topographic relief.

Atulayan Bay MPA is being surrounded by several coastal barangays in Sagñay, Camarines Sur. Mostly fishermen from these barangays depend in fishing activities as source of income around the gulf. Atulayan Island and Nato are two of the coastal barangays near the Atulayan Bay MPA. This study estimated the value of the benefits in conserving the Atulayan Bay MPA in Sagñay, Camarines Sur, Philippines. Strict protection in the marine sanctuary and reserve is needed so that the marine resources can still be present in the future.

MATERIALS AND METHODS

Contingent valuation (CV) is a common method for measuring ecosystem values which is a survey-based technique for the economic valuation of non-market resources (*Castaño-Isaza et al. 2015*). It includes elicitation of the economic value with the aid of a hypothetical scenario asked to the respondents. The contingent valuation method can provide evidence about the willingness to pay (WTP) of fisherfolks in conserving the Atulayan Bay MPA in exchange for the ecosystem services or benefits it provides them.

WTP response data was structured as binary, 1 was assigned to those who answered "yes" and 0 to those who answered "no", or "no, but was willing to pay lesser amount". For the nonparametric analysis, Turnbull's upper and lower-bound method was explored, but only the lower-bound was used, the confidence interval derived for the Turnbull lower-bound estimates using the statistical approach and Turnbull's variance formula (*Bateman et al. 2002*).

The parameter and definition used to get the Turnbull distribution-free estimator are the following:

Parameter	Definition
t_j	Bid amount
N_j	Number of no responses; (WTP=0) to bid t_j
T_j	Total number offered bid/Total number of respondents for bid t_j
F_j	N_j/T_j
f_j*	$F_{j+1} - F_j$

The procedure to calculate the Turnbull distribution-

free estimator (*Calderon et al. 2008*) was listed.

For the turnbull distribution-free estimator:

1. For bids (t_j) indexed j=1, …, M, calculate $F_j = N_j/(N_j+T_j)$ where N_j is the number of "no" responses to t_j and T_j is the total number of respondents for bid. Beginning with j=1, compare F_j and F_{j+1}.
2. If $F_{j+1} > F_j$ then continue.
3. If $F_{j+1} < F_j$ then pool cells j and j+1 into one cell with boundaries (t_j, t_{j+2}), and calculate $F*_j = \{N_j + N_{j+1}\}/\{T_j + T_{j+1}\} = N*_j/T*_j$. That is, eliminate bid t_{j+1} and pool responses to bid tj+1 with responses to bid t_j.
4. Continue until cells are pooled sufficiently to allow for a monotonically increasing sequence.
5. Set $F*_{M+1} = 1$.

For the lower bound (equation 1) and upper bound (equation 2) estimate of the mean willingness to pay (Schuhmann et al. 2019), equation 1 was used;

$$E_{LB}(WTP) = \sum_{j=0}^{M} t_{j+1}\left(F_{j+1} - F_j\right) \tag{1}$$

where j indexes the fee amount, t_j, M is maximum fee amount and F_j is the proportion of respondents who faced a particular fee amount and answered "no", F_j is assumed to represent the probability that a randomly chosen respondent will say "no" to fee tj. The term in brackets, $F_{j+1} - F_j$, is therefore the difference between the proportion of "no" responses at a particular fee amount and the proportion of "no" responses at the next lowest fee amount, and is a consistent estimate of the probability that WTP lies between t_j and t_{j+1}. According to *Haab and McConnel* (*2002*), the value in the equation is considered a lower bound on WTP because the estimated proportion of the sample that has WTP between any two fees amount is assumed to have the lower of the two values.

On the other hand, an upper bound (equation 2) estimate of mean willingness to pay therefore be estimated using the next-highest fee value:

$$E_{UB}(WTP) = \sum_{j=0}^{M} t_{j+1}\left(F_{j+1} - F_j\right) \tag{2}$$

In computing the equation 2, an upper limit on maximum willingness to pay to create t_{M+1} must be defined.

For the parametric analysis, WTP response was modeled as single bounded binary response model, and estimated the coefficient using the logit model. With this

formulation, the probability that a respondent will say "yes" to the WTP question is assumed to be related to the bid value and other explanatory variables as described:

$$P\ (yes) = \frac{1}{1+e^{-(\beta_0+\beta_1 BID+\cdots+\beta_n X_n)}} \qquad (3)$$

where $\beta_0, \ldots, \beta_n$ are the coefficients to be estimated, *BID* is the peso bids for WTP, and *X, . . ., Xn* are the non-bid independent variables. A positive sign in the a priori expectation means that an increase in the factor increase the probability of a "yes" response to the bid, while a negative sign indicates the opposite.

Logistic regression was used to tests all the factors affecting the dependent variable together in one equation. To test the significance of the factors hypothesized to affect the respondent's choice of their willingness to pay, the model below was used;

$$\text{Prob(WTP=Yes)}= a + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \qquad (4)$$
$$\beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \varepsilon$$

where WTP – the dependent variable that was obtained from respondents in the form of "yes" or "no"

Yes – 1   No – 0

a - intercept
$\beta_1 - \beta_n$ - Regression coefficients
X_1 – Age in years
X_2 – Gender
X_3 – Civil status
X_4 – Years spent studying
X_5 – Years of residency
X_6 – Household size
X_7 – Income
ε – Error term

To calculate for the mean and median WTP and to explain the welfare measures that was empirically estimated, the mean and median WTP formula by Hanemann was used and adopted the concept of random utility model, an approach common in CV published literatures.

The mean WTP was computed using the equation 5 as proposed by *Hanemann* (*1994*).

$$MWTP = \frac{1}{|\beta|} \ln(1 + exp\ (\alpha)) \qquad (5)$$

where MWTP is the mean willingness-to-pay, β is the coefficient of the bid price, and α is the constant in the logistic model if there are no additional independent

variables, or sum of the estimated constant plus sum of all significant independent variable coefficients multiplied by their means (*Donovan and Nicholls 2003*), i.e.

$$\alpha = \alpha_0 + \sum_{j=1}^{k} \beta_j \bar{X}_j$$

where α_0 is the constant from the logistic regression results and the β_j are the coefficients of the other independent variables (which are significant) excluding the bid price.

Study site

The town of Sagñay is a 4th class municipality in Camarines Sur province in the Bicol region. Sagñay is bounded by forms of water and mountain ranges. Almost 55% of its total land area or 85.118 km^2 is described as having gently rolling terrain. Two of the nineteen barangays were the study sites, namely Nato and Atulayan (**Figure 1**).

Nato is positioned on a broad, flat coastal plain in

Figure 1. Location map of Nato and Atulayan, Sagñay, Camarines Sur, Philippines.

the gateway of Sagñay river which is only about 1.5 km northeast of the town center. It consists of four purok or sitio which are Del Carmen, Del Rosario, La Purisima and Sta. Cruz.

Atulayan is situated on the western side of Lagonoy Gulf, which is the biggest fishing ground in the Bicol region with an area of 3,000 km^2. The people reside from zone 1 to 7 and sitio Iraya.

Sample size

The respondents of this study were the Atulayan and Nato fisherfolks. Sample size was computed using the developed equation of Cochran (*Israel 1992*) for each barangay.

$$n_O = \frac{Z^2 pq}{e^2} \tag{6}$$

where no is the null sample size; Z in this study is set at 1.96, this is the selected critical value of desired confidence interval; e is the desired level of precision which is at 0.05; p is the estimated proportion of an attribute that is present in the population at 0.5, and q is 1-p at 0.5. The value of Z is found in statistical tables which contain the area under the normal curve.

Finite population correction was applied since the population of the study sites are small, the sample size was adjusted using the next equation:

$$n = \frac{n_O}{1 + \frac{n_O - 1}{N}} \tag{7}$$

where n is the sample size, no is 384 (the computed value above) and N is the population of the registered fisherfolks in the barangays.

Simple random sampling with the aid of random number generator was employed to select respondents. In this sampling method, each unit included in the sample has equal chance of inclusion in the sample (*Singh and Masuku 2014*). Out of 153 registered fisherfolks, 110 were randomly selected from Atulayan. On the other hand, 225 out of 530 registered fisherfolks were randomly selected from Nato. Using the random number generator in the microsoft (MS) excel, the list of sample-respondents were generated.

Survey

Fisherfolks that were randomly selected were interviewed on February to March 2019 with the aid of questionnaire, which includes questions regarding the respondent's demographic information, income, total catch per fishing trip, and factors affecting their decisions for their willingness to pay. These served as tools in the analysis of the study.

A pre-test was conducted to prepare the enumerators for the actual survey and evaluate the appropriateness of the questionnaire and determine the final bid amounts that were used in the survey. Selected respondents were asked to participate in a referendum through a "yes" or "no" option for the proposed conservation which are monitoring and evaluation of the marine resources, and safeguarding against illegal activities in the Atulayan Bay MPA daily. Provided that the change carries a price or cost to the respondent, this preference elicitation was associated with economic value. The question for eliciting the fisherfolks' willingness to pay was a referendum format where they will vote/choose yes or no when asked to support the conversation program if it will cost a certain bid amount or price to be collected to them monthly. Towards this end, a "payment vehicle" is often described allowing respondents to understand the manner in which payments are to be collected. In this case, an amount or tax will be collected monthly from each registered fisherfolks as payment for the preservation of the MPA.

Bid Amounts

This study used dichotomous choice format where fisherfolks were asked if they will pay a given bid amount for the conservation of Atulayan Bay MPA. The bid amounts that were used in the survey were generated from the focus group discussion and from the pre-test. The final set of bid amounts that were used in the survey are PhP 20*, PhP 30*, PhP 50*, PhP 100* and PhP 200* per month. There were 22 and 45 respondents interviewed for each bid level for Atulayan and Nato, respectively. (*1 USD = PhP 52.78; Source: BSP, March 29, 2019).

RESULTS AND DISCUSSIONS

Socio-demographic characteristics of the fisherfolk-respondents.

The socio-demographic characteristics of the 335 total respondents were tabulated to give a background of the fisherfolks in the area studied. The fisherfolk-respondents were classified according to their barangay, specifically Atulayan and Nato (**Table 1**). The basic information of respondents were also presented (**Table 2**).

Table 1. Summary and descriptive statistics of the fisherfolk-respondents.

Barangay/Characteristics	OBS.	Std. Dev.	Min	Max	Mean
Atulayan					
Age (in years)	110	12.7872	23	79	47
Gender	110	0.3348	0	1	0.13
Civil status	110	0.3394	0	2	0.94
Years spent studying	110	2.2931	2	13	6
Years of residency	110	15.0647	3	79	41
Household size	110	2.2799	2	12	6
Income (PhP)*	110	4656.729	1,400	21,000	9,973
Nato					
Age (in years)	225	13.2339	19	78	45
Gender	225	0.4225	0	1	0.23
Civil status	225	0.4864	0	2	0.88
Years spent studying	225	2.3516	2	14	8
Years of residency	225	15.8119	2	78	39
Household size	225	2.4485	2	13	6
Income (PhP)*	225	4826.596	1,000	20,000	7,287
Both					
Age (in years)	335	13.0927	19	79	45
Gender	335	0.3983	0	1	0.19
Civil status	335	0.4437	0	2	0.90
Years spent studying	335	2.4347	2	14	7
Years of residency	335	15.5869	2	79	39
Household size	335	2.3937	2	13	6
Income (PhP)*	335	4929.068	1,000	21,000	8,169

*1 USD = PhP 52.78 (Source: BSP, March 29, 2019)

Factors Affecting the Willingness to Pay of the Fisherfolks for the Conservation of the Atulayan Bay MPA

Prior to the estimation of the willingness to pay, the study also identified the significant factors that affect the fisherfolk's willingness to pay for the conservation of the Atulayan Bay MPA. Out of 335 fisherfolk-respondents, 176 or 52.5% said they were willing to pay in the conservation of Atulayan Bay MPA (**Table 3**) while the remaining 47.5% were not willing because they cannot afford to pay and some said the government should allocate budget for this matter. More than half percent of the respondents from Atulayan (56%) and Nato (51%) were willing to pay for the conservation of the MPA.

Logistic regression was used for the analysis of the factors affecting the willingness to pay of the respondents. It is a mathematical modeling approach that is used to predict the possibility of an individual or group of individuals belonging to a certain group. In this case, it is to distinguish those who are willing to pay for the conservation of Atulayan Bay MPA from those who are not willing to pay for it. The direct or indirect relationship between the decision of the fisherfolks and the hypothesized factor were indicated by the positive and negative coefficients. (**Table 4)**.

A value of 0 was assigned in the event of the fisherfolk was not willing to pay for the conservation of Atulayan Bay MPA and a value of 1 was assigned in the event of the fisherfolk was willing to pay. Using the likelihood-ratio (LR) Chow Test, the result shows that the data should be pooled for the regression analysis. When all variables were included in the model, for barangay Atulayan the factors age, gender, civil status, education, years of residency and household size and for barangay Nato, gender, civil status, education, years of residency and household size, generated insignificant coefficients. If the significance value (P>|z| or SIG.) is less than 5%, the estimated model is statistically significant. This means that the independent variables, combined together, have a significant effect on the dependent variable which was the willingness to pay of the fisherfolks.

Income and bid level for respondents from Atulayan were found significant considering their significant values. Bid level had a negative coefficient while income had positive coefficients. For Nato, age, income and bid level were found to be significant. Age and bid level have negative coefficient meaning, the younger the fishermen and the lower the bid level, the more willing to pay for

Table 2. Socio-demographic characteristics of fisherfolk-respondents.

Characteristics	Barangay					
	Atulayan		Nato		Both	
	No.	Percent	No.	Percent	No.	Percent
Age (in years)						
30 and below	12	11	39	17	51	15
31-59	77	70	156	69	233	70
60 and above	21	19	30	14	51	15
ALL	110	100	225	100	335	100
Average		47		45		46
Gender						
Male	96	87	173	77	269	80
Female	14	13	52	23	66	20
ALL	110	100	225	100	335	100
Civil Status						
Single	10	9	41	18	51	15
Married	97	88	169	75	226	80
Widow	3	3	15	7	18	5
ALL	110	100	225	100	335	100
Years spent studying						
1-6 years	78	71	104	46	182	54
7-10 years	26	24	100	44	126	38
11 and above	6	6	21	10	27	8
ALL	110	100	225	100	335	100
Average		6		8		7
Years of residency						
10 and below	4	3	8	4	12	4
11-20	5	5	18	8	23	7
21-30	20	18	54	24	74	22
31 and above	81	74	145	64	226	67
ALL	110	100	225	100	335	100
Average		41		38		40
Household Size						
4 and below	33	30	97	43	130	39
5-9	66	60	117	52	183	55
10 and above	11	10	11	5	22	6
ALL	110	100	225	100	335	100
Average		6		6		6
Income (PhP)*						
5,000 and below	18	16	80	36	94	28
5,001 to 10,000	50	46	116	52	167	50
10,001 to 15,000	20	18	19	8	41	12
15,001 and above	22	19	10	4	33	10
ALL	110	100	225	100	335	100
Average		9,973		7,287		8,845

*1 USD = PhP 52.78 (Source: BSP, March 29, 2019)

Table 3. Distribution of willingness to pay responses of the fisherfolk-respondents for the conservation of Atulayan Bay MPA, Sagñay, Camarines Sur.

Response	Atulayan		Nato		Both	
	Freq.	%	Freq.	%	Freq.	%
No	48	44	111	49	159	47.5
Yes	62	56	114	51	176	52.5
Total	110	100	225	110	335	100

Table 4. Results of the logistic regression analysis concerning the factors affecting the willingness to pay of Atulayan and Nato fisherfolks in Sagñay, Camarines Sur.

Variable	Parameter Estimate	Standard Error	P>|z| or Sig.
Atulayan			
Age	0.0391593*	0.0316286	0.216
Gender	-0.9050375	0.7241444	0.211
Civil Status	-0.1278292	0.6856221	0.852
Education	0.1068558	0.1134632	0.346
Residency	-0.0315223	0.0265632	0.235
Household Size	-0.1205536	0.1031602	0.243
Income	0.0001486*	0.0000555	0.007
Bid Level	-0.0190944*	0.0047664	0.000
Constant	-0.0660253	1.982545	0.973
Likelihood ratio chi^2 (8)	36.04		
Prob > chi^2	0.000		
Pseudo R^2	0.24		
N	110		
Nato			
Age*	-0.0421712*	0.0198787	0.034
Gender	0.0691177	0.4520844	0.878
Civil Status	0.160429	0.4144014	0.699
Education	-0.0144898	0.0764685	0.85
Residency	-0.0032397	0.0152148	0.831
Household Size	-0.0276249	0.0675953	0.683
Income*	0.0005479*	0.0000836	0.000
Bid Level*	-0.0070666*	0.0029741	0.018
Constant	-1.084308	1.205857	0.369
Likelihood ratio chi^2 (8)	103.06		
Prob > chi^2	0.000		
Pseudo R^2	0.33		
N	225		

* means significant at 5%

the conservation of the MPA. Income had a positive coefficient, which signifies the higher the income, the more willing the fishermen are to pay for the conservation of the MPA.

Analysis of the Willingness to Pay

The study made use of both parametric and non-parametric estimation of the willingness to pay. The expected or mean monthly WTP (**Table 5**) of the fisherfolks for the conservation of Atulayan Bay MPA for the parametric estimation is PhP 91 and PhP 179 for Atulayan and Nato, respectively.

Table 5. WTP estimates of Atulayan and Nato using Logit Model.

Logit Model/ Barangay	α	β	Mean WTP (PhP)*
Atulayan	1.542036242	-0.0190944	91
Nato	0.932974662	-0.0070666	179

*1 USD = PhP 52.78 (Source: BSP, March 29, 2019)

For the non-parametric estimates, the mean WTP using Turnbull estimator were estimated as PhP 85.91 and PhP 26.67 for Atulayan and Nato, respectively. (**Table 6**) The Turnbull also gave an estimate of the range in which the median WTP falls. The median denotes the price for which the probability of no response equals 0.5. Median WTP were the range PhP 50 to PhP 200 and PhP 30 to PhP 50 for Atulayan and Nato, respectively (**Table 7**).

The different models used in estimating the willingness to pay for the conservation of the Atulayan Bay MPA in Sagñay, Camarines Sur generated different mean WTP estimates (**Table 8**). Parametric model provided higher mean WTP than the non-parametric model. This was because of several factors considered in the parametric model.

Estimating the Potential Total Annual Contribution from the Mean Willingness to Pay

The mean WTP estimates were aggregated to the entire population of interest which are the total population

Table 6. Turnbull estimates for the conservation of Atulayan Bay MPA.

Bid Amount (t_j)	Number of NO's (N_j)	Total Number Offered Bid/ Total Number of Respondents for Bid t_j (T_j)	$F_j = N_j/T_j$	$f_j^* = F_{j+1} - F_j$
Atulayan				
0				
20	7	22	0.3182	0.3182
30	9	22	0.4091	0.0909
50	10	22	0.4091	0.0000
100	8	22		
200	14	22	0.6364	0.2273
300			1	0.3636
Nato				
0				
20	18	45	0.4000	0.400
30	21	45	0.4667	0.0667
50	27	45	0.5333	0.0667
100	26	45		
200	19	45		
300			1	0.4667

Table 7. Non-parametric WTP (Turnbull lower and upper bound estimates of WTP), Atulayan and Nato.

	Value (PhP)
Atulayan	
E_{LB} (WTP)	86
E_{UB} (WTP with t_{M+1}=215)	133
E_{UB} (WTP with t_{M+1}=225)	136
E_{UB} (WTP with t_{M+1}=250)	145
E_{UB} (WTP with t_{M+1}=300)	164
Median WTP	50-200
Nato	
E_{LB} (WTP)	27
E_{UB} (WTP with t_{M+1}=215)	114
E_{UB} (WTP with t_{M+1}=225)	118
E_{UB} (WTP with t_{M+1}=250)	130
E_{UB} (WTP with t_{M+1}=300)	153
Median WTP	30-50

*1 USD = PhP 52.78 (Source: BSP, March 29, 2019)

Table 8. Comparison of WTP estimates of the different models.

Barangay	Classification	Model	Mean WTP (PhP)*
Atulayan	Parametric	Logit	91
	Non-Parametric	Turnbull Estimator	86
Nato	Parametric	Logit	179
	Non-Parametric	Turnbull Estimator	27

*1 USD = PhP 52.78 (Source: BSP, March 29, 2019)

of the registered fisherfolks of Atulayan and Nato. There were ways of using the mean in aggregating WTP benefits (*Miller and Lindsay 1993*). The non-respondents wereassumed to have a zero mean WTP value (*Loomis*

1987). The response rate used was the percent of respondents with positive valuation. All non-respondents to the survey were assigned a WTP of zero. The procedure was:

Parametric model
> where WTP = mean monthly WTP
> NRF = number of registered fisherfolks
> PR = Response rate

Aggregated Annual WTP Benefits for Atulayan
> = MWTP (NRF x PR) x 12 months
> = 91 (153 x 0.56) x 12
> = PhP 93,563 (7,797 monthly)

Aggregated Annual WTP Benefits for Nato
> = MWTP (NRF x PR) x 12 months
> = 179 (530 x 0.51) x 12
> = PhP 580,604 (48,384 monthly)

Non-parametric model
Aggregated Annual WTP Benefits for Atulayan
> = MWTP (NRF x PR) x 12 months
> = 86 (153 x 0.56) x 12
> = PhP 88,422 (7,368 monthly)

Aggregated Annual WTP Benefits for Nato
> = MWTP (NRF x PR) x 12 months
> = 27 (530 x 0.51) x 12
> = PhP 87,577 (7,298 monthly)

The computed possible value of the yearly contribution or payment of registered fisherfolks for the

conservation of Atulayan Bay MPA were PhP 93,563 (Atulayan) and PhP 580,604 (Nato) for the parametric model and PhP 88,422 (Atulayan) and PhP 87,577 (Nato) for the non-parametric model. These are the values of the benefits in conserving the Atulayan Bay MPA. The estimated mean willingness to pay from this study could be an alternative source of funds for the conservation of the MPA.

CONCLUSIONS AND RECOMMENDATIONS

The study confirmed that fisherfolks in Atulayan and Nato are willing to pay for the conservation of the Atulayan Bay MPA. The computed values were the aggregated value of the benefits in conserving the Atulayan Bay MPA. The study suggests the possible implementation of collection of fees from the fisherfolks or the user of the resources. The results regarding the mean WTP serve as a basis for the possible amount of fee that will be paid by the fisherfolks. Collected fees will help the barangay and LGU financially and economically since these can be used in different aspects like source of salary for the "bantay-dagat" (patrols) members, source of funds for new boats which can be used in patrolling the area or other materials and equipment that may be useful for the conservation of the Atulayan Bay MPA. Also, the estimated amount can be used as a basis for requesting funding to finance conservation program for the Atulayan MPA. The conservation of the MPA lies not only in the local and barangay government, but also through the help of the local community in the area. Further studies about the Atulayan Bay MPA is recommended.

REFERENCES

Atrigenio, M.P., Deocadez, M.R. Martinez, R.J.S. Panga, F.M. Aliño, P.M. Mamauag, S.S., Muallil, R. 2012. Site establishment and baseline assessment in RARE sites, RARE Program for Sustainable Fishing in the Philippines (Philippines 2 Cohort). Marine Environment and Resources Foundation, Inc. (MERF) and Marine Science Institute, University of the Philippines, Diliman, Quezon City, Philippines 137pp.

Bateman, I.J., Carson, R.T., Day, B., Hanemann, M., Hanley, N., Hett, T. Jones-Lee, M., Loomes, G., Mourato, S., Ozdemiroglu, E., Pearce, D.W., Sugden, R., Swanson, J. 2002. Economic Valuation with Stated Preference Techniques: A Manual. Edward Elgar Publishing Ltd.

Ballad, E.L. and Shinbo, T. 2016. "Are Several Village-based Marine Protected Areas (MPAs) Necessary for Conserving Coastal Resource in a Municipality? A Case of Municipality of Gonzaga, Cagayan, Philippines" *Kuroshio Science* 9(2): 138-149.

Ballad, E.L. Morooka, Y., Shinbo, T. 2016. "Factors Inducing Community Participation in Coastal Resource Management: Case Study of MPAs in Gonzaga, Cagayan, Philippines" *Journal of Rural Problems* 52(4): 241-246.

Bradecina, R.G. 2008. "Socioeconomic Conditions and Governance in the Atulayan Bay" *Kuroshio Science Journal* 2(1): 85-92.

Cabral, R.B., Aliño, P.M., Balingit, A.C.M., Alis, C.M., Arceo, H.O., Nañola, C.L., Geronimo, R.C., MSN Partners. 2014. "The Philippine Marine Protected Area (MPA) Database" *The Philippine Science Letters* 7(2): 300-308.

Castaño-Isaza, J., Newball, R., Roach, B., Lau, W.W.Y. 2015. "Valuing Beaches to Develop Payment for Ecosystem Services Schemes in Colombia's Seaflower Marine Protected Area" *Ecosystem Services Journal* 11: 22-31.

Calderon, M.M., Carandang, M.G., Camacho, L.D., Dizon, J.T. 2008. "Parametric and Non-parametric Models to Estimate Household' Willingness to Pay for Improved Management of Watershed" *Journal of Environmental Science and Management* 11(2): 68-78.

Donovan G.H. and Nicholls, D.L. 2003. Estimating Consumer Willingness to Pay a Price Premium for Alaska Secondary Wood Products. Res. Pap. PNW-RP-533. Portland, OR: US Department of Agriculture, Forest Service, Pacific Northwest Research Station. 7pp.

Fox, H.E., Holtzman, J.I., Haisfield, K.M. McNally, C.G., Cid, G.A., Mascia, M.B., Parks, J.E. Pomeroy, R.S. 2014. "How are our MPAs Doing? Challenges in Assessing Global Patterns in Marine Protected Area Performance" *Coastal Management* 42(3): 207-226.

Haab, T.C. and McConnel, K.E. 2002. Valuing environmental and natural resources: The econometrics of non-market valuation. Edward Elgar Publishing, Northampton.

Hanemann, W.M. 1994. "Valuing the Environment through Contingent Valuation" *Journal of Economics Perspective* 8(4): 19-43.

Israel, G.D. 1992. Determining Sample Size. University of Florida, IFAS Extension. PEOD-5.

Loomis, B.J. 1987. "Expanding Contingent Valuation Sample Estimates to Aggregate Benefit Estimates: Current Practices and Proposed Solutions" *Land Economics* 63(4): 396-402.

Miclat, E. and Ingles, J. 2004. "Standardized Terms and Definitions for Use in Marine Protected Area Management in the Philippines". In: Arceo H.O., Campos, W.L.,

Fuentes, F., Aliño, P.M., (eds): Proceedings of the Workshops

Towards the Formulation of the Philippine Marine Sanctuary Strategy (PhilMarSaSt). Marine Science Institute, University of the Philippines. 2004: 3-8.

Miller J.D. and Lindsay, B.E. 1993. "Willingness to Pay for a State for a Gypsy Moth Control Program in New Hampshire: A Contingent Valuation Case Study" *Journal of Economic Entomology* 86(3): 828-837.

Post, K. 2016. Increasing the Resilience of Marine Ecosystems: Creating and Managing Marine Protected Areas in the Philippines. Marine Conservation Philippines. 32 pp.

Samonte, G.PB., Ramenzoni, V.C., Dacles, T.C., Fortenbacher, D. 2016. "The Effect of Marine Protected Areas on Fishers' Income in the Philippines" *Journal of Ocean and Coastal Economics* 3(1): 1-27.

Schuhmann, P.W., Skeete, R., Waite, R., Lorde, T. Bangwayo-Skeete, P., Oxenford, H.A., Gill, D., Moore, W., Spencer, F. 2019. "Visitors' Willingness to Pay Marine Conservation Fees in Barbados" *Tourism Management Journal* 71: 315-326.

Singh, A.S. and Masuku, M.B. 2014. "Sampling Techniques & Determination of Sample Size in Applied Statistics Research: An Overview" *International Journal of Economics, Commerce and Management* 2(11): 1-22.