

## Article

# Endemic and Threatened: The Conservation Value of the Philippine Duck

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**Abstract:** The Philippine duck (*Anas luzonica*) is a vulnerable species, endemic to the Philippines. The need of local people for food and land has led to the endangerment of the Philippine duck populations through illegal hunting and the conversion of wetlands to aquaculture and farmland. This study was conducted to determine the willingness to pay (WTP) of residents ( $n = 500$ ) in Maguindanao provinces for the conservation of the Philippine duck and the effects of conservation attitude and knowledge toward the Philippine duck, as well as sociodemographic characteristics, on WTP. The mean annual WTP for Philippine duck conservation was USD 0.60, and the total estimated annual amount that could be collected was USD 134 thousand when projected based on the number of households in the Maguindanao provinces. A positive conservation attitude and high knowledge increased the WTP for Philippine duck conservation. Females, pet owners, and those with higher income pledged a higher WTP than males, non-pet owners, and those with lower income. This study revealed that local residents are supportive of the conservation of the vulnerable duck populations by paying a considerable amount. These results are critical for designing and implementing outreach programs for increasing awareness and the acquisition of funds urgently needed for the protection and conservation of the remaining Philippine duck population in the area.

**Keywords:** wildlife management; environmental economics; public outreach; waterbirds; Anatidae; Southeast Asia



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## 1. Introduction

The rapid decline of wildlife has been one of the most disturbing impacts of humans on the planet [1,2]. This decline is attributed to anthropogenic disturbances such as climate change, overexploitation for economic gain, and habitat loss [3,4]. Currently, the estimated ongoing extinction rates greatly exceed the ‘background’ extinction rates by up to 100 times. This has led to warnings of the progression of a sixth mass extinction, which is mainly caused by humans. Avoiding this phenomenon requires a rapid and intensified effort to conserve and lessen the strain on the population of the already threatened and vulnerable species [3]. However, wildlife conservation efforts cannot be successful without public acceptance and appropriate funding [5–8]. It is therefore critical to study public attitudes toward threatened wildlife and recognize the potential sources of funding and the relevant amount of funds that could be secured [9,10].

In the Philippines, a global biodiversity hotspot, anthropogenic activities such as the ongoing loss of natural habitats and illegal hunting and trapping have led to the

endangerment of several bird species. Such species include the Philippine duck (*Anas luzonica*), Java sparrow (*Padda oryzivora*), Philippine hanging parrot (*Loriculus philippensis*), and Philippine eagle (*Pithecophaga jefferyi*) [11–13].

The Philippine duck, hereafter duck, is an endemic bird species that inhabits all the major islands of the Philippines. It utilizes various brackish and freshwater habitats such as mangroves, ponds, marshes, and riverbanks with an estimated population size of around 3300 to 6700 mature individuals [14]. Illegal hunting for meat and sport and the conversion of wetland habitats into aquaculture and farmland are current threats that have led to the steep decline of the duck population [15]. Therefore, the duck has been classified as vulnerable by the International Union for Conservation of Nature (IUCN) and the Department of Environment and Natural Resources—Philippines [16,17]. Areas that have been declared as critical habitats for the duck include the Cabusao Wetland Critical Habitat in the Camarines Sur province (26.93 hectares), Malasi Tree Park and the Wildlife Sanctuary Critical Habitat in the Isabela province (178 ha), the Las Piñas-Parañaque Critical Habitat and Ecotourism Area in Metro Manila (175 ha), the Mangatarem Critical Habitat in Pangasinan province (4422.80 ha), and the Sasmuan Bangkung Malapad Critical Habitat and Ecotourism Area in Pampanga province (405.50 ha) [16,18,19].

Despite the duck's threatened status, the enforcement of a hunting ban has not been very successful, especially outside protected areas [20–22]. Conservation interventions such as the better enforcement of a hunting ban and protection and restoration of wetland habitats require public support and extra funding. Governments and non-governmental organizations are responsible for the implementation of conservation programs. However, conservation funding is mostly provided by governments and supragovernmental institutions whose main monetary source is tax revenues. The existence of the threatened duck is a value of non-use that cannot be traded and directly valued [23]. Therefore, stated preference methods were used to assign economic value to duck conservation, which is also a proxy of public support [24].

### 1.1. Economic Valuation

Several studies have been conducted to measure the perception and public preferences for wildlife conservation using attitudinal and other behavioral scales [7,25,26]. Such studies are important for crafting informed policies and decisions but they do not provide any estimates on public funds available for species conservation. The Contingent Valuation Method (CVM) is the most often used stated preference approach that can be employed to estimate public funds available for implementing species conservation programs through willingness to pay (WTP) surveys [23,24]. The WTP methodology creates a hypothetical market where customers can assign monetary values for the goods in question [23,24]. Through this method, public preferences can be inferred, and the ways in which factors such as cognitions and sociodemographics affect the WTP can be evaluated [27–29].

The WTP questions can be continuous, as in open-ended or payment card formats, or discrete choice [23], with the latter being less biased because they include a limited number of options [30]. There are three types of discrete choice questions: (1) single-bounded, where the respondent has to choose between paying or not paying a set amount for the good or service in question; (2) double-bounded, where the respondent has to choose between two amounts, an initial bid and a follow-up bid, higher or lower than the initial bid depending on their first answer; and (3) multiple-bounded, where the respondent has to state their certainty about paying each of several predetermined bids [23]. The multiple-bounded format was used in this study because it avoids the bias involved in the choice of bids in the single-bounded and double-bounded models [31].

The WTP methodology has its limitations that may affect the accuracy of the measured WTP. According to Greene [23], respondents to WTP surveys may be influenced by how the statements were framed during the interview (framing bias); they might provide socially acceptable answers rather than their true preferred answers (social desirability bias) or provide answers on what they might pay for a service or good rather than what they

will pay in real life (hypothetical bias). Despite these limitations, the WTP method has been a common approach in assigning values for species conservation [27–29]. Several previous studies have used the CVM to determine WTP for the conservation of several bird species, such as the Philippine eagle [12], black-faced spoonbill (*Platalea minor*) [32], northern pintail (*Anas acuta*) [33], white stork (*Ciconia ciconia*) [34], and red-crowned crane (*Grus japonensis*) [35].

### 1.2. Attitudes, Knowledge, and Sociodemographic Characteristics

An attitude is the evaluation of an object or activity that may vary from positive to negative [36]. The likelihood of supporting species conservation is higher among those who have positive attitudes toward animal species than among those who have negative attitudes [7,37]. A positive attitude toward wildlife and its conservation is usually linked to high WTP for the implementation of conservation programs [27,29,38–41], especially for likable species such as birds [35,42–45].

Knowledge is a collection of facts, information, and experience that someone attains, maintains, and utilizes via complex cognitive processes, such as belief, perception, communication, association, and reasoning [46]. Knowledge is known to positively affect people's tolerance and attitudes toward wildlife [47,48]. Increased knowledge about the biology, ecology, and ecological significance of wildlife species led to increased support and WTP for the conservation of South African biodiversity [49]. Gender, age, education, income, and pet ownership are among the sociodemographic characteristics most often reported to affect attitudes toward wildlife and WTP for their conservation. Young people, those with high education, and females are usually more willing to pay for the conservation of wildlife species than old people, those with low education, and males [27–29,34,42,45,50,51]. Young individuals and those with high education have better access to information and are therefore better informed about wildlife-related issues. Females show greater empathy and concern about their children, other people, and living organisms in general, which leads to positive attitudes and support for their conservation [12,52]. People with higher available income will often be more willing to contribute to the conservation of wildlife species [27–29,32,34,35,42,43,45,51,53]. Pet owners often extend their love and interest toward all animals, both domestic and wild, and are more supportive and willing to pay for their conservation [32,51].

### 1.3. Aims of the Study

The endemic duck populations are threatened throughout their distribution. These populations, as well as many waterfowl species, are dwindling primarily because their wetland habitats are among the most threatened in the world, due to their high fertility and occurrence in flat lowlands [14,54]. As a result, more than 87% of wetlands have been converted to farmland and cities since the beginning of the 18th century worldwide [55]. These conditions call for immediate action for the protection of vulnerable waterfowl populations. Wildlife conservation programs in the Philippines are funded by various entities, ranging from international and local organizations to national government agencies. International and local organizations such as the World Wide Fund for Nature—Philippines (WWF-Philippines), the ASEAN Centre for Biodiversity, Conservation International—Philippines, the Wildlife Conservation Society, the United States Agency for International Development (USAID), the Haribon Foundation, and the Philippine Biodiversity Conservation Foundation often provide financial assistance for wildlife conservation projects in the country. These international organizations, through their funding, collaborate with the Philippine government and local communities to protect key species, capacitate locals, and restore habitats. The Philippine government, specifically the Department of Environment and Natural Resources (DENR)—Biodiversity Management Bureau (BMB), is the primary agency that, through the funding of the national government, focusses on formulating and recommending policies and programs for the conservation of wildlife species. Local contributions such as from the Local Government Units (LGUs) and Indigenous Peoples (IPs)

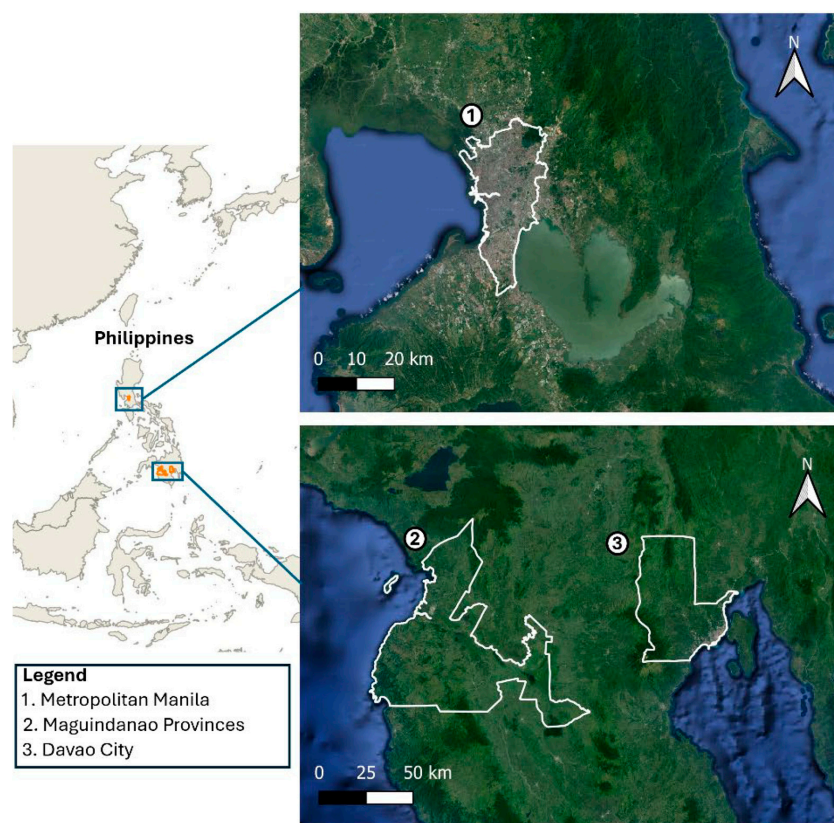
often contribute to wildlife conservation management through their respective sustainable resource management and ecotourism programs [56–58]. Despite these funding sources, it is still a challenge to secure long-term funding sources intended for wildlife conservation programs in the country [59–61].

In the Bangsamoro Autonomous Region in the Muslim Mindanao Island (BARMM), the distribution of the duck is fragmented and, although threatened, they are not well known [13,62]. Successful conservation management requires sufficient funding, and governmental bodies rely on taxation for fund acquisition. These funds will be used for implementing conservation strategies to mitigate threats to duck populations, such as illegal hunting and wetland loss. It is critical to examine the public's attitudes toward the duck and their ability and willingness to contribute to the implementation of conservation management plans. The CVM was selected as the suitable research vehicle to achieve these aims. The objectives of this study were therefore to (1) estimate the WTP for duck conservation and (2) assess how conservation attitudes toward the duck, knowledge about the duck, and sociodemographic characteristics (gender, age, education, income, pet ownership) affect WTP for duck conservation.

## 2. Materials and Methods

### 2.1. Study Area

The study was carried out in Maguindanao del Norte and Maguindanao del Sur provinces in BARMM, Mindanao Island, the Philippines (Figure 1). The area is mostly rural and agriculture is the most common source of livelihood of the residents. The study area has a population of 1,342,719 people belonging to 223,832 households and a GDP per capita of USD 983.85 [63]. The most notable populations of the duck in Maguindanao provinces occur in Ligawasan marsh [62] and Timako Hill in Cotabato City [13]. Although considered a vulnerable species, the duck's population size in these provinces is yet to be determined.



**Figure 1.** Map showing the Maguindanao Provinces in Mindanao Island, Philippines (2), where the survey was conducted. The major urban centers Metropolitan Manila (1) and Davao City (3) are also shown.

## 2.2. Sampling Procedure

Face-to-face interviews were conducted with residents, at least 18 years old, of Maguindanao del Norte and Maguindanao del Sur from September to December 2023. The sampling was conducted during the daytime (8:00 to 15:00 h) in areas that were accessible and safe to the researchers. Every third person who walked past the researchers (K.J.D.J. and J.P.A.C.) was asked to participate in the survey [64]. The confidentiality of their answers and other related ethical issues were explained to the respondents. It took an average of 40 min for the participants to finish the survey.

## 2.3. Survey Questionnaire Design

The questionnaire contained three parts. The first part included questions about sociodemographic characteristics (Tables 1 and S1). Survey participants were asked about their annual household income (in Philippine pesos, PHP; converted to USD in this study), age (in years), gender (male, female, non-binary), level of education (lower or higher), and pet ownership (yes or no).

**Table 1.** Variables used in the willingness to pay (WTP) analysis for the conservation of the Philippine duck.

Variable	Definition	Mean	SD	Min	Max
Conservation attitude	Conservation attitude dimension from exploratory factor analysis.	4.208	0.409	1	5
Knowledge about the Philippine duck	Knowledge dimension from exploratory factor analysis.	3.539	0.734	1	5
Age	Years of age.	35.606	11.643	19	87
Gender	1 if the participant is a man.	0.512	0.500	0	1
Level of education	0 if lower, 1 if higher.	0.602	0.490	0	1
Income	Annual household income (USD × 1000).	2.650	2.030	0.640	17.140
Pet ownership	1 if the participant owns a pet, 0 if the participant does not own a pet.	0.652	0.477	0	1

The second part included 7 statements concerning attitudes toward and knowledge about the duck (Table S1). Participants were asked to rate how much they agreed or disagreed with each attitude and knowledge statement, on a 5-point scale (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, 5 = strongly agree). Knowledge statements “Philippine ducks are herbivores” and “The Philippine duck is found only in Maguindanao provinces” were reverse coded so that the highest rating (“5”) corresponded to the correct answer.

The third part of the questionnaire included the WTP model, following the multiple-bounded format with polychotomous choice options. First, participants were informed about the conservation issue: “The Philippine duck is found only in the Philippines. Its populations are threatened, mainly from the drainage of wetlands and mangroves. Therefore, support of a governmental program for the conservation of the Philippine duck and its habitats, by paying a household tax annually for the next five years, would be required.” Then, a range of amounts was offered, selected based on the socioeconomic status in the Philippines and relevant research: USD 0.018, USD 0.089, USD 0.18, USD 0.36, USD 0.71, USD 1.43, USD 2.68, USD 5.36, and USD 8.93 (PHP 1 = USD 0.018 in 2023 values) [27–29,65,66]. Participants were asked to rate how certain they were about paying each of the offered amounts, with possible answers being “definitely yes”, “probably yes”, “not sure”, “probably no” or “definitely no”.

#### 2.4. The Econometric Model

The multi-bounded discrete choice data were analyzed with the interval model [31]. We followed the “probably yes” approach, with “definitely yes” and “probably yes” recorded as “yes”, and “not sure”, “probably no”, and “definitely no” recorded as “no”. In doing so, the data were transformed to and treated as double-bounded discrete choice data [65,67]. Following the interval model, the respondent’s WTP is bounded by an interval, with the lowest bound being the highest bid the participants accept ( $t^1$ ) and the highest bound being the lowest bid that they do not accept ( $t^2$ ) [31,68,69]. The probability that an individual answers yes to the first question and no to the second question ( $\text{Pr}(y,n)$ ) is given by Equation (4) in Lopez-Feldman’s study [69]. The probability that an individual answers yes to both questions ( $\text{Pr}(y,y)$ ) is given by Equation (5), while the probability that an individual answers no ( $\text{Pr}(n,n)$ ) to both questions is given by Equation (7) in Lopez-Feldman’s study [69].

The parameters of the WTP function:

$$\text{WTP} = X_i\beta + \varepsilon_i \quad (1)$$

where  $i$  denotes the individual,  $\beta$  is a vector of parameters to be estimated,  $X$  is the explanatory variables (individual values, mean values, or group values, e.g., males, pet owners, can be used), and  $\varepsilon_i$  is random error terms. The parameters of the WTP function are estimated by maximizing the log-likelihood function (Equation (8) in Lopez-Feldman’s study [69]).

#### 2.5. Data Analysis

The underlying attitude constructs, based on the 7 attitude statements, were determined after reliability and exploratory factor analysis performed with SPSS Statistics, version 21.0 [70]. A multi-item construct was considered reliable and consistent when Cronbach’s alpha exceeded 0.7 [71].

Predictor variables were included in the econometric interval regression model after checking for multicollinearity. A variance inflation factor (VIF) lower than 5 and Spearman rank correlation ( $r_s$ ) lower than 0.7 were used as inclusion criteria [72]. VIFs were calculated using the function `vifstep` of the `usdm` R package [73] and correlations using the function `cor.test` of the `ggpubr` R package [74]. All predictor variables were retained in the model because all VIFs were  $<1.3$  and pairwise correlations were  $<0.48$ .

The interval regression model was fitted with the function `doubleb` of the Stata Release 15 statistical software [69,75], which directly estimates the parameters  $\beta$  and  $\sigma$  of maximum likelihood and WTP functions.

### 3. Results

#### 3.1. Sample Characteristics

A total of 500 responses were collected from 554 residents (89.2% response rate). The total population of the study area is 1,342,178, of which 51.1% are males and 48.9% are females, and the age ratios for the 18–34, 35–54, and 55–80 age categories are 58.8%/32.5%/8.7%, respectively. In our sample, the ratios for gender (male/female) and age categories (18–34, 35–54, 55–80) are 50.2%/48.8% and 58%/32.8%/9.2%, respectively. We used the Philippine data to describe the level of education since no accurate data regarding the level of education are available in the Maguindanao provinces. The lower and higher level of education in the country is 73.4%/26.6% while it was 39.8%/60.2% in our study [76]. The sample’s gender ( $\chi^2 = 0.072$ ,  $df = 1$ ,  $p = 0.754$ ) and age categories ( $\chi^2 = 0.239$ ,  $df = 2$ ,  $p = 0.887$ ) were not significantly different from the population of the study area. The sample’s educational level categories were significantly different from the population of the study area ( $\chi^2 = 287.204$ ,  $df = 1$ ,  $p < 0.001$ ).

### 3.2. Attitudes and Knowledge

The great majority of the survey participants held positive attitudes toward the duck (Table 2). Of them, 91.0% agreed and 8.8% strongly agreed that the ducks are attractive, 81.0% agreed and 18.8% strongly agreed that greater attention should be given to their conservation, 77.2% agreed and 19.6% strongly agreed that ducks positively affect the environment, 64.6% agreed and 34.6% strongly agreed that they are valuable to people, and 72.6% agreed and 27.4% strongly agreed that duck habitats should be protected. The participants' knowledge about the duck was above average, with 59.4% agreeing and 6.0% strongly agreeing that they are not herbivores and 50.4% agreeing and 5.6% strongly agreeing that they are not found only in Maguindanao, while 21.8% and 35.4% of the participants did not express an opinion, respectively.

**Table 2.** Results of principal component factor analysis of survey participants' ( $n = 500$ ) attitudes toward the Philippine duck. Descriptive statistics, factor loadings, factor eigenvalues, % variance explained, and factor reliability are given. Factor loadings in bold denote factor membership.

Statements	Mean <sup>a</sup>	SD	Conservation	Knowledge
I find the Philippine Duck attractive.	4.086	0.288	<b>0.675</b>	−0.068
Greater attention should be given to the conservation of the Philippine duck.	4.186	0.395	<b>0.797</b>	−0.147
Philippine ducks have positive effects on the environment.	4.156	0.482	<b>0.673</b>	0.070
The Philippine duck is valuable to people.	4.338	0.490	<b>0.741</b>	0.039
Philippine duck habitats should be protected.	4.274	0.446	<b>0.817</b>	0.136
Philippine ducks are herbivores. <sup>b</sup>	3.550	0.877	0.067	<b>0.831</b>
The Philippine duck is found only in Maguindanao provinces. <sup>b</sup>	3.528	0.736	−0.053	<b>0.864</b>
Eigenvalue			2.769	1.489
% Variance explained			39.562	21.264
Cronbach's alpha			0.787	0.722

<sup>a</sup> Range: 1 (strongly disagree)—5 (strongly agree); <sup>b</sup> reverse coded.

Exploratory factor analysis determined two factors based on the criterion of eigenvalues greater than 1, which explained 60.8% of the total variance (Table 2). The first, five-statement "conservation" factor (mean score  $4.208 \pm 0.409$  SD), with an eigenvalue of 2.8 and accounting for 39.6% of the common variance, showed that participants held highly positive attitudes toward the conservation of the duck and its habitats. The second, two-statement "knowledge" factor ( $3.539 \pm 0.734$ ), with an eigenvalue of 1.5 and accounting for 21.3% of the common variance, revealed medium to high knowledge about the diet and distribution of the duck among the participants. Construct reliability was above the 0.7 threshold for both factors (conservation: 0.787; knowledge: 0.722). These factors were used in subsequent analyses.

Pet owners held more positive conservation attitudes than non-pet owners ( $p < 0.001$ ; Table 3). Males and pet owners had more knowledge about the duck than females ( $p = 0.044$ ) and non-pet owners ( $p < 0.001$ ). Younger participants held more positive conservation attitudes toward the duck than older participants ( $r_s = -0.182$ ,  $p < 0.001$ ). Participants with higher income had more knowledge about the duck than participants with lower income ( $r_s = 0.150$ ,  $p = 0.001$ ).

**Table 3.** Differences in sociodemographic categories in attitudes toward and knowledge about the Philippine duck. Means, standard deviations and *t* and *p* values are given. *p* values in italics denote significance (*p* < 0.05).

Mean	SD	<i>t</i> <sub>498</sub>	<i>p</i>
Conservation attitude <sup>a</sup>			
Gender			
Male 4.196 ± 0.421	Female 4.220 ± 0.397	-0.677	0.499
Level of education			
Higher 4.229 ± 0.393	Lower 4.175 ± 0.431	1.441	0.150
Pet ownership			
Pet owner 4.272 ± 0.421	Non-pet owner 4.089 ± 0.357	4.865	<0.001
Knowledge <sup>a</sup>			
Gender			
Male 3.604 ± 0.738	Female 3.471 ± 0.724	2.021	0.044
Level of education			
Higher 3.563 ± 0.751	Lower 3.503 ± 0.706	0.904	0.366
Pet ownership			
Pet owner 3.643 ± 0.716	Non-pet owner 3.346 ± 0.729	4.403	<0.001

<sup>a</sup> Range: 1 (strongly disagree)—5 (strongly agree).

### 3.3. WTP for Philippine Duck Conservation

A mean annual WTP of USD 0.60 ± 0.037 SE (95% CI: 0.52/0.67) was estimated. Based on the mean WTP and the number of households in the study area, the total annual amount that could be collected for the conservation of the duck was estimated at USD 133,896 (95% CI: 117,501/150,328).

Participants who held more positive conservation attitudes toward (*p* < 0.001) and knew more about the duck (*p* < 0.001) pledged a higher WTP for its conservation than participants with more negative attitudes and lower knowledge (Table 4). Females (*p* = 0.001), pet owners (*p* = 0.020), and those with higher income (*p* = 0.002) pledged a higher WTP than males, non-pet owners, and those with lower income.

**Table 4.** Results of the interval regression willingness to pay model (*n* = 500). *p* values in italics denote significance (*p* < 0.05).

	Coefficient	SE	<i>z</i>	<i>p</i> > <i>z</i>	95% CI
Intercept	-93.277	25.424	-3.670	<0.001	-143.108/-43.447
Conservation attitude	18.260	5.347	3.410	<0.001	7.780/28.740
Knowledge	14.976	2.936	5.100	<0.001	9.220/20.731
Age	-0.194	0.191	-1.02	0.310	-0.568/0.180
Gender (Male)	-14.470	4.248	-3.410	0.001	-22.796/-6.144
Level of education (Higher)	-8.644	4.730	-1.830	0.068	-17.915/0.627
Income	0.00006	0.00002	3.060	0.002	0.00002/0.00010
Pet ownership (Yes)	10.732	4.595	2.340	0.020	1.726/19.738
Sigma	46.513	1.544			
-LogLik	1298.564				
Wald $\chi^2_7$	86.520				
<i>p</i> > $\chi^2_7$	<0.001				



## 4. Discussion

### 4.1. The Value of Philippine Duck Conservation

Survey participants expressed a willingness to contribute a seemingly small amount annually for the conservation of the endemic threatened duck. However, a substantial amount of money could be collected if the mean WTP is projected to the population. The funds needed for the implementation of suitable conservation actions are not known. But those funds predicted by the proposed public taxation scheme will be critical for the protection of the duck populations if used for local interventions by the Local Government Units of the Maguindanao provinces.

The mean WTP estimated for the conservation of the duck falls within the range reported for other bird species (Table 5). The mean WTP was similar to the duck's, after correcting for inflation and GDP per capita, for the conservation of the golden-cheeked warbler (*Setophaga chrysoparia*) in the U.S.A. [77], northern pintail in the U.S.A. [33], Elliot's pheasant (*Syrnaticus ellioti*) in China [50], greenfinch (*Chloris chloris*) in Germany [44], and brown kiwi (*Apteryx mantelli*) in New Zealand [78]. Higher WTP than for the duck has been reported for the conservation of birds in Australia [79], white stork in Israel and Poland [34], white-rumped vulture (*Gyps bengalensis*) in Nepal [42], and Philippine eagle in the Philippines [12]. Lower WTP than for the duck has been reported for the conservation of forest birds in the U.S.A. [45], northern pintail in Canada [33], corncrake (*Crex crex*) in Ireland [80], and house finch (*Haemorhous mexicanus*) in the U.S.A. [44].

**Table 5.** WTP for the conservation of various bird taxa. USD and GDP per capita values correspond to the study year and are given in 2015 USD.

Taxon	Mean WTP (USD)	GDP per Capita (USD) <sup>a</sup>	WTP/GDP ×1000	Year of Study	Country	Source
Philippine eagle <i>Pithechophaga jefferyi</i>	4.33	818.37	5.29	2005	The Philippines <sup>b</sup>	[12]
White-rumped vulture <i>Gyps bengalensis</i>	1.98	589.8	3.36	2004	Nepal	[42]
White stork <i>Ciconia ciconia</i>	46.51	14,408.4	3.23	2018	Poland	[34]
Philippine eagle <i>Pithechophaga jefferyi</i>	5.66	2484.83	2.28	2005	The Philippines <sup>c</sup>	[12]
White stork <i>Ciconia ciconia</i>	76.23	38,744.2	1.97	2018	Israel	[34]
Birds	42.25	54,114.7	0.78	2011	Australia	[79]
Northern pintail <i>Anas acuta</i>	7.52	10,161.4	0.74	2016	Mexico	[33]
Bush falcon <i>Falco novaeseelandiae</i>	24.89	35,374.9	0.70	2010	New Zealand	[78]
Black-faced spoonbill <i>Platalea minor</i>	32.77	47,924.2	0.68	2005	Macao SAR	[32]
Red-crowned crane <i>Grus japonensis</i>	5.11	7532.8	0.68	2014	China	[35]
Brown kiwi <i>Apteryx mantelli</i>	22.17	35,374.9	0.63	2010	New Zealand	[78]
Greenfinch <i>Chloris chloris</i>	22.05	36,190.4	0.61	2009	Germany	[44]
Elliot's pheasant <i>Syrnaticus ellioti</i>	6.76	11,223.3	0.60	2021	China	[50]
Philippine duck <i>Anas luzonica</i>	0.47	859.1	0.55	2023	The Philippines <sup>d</sup>	This study
Northern pintail <i>Anas acuta</i>	28.11	57,292.5	0.49	2016	U.S.A.	[33]
Golden-cheeked warbler <i>Setophaga chrysoparia</i>	24.62	54,830.8	0.45	2013	U.S.A.	[77]
Griffon vulture <i>Gyps fulvus</i>	12.07	28,836.5	0.42	2003	Israel	[43]
Migratory birds	13.53	40,785.1	0.33	2003	The Netherlands	[81]
House finch <i>Haemorhous mexicanus</i>	17.39	53,854.2	0.32	2008	U.S.A.	[44]
Corncrake <i>Crex crex</i>	15.99	50,838.1	0.31	2006	Ireland	[80]
Northern pintail <i>Anas acuta</i>	11.49	43,536.9	0.26	2016	Canada	[33]
Forest birds	9.58	62,789.1	0.15	2022	U.S.A.	[45]

<sup>a</sup> Source: Country search in World Bank website [82]; <sup>b</sup> GDP per capita refers to Davao Region, the third wealthiest in the Philippines [63]; <sup>c</sup> GDP per capita refers to the Manila Metro area, the wealthiest in the Philippines [63];

<sup>d</sup> GDP per capita refers to the study area, the poorest in the Philippines [63].

It is not easy to explain the differences and similarities in WTP among different species and locations. Many factors are shaping people's preferences for species conservation, such as attitudes, emotions, knowledge about a species, its conservation status, being charismatic or not, social and cultural norms, and beliefs [9,25,47]. Jacobsen and Hanley [53] examined the effects of income and GDP per capita on WTP in a global meta-analysis of economic valuation of wildlife conservation studies. They found that income and GDP per capita were positively associated with WTP for wildlife conservation, with GDP per capita being as good a predictor of WTP as income. Their main conclusion was that the demand for wildlife conservation rises with the wealth of a nation. The WTP for the conservation of the Philippine eagle was several magnitudes higher than the WTP for the conservation of the duck ([12]; Table 5). The Philippine study was carried out in the Metro Manila area and Davao region, which are among the wealthiest parts of the Philippines, with Manila Metro having the highest GDP per capita and Davao the third highest [63]. In contrast, BARMM, where the Maguindanao provinces are found, is the poorest area in the Philippines, having the lowest GDP per capita [63]. Residents with low income may prioritize their own basic needs such as shelter, healthcare, and food before allocating funds for non-essential needs, such as contribution to wildlife conservation [83,84]. This may be an explanation for the low WTP for duck conservation in the study area. Further, the Philippine eagle has been recognized as the national bird in the country and as such has received high publicity and is highly valued by the residents [85]. This most likely induces further support for conserving this iconic predator [86].

#### 4.2. Effects of Attitudes, Knowledge, and Sociodemographics

Survey participants expressed highly positive attitudes toward the duck. They considered the species attractive and valuable and supported its conservation. WTP increased with improving attitudes toward the duck among the participants. Positive attitudes toward a wildlife species have been strongly linked with support for its conservation [25,46]. This support is most often translated into willingness to pay for the conservation of species that are viewed positively by the public [27,29]. Also, birds are among the most attractive and likable animal taxa, along with mammals [25,87,88]. People with greater conservation attitudes toward birds stated a higher WTP for the conservation of the white-rumped vulture in Nepal [42], white stork in Poland [34], songbirds in the U.S.A. [44], red-crowned crane in China [35], and forest birds in the U.S.A. [45].

Participants had good knowledge about aspects of the duck's life history, and WTP increased with increasing knowledge. Knowledge about the ecology, biology, and ecological and social value of wildlife has been linked to positive attitudes toward species and nature [29,49,51]. Børresen et al. [89] examined the effect of knowledge on the attitudes of students in Tanzania toward wildlife. They found an increased environmental awareness of students after the education program and concluded that such programs can be important tools in conservation biology. Increased knowledge about a species has been reported to positively influence WTP for the conservation of bird species such as the white stork in Israel and Poland [34] and forest birds in the U.S.A. [45].

Females were more willing to pay for the conservation of the duck than males. Previous studies most often report that females express more positive attitudes toward animals, are more pro-conservationist, and tend to state higher WTP than males [27–29,33,51]. These trends in gender behavior can be explained by the gender socialization theory [52]. According to this theory, women see the world with empathy and care (the “ethic of care” [90]), learning early in their lives to be responsible, caring, unaggressive, and compassionate. On the other hand, men learn to be fair, logical, assertive, and competitive. Therefore, it was expected that females would be more willing to pay for wildlife conservation, a trend reported for bird species such as the griffon vulture (*Gyps fulvus*) in Israel [43], forest birds in the U.S.A. [45], and Elliot's pheasant in China [50]. In contrast, Baral et al. [42] found that males were more willing to pay than females for the conservation of the white-rumped vulture in Nepal. White-rumped vultures are depicted negatively in Nepalese culture,

considered harbingers of death or evil spirits, and knowledge about their endangered status is lacking among the local people [42]. In this study, the duck was positively perceived by the participants. In addition, females were more knowledgeable about aspects of the duck's life history than males. These differences between Nepalese people and Filipinos might explain the gender differences in WTP.

Pet owners pledged a higher WTP for duck conservation than non-pet owners. Pet owners are interested in their animals and they are also more likely to have an interest in other animals and nature [51,91]. Pet owners adopt positive attitudes toward wildlife and are more likely to seek and retrieve information about them. In agreement with these findings, Filipino pet owners expressed more positive attitudes toward the duck and knew more about the duck's habits than non-pet owners. Jin et al. [32] also reported that pet owners stated higher WTP for the conservation of the black-faced spoonbill than non-pet owners.

Income was positively associated with WTP for duck conservation. According to economic principles, the value of conservation can be categorized as "normal", when WTP increases with income, "inferior", when WTP decreases with income, or "inelastic", when the elasticity of demand is zero [92]. Therefore, duck conservation had a normal value. Conservation also had a normal value for the white-rumped vulture in Nepal [42], the white stork in Poland and Israel [34], the red-crowned crane in China [35], the black-faced spoonbill in Macao SAR [32], and forest birds in the U.S.A. [45].

#### 4.3. Methodological Considerations

The sample was representative of the population of Maguindanao provinces in terms of gender and age but not of education level. Therefore, the findings could be projected to the population, considering the differences in educational level. Inter-observer bias was not assessed. However, the two researchers who carried out the survey received similar training and had similar experience. Therefore, we can assume that inter-observer bias was minimal.

The methodological biases of the WTP were minimized during the survey. Anonymity was maintained at all stages of the survey, while participants completed the questionnaire by themselves [64]. Participants should be aware of the conservation issue to make informed decisions; thus, framing bias was purposely introduced to the methodology by framing the WTP question. The methodology also suffers hypothetical bias [23]. A hypothetical WTP was pledged by the participants, an overestimate of the true WTP by an average of 21% [93].

#### 4.4. Conservation and Management Implications

The poor local people rely on ducks for food and compete with them for habitat. However, they were largely positive toward and willing to contribute to their conservation. Filipino policymakers have considered the enforcement of legislation on impoverished populations as both unethical and ineffective and argued that wildlife conservation will be both ethical and effective only if economic incentives are provided to those affected by conservation actions [94,95]. Ziegler et al. [96] reported positive changes in the attitudes and behaviors toward whale sharks (*Rhincodon typus*) and their conservation among workers in small-scale ecotourism in the Philippines.

Public funds should be used by the Local Government Units of the BARMM governments to design and implement programs for the monitoring and protection of the duck's critical habitats, such as the Ligawasan marsh, an area of 2200 km<sup>2</sup>, spanning the provinces of Cotabato, Maguindanao and Sultan Kudarat [62] and Timako Hill in Cotabato City [13]. Local people should be involved in research and conservation activities. The use of remuneration will return a portion of the donated funds to society, increase support for duck conservation and trust among stakeholders, and further support local revenue [97].

Attitudes toward the duck were very positive, while knowledge about the species was good. Research has shown that further improving attitudes and knowledge would further

increase support and WTP for the conservation of the duck [35,42,89]; therefore, education and outreach programs should primarily target those people with negative attitudes toward and low knowledge about the duck. Communication, education, and public awareness campaigns improved attitudes toward and support for the conservation of the Philippine crocodile (*Crocodylus mindorensis*) in the Philippines [98]. Campaigns aiming to create a sense of pride for the occurrence of this rare and iconic, although fearsome, species were successful, suggesting that pride is an important incentive for people to support the conservation of this reptile [99].

## 5. Conclusions

The mean annual WTP of USD 0.60 that survey participants pledged for the conservation of the duck is sizable, considering the income constraints of the local population, being the poorest in the Philippines [63]. This finding suggested that participants were generally supportive of the conservation of the imperiled population of this waterfowl species. Participants with positive conservation attitudes toward the duck and high knowledge about the duck, as well as young people, females, pet owners, and participants with high income, pledged the highest WTP for the conservation of the duck. Further research using threat and stakeholder analysis will allow for more insights into the issue [100–102]. The conservation value of the duck among stakeholder groups that are more likely to encounter and interact with ducks, such as farmers, hunters, and outdoor recreationists, should also be examined. Findings from this study will be valuable to wildlife managers for designing and implementing tailored education and outreach programs for improving attitudes toward the duck, knowledge about the duck, and ultimately support for the conservation of the duck. Securing required funds and support for conservation strategies is critical for the survival of this charismatic but vulnerable waterfowl [5,9,103].

**Supplementary Materials:** The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/d16100602/s1>, Table S1: Raw data.

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**Institutional Review Board Statement:** The study was conducted in accordance with the Declaration of Helsinki and complied with the ethical standards designed by the Ethics Research Committee of the Office of the Vice Chancellor for Research and Extension (OVCRE), Mindanao State University (MSU), Maguindanao, Philippines. As per a review of the Ethics Research Committee of MSU, this study was deemed to cause no more than minimal risk (OVCRE-ERC form No. 03).

**Informed Consent Statement:** We sought informed consent from all the participants and maintained anonymity at all the stages of the research.

**Data Availability Statement:** The data presented in this study are available on reasonable request from the corresponding author.

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