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Economic Valuation of Northern White-Breasted Hedgehog Conservation

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Abstract: The northern white-breasted hedgehog (*Erinaceus roumanicus*) is a charismatic insectivore mammal threatened by habitat loss, the use of biocides, and collisions with vehicles. We aimed at valorizing hedgehog conservation through the contingent valuation method for estimating the proportion and the amount of willingness to pay (WTP) and the effects of cognitions and sociodemographic characteristics on WTP. We collected data through interviews with 704 residents of four administrative regions of northern Greece. Binary logistic regression and Welsh–Poe interval regression were used for estimating the effects of predictors on the proportion and mean WTP, respectively. Most participants (58.2%) were WTP a mean of EUR 31.7 for hedgehog conservation, totaling EUR 21.9 million annually when projected to the population. Positive attitudes, mutualism wildlife orientations, intention to participate in hedgehog conservation actions, and participation in consumptive and non-consumptive wildlife-related recreational activities increased WTP. Highly educated females, with high income and a pet were more WTP than less educated males, with low income and without a pet. Findings provided necessary information to managers about the value of hedgehog conservation, the potential for raising required funds and the differences in WTP among and within public groups.

Keywords: mammals; wildlife value orientations; stated preference; random utility; econometric model; Erinaceidae

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1. Introduction

The northern white-breasted hedgehog (*Erinaceus roumanicus*), hereafter hedgehog, is a small (<1.5 kg), insectivorous mammal found throughout central and eastern Europe, expanding east to Siberia [1–6]. It is one of the 13 species of the order Eulipotyphla (former Insectivora) found in Greece [7]. The hedgehog is found in most of Greece, except from the island of Rhodes where the southern white-breasted hedgehog (*E. concolor*) does exist. Hedgehogs live in a variety of habitats, such as farmland, parks and gardens in rural and urban areas, scrubby habitats at the edge of forests, and shrubby vegetation [8]. Road mortality due to collisions with vehicles is considered the most serious threat to hedgehog populations, due to their attraction to urban and suburban areas [8–11]. Habitat loss and fragmentation, and the application of pesticides due to the intensification of agriculture and the expansion of urban areas also threaten the species [12–15]. Although fairly common in Greece, hedgehogs are seriously affected locally by these threats. Therefore, the hedgehog is protected in Greece under the Presidential Decree no 67/1981 "On the protection of native Flora and Fauna and establishing a coordination and control procedure for Research on them". It is also listed as a protected species (Appendix III) in the Bern Convention on the Conservation of European Wildlife and Natural Habitats. Hedgehogs are considered a farmer's friend due to their insect consumption, including agricultural pests [8]. They are also among the most likeable and desirable species due to their cuddly appearance and their body-curling behavior [16,17]. The support and participation of the public to conservation actions and the securing of necessary funds are prerequisites of successful

wildlife conservation management [18,19]. Therefore, knowledge about the public attitudes toward and intention to support and fund hedgehog conservation programs are necessary for informing their successful application.

It is not easy to put a direct economic value on animal species and their conservation, because they are non-market goods, meaning that there is not a market where they can be traded. However, the economic valuation of wildlife conservation is a powerful tool for designing and implementing fundraising and conservation actions. Therefore, economists have tried to overcome this issue by using a practical approach for valuing non-market goods, the contingent valuation method, through the application of questionnaire surveys to determine willingness to pay (WTP) by creating a hypothetical market [20,21]. As such, the contingent valuation method can yield important information on the availability of public funds for wildlife conservation [20]. It can also infer public preferences and allows for assessing the effects of various cognitive, affective, and environmental factors on WTP. Therefore, the contingent valuation method is commonly used for determining the WTP for wildlife conservation (e.g., [22–34]), and several such studies have been carried out in Greece, concerning the Mediterranean monk seal (*Monachus monachus*) [35–37], the loggerhead sea turtle (*Caretta caretta*) [38,39], the Balkan chamois (*Rupicapra rupicapra balkanica*) [40], and bats [41].

Values form the basis of the cognitive hierarchy, are generally few, common in all members of society, difficult to change. They are defined according to Rokeach [42] as "an enduring belief that a specific mode of conduct or end state of existence is personally or socially preferable to an opposite or converse mode of conduct or end state of existence" (p. 5). Basic beliefs reflect our thoughts about general classes of objects (e.g., wildlife, ecosystems) and give meaning to the more abstract values. Wildlife value orientations are networks of basic beliefs that shape the more general values and provide contextual meaning to those values in relation to wildlife [19,42,43]. They were used by Fulton et al. [44] to develop an instrument for measuring basic beliefs relating to human–wildlife interactions. Following this research, Manfredo et al. [43] determined two basic wildlife value orientations: domination and mutualism. Domination refers to giving priority to human well-being over wildlife and using wildlife for human benefit. Mutualism refers to viewing wildlife as part of one's community and as deserving of rights and care as humans. Wildlife value orientations have proved important predictors of public attitudes and behaviors toward wildlife, with those who are more mutualist being more positive toward and supportive of wildlife conservation than those who are more dominionistic [19,43,45–47].

Fazio et al. [48] defined attitude as "an association, in memory, of an evaluation with an object" (p. 341). Attitude is the most commonly used concept in human dimensions research because it can directly predict behavioral intentions and behaviors [49]. Attitudes toward wildlife have been found important in predicting support for wildlife conservation. More specifically, those who have positive attitudes toward wildlife in general and a certain species in particular are usually proponents of wildlife conservation [18,50–53]. Wildlife-related consumptive (engaging with, e.g., hunting and fishing) and non-consumptive (engaging with, e.g., wildlife-watching and photography) recreationists are usually interested in and involved with wildlife conservation [54]. Hunters have greater knowledge about wildlife species, both game and non-game, which is a proxy of positive attitude [55] and often participate in wildlife conservation actions for both game and non-game species [56,57]. Age, gender, income, educational level, and pet ownership are among the sociodemographic factors most often reported as important predictors of the support and WTP for wildlife conservation. Young, educated females with high income and owning a pet are generally more supportive and WTP for wildlife conservation [17,18,32,40,41,51,58].

The study's aim was to valorize hedgehog conservation in Greece through the application of the contingent valuation method. Findings would provide managing authorities with necessary information about the value of the species' conservation for the public, the

funds that could be potentially raised, and the differences among and within certain public groups. Based on the aim, the study's objectives were:

- To estimate the proportion of the Greek public that would be WTP for hedgehog conservation.
- To estimate the amount of WTP for hedgehog conservation.
- To evaluate the effects of predictors such as cognitions (wildlife value orientations, attitudes toward hedgehogs, participation in actions for the conservation of hedgehogs and wildlife-related recreation) and sociodemographic characteristics (age, gender, income, educational level, pet ownership) on the proportion and the amount of WTP.

2. Materials and Methods

2.1. Sample Collection

The study was carried out in four administrative regions of north Greece: Epirus, Western Macedonia, Central Macedonia, Eastern Macedonia and Thrace (Figure 1), with a population of about 3,110,000 inhabitants in 1,183,010 households [59]. Although hedgehogs are found throughout most of Greece, we chose areas closer to our department (Drama, Western Macedonia) for logistical reasons. Data were collected through on-site face-to-face questionnaire surveys, between April and June 2019. A pretest of the survey (n = 30 random people) was conducted to test question clarity and completion time. During the main survey, cities, towns, and villages in all the regions, was visited during open market hours (9.00–15.00 and 17.00–21.00, from Monday to Saturday). People in most neighborhoods were surveyed, representing areas of different socioeconomic status. The researcher (D.C.) asked every fifth person passing in front of her to participate in the survey by reading and responding to questions in the questionnaire (respondent-completed survey; [60]). The researcher provided help to the respondent when necessary. In cases in which more than five persons had passed before the completion of a survey, the researcher asked the first person that she came across to participate. The participants needed about 45 min to complete the survey.

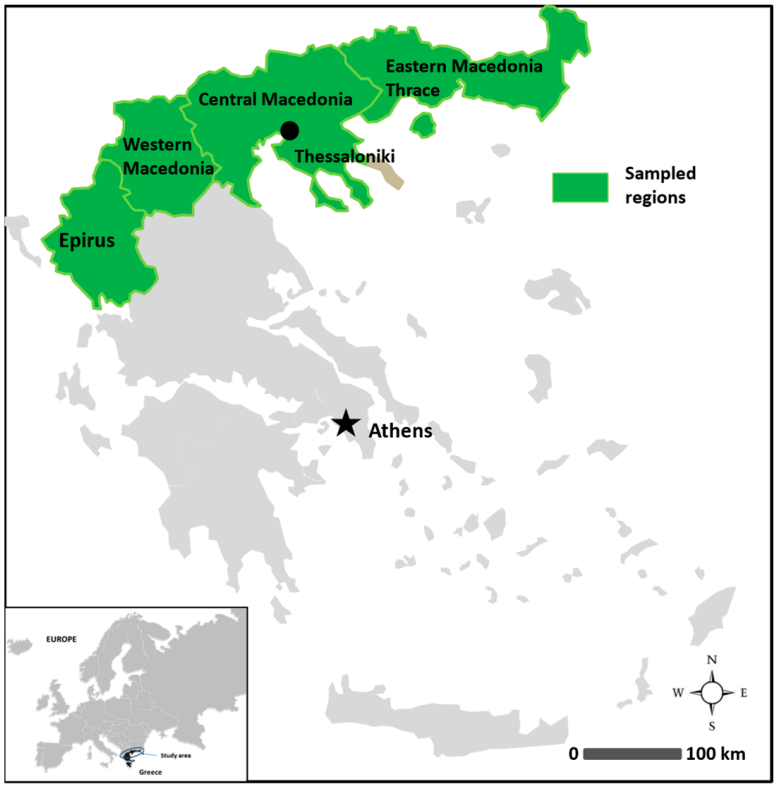

Figure 1. Map of the study area.

2.2. Questionnaire Development

In the first part of the questionnaire, the participants were asked about their willingness to pay for the conservation of hedgehogs. The contingent valuation method included two steps. Firstly, participants were asked: "Hedgehogs face several threats in your area. Would you contribute an annual tax for a period of five years to support a governmental management program for the conservation of hedgehogs?" The participants who accepted to contribute were then asked about the amount that they would like to contribute: "Please indicate how certain you are that you would like to contribute each of the nine amounts: EUR 1, EUR 5, EUR 10, EUR 20, EUR 40, EUR 80, EUR 150, EUR 300, and EUR 500." The levels of certainty were "definitely yes," "probably yes," "not sure," "probably no" or "definitely no". These amounts were selected after studying the relevant literature [61,62].

In the second part, sociodemographic characteristics were recorded and attitudes toward hedgehogs, the intention to participate in hedgehog conservation actions, and wildlife value orientations were assessed. All the participants were asked about sociodemographic characteristics, such as: gender (female or male), age (in years), educational level (recorded as higher: technical college and university; or lower: elementary and secondary), annual household income, and pet ownership. Then, participants were asked to rate each of eight attitude and six conservation actions on a 5-point scale (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, 5 = strongly agree). The two basic wildlife value orientations were assessed by 19 statements in total on a 7-point scale (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither, 5 = somewhat agree, 6 = agree, 7 = strongly agree). Participation in consumptive and non-consumptive use of nature was assessed by asking participants "How often do you:" a) hunt/fish, b) participate in recreation other than hunting and fishing (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often).

2.3. The Econometric Model

We used a binary logistic model to analyze the data from the first step of the contingent valuation method [21]. WTP for hedgehog conservation was the response variable and sociodemographic characteristics, wildlife value orientations, attitudes, and participation in conservation actions and consumptive and non-consumptive recreation were the predictors.

We used the Welsh–Poe interval model [63] to analyze the multiple-bounded data from the second step of the contingent valuation method (including only the participants who accepted to contribute to hedgehog conservation in the first step). We treated data following the "probably yes" implementation ("definitely yes" and "probably yes" were coded as "yes", and "not sure", "probably no", and "definitely no" were coded as "no"). This implementation gives results similar to other models (e.g., dichotomous choice, payment card, open-ended) [61]. After this treatment, data could be analyzed as double-bounded [62,63]. Let A^L be the highest "yes" bid that the participants accept and A^U the lowest "no" bid that the participants do not accept, then the maximum WTP is $A^L \leq \text{WTP} < A^U$. Assuming a distribution function F forWTP, the likelihood is [62–64]:

$$lnL = \sum_{i=1}^{N} [\ln(F(A^U) - F\left(A^L\right)] \quad (1)$$

Then, following a log-logistic distribution:

$$F\left(A^U\right) = \left(1 + e^{\delta X - \alpha \ln\left(A_i^U\right)}\right)^{-1} \quad (2)$$

and

$$F\left(A^L\right) = \left(1 + e^{\delta X - \alpha \ln\left(A_i^L\right)}\right)^{-1} \quad (3)$$

where X is the vector of covariates, and δ is the corresponding parameter vector. The parameter α corresponds to the bid and can be interpreted as the marginal utility of money. Mean WTP is then calculated as:

$$MWTP = e^{\frac{\delta X}{\alpha} + \left(\frac{\alpha^{-1}}{2}\right)^2} \quad (4)$$

2.4. Data Analysis

We assessed multicollinearity using the variance inflation factor (VIF < 5), performed by the function *vifstep* of the *usdm* R package [65], and Spearman correlation (r_s < 0.7), performed by the function *cor.test* of the *ggpubr* R package [66]. All VIFs were <2.180 and correlations < 0.586, so we retained all the predictors in the analyses.

Principal components factor analysis with varimax rotation, using the eigenvalue criterion of ≥1 for factor inclusion, was applied to attitude and conservation actions statements for assessing group (factor) membership. Confirmatory factor analysis was used to validate the two basic wildlife value orientations. Model fit was determined with five indicators: $\chi^2/\text{df} \leq 3$, with acceptable value comparative-fit index, CFI ≤ 0.95; goodness-of-fit index, GFI ≤ 0.90; normed-fit index, NFI ≤ 0.95; root mean-square residual, RMR ≤ 0.08 [67]. Cronbach's alpha was used to determine whether the statements included in the factors reliably measured the constructs, with $\alpha > 0.7$ being generally accepted [68].

The binary logistic regression was performed with the function *glm* (binomial distribution with logit link function) of the *stats* R package [69]. We estimated odds ratios with the *logitor* and marginal effects at the mean with the *logitmfx* functions of the *mfx* R package [70]. The Welsh–Poe interval model was fitted with a log-logistic distribution using the function *dbchoice* of the *DCchoice* R package [71]. Confidence intervals (95% CI) for the mean WTP were calculated with the nonparametric bootstrap method using the *bootCI* function.

Principal components factor analysis was performed with SPSS Statistics, and confirmatory factor analysis with SPSS Amos statistical software (version 21.0, IBM Corp., 2012). The econometric models (binary logistic and interval regressions) were performed in program R 4.0.2 [69]. Significance level was set at $\alpha = 0.05$.

3. Results

3.1. Sociodemographics

A total of 704 questionnaires were collected (86%response rate). The study area's population gender ratio was 51.1% female/48.9% male, the age ratio was 29.4%/36.2%/34.4% in the 18-34-, 35-54- and 55+-year-old age classes, respectively, and the higher/lower educational ratio 19.6%/80.4% [59]. The sample's gender ($\chi^2 = 0.169$, $df = 1$, $p = 0.653$), age ($\chi^2 = 3.085$, $df = 2$, $p = 0.214$), and educational level ($\chi^2 = 2.548$, df = 1, $p = 0.106$) structure (Table 1) was not different from the target population's structure.

Table 1. Willingness to pay (WTP) and predictor variables.

Variable	Definition	Mean	SD	Min	Max
WTP	Binomial: 0 if no, 1 if yes.	0.58	0.49	0	1
Mutualism	Wildlife value orientation dimension from confirmatory factor analysis in Table 2 (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither, 5 = somewhat agree, 6 = agree, 7 = strongly agree).	4.48	1.18	1	7
Domination	Wildlife value orientation dimension from confirmatory factor analysis in Table 2 (1 = strongly disagree, 2 = disagree, 3 = somewhat disagree, 4 = neither, 5 = somewhat agree, 6 = agree, 7 = strongly agree).	3.01	0.99	1	7

Table 1. *Cont.*

Variable	Definition	Mean	SD	Min	Max
Attitude	Attitude factor from exploratory factor analysis in Table 3 (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, 5 = strongly agree).	4.15	0.70	1	5
Conservation actions	Conservation actions factor from exploratory factor analysis in Table 4 (1 = strongly disagree, 2 = disagree, 3 = neither, 4 = agree, 5 = strongly agree).	3.79	0.78	1	5
Age	Years of age.	41.82	17.42	18	88
Gender	Binomial: 0 if the participant is male, 1 if the participant is female.	0.52	0.50	0	1
Educational level	Binomial: 0 if lower, 1 if higher.	0.22	0.48	0	1
Income	Participant's household income (EUR × 1000).	17.26	16.29	0	230
Pet ownership	Binomial: 1 if the participant owns a pet, 0 if the participant does not own a pet.	0.46	0.5	0	1
Consumptive recreation	Frequency of hunting or fishing trips (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often).	1.53	0.99	1	5
Non-consumptive recreation	Frequency of participation in recreational activities other than hunting and fishing (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = very often).	3.25	1.16	1	5

Table 2. Reliability and confirmatory factor analysis (CFA) of wildlife value orientation statements.

Wildlife Value Orientation Statements	Mean [a]	SD	CFA	Reliability Analysis		
	Mean [a]	SD	Factor Loadings [c]	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Domination	3.007	0.995				0.823
Appropriate use beliefs	3.107	1.235				0.777
Humans should manage fish and wildlife populations so that humans benefit.	3.266	2.208	0.671	0.472	0.725	
The needs of humans should take priority over fish and wildlife protection.	3.500	2.016	0.753	0.510	0.687	
It is acceptable for people to kill wildlife if they think it poses a threat to their life.	4.178	2.117	0.596	0.491	0.712	
It is acceptable for people to kill wildlife if they think it poses a threat to their property.	3.438	2.002	0.733	0.611	0.678	
It is acceptable to use fish and wildlife in research even if it may harm or kill some animals.	2.372	1.634	0.644	0.47	0.715	
Fish and wildlife are on earth primarily for people to use.	1.845	1.332	0.874	0.443	0.730	
Hunting beliefs	2.867	1.118				0.735
We should strive for a world where there is an abundance of fish and wildlife for hunting and fishing.	3.296	2.022	0.655	0.474	0.695	
Hunting is cruel and inhumane to the animals. [b]	2.280	1.644	0.534	0.583	0.537	

Table 2. *Cont.*

Wildlife Value Orientation Statements	Mean [a]	SD	CFA	Reliability Analysis		
	Mean [a]	SD	Factor Loadings [c]	Item Total Correlation	Alpha If Item Deleted	Cronbach's Alpha
Hunting does not respect the lives of animals. [b]	2.365	1.777	0.58	0.62	0.52	
People who want to hunt should be provided the opportunity to do so.	3.526	1.822	0.683	0.441	0.699	
Mutualism	4.447	1.183				0.884
Social affiliation beliefs	4.680	1.234				0.798
We should strive for a world where humans and fish and wildlife can live side by side without fear.	4.365	2.094	0.562	0.472	0.754	
I view all living things as part of one big family.	5.164	1.796	0.657	0.616	0.672	
Animals should have rights similar to the rights of humans.	4.668	1.956	0.817	0.543	0.718	
Wildlife is like my family and I want to protect it.	4.602	1.687	0.800	0.624	0.673	
Caring beliefs	4.299	1.085				0.784
I care about animals as much as I do for people.	4.602	1.935	0.763	0.497	0.802	
It would be more rewarding to me to help animals rather than people.	3.069	1.807	0.55	0.454	0.812	
I take great comfort in the relationships I have with animals.	4.204	1.761	0.676	0.696	0.745	
I feel a strong emotional bond with animals.	4.510	1.782	0.814	0.732	0.727	
I value the sense of companionship I receive from animals.	5.109	1.715	0.743	0.631	0.763	

[a] Variables coded on seven-point scales ranging from 1 (strongly disagree) to 7 (strongly agree); [b] Item was reverse-coded prior to analysis; [c] All t values for standardized factor loadings were significant at $p < 0.001$.

Table 3. Principal components factor analysis of attitudes toward northern white-breasted hedgehogs (n = 704). Descriptive statistics, factor loadings, factor eigenvalues, % variance explained, and factor reliability are given.

Statements	Mean [a]	SD	Attitude [b]
I would like to have northern white-breasted hedgehogs on my property.	3.500	1.320	0.737
I would like to see northern white-breasted hedgehogs in my neighborhood.	3.697	1.274	0.745
I would like to see northern white-breasted hedgehogs in the wild.	4.753	0.709	0.595
Northern white-breasted hedgehogs have the same rights as people.	3.865	1.307	0.667
Northern white-breasted hedgehogs are important features of my local landscape.	4.063	1.174	0.743
Northern white-breasted hedgehogs must exist because they are valuable to nature.	4.701	0.762	0.648
Northern white-breasted hedgehogs must exist because they are valuable to people.	3.569	1.272	0.503
Endangered northern white-breasted hedgehog populations should be protected.	4.592	0.863	0.557
Eigenvalue			3.432
% Variance explained			43.323
Cronbach's alpha			0.787

[a] Range: 1 (strongly disagree)—5 (strongly agree); [b] Factor loadings.

Table 4. Principal components factor analysis of the intention to participate in actions for the conservation of northern white-breasted hedgehogs (n = 704). Descriptive statistics, factor loadings, factor eigenvalues, % variance explained, and factor reliability are given.

Statements	Mean [a]	SD	Conservation Actions [b]
I would create habitat suitable for northern white-breasted hedgehogs on my property (e.g., water holes, nests, wood piles).	3.105	1.267	0.734
I would drive slowly at night to avoid collision with northern white-breasted hedgehogs or ask the driver to do so if I am not driving.	4.730	0.580	0.511
I would remove northern white-breasted hedgehogs from road surface.	4.089	0.993	0.594
I would vote laws and regulations for the conservation of northern white-breasted hedgehogs in my area.	4.020	0.944	0.687
I would donate money for the conservation of northern white-breasted hedgehogs in my area.	3.230	1.369	0.834
I would urge friends and relatives to participate in actions for the conservation of northern white-breasted hedgehogs in my area.	3.563	1.247	0.842
Eigenvalue			3.029
% Variance explained			50.488
Cronbach's alpha			0.800

[a] Range: 1 (strongly disagree)—5 (strongly agree); [b] Factor loadings.

3.2. Wildlife Value Orientations, Attitudes, Conservation Actions

Confirmatory factor analysis provided a good fit for the data (χ^2/df = 2.73, CFI = 0.978, GFI = 0.934, NFI = 0.966, RMR = 0.056) and supported the wildlife value orientation constructs, with standardized factor loadings being statistically significant ($p < 0.001$; Table 2). Furthermore, domination and mutualism had high internal reliability (α = 0.823 and 0.884, respectively) and deleting any item did not improve reliability. The participants were more mutualism-oriented (mean score 4.447 $\pm$ 1.183 SD; 7-point scale) than domination-oriented (3.007 $\pm$ 0.995; 7-point scale).

Exploratory factor analysis grouped attitude and conservation actions statements in one common factor for each construct. The attitude factor (eigenvalue 3.4) with high internal reliability (α = 0.787), explaining 43.3% of the variance (Table 3) and the conservation actions factor (eigenvalue 3.0) with high internal reliability (α = 0.800), explaining 50.5% of the variance (Table 4). The participants' attitudes toward hedgehogs were positive (4.093 $\pm$ 1.085; 5-point scale), while they also agreed to participate in hedgehog conservation actions (3.790 $\pm$ 1.067; 5-point scale).

The mutualism, domination, attitude, and conservation actions factors were used as predictors in the econometric models.

3.3. Willingness to Pay for Hedgehog Conservation

Overall, 58.2% of the participants were WTP for the conservation of hedgehogs. The logistic regression, yes/no, model correctly predicted 81.5% of the sample (Table 5). Those who were more mutualistic were more WTP than those who were less mutualistic (p = 0.002), with the probability of WTP increasing by 8.4% per unit of increase in mutualism. The increasing intention to participate in hedgehog conservation actions increased WTP ($p < 0.001$), with the probability of WTP increasing by 61.9% per unit of increase in the intention to participate in conservation actions. Females were 18.6% more WTP than males (p = 0.004), while high household income was associated with high WTP (p = 0.035), with the probability of WTP increasing by 0.2% per unit of increase in income. Those who

participated more in consumptive recreation were 7.7% less likely to be WTP for hedgehog conservation than those who participated less in consumptive recreation ($p = 0.044$).

Table 5. Binary logistic regression willingness to pay model (yes/no, $n = 704$).

Variable	Odds Ratio	Marginal Effects	*p*
Mutualism	1.411	0.084	*0.002*
Domination	1.278	0.060	0.094
Attitude	1.210	0.046	0.423
Conservation actions	12.769	0.619	*<0.001*
Age	0.989	−0.003	0.339
Gender (female)	2.146	0.186	*0.004*
Level of education (higher)	1.340	0.071	0.248
Income	1.007	0.002	*0.035*
Pet ownership (yes)	2.892	0.258	*<0.001*
Consumptive recreation	0.728	−0.077	*0.044*
Non-consumptive recreation	1.200	0.044	0.082
Nagelkerke's R^2		0.573	
−2LogLik		487.902	
AIC		511.902	

The second model estimated a mean WTP of EUR 31.7 (95% CI: 24.8–38.9) for hedgehog conservation (Table 6), totaling about EUR 21.9 million (min EUR 17.1 million, max EUR 26.8 million) based on the proportion of those WTP and the number of households in the study area. Participants with more positive attitudes toward hedgehogs ($p < 0.001$), who participated more in hedgehog conservation actions ($p < 0.001$), had more mutualistic wildlife value orientations ($p < 0.001$), and participated more in consumptive ($p = 0.005$) and non-consumptive recreation ($p < 0.001$) were WTP a higher amount for hedgehog conservation than those with less positive attitudes, who participated less in conservation actions, with less mutualistic wildlife value orientations, and who participated less in consumptive and non-consumptive recreation. Highly educated ($p < 0.001$) females ($p < 0.001$) with higher income ($p = 0.041$) were WTP a higher amount for hedgehog conservation than less educated males with lower income. Domination wildlife value orientation, age and pet ownership did not significantly affect the amount of WTP ($p > 0.05$).

Table 6. Interval regression willingness to pay model (highest yes/lowest no bids, $n = 410$).

Variable	Coefficient	SE	*p*
Mutualism	0.206	0.026	*<0.0001*
Domination	−0.026	0.034	0.448
Attitude	0.204	0.056	*<0.001*
Conservation actions	0.253	0.061	*<0.0001*
Age	0.001	0.003	0.738
Gender (female)	0.440	0.047	*<0.0001*
Level of education (higher)	0.271	0.057	*<0.0001*
Income	0.001	0.000	*0.041*
Pet ownership (yes)	−0.007	0.051	0.897
Consumptive recreation	0.062	0.028	*0.005*
Non-consumptive recreation	0.086	0.072	*0.001*
Nagelkerke's R^2		0.488	
−2LogLik		922.493	
AIC_c		958.314	
Mean WTP (EUR)		31.715	
95% CI of mean WTP (EUR)		24.811–38.924	

4. Discussion

4.1. WTP for Hedgehog Conservation

Most of the survey participants were willing to financially support the implementation of a five-year hedgehog conservation plan by paying an annual tax. Based on mean WTP, a considerable amount could be collected annually. Mean WTP from our study was within and most often compared favorably to those reported form other studies: 31% to 80% rates of WTP and EUR 0.0 to EUR 71.2 mean WTP reported from similar studies [22,23,25,26,30,31,61,72]. Our findings suggested that a considerable amount could be collected annually. Mortality due to collisions with vehicles has been recognized as the major threat to hedgehogs across their range [9–11]. Although hedgehogs provide important ecosystem services to farmers by predating on insect pests, they are threatened by agricultural activities that destroy and fragment their habitats and intoxicate them with biocides [12–14]. Although the funds that our study predicted that could be secured for hedgehog conservation seem adequate, an assessment of the cost of specific conservation actions should be conducted. Furthermore, an improvement of public support would be welcome because, as well as the need for funding, public support is necessary for the successful conservation of hedgehog populations [18,19].

Our findings suggested that the Greek public is considerably interested in hedgehog conservation. In general, WTP is higher for mammals and birds [22,25,30,31] than other vertebrate taxa, such as reptiles and amphibians [24,34]. Previous studies have suggested that support for the conservation of endangered species was higher among mammal and bird species than among reptile and amphibian species [18,51]. These trends have been associated with species' phylogenetic resemblance to humans, physical size, and the more positive social construction of mammals and birds than reptiles and amphibians [73–76]. In Greece, WTP was EUR 21.7 for the conservation of bats [41] and EUR 41.6 for the conservation of the Balkan chamois [40]. These findings suggested that the public assigned different economic values to different mammals. Other contingent valuation method studies also reported lower WTP for bats as compared to other species [32,72]. This difference in the public interest in the conservation of hedgehogs and bats could be attributed to the fact that hedgehogs are among the more attractive and likeable animals [16,17], while bats are among the less likable and more feared animals, factors that have been found important in predicting public support for species conservation [18,51].

4.2. Effects of Attitudes, Wildlife Value Orientations, and Sociodemographics

Positive attitudes toward hedgehogs increased WTP for their conservation, as expected. Previous contingent valuation method studies have also reported a positive correlation of attitudes with WTP and support for species conservation [18,30,50–53]. The intention to participate in conservation actions for the management of hedgehogs was also positively associated with WTP. Participation in conservation actions is suggestive of a high interest in wildlife and nature in general. Those who express such intentions are usually proponents of wildlife conservation and animal welfare and opposed to harmful wildlife management strategies [77].

Mutualism was the basic wildlife value orientation that predicted, positively, WTP for hedgehog conservation. Mutualists view humans and wildlife as a big family, ascribe them similar rights, and care about their welfare. Mutualism was a more important predictor than domination of support for the reintroduction of endangered species in Germany (grey wolf *Canis lupus*, European bison *Bison bonasus*) [78]. Similarly to these findings, human dimensions studies commonly report that mutualism is a stronger predictor of wildlife conservation [18,46,51], while domination is a stronger predictor of wildlife impact management [44,79–81].

Participation in wildlife-related recreation, both consumptive (e.g., hunting, fishing) and non-consumptive (e.g., birdwatching, wildlife photography), was positively associated with WTP. Both consumptive and non-consumptive users of wildlife are outdoor enthusiasts who put a high value on their activities. Previous research has shown that recreationists

such as hunters and birdwatchers have a high knowledge about the natural history of wildlife species and a special interest in their conservation [54,55]. These attributes resulted in wildlife recreationists being involved in pro-environmental and conservation behaviors much more often than other outdoor recreationists (e.g., hikers, campers).

WTP for hedgehog conservation was associated with females, high level of education, pet ownership, and high income. According to economic theory, market goods can be classified as "normal goods" when WTP is positively associated with income, "inferior goods" when WTP is negatively associated with income, or "inelastic goods" when WTP does not vary with income [82]. Our findings suggested that income represented a "normal good" for the Greek residents. Liordos et al. [41] found that WTP for bat conservation among Greek residents was associated with high level of education and pet ownership but not with gender or income. Similar studies have found variable trends. Van Eeden et al. [22] and Haefele et al. [83] reported that gender, income, and educational level were associated with WTP for gray wolf and Mexican free-tailed bat (*Tadarida brasiliensis mexicana*) conservation. Becker et al. [25] and Ma et al. [30] reported that educational level and income were positively associated with WTP for white stork (*Ciconia Ciconia*) and giant panda conservation. Jaunky et al. [72] and Bhattarai et al. [84] reported that gender, income, and educational level did not affect the WTP for the conservation of the tiger and the Mauritian Flying Fox (*Pteropus niger*). Pet owners are concerned about animal welfare and security, interested in both pet and wild animals, and are usually champions of wildlife conservation [16,17,58].

4.3. Study Limitations

Study limitations should be considered when interpreting and using findings. The limitations of face-to-face surveys include observer bias, respondent's time availability bias, and giving socially acceptable answers to sensitive questions [60]. We dealt with interobserver bias by using one researcher to carry out surveys. We avoided eliciting socially desirable answers by using the respondent-completed approach [60] and keeping the surveys anonymous. The high response rate to our survey indicated that the respondents' time availability did not greatly affect their decision to participate in the survey.

5. Conclusions

Most of the survey participants were WTP for the conservation of hedgehogs. Mutualism, participation in hedgehog conservation actions, female gender, household income, and pet ownership were positively associated with the proportion of WTP, and participation in consumptive recreation negatively.

Mean WTP was considerable, allowing for the collection of a high amount through taxation that is considered adequate for funding measures for the conservation of hedgehog populations. Mutualism, attitudes toward hedgehogs, participation in hedgehog conservation actions and consumptive and non-consumptive recreation, female gender, household income, and high level of education were positively with the amount of WTP.

Our findings emphasized the usefulness of the contingent valuation method in determining support for wildlife conservation and the funds that could be collected for this purpose. Future research should investigate the effects of other factors, such as profession, place of residence, and emotions on WTP. Our findings provided information necessary for managing authorities to determine public support and the potential for raising the required funds for applying measures for the conservation of hedgehog populations. Furthermore, the revealed differences among and within public groups would allow for tailored actions.

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

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