

ECONOMICS, ECOLOGY AND THE ENVIRONMENT

Working Paper No. 115

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Species: How Important are they for Proposed
Payments for Conservation**

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THE UNIVERSITY OF QUEENSLAND

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ENDANGERMENT AND LIKEABILITY OF WILDLIFE SPECIES: HOW IMPORTANT ARE THEY FOR PAYMENTS PROPOSED FOR CONSERVATION?

Abstract

Examines empirically the relative influence of the degree of endangerment of wildlife species and their stated likeability on individuals' willingness to pay (WTP) for their conservation. To do this, it utilises data obtained from the IUCN Red List and likeability and WTP data obtained from two serial surveys of a sample of the Australian public who were requested to assess 24 Australian wildlife species in each of three animal classes: mammals, birds and reptiles. Between the first and second survey, respondents were provided with extra information about the focal species. This information resulted in the clear dominance of endangerment as the major influence on the WTP of respondents for the conservation of the focal wildlife species. Our results throw doubts on the proposition in the literature that the likeability of species is the dominant influence on WTP for conservation of wildlife species. Furthermore, our results suggest that the relationship between WTP for the conservation of wildlife in relation to their population levels may be more complex and different to that suggested in some of the literature on ecological economics.

Keywords: Conservation of wildlife species; contingent valuation; endangerment of species; likeability of species; willingness to pay.

ENDANGERMENT AND LIKEABILITY OF WILDLIFE SPECIES: HOW IMPORTANT ARE THEY FOR PAYMENTS PROPOSED FOR CONSERVATION?

1. Introduction

The demand for commodities depend on their inherent attributes or characteristics (Lancaster, 1996). The demand for conserving wildlife species is no exception. There has been considerable debate in the academic/scientific literature about how important the perceived level of likeability of individual wildlife species is compared to their level of endangerment in determining the relative level of support for the conservation of different wildlife species. Metrick and Weitzman (1996) came to the conclusion that likeability factors played a more important role in the allocation of US public funds for the conservation of endangered wildlife species than their degree of endangerment. Their results suggest that likeability may be a more important factor than endangerment in determining relative support for the conservation of wildlife species. On the other hand, Tkac (1998) found that information about the degree of endangerment of species seemed more important in influencing the stated willingness of individuals to pay for their conservation than information about their physical attributes. It is widely claimed in the literature that humans find species that are more human-like (higher order species or physically attractive) to be more likeable (Kellert, 1980; Plous, 1993; Gunnthorsdottir, 2001). By contrast, Tkac's results imply that the likeability of a wildlife species is a less important influence than its perceived degree of endangerment in determining the willingness of individuals to pay for its conservation.

The purpose of this article is to report and analyse further experimental evidence on the relationship between the stated willingness of individuals to contribute funds for the conservation of wildlife species, their likeability of the species and the endangerment of the species. Particular attention is given to the comparative significance of the independent variables. In addition, consideration is given to how information provision alters the relative significance of the likeability of wildlife species and their endangerment as influences on the proposed amounts paid by individuals for the conservation of the focal wildlife species. We proceed by first outlining the experimental procedures adopted, report the results, then discuss and analyse these before concluding.

2. Methodology

Three serial survey questionnaires were employed to obtain data about the public's knowledge of Australian tropical wildlife species, their attitudes towards these wildlife species and their willingness to pay to conserve these wildlife species. This study draws on the results obtained from the first two survey questionnaires, referred to here as Survey I and Survey II. The questionnaires were pre-tested on a group of university students and adjusted for greater clarity where needed. These questionnaires gathered the following information:

- (i) survey participants' background (e.g., gender, education and income levels);
- (ii) how knowledgeable they are about each of the 24 Australian tropical wildlife species (9 mammals species, 10 bird species and 5 reptile species);
- (iii) how much they liked each wildlife species in the survey (gauged using the following Likert-type scale: "like strongly, like, dislike, strongly dislike, and uncertain of feelings towards species");
- (iv) what percentages of a hypothetical windfall fund of \$1,000 they would allocate to help conserve each species in each animal class (provided separately for each animal class).

The sampling location was Brisbane, Queensland, Australia. The sample group was the Brisbane urban public. Invitations to participate in the survey were mostly made by letterbox drops in various suburbs of Brisbane with differing socio-economic profiles. The letterbox invitations contained circulars that informed potential respondents that the surveys will be about wildlife valuation and those selected to participate would be offered \$20 for attendance, a public lecture, refreshments and an opportunity to win \$200¹. A sample was selected from interested respondents that reflected the age and gender distribution of the population of Brisbane. The selected sample was also varied in terms of income distribution and education level of participants.

The selected survey sample consisted of 204 participants. They were divided into about equal-sized groups of five. Four groups were asked to attend survey sessions held at The University of Queensland: two groups during the working week and two during the weekend. The fifth group was asked to attend a survey session held in a church hall on a Sunday. This arrangement gave participants flexibility to select a time and place convenient to them and helped maximise attendance.

During the survey sessions, participants first filled out structured questionnaire Survey I which gathered the information described earlier. They were then given a tea break, after which they were asked to attend an illustrated wildlife presentation by Dr. Steve Van Dyck, the senior Curator of Vertebrates at the Queensland Museum. Following the presentation, each participant was given a coloured photo booklet containing brief information about each of the 24 species in the survey such as their descriptions, geographic distributions, life histories and conservation statuses (whether the species were abundant or rare or endangered). Participants were requested to take this booklet home with the second questionnaire, Survey II. They were asked to read the booklet, fill out Survey II and return the questionnaire in the postage pre-paid envelope provided.

Survey II contained overlapping questions with Survey I. Survey I was intended to obtain about participants prior to information provision and Survey II after provision information. Therefore, by comparing Survey II results with that of Survey I, changes in participants' WTP allocation with their learning about the species could be observed. Change is assessed based on the factors of species likeability and endangerment.

To calculate the average likeability index for each species, the following weights were assigned to the values on the Likert scale: like strongly (2), like (1), neutral or uncertain of feelings (0), dislike (-1) and strongly dislike (-2). A simple average of responses of those sampled was calculated. The ranking of the endangerment of species was based on data in the IUCN Red List (IUCN, 2004). Wildlife species were classified as follows: (1) not threatened (i.e., not in the Red List); (2) near threatened; (3) vulnerable; (4) endangered; and (5) critically endangered. The format of the WTP allocation question posed in the surveys is as follows for each animal class:

'Suppose that you are given \$1,000, but you can only use it to donate funds to support the conservation of the <mammals/birds/reptiles> in Australia listed below. Suppose that a reliable organisation were to carry out the conservation work and your money would supplement other funds for this purpose. What percentage of your \$1,000 would you contribute for the conservation of each of the <mammals/birds/reptiles> listed below? Your total should add up to 100%.'

<Mammals/Birds/Reptiles>	(%)
<Species 1>	
<Species 2>	
...	
	100

The Spearman's rank correlation procedure (Zar, 1999; Gujarati, 2003), a non-parametric test, was adopted to estimate the rank correlation between WTP for the conservation of wildlife species in each animal class and their degree of endangerment. This is also done for the likeability of the focal species. Comparisons are made between the two sets of results and between results for Survey I and Survey II.

Furthermore, a multiple regression is performed using dummy variables as indicators of degree of endangerment of wildlife and average likeability of the wildlife species as the independent variables. WTP is the dependent variable. The multiple regression is performed using LIMDEP 8.0 (Econometric Software, 2002) and is used to analyse further the relative significance of the independent variables.

The common and scientific names of the 24 Australian tropical species involved in the study are listed in Table 1.

Table 1:
A list of the 24 Australian wildlife species covered in this study

Common name	Scientific name
Mammals	
Lumholtz's tree kangaroo	<i>Dendrolagus lumholtzi</i>
Red kangaroo	<i>Macropus rufus</i>
Koala	<i>Phascolarctos cinereus</i>
Mahogany glider	<i>Petaurus gracilis</i>
Northern bettong	<i>Bettongia tropica</i>
Northern quoll	<i>Dasyurus hallucatus</i>
Dugong	<i>Dugong dugon</i>
Northern hairy-nosed wombat	<i>Lasiorhinus krefftii</i>
Eastern pebble-mound mouse	<i>Pseudomys patrius</i>
Birds	
Southern cassowary	<i>Casuarius casuarius</i>
Brolga	<i>Grus rubicundas</i>
Golden-shouldered parrot	<i>Psephotus chrysopterygius</i>
Palm cockatoo	<i>Probosciger aterrimus</i>
Eclectus parrot	<i>Eclectus roratus</i>
Gouldian finch	<i>Erythrura gouldiae</i>
Red-tailed black cockatoo	<i>Calyptorhynchus banksii</i>
Golden bowerbird	<i>Prionodura newtoniana</i>
Australian magpie	<i>Gymnorhina tibicen</i>
Kookaburra	<i>Dacelo novaeguineae</i>
Reptiles	
Saltwater crocodile	<i>Crocodylus porosus</i>
Australian freshwater crocodile	<i>Crocodylus johnstoni</i>
Taipan snake	<i>Oxyuranus scutellatus</i>
Hawksbill turtle	<i>Eretmochelys imbricata</i>
Northern long-necked turtle	<i>Chelodina rugosa</i>

3. Results

3.1. Rank correlation between degree of endangerment of focal wildlife species and willingness to pay for their conservation

The Spearman's rank correlation coefficients, their p-values and the levels of their statistical significance in relation to the average WTP for the conservation of the focal wildlife species in each animal class and their ranked degree of endangerment are shown in Table 2. It can be seen that in Survey II, all correlation coefficients are positive and large for all animal classes and are statistically significant for the mammal and bird classes in Survey II. On the whole,

correlation coefficients increase considerably between Survey II and Survey I and become statistically significant. This suggests that greater knowledge of the species increases the relative importance of the endangerment of species as a determinant of the WTP for their conservation. Note, however, that the values for the reptile class do not vary between the surveys. This is partly because the reptile species were relatively well known by respondents even in Survey I and consequently the extra information provided gave little extra knowledge to respondents. Secondly, there is little variation in the degree of endangerment of species in the reptile group chosen for the experiment and the small numbers of observations reduce the likelihood of obtaining statistically significant confidence levels.

Table 2:
WTP and IUCN Red List threatened species category ranking: Spearman's rank correlation coefficients and *p*-values

Animal class	Survey I (r_s, p)	Survey II (r_s, p)
Mammals ($n = 9$)	0.39, 0.33	0.76, 0.03*
Birds ($n = 10$)	0.46, 0.20	0.83, <0.01**
Reptiles ($n = 5$)	0.75, 0.25	0.75, 0.25

**Significant at the 99% confidence level, *significant at the 95% confidence level.

3.2. The rank correlation between the likeability of wildlife species and WTP for their conservation

The results of the Spearman's rank correlation procedure for the association between the average likeability of species and the average WTP for their conservation are shown in Table 3.

Table 3:
WTP and likeability: Spearman's rank correlation coefficients and *p*-values

Animal class	Survey I (r_s, p)	Survey II (r_s, p)
Mammals ($n = 9$)	0.33, 0.41	0.47, 0.22
Birds ($n = 10$)	-0.09, >0.50	0.10, >0.50
Reptiles ($n = 5$)	0.90, 0.10*	0.90, 0.10*

*Significant at the 90% confidence level.

Except in the case of reptiles, corresponding correlation coefficients are lower in Table 3 than in Table 2 and the coefficients are statistically less significant in Table 3. This suggests that likeability is a less important influence on WTP for species than their degree of

endangerment. Note also that, except in the case of reptiles, there is some increase in the Spearman's rank correlation coefficients in Survey II compared to Survey I. Some increases in the association between the likeability of species and the WTP occurs as individuals are more informed about the species.

3.3 Multiple regression results relating the WTP for the conservation of species to their endangerment and likeability

In order to compare the joint and individual influence of level of endangerment and likeability of wildlife species on respondents' average WTP to pay for their conservation, multiple linear regression analysis was completed using average WTP for the conservation of each of the species as the regressand and their level of endangerment and average likeability as regressors. Level of endangerment is a discrete variable consisting of ranked categories. It was specified by three dummy variables: not threatened (not in the IUCN Red List), near threatened and vulnerable (low level of threat) and endangered and critically endangered (high level of threat). Average likeability is a continuous variable.

We find that the overall level of endangerment and likeability jointly explain the variations in average WTP fairly well in Survey II for all three animal classes (observe the high R^2 values and the significant F -ratios in Table 4). In comparison, Survey I regression results reveal lower R^2 results for the mammal and bird classes and only the regression for reptiles has a high R^2 .

Table 4:
The dependence of WTP on IUCN Red List threatened species category ranking and likeability: results of multiple regression analysis for each animal class in Survey I and Survey II

Animal class and regressors	Survey I	Survey II
	R^2, F	R^2, F
Mammals	0.67, 3.41	0.78, 6.05**
	Coefficient, t	Coefficient, t
Constant	1.43, 0.41	-4.57, -0.75
LOWTHREAT	5.69, 2.89**	5.26, 2.14*
HIGHTHREAT	5.33, 2.58*	9.20, 3.54**
LIKEABILITY	4.45, 1.98	8.17, 1.70
	R^2, F	R^2, F
Birds	0.36, 1.10	0.87, 13.75***
	Coefficient, t	Coefficient, t
Constant	6.88, 1.91	0.47, 0.09
LOWTHREAT	3.10, 1.70	8.60, 3.94***
HIGHTHREAT	1.07, 0.80	8.82, 5.44***
LIKEABILITY	2.56, 0.83	6.13, 1.28
	R^2, F	R^2, F
Reptiles	0.92, 11.46*	0.99, 228.47***
	Coefficient, t	Coefficient, t
Constant	13.00, 5.38**	9.86, 10.16***
HIGHTHREAT ^a	8.73, 1.74	27.82, 12.49***
LIKEABILITY	11.81, 2.98*	8.73, 5.18**

***Significant at the 99% confidence level, **significant at the 95% confidence level, *significant at the 90% confidence level.

^a Only two endangerment dummy variables were specified for the reptile case. This is because in this set of five reptile species, only one species was classified 'critically endangered' in the IUCN Red List while the rest were not considered to be threatened.

The coefficients of the regressors, which show the degree to which the regressors affect WTP, and their t -ratios, an indication of how significantly the regressors improve the fit of the model, were examined (see Table 4). In Survey I, t -ratios are significant only for levels of endangerment for the mammal class and for likeability in the reptile class. In Survey II, dominance of levels of endangerment as factors influencing WTP is apparent; the t -ratios for levels of endangerment have become very significant for all animal classes whereas likeability remains significant only for reptiles.

Regressor coefficients for levels of endangerment and likeability generally rose between Survey I and Survey II, except for the case of the reptiles where the likeability coefficient fell. Also, note that although the likeability coefficient is larger than the coefficient for level of endangerment for reptiles in Survey I, in Survey II the coefficient for level of endangerment has become the larger of the two.

Because likeability and level of endangerment could be correlated, and because the R^2 and F -ratio for the reptile case in Survey I appear unusually high even though the t -ratios of the regressors are not greatly significant, we tested all six models for collinearity. Using Spearman's rank correlation and linear regression, we ranked and regressed the regressors against each other. The results are shown in Table 5. For birds and mammals, the Spearman rank correlation coefficients and VIFs for likeability and level of endangerment are extremely low and negligible in both surveys. There appears little evidence of collinearity here. For reptiles, however, there appears to be a fairly strong rank correlation between the two factors, higher though weak R^2 and correspondingly low VIFs. This may be indicative of some collinearity between likeability and degree of endangerment for the reptile cases, but since the VIFs are far below the value of 10, we do not consider multicollinearity to be significant enough to affect the validity of our results (see Belsley et al., 1980).

Table 5:

Likeability and IUCN Red List threatened category ranking: Results for Spearman's rank correlation and linear regression tests for collinearity. The Variance Inflation Factor (VIF) is a yardstick to assess the degree of multicollinearity (Neter et al., 1996)

	Spearman's rank correlation		Linear regression	
	Survey I (r_s, p)	Survey II (r_s, p)	Survey I (R^2, VIF^a)	Survey II (R^2, VIF^a)
Mammals ($n = 9$)	-0.38, 0.34	0.05, >0.50	0.03, 1.03	<0.01, <1.01
Birds ($n = 10$)	0.03, >0.50	0.11, >0.50	0.04, 1.04	<0.01, <1.01
Reptiles ($n = 5$)	0.50, 0.50	0.75, 0.25	0.25, 1.33	0.42, 1.72

^a $\text{VIF} = 1/(1-R^2)$.

4. Discussion

The Spearman's rank correlation results indicate that there is a statistically more significant association between WTP for the conservation of wildlife species in relation to their degree of endangerment than in relation to their stated likeability. With the provision of information

about the focal wildlife species (that is, before Survey II was completed), the association between WTP for the conservation of the species and their degree of endangerment strengthened as indicated by rises in the Spearman's rank correlation coefficients and in the statistical significance of the results. This was so except in the case of reptiles where these indicators remained unchanged between Survey I and Survey II. The reason for the latter result is probably that individuals were relatively knowledgeable about the reptiles even in Survey I and there were only two categories of degrees of endangerment represented by the reptile species.

These results accord with those of Tkac (1998, p. 1218) that endangerment is a more important influence than physical attributes of species in determining allocation of funds for the conservation of wildlife species, and that the comparative importance of the endangerment variable tends to rise with information disclosure. The physical attributes of species are often used as an indicator of the likeability of species. Those that are more human-like are often regarded as more likeable (Kellert, 1980; Plous, 1993; Gunnthorsdottir, 2001) even though Tisdell et al. (2004) suggest that this hypothesis may need some qualifications.

The results based on Spearman's rank correlation procedure are further supported by results from the multiple regression analysis. The high threat variable was statistically significant in Survey II for all animal classes but not in Survey I. Likeability on the other hand was not statistically significant at the 95% level or higher for any animal class in Survey I, and only significant in the reptile class in Survey II at the 95% confidence level.

The strong influence of endangerment on the WTP for the conservation of species seems also to obtain indirect support from other studies. For example, Bandara and Tisdell (2004) found that the stated WTP of respondents in Sri Lanka for the conservation of the Asian elephant rose on average as the size of wild elephant population in Sri Lanka was hypothetically reduced. A possible reason is that respondents perceived that the Asian elephant would become more endangered as its population was decreased. The empirical results obtained by Fredman (1995) in assessing the WTP for the conservation of the white-backed woodpecker as its population is reduced are also consistent with such a relationship.

On the other hand, the results raise some queries about regression results obtained by Loomis and White (1996). They found that over half of the WTP value is explained by changes in the size of the population of rare and endangered species, if the change in size is measured by the proposed percentage change in the population of a species. They find that the relevant coefficients for this term are positive, and in the double log case, the elasticity of increase in WTP is around 0.8. Thus, for each one percent increase in the population species, WTP rises by 0.8%, that is, at a decreasing rate. However, our findings suggest that the relationship may not be reversible or symmetric and could change sign. Our results imply that as the population of a species declines and its endangerment increases, the WTP for its conservation can be expected to rise. However, this is not implied by the results from the meta-analysis conducted by Loomis and White (1996). This is possibly because their set of data is dominated by studies which only take account of increased population of species and do not consider reduced population of species. This suggests that one ought to be wary in drawing conclusions from meta-analyses of this type, even though they can contribute to our understanding ecological valuation.

Incidentally, Tkac (1998) found that individuals were willing to pay for the conservation of species that were endangered but not saveable (*cf.* Samples et al., 1986, p. 311; DeKay and McClelland, 1996, p. 70). We found in our survey that several respondents stated that they are willing to pay for the conservation of abundant species that are not endangered. Many stated that they did so because all species have a right to exist (see also Tisdell et al., 2004). Thus, this also seems to be a form of moral signalling.

5. Conclusion

Our empirical results support the general findings of Tkac (1998) that the degree of endangerment of wildlife species is a more important factor on the willingness of individuals to pay for their conservation than their likeability and their similarity to humans. Furthermore, the provision of information about species to respondents increases the significance of endangerment as an influence on the WTP of respondents for the conservation of endangered species. Other things equal, there is strong tendency for individuals to increase their willingness to contribute to the conservation of species as they become more endangered and once their endangerment is known. This is, however, not reflected in the meta-analysis of Loomis and White (1996) of the WTP for the conservation of rare and

endangered species, possibly because the empirical data used mostly relates to increased populations of such species.

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Notes

¹ All dollar values mentioned in this paper refer to the Australian dollar.

References

- Bandara, R. and Tisdell, C. (2004) "Changing abundance of elephants and willingness to pay for their conservation", *Economic Theory, Applications and Issues*, Working Paper No. 34, School of Economics, The University of Queensland, Brisbane, 4072, Australia.
- Belsley, D.A.; Kuh, E. and Welsch, R.E., (1980) *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. John Wiley, New York.
- DeKay, M.L. and McClelland, G.H. (1996) "Probability and utility components of endangered species preservation programs", *Journal of Environmental Psychology: Applied*, **2**: 60-83.
- Econometric Software, Inc. (2002) *LIMDEP Version 8.0 Reference Guide*. Econometric Software, Inc., . Plainview, New York.
- Fredman, P. (1995) "The existence of existence value – a study of the economic benefits of endangered species", *Journal of Forest Economics*, **1**: 307-327.
- Gujarati, D. (2003) *Basic Econometrics* (4th Edition). McGraw Hill, Boston.
- Gunnthorsdottir, A. (2001) "Physical attractiveness of an animal species as a decision factor for its preservation", *Anthrozoös*, **14**: 204-215.
- IUCN, (2003) 2003 IUCN Red List of Threatened Species. Available from: <http://www.redlist.org> [Accessed 1st November 2004].
- Kellert, S.R. (1980) "American attitudes toward and knowledge of animals: an update", *International Journal for the Study of Animal Problems*, **27**: 87-119.

- Lancaster, K. (1996) "A new approach to consumer theory", *Journal of Political Economy*, **74**: 132-157.
- Loomis, J.B. and White, D.S. (1996) "Economic benefits of rare and endangered species: summary and meta-analysis", *Ecological Economics*, **18**: 197-206.
- Metrick, A. and Weitzman, M.L. (1996) "Patterns of behavior in endangered species preservation", *Land Economics*, **72**: 1-16.
- Neter, J.; Kutner, M.H.; Nachtsheim, C.J. and Wasserman, W. (1996) *Applied Linear Statistical Models* (4th Edition). Irwin Press, Chicago, Illinois, USA.
- Plous, S. (1993) "Psychological mechanisms in the human use of animals", *Journal of Social Issues*, **49**: 11-52.
- Samples, K.C.; Dixon, J.A. and Gowen, M.M. (1986) "Information disclosure and endangered species valuation", *Land Economics*, **62**: 306-312.
- Tisdell, C.; Wilson, C. and Swarna Nantha, H. (2004) Comparative public support for conserving reptile species is high: Australian evidence and its implications. *Economics, Ecology and the Environment*, Working Paper No. 109, School of Economics, The University of Queensland, Brisbane, 4072, Australia.
- Tkac, J. (1998) "The effects of information on willingness-to-pay values of endangered species", *American Journal of Agricultural Economics*, **80**: 1214-1220.
- Zar, J.H. (1999) *Biostatistical Analysis* (4th Edition). Prentice Hall, Upper Saddle River, New Jersey, USA.

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