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Public Choice of Species for the Ark: Phylogenetic Similarity and Preferred Wildlife Species for Survival

Abstract

Humans play a role in deciding which species are preserved and which will perish in the current extinction wave. Because of the Similarity Principle, physical attractiveness and likeability, it is argued that public choice would greatly favour the survival of higher-order species at the expense of others. This paper empirically tests this argument by considering a hypothetical 'Ark' situation. Results are drawn from surveys of 204 members of the Australian public who were asked whether they are in favour of the survival of each of 24 native mammal, bird and reptile species. The species were ranked by percentage of 'yes' votes received. Species composition in various fractions of the ranking was determined. If the Similarity Principle holds, mammals would rank highly and dominate the top fractions of animals in the hierarchical list that would be saved (i.e., taken on the 'Ark'). We find that although mammals would be over-represented in the 'Ark', birds and reptiles would also be well represented when social choice is based on numbers 'voting' for the survival of each species. Differences in public support for species in the relevant taxa are not as statistically significant as one might expect from the Similarity Principle.

Public Choice of Species for the Ark: Phylogenetic Similarity and Preferred Wildlife Species for Survival

1. Introduction

Resources available to protect wildlife species from extinction are limited, and choices have to be made about which species to concentrate conservation efforts on (Tisdell 1990). It is claimed that humans favour species for preservation that are similar to humans, physically attractive and are liked (Kellert 1980; Schultz 1987; Plous 1993; DeKay and McClelland 1996; Gunnthorsdottir 2001). Metrick and Weitzman (1996, 1998) found that government spending decisions for conserving endangered species in the United States conformed with this preference and were determined more by 'visceral' characteristics such as physical size and whether the animals were higher life forms than by scientific characteristics such as the degree of species endangerment or taxonomic uniqueness.

Where only a limited number of species can be saved, liked species, mostly mammals, may dominate the list of those chosen to join the 'Ark', while other taxonomic groups such as reptiles or insects may be poorly represented or not represented at all. According to Gunnthorsdottir (2001), if the support of citizens for wildlife conservation policies are guided by such "superficial characteristics" of an animal, then an "animal's external characteristics may seal its fate".

The Similarity Principle suggests that humans will prefer mammal species to birds for survival and the survival of birds in preference to reptiles. This study aims to test this hypothesis using a simulated public choice experiment involving 24 native Australian tropical mammal, bird and reptile species, and the stated preferences of a sample of the Australian public for the survival of each of the species. Using the plurality voting system, the species are ranked by the percentage of survey respondents who responded 'yes' to their survival. We now outline the methodology, present the results and discuss their implications.

2. Methodology

Survey methods

Two serial questionnaires, Survey I and Survey II, were employed to gather information on the public's attitude towards the conservation and sustainable use of Australian tropical wildlife species. The questionnaires were pre-tested on a group of university students and

were modified for greater clarity. A sample of the public in Brisbane, Australia was obtained using letterbox-dropped invitations in diverse suburbs to acquire a sample representative of the socio-economic characteristics of the Brisbane populace. The circulars informed potential respondents that the surveys would be about Australia's tropical resources and that they would be offered Aus$20 for attendance, a public lecture, refreshments and a chance to win Aus$200. A sample of 204 participants was selected to match the age and gender distribution of the Brisbane population.

Participants were divided into five groups of approximately equal sizes for the survey sessions and met on weekday slots as well as on Saturday and Sunday. These arrangements allowed participants some flexibility in choosing a time and place convenient to them so that representative participation could be maximised.

At the start of these survey sessions, participants filled out questionnaire Survey I. This provided information on the participants' socio-economic background and their attitude towards conserving each of the Australian wildlife species listed in Table 1. The relevant question for this was whether participants favoured the survival of each of these species. Participants could answer either 'yes', 'no', or 'indifferent'. After completing Survey I, participants were given a tea break.

Table 1:

The 24 Australian wildlife species covered in this study.

Common name	Scientific name	Abbreviation
Reptiles		
Saltwater crocodile	*Crocodylus porosus*	*Sc*
Australian freshwater crocodile	*Crocodylus johnstoni*	*Fc*
Hawksbill turtle	*Eretmochelys imbricata*	*Ht*
Taipan snake	*Oxyuranus scutellatus*	*Ts*
Northern long-necked turtle	*Chelodina rugosa*	*Lt*
Mammals		
Lumholtz's tree kangaroo	*Dendrolagus lumholtzi*	*Tk*
Red kangaroo	*Macropus rufus*	*Rk*
Koala	*Phascolarctos cinereus*	*K*
Mahogany glider	*Petaurus gracilis*	*Mg*
Northern bettong	*Bettongia tropica*	*Nb*
Northern quoll	*Dasyurus hallucatus*	*Nq*
Dugong	*Dugong dugon*	*D*
Northern hairy-nosed wombat	*Lasiorhinus krefftii*	*Nw*
Eastern pebble-mound mouse	*Pseudomys patrius*	*Em*
Birds		
Southern cassowary	*Casuarius casuarius*	*Scw*
Brolga	*Grus rubicundas*	*B*
Golden-shouldered parrot	*Psephotus chrysopterygius*	*Gp*
Palm cockatoo	*Probosciger aterrimus*	*Pc*
Eclectus parrot	*Eclectus roratus*	*Ep*
Gouldian finch	*Erythrura gouldiae*	*Gf*
Red-tailed black cockatoo	*Calyptorhynchus banksii*	*Bc*
Golden bowerbird	*Prionodura newtoniana*	*Gb*
Australian magpie	*Gymnorhina tibicen*	*Am*
Kookaburra	*Dacelo novaeguineae*	*Kb*

Following the tea break, participants attended a presentation by the Queensland Museum's senior Curator of Vertebrates, Dr. Steve Van Dyck about Australia's tropical wildlife, but with emphasis on the mahogany glider. Following his presentation, each participant was given a coloured photo booklet containing information on each of the focal species. The information included the species' description, geographic distribution, life history and conservation status. The participants were requested to take the booklet home and read it before filling out the second questionnaire, Survey II, and returning it in the provided postage pre-paid envelopes.

Survey II also asked if respondents favoured the survival of each of the species listed in Table

1. This was done to see whether the provision of information might alter participants' preferences.

Data analysis

For each species in the questionnaire, the percentage of the total participants saying 'yes' to their survival is calculated and the species are then ranked by decreasing percentages of participants favouring their survival. The list of species is then divided into various fractions for survival and the composition of species from the different classes in each of these fractions is assessed. The ratios of the observed and the expected proportions for mammals, birds and reptiles are calculated to ascertain the degree to which the observed values correspond to the expected values if there is no class preference. The degree of difference between the observed and expected values was tested using the chi-squared test (Zar 1999).

3. Results

Table 2 lists the species ranked by the percentage of participants in favour of their survival. Table 3 compares the observed and expected number of species from the three animal classes in various fractions of the set.

Table 2:

Rankings of species in Surveys I and II by percentage of participants favouring the species' survival, in descending order.

Survey I		Survey II	
Species	**Average percentage of participants favouring species' survival**	**Species**	**Average percentage of participants favouring species' survival**
K	98.0	Mg	97.1
Bc	97.5	K	96.6
Rk	97.1	D	96.6
Lt	96.6	Ht	96.1
Tk	96.6	Rk	96.1
D	96.6	Tk	95.6
One quarter of species			
Scw	96.6	Nb	95.6
B	96.6	Nq	95.6
One third of species			
Kb	96.6	Nw	95.6
Nw	96.1	Gb	95.6
Gb	96.1	Gp	95.1
Mg	95.6	Bc	95.1
Half of species			
Ht	95.1	Lt	94.6
Pc	95.1	B	94.6
Ep	94.1	Em	94.1
Gp	93.6	Scw	94.1
Two thirds of species			
Gf	93.6	Gf	94.1
Am	93.2	Pc	93.6
Three quarters of species			
Nb	92.6	Ep	93.1
Fc	92.2	Fc	92.2
Sc	91.7	Kb	92.2
Nq	89.7	Sc	91.2
Em	84.3	Am	89.7
Ts	82.8	Ts	86.3

Table 3:

Observed and expected number of species for survival by animal class (M = mammals, B = birds, R = reptiles) when various fractions of all species in Table 1 can be selected for the 'Ark'. O/E ratios indicate the proportion by which the observed number of species is in excess of the expected number of species in each fraction. Gray shading indicates over-representation of an animal class

	Survey I					Survey II				
	M	**B**	**R**	**Tot.**	**χ^2 (*p*)**	**M**	**B**	**R**	**Tot.**	**χ^2 (*p*)**
One quarter										
Observed	4	1	1	6	2.31	5	0	1	6	5.91
Expected	2.25	2.50	1.25	6	(0.32)	2.25	2.50	1.25	6	(0.05)
O/E Ratio	1.78	0.40	0.80			2.22	0.00	0.80		**
One third										
Observed	4	3	1	8	0.63	7	0	1	8	8.93
Expected	3.00	3.33	1.67	8	(0.73)	3.00	3.33	1.67	8	(0.01)
O/E Ratio	1.33	0.90	0.60			2.33	0.00	0.60		***
Half										
Observed	6	5	1	12	1.40	8	3	1	12	4.42
Expected	4.50	5.00	2.50	12	(0.50)	4.50	5.00	2.50	12	(0.11)
O/E Ratio	1.33	1.00	0.40			1.78	0.60	0.40		*
Two thirds										
Observed	6	8	2	16	0.80	9	5	2	16	2.45
Expected	6.00	6.67	3.33	16	(0.67)	6.00	6.67	3.33	16	(0.29)
O/E Ratio	1.00	1.20	0.60			1.50	0.75	0.60		
Three quarters										
Observed	6	10	2	18	1.73	9	7	2	18	1.6
Expected	6.75	7.50	3.75	18	(0.42)	6.75	7.50	3.75	18	(0.45)
O/E Ratio	0.89	1.50	0.60			1.33	1.05	0.60		
Bottom quarter										
Observed	3	0	3	6	5.2	0	3	3	6	4.8
Expected	2.25	2.5	1.25	6	(0.07)**	2.25	2.5	1.25	6	(0.09)
O/E Ratio	0.89	1.50	0.60			1.33	1.05	0.60		**

***Statistically significant at the 95% confidence level, ** at the 90% level, * at the 85% level.

If only one quarter (or 6 species) of the set of 24 species is able to be saved, the observed versus expected ratios of 1.78 in Survey I and 2.22 in Survey II indicate that mammals are over-represented by 78% and 122% respectively. This over-representation of mammals is evident in up to the first half of the list of rankings for Survey I and in all selected fractions of the list for Survey II. The differences between the observed numbers of mammal, bird and reptile species and the corresponding expected values are found to be statistically significant at the 90%, 95% and 85% confidence levels respectively for the survival of one-quarter, one-third and a half of the relevant species in Survey II. The over-representation of mammals and under-representation of birds and reptiles in those fractions in Survey II is significant. Birds are found to be over-represented in the top two-thirds and top three-quarters of the list in Survey I, but their observed and expected values are found to be not significantly different. Reptiles are consistently under-represented in both surveys, and in Survey II, birds are not represented at all in the top one-third of the list of species' rankings.

Consider also the bottom quarter of Table 2. It contains species with the least likelihood of being selected for survival. In Survey I, mammals and reptiles are both over-represented in the bottom quarter whereas no bird species are present (Table 3). However, in Survey II, the bottom quarter consists of no mammals but includes birds such as the more common kookaburra and the least-liked bird, the magpie. Information provision altered respondents' priorities for survival of the species to some extent, as might be expected from the theories of Bergstrom et al. (1990), Ajzen et al. (1996) and Spash (2002).

Finally, observe from Table 2 that the average percentage of support for the species whose survival is least favoured by respondents is quite high (taipan snake: Survey I = 82.8%; Survey II = 86.3%). There is also within-class variation in support for survival. For instance, although the taipan snake is at the bottom of the rankings, other reptiles like the northern long-necked turtle and the hawksbill turtle rank highly, above some mammal species. Similarly, the eastern pebble-mound mouse, a mammal, ranks second last in Survey I and below most of the reptiles in the set.

4. Discussion

Note that our results relate to preferences for the survival of species, not to willingness to contribute fund for the conservation of each. The latter is likely to be poorly related to preferences for survival of species in an Ark-type situation because it is influenced by such

factors as the degree of endangerment of the species and hence, the relative urgency for conservation action in each case. For example, a species such as the red kangaroo has a high priority for survival but since it is abundant and secure, individuals are willing to pay little for its conservation (Tisdell and Wilson 2004, p. 2354). Note also that we use the relative number of 'votes' in favour of survival of species as the basis of social choice. Other rules are possible, some of which are mentioned in Tisdell (1990).

Results from this experiment accord with the Similarity Principle when a limited number of species are selected for survival from a larger pool of species. Respondents tend to favour the survival of mammals rather than birds or reptiles. Favouritism for survival of mammals strengthened in Survey II after knowledge provision. In Survey II, no mammal species at all was found in the bottom quarter of the list of rankings.

However, it would be hasty to conclude that species from non-mammal animal classes would be excluded from 'Ark'. From Survey I results in Table 2, we see that at least one species from each animal class is represented in the top four species (top 12½ percent) found in the list of rankings (mammals: the koala and the red kangaroo; birds: the red-tailed black cockatoo; reptiles: the northern long-necked turtle). In Survey II, at least one species from each animal class is represented if the top 10 species (top 42 percent) are considered. For both surveys, at least two species from each animal class is represented in the top 13 species or about half way down the list of rankings. Thus, even if only half of this set of animal species were to be saved, non-mammal animal classes would still be represented. Furthermore, regardless of the hierarchical ranking in support for survival of individual species, there are clear majorities favouring the survival of all the species.

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