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Comparison of funding and demand for the conservation of the charismatic koala with those for the critically endangered wombat *Lasiorhinus krefftii*

CLEM TISDELL* and HEMANATH SWARNA NANTHA
*School of Economics, The University of Queensland, Brisbane 4072, Australia; *Author for correspondence (e-mail: c.tisdell@economics.uq.ezdu.au; phone: +61-7-33656570; fax: +61-7-33657299)*

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Abstract. This study contrasts the actual conservation spending and the Australian public's demand for conservation funding for two Australian mammal species, the koala and the northern hairy-nosed wombat. It involves a survey of 204 members of the Australian public. Willingness to fund conservation action to protect the northern hairy-nosed wombat was found to be higher than that for the koala despite the koala's immense popularity. The critically endangered status of the northern-hairy nosed wombat and the more secure conservation status of the koala is a factor likely to have influenced the comparative willingness-to-pay decisions. Actual annual conservation expenditure for both species is lower than the estimated aggregate willingness-to-pay for their conservation. Furthermore, conservation funding for the koala is much more than that for the northern hairy-nosed wombat even though the estimated public willingness-to-pay (demand) for funding koala conservation was less than for this wombat species. Reasons for this are suggested. They may also help to explain misalignment between demand for conservation funding of other species involving differences in charisma and endangerment.

Abbreviation: WTP – Willingness to pay

Introduction

There is evidence that charismatic wildlife species are likely to obtain more public funding for efforts to conserve them than less charismatic ones if both are equally endangered, or even if the latter are more endangered (Metrick and Weitzman 1996, 1998; Naidoo and Adamowicz 2001). Nonetheless, it is still unclear how closely public funding of conservation efforts for different species reflects the public's comparative support for those efforts. It is, for example, possible that this actual comparative public support does not closely reflect

public demand because pure public goods or mixed goods[1] are involved, and complex non-market mechanisms, such as political mechanisms, determine actual allocations. There may be 'excessive' public allocation of funds for conservation efforts for charismatic species compared to what the public actually demands. The purpose of this article is to explore this possibility, taking the charismatic koala *Phascolartos cinerus* and the critically endangered northern hairy-nosed wombat *Lasiorhinus krefftii* as comparative cases.

The public's stated willingness to donate funds to support efforts for the conservation of wildlife species appears to depend mainly on the extent of the public's knowledge of the species, their likeability and the perceived degree to which they are endangered (*cf*. Samples et al. 1986; Tkac 1998). The likeability of the species may depend on factors such as their charismatic nature, size, whether they are human-like and so on (Metrick and Weitzman 1996). Lorenz (1970), Gould (1980), Kellert (1980), Plous (1993) and Gunnthorsdottir (2001) indicate that more human-like or physically attractive species are liked more and regarded with greater affection than those that are not so, and are likely to receive more public support.

The koala is charismatic, has a face without a muzzle, eyes placed forward rather than on the side of its head and frequently assumes an upright posture in trees. It is, therefore, considered to be quite humanoid (Lee and Martin 1988; Martin and Handasyde 1999). While the wombat has some charisma and humanoid features, these are less pronounced than in the case of the koala. Therefore, given the above theories, one might expect koalas to be liked more than wombats. Whereas the northern hairy-nosed wombat is critically endangered (IUCN 2004), the koala is considered to be at low risk of extinction; the IUCN (2004) classifies the koala as being at "least concern/near threatened". If likeability happened to be the dominant influence on the public's support for funding the conservation of species, we would expect the public to give greater support to the funding of the conservation of the koala than to the hairy-nosed wombat. On the other hand, if endangerment is the dominant influence, we would expect the reverse preference.

In these circumstances, does the stated willingness of the Queensland public to contribute funds for conservation of the koala exceed that for the northern hairy-nosed wombat or is the opposite the case? To what extent does the actual distribution of funds for conserving koalas and northern hairy-nosed wombats accord with the comparative stated willingness of members of the Queensland public to contribute funds to aid their conservation? Both these questions are considered here. In addition, possible reasons for a discrepancy, should there be a discrepancy, will be considered.

[1]A pure public good can be described as a good that is nonexclusive (it is impossible to exclude everyone/anyone from enjoying the good) and nonrival (the enjoyment of the good by one person does not diminish another's enjoyment of the good) (*cf*. Tisdell 1982, p. 406; 2005, Ch. 3). The impossibility of or impracticality of exclusion means that the good cannot be marketed. In the case of mixed goods, partial exclusion may be possible. So limited marketing of these can occur.

Experimental surveys are used to gather evidence on the likeability of the focal species, the stated willingness of survey participants to contribute funds for the conservation of species and the impacts of information provision on these factors. Information provision increased the knowledge of participants about the focal species, including their conservation status.

After briefly providing some general background on the focal species, the methodology is outlined. The willingness to pay (demand) results from the experimental survey are then reported. This is followed by an estimate of actual Queensland's expenditures on the conservation of koalas and hairy-nosed wombats and these are compared with the estimated willingness-to-pay figures. Discrepancies are observed and then discussed and possible limitations of the study are outlined.

Brief observations on the focal species

The koala is a tufty-eared, pale-grey/grey-brown marsupial that inhabits sclerophyll forests and woodlands from north Queensland down to New South Wales and Victoria (Martin and Handasyde 1995; Menkhorst and Knight 2004). It is arboreal and dependent primarily on eucalyptus leaves for food (Hindell and Lee 1990). This species is being threatened in some localities by the recession of its habitat due to land clearing (Maxwell et al. 1996; Melzer et al. 2000, p. 623). Overall, it is considered to have a low risk of extinction (IUCN 2004). Regionally, the conservation status of the koala in Queensland is 'vulnerable' in the south-east but 'common' elsewhere (Queensland Environmental Protection Agency 2003, p. 6), and the Victorian koala population is more secure than the New South Wales population, which is classified as vulnerable Jackson et al. 2003, p. 148).

Generations of Australian children have grown up developing an affinity for the koala as a result of their exposure to classic children's storybooks such as *Magic Pudding* (Lindsay 1936) and *Blinky Bill* (Wall 1939). They have also been exposed to the koala in children's television programmes such as Hanna Barbera's cartoon ''Kwicky Koala Show''. Due to their popularity, koalas are thought to be useful means for creating awareness and educating the public about wildlife conservation (Finnie 1990). They have recently been used in posters (displayed in the waiting rooms of doctors' surgeries) to encourage Australians to take precaution against sun exposure. The koala is a one of the world's most widely recognised and loved mammals (Cork et al. 2000). Koalas draw a great number of foreign tourists to Australia annually (Hundloe and Hamilton 1997). Tourists are able to see and interact with this creature in many wildlife parks such as the Featherdale Wildlife Park in Sydney and the Lone Pine Koala Sanctuary in Brisbane. They are also held in numerous zoos throughout the world (Jackson 2001; Lees and Johnson 2002). The koala is a prominent symbol used in tourism advertisements, magazine advertisements, on billboards and in promotions of products and services by businesses such as

Qantas Airlines (Martin and Handasyde 1999, p. 2) and is frequently the mascot of Australian teams at the Olympics (Phillips 1990, p. 6).

The northern hairy-nosed wombat is the largest and rarest of the three wombat species in Australia. The more abundant species are the common wombat *Vombatus ursinus*, found in south-eastern Australia, and the southern hairy-nosed wombat *Lasiorhinus latifrons*, occurring in South Australia and south-eastern Western Australia (Triggs 1996; Jackson 2003). The northern hairy-nosed wombat is a rotund, burrowing, herbivorous mammal with silky fur, pointy ears and a square muzzle (Horsup 1999; Menkhorst and Knight 2004). It is very secretive, nocturnal (McDonald and Norris 2001; Woodford 2002) and spends most of its time underground (Horsup 1999).

Historically, it used to inhabit native perennial grassland and open woodland areas in the semi-arid zone encompassing Queensland and New South Wales, but due to overgrazing by cattle and drought, its range declined and at present the species is limited to a 300-hectare area in Epping Forest National Park, located inland in central Queensland (between Townsville and Rockhampton) (Horsup 1999). Its population size was estimated to be 113 (Banks et al. 2003) but has recently dropped to 90 due to dingo predation and drought (Australian Geographic 2005; Alan Horsup, personal communication, 19th April 2005). It is classified as 'critically endangered' (IUCN 2004). The major threat to its existing population is its small size and single location, which makes it vulnerable to disease, to environmental changes and disturbances and to inbreeding (Horsup 1999).

Cultural factors have helped to endear the wombat to many Australians. The wombat in general has featured in popular children's books like the *Magic Pudding* and others (Lindsay 1936; Trinca and Argent 1987; French and Whatley 2003), and is the lead character in the Australian Broadcasting Corporation's (2005) radio serialisation of *The Muddle-Headed Wombat* stories by Ruth Park (1962). The wombat also features in adult literature, such as in the poems of Ogden Nash (Nash 1954), and in the drawings and verses of the 18th century Italian painter and poet, Dante Gabriel Rossetti (Archer 1965; McGann 2000).

Unlike the koala, the northern hairy-nosed wombat cannot be seen in zoos and wildlife parks nor do the public have access to it in the wild. At Epping Forest National Park, entry to its habitat is restricted to those trying to ensure its survival. This implies that currently the total economic value[2] of the two species consist of different components.

[2]An individual's total gain in wellbeing obtained from a change in policy is usually measured, in this case, by the individual's willingness to pay for that change (or to avoid it) (Bateman et al. 2002, p. 28). This willingness to pay, once aggregated across all individuals in a society, is often used to measure the total economic value of that change to society. Total economic value of an environmental good is sometimes expressed as follows: Total economic value = Use values + non-use values = [Direct (consumptive) use value + indirect (non-consumptive) use value + option value] + [existence value + bequest value + altruistic value] (see Pearce and Moran 1994, p. 12; see also Tisdell 2005, Ch. 3).

The total economic value of the northern hairy-nosed wombat consists only of its non-use (or passive) economic values, such as existence and bequest values. It currently has no use value but this could be a potential economic value in the future. Presently, it can be classified as a pure public good.[3] On the other hand, the koala has economic use as well as non-use values because Australians value its continuing existence in the wild. The current economic use value of the koala is non-consumptive and consists of viewing and photographing it in the wild, in zoos and in private wildlife parks. In the latter case, individuals are often photographed (for a fee) holding a koala. Koalas in private wildlife parks and zoos can be classified as virtually private economic goods because those who do not pay can be excluded from the establishment. Some rivalry occurs in use, e.g., only one person can hold a koala at a time for a photograph and crowding can reduce viewing opportunities. Because the use of the koala involves private good plus public good components, it can be regarded as a mixed economic good. In the wild, the koala is also a common property resource in many situations. For example, access to most national parks and state protected areas in Queensland where koalas may be seen is free, but use of these resources is subject to state (communal) regulations. Because the components of the economic value of these two species differ, this may (as taken up in the discussion section) affect the comparative amount of funds actually allocated for their conservation.

Methods

Survey methodology and questions

This study was conducted using two serial questionnaires, Survey I and Survey II. Drafts of these were pre-tested on a group of university students and were subsequently modified for greater clarity. A stratified sample of the public in Brisbane was obtained for the surveys by means of 1500 invitations letterbox-dropped in varied suburbs to acquire a representative socio-economic sample of the local population. The circulars informed potential respondents that the surveys would be about the use of Australia's tropical resources and that participants would be offered Aus$20, a presentation, refreshments and an opportunity to win Aus$200 in a draw. The precise aims of the study were withheld to avoid selection bias. After screening respondents to match the adult age (18 years old or more) and gender distribution of the Brisbane population, 204 participants were selected for the survey. Participants were divided into five groups of about equal size for the survey sessions held during the working week and at the weekend. This allowed participants flexibility in choosing a convenient time and helped to increase the representativeness of the sample.

[3]See Note 1.

At the beginning of the survey sessions, participants filled out questionnaire Survey I. This provided information on the participants' socio-economic background and their attitude towards the use and conservation of a number of Australian animal species of which the set of mammals is the only relevant one here. The koala and the northern hairy-nosed wombat were included in the mammal set. Once the forms in Survey I were completed, they were collected.

The nine species in the mammal set were selected to include species that all occur in tropical Australia (some of which it was assumed would be well known to Brisbane residents and some poorly known) and to include a mixture of species with varied conservation status. The selected species were the (1) dugong *Dugong dugon*, (2) eastern pebble-mound mouse *Pseudomys patrius*, (3) koala *Phascolarctos cinereus*, (4) mahogany glider *Petaurus gracilis*, (5) northern bettong *Bettongia tropica*, (6) northern hairy-nosed wombat *Lasiorhinus krefftii*, (7) northern quoll *Dasyurus hallucatus*, (8) red kangaroo *Macropus rufus* and (9) tree kangaroo *Dendrolagus lumholtzi*.

Participants were asked to self-rate their knowledge of all the species (''very good'', ''good'', ''poor'', ''non-existent''); how much they liked or disliked a species (''strongly like'', ''like'', ''dislike'', ''strongly dislike'' or ''uncertain of feelings towards species''); and whether they favoured the survival each of the species or not (''yes'', ''no'' or ''indifferent''). While these measures are subjective, they are able to rank comparatively species and highlight relative changes between Survey I and Survey II for the focal species. They act as ordinal indicators.

This procedure was followed by the presentation of willingness-to-pay questions. Three different indicators of willingness-to-pay for conservation of the focal species were used: (i) stated willingness to contribute money out of the participants' own pocket for funds (using the single-bid method) to conserve the koala and the northern hairy-nosed wombat, and reasons for the amounts stated if the amount is different between the species; (ii) the allocation of a windfall of Aus$1000 for conservation between nine mammal species; and (iii) comparative willingness to contribute a windfall of Aus$1000 for conservation between two wombat species, the northern hairy-nosed wombat and the southern (hairy-nosed) wombat and reasons for the allocations stated.

The exact questions corresponding to the above three willingness-to-pay indicators are stated in the results section. All involve variations on the contingent valuation method (*cf*. Champ et al. 2003, pp. 101–103). The first estimate involves a single-bid approach rather than iterative bidding. Bishop and Heberlein (1990) suggest that the single-bid approach tends to underestimate willingness to pay and may not be as accurate as iterative bidding. However, it is a less costly method than iterative bidding to apply and causes less fatigue to respondents. Since respondents were asked many questions in our survey, this was an important consideration in our choice.[4]

[4]Furthermore, perfect accuracy of estimates is not always needed for ideal policy choices nor even for perfect rationality Baumol and Quandt 1964; Tisdell 1996, Chs. 2 3). Even in the absence of perfect knowledge, rational conclusions can sometimes be drawn as will transpire in this case.

It is, however, well known that stated willingness to pay estimates are subject to several limitations. These include strategic bias, informational bias, hypothetical bias, and instrument bias. Strategic bias occurs, for example, when individuals deliberately inflate (or possibly deflate) their stated willingness to pay for, say, conservation of particular species or all species so as to influence conservation policy in their favour. The provision of information by interviewers could be slanted or defective and cause bias. The outcome may also be subject to income effects; persons on higher income are able to pay more to satisfy their preferences.

The two fixed-pie questions involving the allocation of windfall gains between the species provide further evidence about the relative support of respondents for funding conservation efforts of the different species. The formulation means that possible income effects on the willingness to pay are lessened and strategic bias is reduced (*cf*. Samples et al. 1986, p. 309; Gunnthorsdottir 2001, p. 207). The income influence is eliminated by the fixed pie method because all obtain the windfall gain which can only be allocated to funding conservation of the species listed. Strategic bias is reduced because the total funds for conservation are fixed and in allocating more funds to one species, the respondent must reduce allocations to others, that is must make trade-offs.

Upon completing Survey I and handing in their survey forms, participants were given a tea break. Participants then attended a presentation by the Queensland Museum's senior Curator of Vertebrates about Australia's tropical wildlife. After his presentation, participants were each given a booklet containing information on each of the focal species of the study. The information consisted of descriptions and coloured photographs of the species, their geographic distributions, life histories and conservation status. The information provided for each species was approximately of the same amount, and was kept brief and descriptive. The participants were requested to take the booklet home and read it before filling out the second questionnaire, Survey II, and returning this questionnaire in the postage pre-paid envelopes provided. Survey II contained the same set of questions as those described earlier for Survey I. The purpose of Survey II was to quantify possible changes resulting from information provision in participants' attitudes towards the species and their willingness to pay to conserve them compared to Survey I.[5]

Data analysis of survey data

The percentage of participants who stated their knowledge of the koala and the northern hairy-nosed wombat was 'very good' or 'good' was calculated in both surveys. Indices of how much a species is liked (likeability) were constructed by

[5]Note that completed Survey I forms were collected prior to participants being given forms for Survey II. This was to help ensure that responses were given independently.

assigning weights to each attribute of the Likert scale (2 for "strongly like", 1 for "like", 0 for "uncertain of feelings towards species", −1 for "dislike" and −2 "for strongly dislike") and by averaging the input of all participants for each species. The percentages of participants who answered "yes" to the question of whether they favoured the survival of the species were also calculated.

The single-bid willingness-to-pay (WTP) values given by each participant for both the koala and the northern hairy-nosed wombat were averaged. Care was taken with zero bids. The mean WTP values obtained for both species in Survey I and Survey II were compared using the Wilcoxon test for paired samples (Zar 1999). This statistical procedure was also used to compare the change in the mean WTP for each species between surveys. This non-parametric test was used because the distribution of the WTP values from the sample population appears to be non-normal. The mean allocation of funds for the koala and the northern hairy-nosed wombat (obtained from the allocation exercise involving all the mammal species in the survey) were also compared using the Wilcoxon test. The same statistical test was also applied in comparing the mean allocations of funds between the two wombat species (the northern hairy-nosed wombat and the southern wombat). Reasons given by participants for their stated single-bid WTP and their allocation of funds were reviewed.

The aggregate willingness to pay for the conservation of the koala and the northern hairy-nosed wombat in Queensland was then calculated as described by Bateman et al. (2002, Ch. 9) and as performed by Bateman et al. 2000) and Tisdell et al. (2005). This involved extrapolating survey participants' mean WTP for the koala and the wombat to Queensland's adult population. A necessary assumption for use of this method is that the sample is reasonably representative of the population. Our sample was chosen so as to be reasonably representative of Brisbane's population so we provide estimates of aggregate willingness to pay for this population. The wider the population considered, e.g., in this case the entire Australian population, the less accurate is the aggregate WTP likely to be due to the 'distance decay' effect (Bateman et al. 2002, p. 333).

Method of estimating actual expenditure on conservation of koalas and northern hairy-nosed wombats

Estimates of the willingness of individuals to pay for programs for the conservation of the koala and the northern hairy-nosed wombat are compared with estimates of actual payments for these programs in Queensland. Estimates for the koala are minimum values but for the northern hairy-nosed wombat are close to actual values. They are obtained by using secondary data, information provided by personal communications and various assumptions outlined later.

Results

Knowledge, likeability and support for survival

In Survey I, more than three-quarters of participants stated that they have very good or good knowledge of the koala whereas only a third of the participants claimed to have similar levels of knowledge about the northern hairy-nosed wombat (Table 1). After information provision, the number of participants who stated that they have very good or good knowledge of the northern hairy-nosed wombat increased by 70% but this still accounted for only a little more than half of all participants. The koala remained the better-known species by far. Participants also, on average, found the koala more likeable than the wombat in both surveys (Table 1). In Survey I, 98% and 96.1% of participants were strongly in favour of the survival of the koala and northern hairy-nosed wombat, respectively. In Survey II, it was 96.6% and 95.6% respectively.

Stated willingness to contribute to conservation funding from own funds to conserve the northern hairy-nosed wombat and the koala

The following questions were asked:

> "Assume that the government or a conservation body is raising money to save the northern hairy-nosed wombat. What is the maximum amount you would be willing to pay per week to conduct research, protect and conserve (such as by buying land) this species for the next ten years? Aus$ …… a week
>
> Now assume that instead of the northern hairy-nosed wombat, funds are being raised to conduct research, protect and conserve the koalas. What is the maximum amount you would be willing to pay per week for the conservation of koalas for the next ten years? Aus$ …… a week"

Results indicate that participants were willing to pay more to conserve the northern hairy-nosed wombat on average than to conserve the koala in both surveys (before and after participants were provided information about the species) despite the fact that the koala is liked more than the northern hairy-

Table 1. Percentages of participants stating that they have 'very good' or 'good' levels of knowledge of the species[a] and their estimated likeability indices.

	Knowledge level (% very good or good)		Likeability indices	
	Northern hairy-nosed wombat	Koala	Northern hairy-nosed wombat	Koala
Survey I	33	79	1.27	1.53
Survey II	56	83	1.20	1.42

[a]The remainder have poor or no knowledge of the species.

nosed wombat (Table 2). The differences in the mean WTP between the species are statistically significant at the 99% confidence level in both surveys. The rise in mean WTP of participants for the northern hairy-nosed wombat between surveys is large and statistically significant whereas the change in the mean WTP for the koala is small and not statistically significant. While for most participants the WTP amounts were equal for both species, the proportion of participants willing to pay relatively more for the wombat than for the koala was large and increased in Survey II (Table 3).

The allocations received by the koala and the northern hairy-nosed wombat from a hypothetical fund to conserve the nine mammals species studied

In order to obtain further evidence about whether the participants' demand for conservation efforts to support the northern hairy-nosed wombat are greater than for the koala, the following proposition was put to the participants:

> "Suppose that you are given Aus$1,000. This time you can only donate it to organisations in Australia to help conserve mammals in Australia,

Table 2. The northern hairy-nosed wombat and the koala: mean stated WTP for their conservation per week.

	Mean WTP ($)		Significance of difference between species (W, p)
	Northern hairy-nosed wombat	Koala	
Survey I (n = 185)	1.73	1.40	1409, < 0.01**
Survey II (n = 192)	1.94	1.45	3512, < 0.01**
Significance of difference between surveys (W, p)	−1208, 0.02*	454, 0.43	

Statistical significance: **99% confidence level, *95% confidence level.

Table 3. Distributions in the sample of WTP for the conservation of northern hairy-nosed wombat and the koala.

	Survey I No. (and as a % of all participants)	Survey II No. (and as a % of all participants)
Participants who gave equally to both species	117 (63.2%)	98 (51.0%)
Participants who gave more for the wombat	55 (29.7%)	83 (43.2%)
Participants who gave more for the koala	13 (7.0%)	12 (6.3%)
Participants who did not answer	19 (10.3%)	12 (6.3%)
Total responding participants	185	192

including marsupials, in the list below. What percentage of it would you allocate for the conservation of each of the mammals listed below? Your total should add up to 100%."

In Survey I, while the mean allocation for the koala was less than for the northern hairy-nosed wombat, the difference was not statistically significant

Animals (Mammals)	(%)
Tree kangaroos	
Red kangaroos	
Koalas	
Mahogany gliders (similar to the squirrel glider)	
Dugongs (a sea cow, not related to seals or whales)	
Northern quolls (a native marsupial cat)	
Northern bettongs (a small kangaroo-like marsupial)	
Northern hairy-nosed wombats (two related species are found in southern Australia)	
Eastern pebble-mound mice (four related species are found in Australia)	100

(Table 4). In Survey II, however, there was a statistically significant rise (at the 95% confidence level) in the mean allocation for this wombat, whereas the mean allocation for the koala fell significantly (at the 99% confidence level). The difference between the mean allocation of funds for the koala and the wombat in Survey II is statistically significant at the 99% confidence level. The change is probably mainly a result of respondents obtaining more information about the conservation status of each of these species. Note that if all nine mammal species in the survey received equal allocation, then each would receive an average 11.1% of the funds. In Survey II, the allocation for the northern hairy-nosed wombat is 29% higher and the allocation for the koala is 16% lower than that 11.1% average.

Table 4. Mean stated percentage allocations of funds for conserving nine mammal species: percentage allocated to the northern hairy-nosed wombat and the koala.

	Mean allocation (%)		Significance of difference between species (W, p)
	Northern hairy-nosed wombat	Koala	
Survey I (n = 159)	13.0	12.4	7, 0.99
Survey II (n = 166)	14.3	9.3	2892, <0.01**
Significance of difference between surveys (W, p)	−1379, 0.03*	3106, <0.01**	

Statistical significance: **99% confidence level, *95% confidence level.

The northern hairy-nosed wombat and the southern wombat: percentage allocation and distribution of funds for their conservation

In order to check whether support for programs to conserve the northern hairy-nosed wombat was not merely a consequence of it being a wombat, participants were asked the following:

> "You are given Aus $1,000 that you can allocate to conserve the northern hairy-nosed wombat or the southern wombat (this species is common). What percentage would you allocate to each?
>
> Northern hairy-nosed wombat .....%
>
> Southern wombat .....%"

When asked to allocate funds between these two, morphologically similar wombat species, the results shown in Table 5 were obtained. The northern hairy-nosed wombat was on average allocated a significantly greater proportion of the funds than the southern wombat in both surveys. Following provision of information about the species, the mean allocation for the northern hairy-nosed wombat rose significantly in Survey II at the expense of the allocation for the southern wombat.

More than two-thirds of the participants gave greater allocation of the funds to the northern hairy-nosed wombat, less than a quarter allocated equally between the species, and none allocated more funds to the southern wombat in Survey II (Table 6). Hence, support for conservation efforts for the northern hairy-nosed wombat significantly exceeds that for the southern wombat which is not under threat of extinction at present.

Aggregate WTP for projects to conserve the koala and the northern hairy-nosed wombat and actual expenditure on these

Table 7 provides point estimates of the aggregate (annual) WTP of Brisbane adult residents, the Queensland adult population and the Australian adult population for conservation projects for the koala and the northern hairy-nosed wombat. These are obtained by the benefit transfer method Bateman et al. 2002). This is also sometimes called the simple transferring point estimate approach and has been used, for example, by Hadker et al. (1997), Loomis and Ekstrand (1998) and Loomis et al. (2000). Table 7 is based on the results in Table 2, times 52 (weeks in a year) and multiplied in each instance by the estimates of the Australian Bureau of Statistics (2002, 2004a, b) of the adult populations involved. Note that these figures are annual sums and are based upon the stated willingness of respondents to contribute weekly to the conservation of the species for the next 10 years. The results from Survey I correspond to the situation in which the public is provided with no extra

information about the species beyond what they already have whereas the aggregates corresponding to Survey II assume that the public is provided with the extra information given to survey participants in this experiment.

Table 5. Northern hairy-nosed wombat and southern wombat: average percentage allocation of funds for conservation of the species in Survey I and Survey II.

	Mean allocation (%)		Significance of difference between species (W, p)
	Northern hairy-nosed wombat	Southern wombat	
Survey I (n = 177)	70.2	29.2	5585, <0.01*
Survey II (n = 189)	78.1	22.0	10010, <0.01*
Significance of difference between surveys (W, p)	-3223, <0.01*	3051, <0.01*	

*Significant at the 99% confidence level.

Table 6. Distribution of allocation of funds for conservation of the northern hairy-nosed wombat and southern wombat.

	Survey I No. (and as a percentage of all participants)	Survey II No. (and as a percentage of all participants)
Participants who allocated more for the n. wombat	105 (51.5%)	142 (69.6%)
Participants who allocated equally	70 (34.3%)	47 (23.0%)
Participants who allocated more for the s. wombat	2 (1.0%)	0 (0.0%)
Participants who did not answer	27 (13.2%)	15 (7.4%)
Total responding participants	177	189

Table 7. Estimates in millions of Australian dollars of aggregate annual willingness to contribute funds for conservation projects for the koala and the northern hairy-nosed wombat by different constituencies based on aggregated benefits in Table 2 times 52.

Population, survey and species	Brisbane (in millions)	Queensland (in millions)	Australia (in millions)
Adult population size (millions)	1.20	2.92	15.31
Aggregate WTP ($) (millions)			
Survey I			
Koala	87.36	212.68	1114.36
Northern hairy-nosed wombat	108.16	262.60	1378.00
Survey II			
Koala	90.48	219.96	1154.40
Northern hairy-nosed wombat	121.16	292.76	1544.40

Sources of population estimates: Australian Bureau of Statistics (2002, 2004a, b). Adult population defined as those 18 years old and older.

The estimates are likely to be of decreasing accuracy the larger the constituencies. Those for Brisbane should be the most accurate and those for Australia the least. If one wants to reflect the actual demand of the public for those conservation programs, results from Survey I are probably the most appropriate. However, if one is concerned about the demand of a better informed public, then those for Survey II are more relevant. A better informed public increases its relative demand for projects to conserve the more threatened species, namely the northern hairy-nosed wombat.

Estimating actual expenditure on each of the two focal species is difficult, especially for the koala. This is so because data from the Australian Koala Foundation on its allocations, for example, are very limited. Nevertheless, it is possible to obtain a rough minimum estimate for Queensland for the koala and a relatively precise estimate for the northern hairy-nosed wombat. These estimates and their bases are given in Table 8.

Comparing Tables 7 and 8, a large discrepancy is apparent between (i) the estimated demand of adult Queenslanders for conservation funding of the koala and the northern hairy-nosed wombat and (ii) the comparative allocation of funds for conservation of these species. Whereas the Queensland

Table 8. Estimated recent (approximately 2003–2004) annual expenditure on conservation projects for the koala and the northern hairy-nosed wombat in Queensland in Australian dollars.

Funding source	Koala ($)	Northern hairy-nosed wombat ($)
Queensland state government	≈700,000[a]	149,625[b]
Public donations/funds from NGOs	83,333[c]	51,377[d]
Research grants	130,000[e]	106,800[f]
Funds for community-level conservation initiatives	13,467[g]	0
Total annual expenditure	926,800	307,802

[a]See Queensland Environmental Protection Agency (2003, p. 14).
[b]Financial year 2003–2004 (Alan Horsup, Queensland Parks and Wildlife Service, Coordinator of the northern hairy-nosed wombat recovery program, pers. comm.).
[c]Average annual contribution of the Australian Koala Foundation till end of 2004 would be approximately Aus$250,000 (the organisation claims to have allocated Aus$2 million to koala research and conservation projects since 1986) (Australian Koala Foundation, undated). This figure is for funds raised for koalas Australia-wide, not for Queensland alone. Therefore, funds potentially allocated annually for each of the three states where koalas mainly occur would be, on average, a third of the Aus$250,000 sum. Note that there are many sources of funds from the public and from non-governmental institutions (local and overseas). The San Diego Zoo in the United States, for example, loans its koalas to other zoos and part of the funds obtained from these loans are donated to koala habitat conservation in Australia (Zoological Society of San Diego 2005).
[d]From donations, financial year 2003–2004 (Alan Horsup, personal communication).
[e]Average annual funds from Rio Tinto Coal Australia to The University of Queensland's Koala Study Program for a three-year research and management program in central Queensland to help conserve koalas (The University of Queensland 2005).
[f]From the Federal Government, financial year 2003–2004 (Alan Horsup, personal communication).
[g]Average annual grants from The National Heritage Trust's ENVIROFUND (Commonwealth Government) for community-based local conservation projects. Over the past 3 years, funding for community koala conservation projects in Queensland totalled Aus$40,402.

public's demand for conservation spending on the northern hairy-nosed wombat exceeds that for the koala, actual annual spending in Queensland on conserving the northern hairy-nosed wombat is a third of that spent on the koala. A significant imbalance is present. Overall, conservation spending on each of these species falls far short of what appears to be demanded by the Queensland public. There may, however, be some strategic bias present. The WTP figures may overstate what respondents are really willing to pay. Nonetheless, the results in Table 4 (the case in which respondents allocate a fixed sum of money for the conservation of species) also supports the view that demand for expenditure on conserving the northern hairy-nosed wombat at least equals that for expenditure on projects to conserve the koala. In fact, when respondents are better informed about the conservation status of the species, demand for conservation projects for the former exceeds that for the koala. Note that the amount of funding koala conservation receives exceeds that apparent from the Queensland data. Both New South Wales (NSW National Parks and Wildlife Service 2003) and Victoria have projects to conserve the koala too but not the northern hairy-nosed wombat because it does not occur in these states.

Discussion and conclusions

The koala, a well-known iconic species, is at present not as threatened as the less well-known northern hairy-nosed wombat which is critically endangered. Our sample of Brisbane respondents said that they liked both species but the koala was liked most on average. This may be because the koala is more humanoid in appearance than the northern hairy-nosed wombat and has been given greater cultural coverage in Australian than the wombat. Nevertheless, our Brisbane respondents stated that they are willing to contribute more towards projects to conserve the northern hairy-nosed wombat than the koala, particularly so when they were better informed about the relative conservation status of the species. Aggregate actual funding for the conservation of both species is also lower than the aggregate WTP for their conservation even if only the Brisbane population is considered.

Differences in the respondents' stated likeability of the species did not appear to be the major influence on the stated willingness of respondents to contribute funds for projects to conserve these species. The major influence seems in this case to be differences in respondents' perception of the degree of endangerment of the species. In turn, this reflects the degree of urgency of conservation actions demanded (*cf*. Bandara and Tisdell, 2005). While likeability plays a role in influencing the public's demand for projects to conserve species, the degree of endangerment of the species appears to be the over-riding influence in many cases, as in this case (*cf*. Tkac 1998; Tisdell et al. in press). On the whole, this appears to be a rational approach to biodiversity conservation, although there are signs that some individuals will support projects to conserve a species when

it is known that the species cannot be saved (Samples et al. 1986; DeKay and McClelland 1996), which does not seem rational unless there is uncertainty about whether the species can be saved. Nevertheless, this action can reflect a deeply held moral commitment.

Despite the above, public demand for conservation projects for different wildlife species is not always well reflected in actual aggregate expenditures on these projects because wildlife species are often pure public economic goods or mixed economic goods. This leaves scope for free-riding and political influences on the funding of wildlife conservation. In this case study, the northern hairy-nosed wombat is a pure public good whereas the koala is a mixed economic good. Actual aggregate funding in Queensland for koala conservation was found to be greater than that for the northern hairy-nosed wombat even though public demand is more in favour of this wombat.

Reasons for this imbalance could be the following:

(1) The koala has private and public good components whereas the northern hairy-nosed wombat is a pure public good. Private beneficiaries from the existence of the koala, such as wildlife parks and zoos, and tourism bodies that indirectly benefit from its existence may have an incentive to lobby governments to contribute to its conservation. As can be seen from Table 8, government funds account for the lion's share of funds for the conservation of these focal species. No private appropriation of economic benefits results from the existence of the northern hairy-nosed wombat.
(2) This point is partly related to (1). The koala is regarded as a significant international tourism attraction for Australia (Hundloe and Hamilton 1997). Hundloe and Hamilton (1997) estimated that the contribution of koalas to the revenue of the Australian tourism industry in 1996 was Aus$1.1 billion. By contrast, the northern hairy-nosed wombat would make no contribution to the Australian tourism industry. This industry, would, therefore, have an incentive to lobby in favour of government funding for conservation of the koala rather than the northern hairy-nosed wombat.
(3) Wildlife parks and zoos that utilise koalas may be anxious to purchase 'moral respectability' by donating to koala conservation, informing visitors of this and also providing an opportunity for visitors to contribute. This may help to counteract critics who object to koalas being kept in captivity, and who especially oppose koalas being handled by the public.
(4) The fact that the koala is more widespread and better known than the northern hairy-nosed wombat may also favour conservation support for the former.
(5) The koala has some well established NGOs, such as the Australian Koala Foundation, to campaign for its conservation whereas this is not so for the northern hairy-nosed wombat. This may indicate that NGOs can more easily obtain funds to support conservation initiatives for the koala.

The theory of public goods indicates that these goods are likely be unsupplied or undersupplied compared with the demand for them and this is also

likely to be so for a mixed good that contains a large public good component. The results reported in Tables 7 and 8 accord with this theory. In Queensland, government policy has failed to compensate for the undersupply of the conservation effort for the two focal species compared to the estimated demand for this effort. However, whether demand is as high as estimated is unclear. For example, strategic bias may be present; respondents may have exaggerated their willingness to pay. Nevertheless, the gap between conservation support and estimated demand is very large. Hence, gross overstatement would be required for the above mentioned result not to hold. (6) As pointed out by one of the referees, it is also possible that the Queensland government believes that it is acting in accordance with public preferences. However, not having surveyed public opinion, it has no way of knowing if it is right or wrong.

Furthermore, it is necessary to consider limitations of the methods used. The results are based on a sample. While care was taken in the selection of the sample, bias is always possible. It would be desirable to draw further and larger samples to see if the results are consistent with those reported here. The type of indicators used to take account of knowledge and likeability of the species are more qualitative or ordinal in nature than cardinal but this suffices for comparative purposes. Further refinement of these measures would be useful. In addition, contingent valuation methods are subject to several limitations of which strategic bias and embedding are just a couple (Bateman et al. 2002, Ch. 8).

However, for the purpose of this particular exercise, exact valuations are unnecessary – considerable variations in the valuation estimates would still be consistent with the main observation that *relative* funding for koala conservation far exceeds that for the northern hairy-nosed wombat even though public demand does not support such a large disparity. According to Buchanan (1996), the koala is in a privileged conservation position – funding for its conservation exceeds that of most of the other 210 mammal, bird, amphibian and reptile species listed in the Australian Federal Government's *Endangered Species Protection Act 1992*. But this may not reflect the demand or preferences of the general public according to the results reported here. It is even less likely to accord with preferences of some ecologists, for example, May (2002), who expressed concern about preferences for the conservation of 'cute' species. He says too much conservation effort is aimed at what the "heart engages", the "furries and featheries" and charismatic megafauna.[6] Similar types of imbalances in

[6]Given this, Clark and May (2002) think that such bias could may not be so bad after all: public support for charismatic species like the koala could have "trickle-down benefits for less charismatic species". Other scientists argue that the conservation of the koala can confer protection to a larger number of naturally co-occurring species (the umbrella species concept) (*cf.*[6] Caro 2003; Roberge and Angelstam 2004). However, Stein et al. (2002) argue that giving excessive focus to charismatic organisms to raise public support and conservation funds leads to the underrepresentation of a vast majority of species that are at a much greater risk of extinction and that require more conservation attention. Also, conservation based purely on the umbrella species approach, especially if based on just a single species, raises questions such as whether the resulting protected area fulfils the principles of comprehensiveness, adequacy and representativeness of species and ecosystems.

conservation funding to that observed here may also occur for other species for similar reasons to those suggested in this case. Other cases are worthy of investigation.

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