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Changing abundance of elephants and willingness to pay for their conservation

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Abstract

This paper explores the way in which the stated willingness to pay for the conservation of Asian elephants in Sri Lanka varies with hypothetical variations in their abundance. To do that, it relies on results from a sample of residents of Colombo. The willingness to pay function is found to be unusual. It increases at an increasing rate for hypothetical reductions in the elephant population compared to its current level (a level that makes the Asian elephant endangered) and also increases at a decreasing rate for increases in this population from its current level. Rational explanations are given for this relationship. The relationship is, however, at odds with relationships suggested in some of the literature for total economic value as a function of the abundance of a wildlife species. It is suggested that willingness to pay for conservation of a species rationally includes a strategic element and may not always measure the total economic value of a species. Nevertheless, willingness to pay is still policy relevant in such cases.

Keywords: Asian elephant; Contingent valuation; Sri Lanka; Total economic value; Wildlife conservation; Willingness to pay.

1. Introduction

Asian elephant (*Elephas maximus*) in Sri Lanka is the most prominent symbol of conservation, a 'true flagship species' (Desai, 1998). Ensuring its continued existence in the wild is supported by the majority of Sri Lankans who consider it to be a valued resource (Bandara and Tisdell, 2003a,b). The economic value of the elephant, as for many other endangered species, resides in its varied economic, ecological and socio-cultural attributes. For example, substantial economic benefits, as estimated by Gunathilaka and Vieth (1998) and Tisdell and Bandara (2003), are obtained from the elephant-based tourism and recreational activities. Ecologically, elephants are dominant herbivores and exert a profound impact on the other wild species and plants in the areas where they dwell (Sukumar, 1989). From socio-cultural and religious perspectives, De Silva (1998) describes the elephant as an important icon in many countries in Asia. Recently, Bandara and Tisdell (2003b) used the total economic valuation framework to assess the relative importance of the economic values of the elephant. They found that the majority of the surveyed respondents gave most weight to the non-use values of the elephant.

Similar results have been found by others for other species. For example, Langford et al. (2001) claim that people mostly choose to pay for conservation of an endangered species to secure its existence primarily because it ensures a variety of subsidiary benefits for themselves and also for future generations. On the other hand, Kotchen and Reiling (2000) believe that desires to conserve some endangered species are mostly associated with the people's ethical motivation rather than their socio-economic interests. These authors also note that stronger pro-environmental attitudes of respondents usually yield significantly higher probabilities of responding 'yes' to contingent valuation questions supporting conservation of species.

Bulte and Van Kooten (2002) summarise the findings of the contingent valuation analyses of the African elephant (*Loxodonta africana*), and concluded that the bulk of these studies are directed at determining the willingness to pay

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(WTP) for conserving the current population of this species. Analyses undertaken on the Asian elephant are similarly focused (e.g. Bandara and Tisdell, 2004). However, none of these analyses of either the African or Asian elephant have examined how changes in the elephant population (their abundance) might influence the people's WTP for the conservation of this species.

The aim of this paper is to determine how the WTP for conservation of the Asian elephant varies with hypothetical alterations in the population of elephants. It also considers how well WTP reflects the total economic value (TEV) of this species in relation to variations in its abundance.

The analyses in this paper are based on data gathered from a contingent valuation survey of a sample of urban residents chosen from three housing schemes in Colombo, the capital of Sri Lanka. This survey was primarily undertaken to elicit their WTP for the conservation of the current wild elephant population (CWEP) in Sri Lanka. However, it also assessed the possible impact on the initial WTP amounts that the respondents agreed to pay for the conservation of the CWEP for six different hypothetical population scenarios (an increase/decrease in elephant populations of 25, 50 and 75% compared to the CWEP).

After reviewing relevant literature on non-market valuation of endangered species, this paper outlines the nature of the survey sample and the methods and materials used in the data collection process. The WTP elicitation procedure adopted in obtaining responses to the proposed hypothetical changes in the CWEP in Sri Lanka are then reported together with results and followed by analysis and discussion of the results.

2. Changes in population density and economic value of conserving endangered species: a review of the literature

The economics of conserving endangered wildlife species has received significant attention over the last few decades (see Bulte and Kooten, 2002; Tisdell, 2002). During this period, several non-market valuation techniques have been developed and much experimentation has been completed with regard to their capability of estimating the TEV of conserving species (e.g. Kotchen and Reiling, 2000; Langford et al., 2001). Carson et al. (2001) and Bateman et al. (2002) provide useful discussions about stated-preference techniques and their application to the estimation of TEV. However, except for the work of authors such as Whitehead (1993), Loomis and Larson (1994), Fredman (1995), Fisher (1996), and Tisdell and Wilson (2002) there has been little systematic discussion of how changes in the population density of endangered species might influence people's WTP for their conservation.

Whitehead (1993) explores the theoretical validity of the CVM in estimating TEV under conditions of uncertainty about the population density of loggerhead sea turtles in coastal North Carolina. He found that the results were consistent with those predicted by the basic principles of consumer demand theory. The analysis by Loomis and Larson (1994) considers two hypothetical increases (i.e. 50 and 100%) in the current gray whale population along the California coast to assess the consistency of respondents' WTP for conserving this species. They conclude that carefully performed contingent valuation studies yield results consistent with principles of demand theory for reasonably large changes in the quantity of a public good. After studying the responses from a survey of visitors to Mon Repos turtle rookery in Bundaberg, Australia, Tisdell and Wilson (2002) noted that demand to engage in turtle-watching could decline with a decreased population of turtles on the beach. Thus, unless the visiting turtle population is saved early enough from significant collapse, both tourist numbers and the public support for turtle conservation could diminish. None the less, they did not rule out the opposite possibility that in some cases, a reduced population of a species might result in increased social support for its conservation (p. 1535).

Fredman (1995) outlines a specific theory of the relationship between the total value that an individual or household might place on a species in relation to its abundance. He tests this for hypothetical population densities of the white-backed woodpecker (*Dendrocopos leucotos*) in Sweden.

According to Fredman, the TEV of a wildlife species is equal to:

$$\mathrm{TEV} = \mathrm{EXV} + \mathrm{ONUV} + \mathrm{UV} \tag{1}$$

where the EXV is its the existence value, ONUV is the remainder of its non-use value (that is, for other than its existence value), and UV is its use value. Moreover, TEV is considered to be a function of the population density (Z) of the species and is assumed to have the following form where the terms in Eqs. (2) and (3) correspond to those in Eq. (1):

$$\mathrm{TEV} = F(Z) + g(Z) + h(Z) \tag{2}$$

$$\mathrm{TEV} = a + g(Z) + h(Z) \tag{3}$$

and 'a' is a positive constant for $Z \geq \mathrm{MVP}$ and zero for $Z < \mathrm{MVP}$. Eq. (3) implies that the existence value of a wildlife species is independent of its population for all $Z \geq \mathrm{MVP}$, where MVP represents the minimum viable population of the species. Whether or not existence value is always a constant of the type suggested by Fredman is contentious. For example, in their empirical study Rollins and Lyke (1998) found increasing valuation of remote wilderness parks in Canada as their area rose, and their existence valuation increased at a decreasing rate with their total area.

Fig. 1 presents the nature of the relationships that Fredman (1995) hypothesised between the value components of the TEV of a wildlife species and its population density. He assumed that the species would become extinct if $Z < \mathrm{MVP}$, but will survive if $Z \geq \mathrm{MVP}$. Existence value disappears if $Z < \mathrm{MVP}$. Extinction also implies no UV and