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Analysis

Economic valuation of species loss in the open sea

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ABSTRACT

Although the oceans cover 70% of the surface of the planet few studies have considered the economic valuation of marine biodiversity, despite the importance of such information for marine management and conservation. This study uses a contingent valuation method to estimate the public's willingness to pay (WTP) to avoid loss in the number of marine species in the waters around the Azores archipelago. We estimated the marginal value associated with increased levels of species loss (10% and 25%) in five marine taxa (mammals, fish, algae, birds and invertebrates) and all marine species considered as a whole, via a face to face survey of residents and visitors to two Azorean islands. The results suggest small but statistically significant differences in the WTP to prevent losses in the different taxa (mammals = fish > birds = invertebrates = algae). The results also suggest a greater WTP to preserve all marine taxa as a whole, than for a series of individual marine taxa. The valuation of the ecosystem and taxa may be influenced by the maritime culture of the respondents, but despite this, the findings challenge the commonly held premise that charismatic taxa have a disproportionately strong influence on WTP, and they provide important insights into human preferences for biodiversity conservation.

1. Introduction

Environmental valuation studies undertaken to date have tended to focus on terrestrial systems, whereas marine systems have received relatively little attention (Turner et al., 2003). Marine and coastal systems cover 70% of the surface of the planet and provide a wide range of direct, indirect and non-use values (Beaumont et al., 2007). A better understanding of the perceived value of marine systems would inform conservation and other management decisions that affect societal welfare.

Not only are there relatively few studies on the value of marine biodiversity, but existing studies tend to be restricted with regard to the taxa and locations they consider. A taxonomic bias is illustrated by a recent meta-analysis of the economic values of species (Martín-López et al., 2008) which identified twelve studies on marine mammals (e.g. whales, otters and seals), six on fish, two on birds and one on reptiles (Table 1). A large body of literature has concluded a strong public preference for the allocation of conservation funds to likeable and charismatic individual species (White et al., 1997, 2001; Metrick and Weitzman, 1996; Loomis and White, 1996). However, the strength of this preference may be overestimated by the bias in valuation studies which are largely based on single and high profile species, and greater attention should be given to ensure that wider assessments are conducted. The valuation of less charismatic species is important in order to provide relevant data on all elements of marine ecosystems to decision-makers. The current bias towards charismatic species in the literature may lead decision-makers to make inappropriate allocation of funds for conservation which could lead to a failure to meet conservation goals.

The geographic bias in the literature on the value of marine biodiversity arises as much of the research in this field is U.S. focussed (Martín-López et al., 2008), with few studies being reported for Europe, and almost none in southern Europe. This is unfortunate as current European legislation requires that the value of biodiversity is included in conservation and management decisions (e.g. the Marine Strategy Framework Directive). The lack of valuation studies that consider all taxa and represent the cultural and ecological diversity across Europe presents serious challenges to decision makers seeking to establish mechanisms for marine conservation within the European Union.

The present study addresses some of the issues introduced earlier using a contingent valuation method to estimate the public's WTP to avoid marine species loss in the waters around the Azores archipelago. Coverage of marine taxa is broad and the aim was to estimate the marginal value associated with increased levels of species loss (reduction in species richness) and also to estimate WTP to avoid the loss of species in different marine taxa. Finally we tested for differences in the WTP between residents and visitors to the Azores. To the best of our knowledge this is the first time these issues have been tested in the context of marine ecosystems.

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Table 1
Summary of published economic values of marine species[a].

Taxa	Commom name	Scientific name	Mean value[b] (US$2005)	Reference
Mammal	California Sea Otter	*Enhydra lutris nereis*	36.76	Hageman, 1985, 1986
Mammal	European Otter	*Lutra lutra*	24.4	White et al., 1997
Mammal	Gray seals	*Halichoerus grypus*	13.81	Bosetti and Pearce, 2003
Mammal	Hawaiian monk seal	*Monachus schauinslandi*	12.83	Samples and Hollyer, 1990; Brown et al., 1994
Mammal	Mediterranean monk seal	*M. monachus*	93.87	Langford et al., 1998
Mammal	Northern elephant seal	*Mirounga angustirostris*	17.54	Hageman, 1986
Mammal	Steller sea lion	*Eumetopias jubatus*	31.53	Giraud et al., 2002
Mammal	Beluga whale	*Delphinapterus leucas*	73.83	Tkac, 1998
Mammal	Blue whale	*Balaenoptera musculus*	14.2	Hageman, 1985, 1986; Bulte and van Kooten, 1999
Mammal	Bottlenose dolphin	*Tursiops truncatus*	44.57	Hageman, 1986
Mammal	Gray whale	*Eschrichtius robustus*	23.17	Hageman, 1985, 1986; Loomis and Larson, 1994
Mammal	Humpback whale	*Megaptera novaeangliae*	128.34	Samples et al., 1986
Birds	Harlequin Duck	*Histrionicus histrionicus*	11.15	Tkac, 1998
Birds	Whooping Crane	*Grus americana*	53.42	Bowker and Stoll, 1988
Reptile	Loggerhead sea turtle	*Caretta caretta*	16.98	Whitehead, 1992; Wilson and Tisdell, 2003
Fish	Atlantic salmon	*Salmo salar*	9.45	Stevens et al., 1991; Bulte and van Kooten, 1999
Fish	Chinook salmon	*Oncorhynchus tshawytscha*	126.66	Hanemann et al., 1991; Olsen et al., 1991
Fish	Steelhead	*O. mykiss*	64.47	Olsen et al., 1991
Fish	Shortnose sturgeon	*Acipenser brevirostrum*	30.86	Kotchen and Reiling, 1998
Fish	Kelp bass	*Paralabrax clathratus*	43.35	Carson et al., 1994
Fish	White croaker	*Genyonemus lineatus*	43.35	Carson et al., 1994

[a]Adapted from Martín-López et al. (2008).
[b]Values refer to the mean of values from the studies cited in Reference column.

1.1. The Azores Case Study

The Azores archipelago (36°–40°N, 24–32°W) is composed of nine volcanic islands and several small islets, scattered in three main groups along 600 km of the northern part of the Mid Atlantic Ridge. The coastline is approximately 790 km in length (Menezes, 2003), and the marine environment of the Azorean archipelago and its surrounding Economic Exclusive Zone covers roughly 1 million square kilometres, with an average depth of 3000 m. The Azores archipelago is of considerable conservation and marine biological interest due to its isolated position in the middle of the north eastern Atlantic and its relatively young age (Santos et al., 1995). Owing to the impracticality of undertaking a valuation survey in all islands due to time and budget constraints, two islands of the central group — Pico and Faial — were chosen as the location for this study (Fig. 1). These islands are closely associated both physically and socially; they are divided by a strait 8.3 km long and have a strong interchange of residents and visitors. Communities on both islands have a tradition of engaging in activities

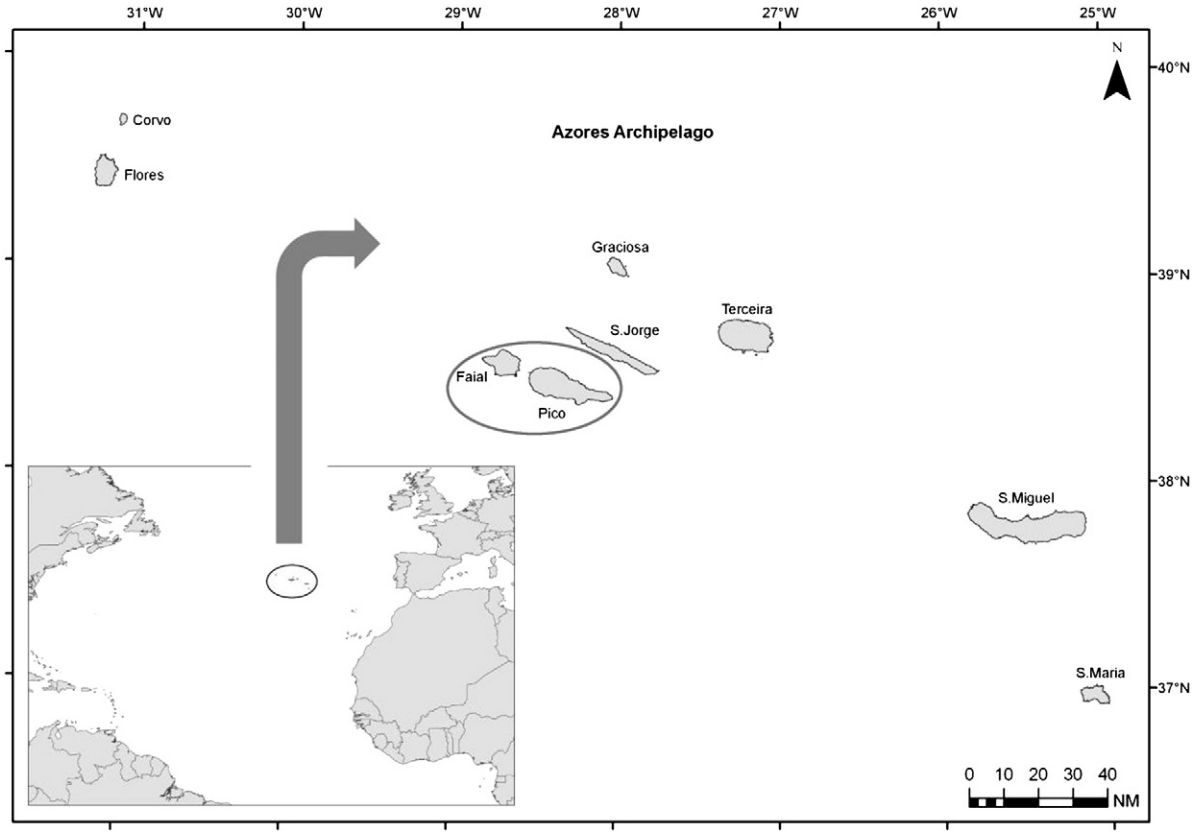

Fig. 1. Azores archipelago.