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Social Values of Biodiversity Conservation for the Endangered Loggerhead Turtle and Monk Seal

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Abstract

The Mediterranean monk seal (*Monachus monachus*) and the loggerhead turtle (*Caretta caretta*) are two species on the priority list for conservation in Greece due to their dwindling populations worldwide. Hence the issue of estimating willingness to pay for their conservation is germane to any protection initiative. Zakynthos Island in Greece has created a marine park for the conservation of such species. We report the results of a survey of visitors and residents of this island who were asked about making one time donations in the form of either a tax for residents or a plane landing fee for tourists. We find that all people were willing to pay to protect these species; however, residents were willing to pay more than tourists. We then tested whether there was a sequence or ordering effect if the seal questions came before the turtles as well as if the turtle questions came before the seals. Such effect was found when turtle questions were presented first, but not when seal questions were presented first. Due to the extensive interest, it is recommended that an increase in the airplane landing fee to Zakynthos could be used to contribute towards funds for loggerhead turtle and monk seal protection.

Keywords
Biodiversity Conservation
Zakynthos
Contingent Valuation
Ordering Effect
Monk seal
Loggerhead turtle.

JEL Classification
Q2, Q34

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1. Introduction

In 1992, at the United Nations Conference on Environment and Development in Rio de Janeiro, the Convention of Biological Diversity was created with the goals of promoting "the conservation of biological diversity, the sustainable use of its components, and the fair and equitable sharing of the benefits from the use of genetic resources." Greece was one of 150 countries that became a party to the Convention with all parties agreeing to develop national biodiversity strategies and action plans to reduce biodiversity loss. Greece ratified the Convention in 1994 and produced their National Biodiversity Strategy to reflect its commitment. In addition, Greece is a member of the European Union and has participated in and abides by the European Communities Biodiversity Strategy and Action Plans relative to this Convention (Convention on Biological Diversity, 2005).

One of the goals in the National Biodiversity Strategy for Greece is to reduce biodiversity loss; this can be accomplished, in part, by preventing or slowing the extinction process for numerous flora and fauna species. There are many species in Greece that enter the priority list for conservation. Two such species are of particular charismatic value: the Mediterranean monk seal (*Monachus monachus*) and the loggerhead turtle (*Caretta caretta*) (Figure 1).

Figure 1. Left: Monk seals (*Monachus monachus*), photo by Alex Aguilar (2006). Right: Loggerhead turtle (*Caretta caretta),* photo by Marco Giuliano (2006). Photos provided by Conservation International.

The Mediterranean monk seal (Figure 1 - Left) was once found on the beaches and rocky shores throughout the Mediterranean, eastern Atlantic, and Black Seas. However, during the Roman era and the Middle Ages these seals were hunted extensively for meat, oil, fur, tents, and medicines. Their once large Mediterranean population has never recovered and continues in a downward spiral (Conservation, 2003; Monachus, 1999). Their current threats include competition with introduced species, entanglement in fishing nets, habitat

loss, habitat degradation, and death by fishermen that perceive the seal as a competitor with their fish catch. Therefore, while they once congregated on open beaches, they are now only found on cliffs with hard access to man and in caves with underwater entrances (Conservation, 2003; Monachus, 1999).

Due to human disturbance, the Mediterranean monk seal is now the rarest seal species in the world and is the most endangered marine mammal in Europe. It is on the International Union for the Conservation of Nature and Natural Resources (IUCN) critically endangered species list with the entire world population of monk seals estimated at only 520 animals (Table 1) (Johnson, *et al.*, 2006; Conservation, 2003; Monachus, 1999). As can be seen in Table 1, Greece is an extremely important country for the monk seal as it holds the largest population in the Mediterranean (Johnson, *et al.*, 2006; Conservation, 2003; Monachus, 1999)

Table 1: Estimated 2006 Mediterranean Monk Seal (*Monachus monachus*) Population Worldwide
Mediterranean monk seal population estimates*

Country	Area Population Estimate
Greece	225
Turkey	100
Algeria	10
Madeira (Portugal)	30
Mauritania	3
Morocco	2
Western Sahara (Cabo Blanco)	150
Total	**520**

*Table adapted from Johnson *et al.*, 2006.

The second species of interest in this study is the loggerhead turtle *(Caretta caretta)* (Figure 1 - Right). Loggerhead turtles are circumglobal and occur in both temperate and tropical regions of the Indian, Pacific and Atlantic Oceans. They live in different areas during different stages of their lives. Loggerheads lay their eggs in the sand on beaches, two of which hold the largest proportions of nesting populations: one in South Florida in the USA and one on Masirah Island in Oman. In the Mediterranean, nests total only 3 300 to 7 000 per season with the majority of which being found in Greece, Turkey and Cyprus (NOAA, 2006; USFWS, 2006). Therefore, Greece is a significantly important area for the loggerheads.

Like the monk seals, loggerhead turtles have many threats to their existence. There is an extensive underground food market based on turtle eggs and meat, with hunting still occurring in areas such as the Bahamas, Mexico and Cuba. Nesting habitat loss from coastal development and beach armouring is also significant. On beaches with artificial lighting nearby, hatchlings become disoriented and may die crossing roads when they should be moving towards the sea. But if they make it to the sea, they have other worries; they are sometimes struck by watercraft and can also be impacted by marine pollution and debris. The greatest cause of the decline in species, however, is incidental death from fishing equipment such as long lines, gill nets, traps, dredges, pots, and trawls (NOAA, 2006; USFWS, 2006).

There are many laws in place to protect the loggerhead turtle. These would include protection under the U.S. Endangered Species Act in 1978, as well as international treaties and agreements like the Convention of International Trade in Endangered Species of Wild Flora and Fauna and by the Convention on Migratory Species as well as the Inter-American Convention for the Protection and Conservation of Sea Turtles. Since loggerheads are highly migratory, it is not only important to protect them Greece but protection must have a worldwide scope (NOAA, 2006; USFWS, 2006). On the European level, *Caretta caretta* is – according to EU Legislation (Council Directive 92/43/EEC of 21 May 1992 on the conservation of natural habitats and of wild flora and fauna – FFH Directive; App. II) a species of community interest and in need of strict protection – as well as its habitats. The Directive, known as the Habitats Directive, establishes a European ecological network known as "Natura 2000" intending to help maintain diversity in the Member States.

In this paper, we investigate how visitors and residents in Greece value increased protection for the monk seal and loggerhead turtle. In this way, we could compare the values for two populations that might hold very different interests for and against in-situ conservation. For example, tourists have mostly existence values as they may never see the animals during their visit, while residents might have strong indirect use values, especially if they have income linked to tourism. To accomplish our goal, a questionnaire-based survey instrument was developed and administered to both visitors and residents in Greece on the island of Zakynthos. Surveys asked people whether they were willing-to-pay to increase protection for monk seals and loggerhead turtles. Our objective is to determine whether increasing protection of monk seals and loggerhead turtles is justified from a social point of

view and if they can be supported financially at a local level without European Union (EU) funding. Furthermore, we explored the possibility of a sequence or order effect.

2. Materials and Methods

2.1. Study Location

This study focuses on investigating the values people have for the conservation of monk seals and loggerhead turtles in Greece. To do this, we selected to study the population of the island of Zakynthos. On this island both species are present and an attempt is made at their conservation via the maintenance of a National Marine Park, which effectively functions as a conservation area.

Major strains for turtles come in the form of the presence of umbrellas and sun beds on the nesting beaches, vehicles compacting the sand, artificial lighting, tense human presence and activity during night and pollution (for example, turtles mistake plastic bags for jellyfish resulting in their suffocation). This has had a significant impact on turtle eggs, both in laying and in hatching. In addition, the added pollution from tourists is having a negative effect on both monk seal and loggerhead turtle populations. (Wikipedia, 2006).

Apart from factors related to tourism development affecting both species, turtles are captured by mistake in fishing nets while in the case of seals fishermen kill them because they damage fishing gear whilst trying to fish directly from the nets.

The southwest and northeast coasts of Zakynthos contain critical habitats for monk seal survival. Seals are commonly found on the southwestern end of the island in the National Marine Park of Zakynthos (NMPZ). From 1997 to 1999, a World Wildlife Fund monk seal project estimated the birth rates of pups on Zakynthos to be two per year. Monk seals are still successfully raising pups on Zakynthos at a minimum of two pups per year. Currently it is believed that there are at least 13 to 16 seals living in the area (ESS, 2006).

Loggerhead turtles come to Zakynthos to nest. Nesting areas are located in the Bay of Laganas within the National Marine Park of Zakynthos (NMPZ). There are six beaches in which turtles are currently nesting, one of which, Sekania Beach, has the highest nesting concentrations of loggerhead turtles in the Mediterranean. The annual number of clutches deposited in the Bay of Laganas ranges from 857 to 2 018 (Margaritoulis, 2000). As a result,

the Bay of Laganas has been included in the national list proposed for the Natura 2000 network, under the European Union – Habitats Directive 92/43 (Dimopoulos *et al.* 1999).

2.2. The Survey

2.2.1. Survey Layout

To investigate the values people have for monk seals and loggerhead turtles in Zakynthos, a survey instrument was developed and tested. It was decided that in order to capture values accurately, both residents and tourists would be approached in-person and asked to fill out different versions of a questionnaire by the enumerator. The survey consisted of 19 questions divided into four sections. The first section presented the respondents with background information about the biodiversity of the island, the role of the NMPZ, and the pressure tourist development has put on the monk seal and loggerhead turtle habitat. This section included pictures of both species as well as a coloured map of the NMPZ and its protected zones.

The second section of the survey asked respondents about their familiarity with monk seals and loggerhead turtles including attitudinal and behavioral information, while the third section tried to elicit values through willingness-to-pay (WTP) questions. The final section of the survey asked respondents questions about their socio-economic status such as sex, age, educational level, own and joint income, and number of dependents.

2.2.2. Survey Methodology

While there are several techniques that can be used to measure non-market values, because of the presence of a large non-use component in the total economic value of a conservation project, the contingent valuation method (CVM) is the one most commonly employed in this context of study (Carson, 2000; Carson *et al.*, 1998; Pearce and Turner, 1990). CVM uses survey questions to elicit a person's WTP for a change in supply of environmental goods. In this case, we are looking at changes in the population levels of monk seals and loggerhead turtles.

As each individual has their own unique WTP values for various goods, the best way to elicit their WTP value is to ask them using an incentive compatible (truth revealing) mechanism. For public goods this is typically conducted in the form of a referendum CVM survey, since this method is believed to be potentially incentive compatible and this is how

we will be obtaining our WTP values (Hanemann, 1994; Arrow *et al.*, 1993; Carson *et al.*, 2000; and Champ *et al.*, 2003).

Non-market valuation WTP questions defined the current situation for the two species as well as the potential change presented. Greek residents and tourists were given different questions. WTP questions were as follows:

Willingness to Pay Question for the Turtle – Visitors' Sample

A. Suppose that before coming to Zakynthos you had known that local authorities imposed a ***landing fee*** *per head to all visitors to the island of X Euro exclusively destined to support the Park activities. Before answering, remember that the revenue from landing fees will only be spent for these extra activities in the Park, and that there are other things that this money could be spent on. Please, remember to be truthful in your response as this is scientific research and your answer cannot be associated with you as the data are used only in an aggregate fashion.*

B. Suppose that Zakynthos authorities set up a charity to raise money for the Park. You could either decide to make a ***donation*** *to this charity by paying X Euro, or decide not to support it. Before answering, remember that the revenue from your donation will only be spent for these extra activities needed to fully enforce the Park regulations, and that there are other things that this money could be spent on. Please, remember to be truthful in your response, as this will be used for scientific research. Your answer cannot be associated with you, as the data are used only in an aggregate fashion.*

Willingness to Pay Question for the Turtle – Residents' Sample

A. Suppose that Zakynthos authorities held a popular referendum in which you were to be called upon and vote in favour of a proposal that increased the Park activities to the level described above. You would be called to either vote in favour (YES), or against (NO) to this proposal. However, if you voted in favour and the YES won the referendum (more than 50% voted Yes), everyone, including you would be asked to pay a given ***lump sum*** *(one payment only) amount X to a special agency. Before answering, remember that the revenue from tax payment will only be spent for these extra activities, and that there are other things that the tax money could be spent on. Please, remember to be truthful in your response as this is a scientific research and your answer cannot be associated with you as the data are used only in an aggregate fashion.*

B. Suppose that Zakynthos authorities set up a charity to raise money for the Park. You could either decide to make a ***donation*** *to this charity by paying X Euro, or decide not to support it. Before answering, remember that the revenue from your donation will only be spent for these extra activities needed to fully enforce the Park regulations, and that there are other things that this money could be spent on. Please, remember to be truthful in your response, as this will be used for scientific research. Your answer cannot be associated with you, as the data are used only in an aggregate fashion.*

Willingness to Pay Question for the Seal – Residents' Sample

Suppose that Zakynthos authorities:

*(1) Held a popular referendum in which you were to be called upon and vote in favour of a proposal that CREATED a protected area for monk seals in the West of Zakynthos. You would be called to either vote… (**taxation**)*

*(2) Set up a charity to raise money for the CREATION of a protected area for monk seals in the West of Zakynthos. You could either decide… (**donation**)*

Willingness to Pay Question for the Seal – Visitors' Sample

*(1) Suppose that Zakynthos authorities set up a charity to raise money for the CREATION of a protected area for monk seals in the West of Zakynthos. You could either decide… (**donation**)*

*(2) Suppose that before coming to Zakynthos you had known that local authorities imposed a **landing fee** per head to all visitors to the island of X Euro exclusively destined to CREATE a protected area for monk seals in the West of Zakynthos*

At the end of the presentation of each WTP scenario, respondents were asked if they would be willing to contribute to the cause and were given five options: absolutely no, probably no, not sure, probably yes, and positively yes. If they said anything besides absolutely no, they were asked an open ended WTP question:

> *"What is the maximum amount of X in Euro that you would be willing to pay before deciding to vote NO in the referendum?"*

Although this open-ended elicitation mechanism is subject to various problems and tends to give more conservative WTP amounts than other formats (Bateman *et al.*, 1995), it is considered a more straightforward method that doesn't involve anchoring bias and at the same time is very informative since maximum WTP can be identified for each respondent (Kealy and Turner, 1993; Balisteri *et al.*, 2001; Halvorsen and Sœlensminde, 1998).

In the past, there has been one contingent valuation study conducted on the monk seal and two on the loggerhead turtle. The monk seal study, Skourtos *et al.*, 1996, found that people were willing to pay for a two year rise in water rates between 34 and 65 Euros to protect the Mediterranean monk seal in the Aegean Sea.

The loggerhead turtle studies include Kalfagianni, 2000 and Togridou *et al.*, 2006. Kalfagianni, 2000 found that residents were willing to either make a one off payment of 62 Euros or five annual payments of 49 Euros for the loggerheads in Hellas (Greece). Togridou *et al.* 2006 found that people were willing to increase their admission fee to NMPZ by 6.15 Euros to pay to protect the loggerhead turtle. Our study goes beyond these studies by looking

at both monk seal and loggerhead turtle protection in the same survey as well as at different payment mechanisms, adding dimensions to the issues of monk seal and loggerhead turtle conservation at NMPZ (Table 2).

Table 2. Previous Willingness to Pay Studies for the Monk Seal and Loggerhead Turtle

	Mean WTP for the Monk Seal	Mean WTP for the Loggerhead Turtle	Payment Method
Skourtos *et al.*, 1996.	34-65 Euros		Two year rise in water rates
Kalfagianni, 2000.		62 Euros	One-off payment (Residents)
Kalfagianni, 2000.		49 Euros (average mean)	Annual payments for five years (Residents)
Togridou *et al.*, 2006		6.15 Euros	Addition to park admission fee (Visitors)

2.2.3. Survey sites

To capture an adequate number of residents and visitors, three survey sites were selected. The first survey site was in the city centre of Zakynthos, the second at Laganas Beach, and the third at Kalamaki Beach. Both beaches are located in the core area of the NMPZ. As was to be expected, the city centre site would capture more residents, while the beaches would capture more tourists. The majority of tourists came from the United Kingdom (UK).

Potential survey respondents were approached between 4 and 21 August 2003 at the three locations and asked if they would fill out a survey. If they agreed, they would be given a copy of the survey as well as a pen to fill them out. No incentives were provided to the respondents. In total, 285 people were asked to participate in the survey with 235 people agreeing to fill it out for a response rate of 82.45%. From the 235 questionnaires, 200 were usable. Furthermore, protest zeros were eliminated leaving 155.

3. Results

3.1. Demographics

In total there were 155 usable surveys, 85 of which represented the visitors while 70 represented the residents. Males made up 40.6% of the sample, with a slightly higher percentage of males (42%) in the visitors sample than in the residents sample (38.5%). The average age of respondents was 36. This came from an average age of 36 for visitors and 37

for residents. Visitors had mostly finished university while the residents had, on average, attended some university. For 71% of the visitors, this was their first trip to Zakynthos.

Responses between visitors and residents varied when asked whether they known that monk seals and loggerhead turtles were present on the island (Table 3). As can be seen, 94% of the residents had known that the monk seals were present on Zakynthos while only 16% of visitors had this knowledge. Even though a high percentage of residents knew about the monk seals on the island, only 25% had seen them. However, none of the visitors had seen monk seals.

The differences in the loggerhead statistics were not as drastic as the monk seal data differences. Here we find that all residents knew about the presence of the loggerhead turtle on Zakynthos while 90% of the visitors knew. Of the residents, 87% had seen loggerheads, while only 34% of visitors had.

Table 3. Knowledge of Monk Seals and Loggerhead Turtles

	Overall sample	Visitors sample	Residents sample
Know of the presence of monk seals on Zakynthos? (% Yes)	51%	16%	94%
Seen a monk seal on Zakynthos? (% Yes)	11%	0%	25%
Know about the presence of the loggerhead on Zakynthos? (% Yes)	94%	90%	100%
Seen a loggerhead on Zakynthos? (% Yes)	58%	34%	87%

3.2. Willingness to Pay Results

WTP results show that respondents were, on average, in favour of contributing to pay for monk seal and loggerhead turtle conservation efforts, whether it is in the form of donations, taxation, or landing fees. Overall, respondents were willing to make a onetime payment of 30.92 Euros for monk seal protection and 27.36 Euros for loggerhead turtle protection. Splitting these results by residents and visitors, we find residents are willing to contribute more to the cause, on average, than the visitors. Residents are willing to make a onetime payment of 48.98 Euros for monk seals and 41.83 Euros for loggerhead turtles while visitors are willing to make a onetime payment of 13.21 Euros for monk seals and 13.18 Euros for loggerhead turtles. While we do see the values for monk seals to be slightly higher than that

for loggerhead turtles, there is no statistically significant differences between the two (Table 4).

Table 4. Willingness to pay for monk seal and loggerhead turtle protection results.
Values are in 2003 Euros and represent a onetime payment.[1]

	Monk Seal		Loggerhead Turtle	
	Mean	Std. Dev.	Mean	Std. Dev
Overall	30.92	85.49	27.36	82.42
Residents Overall	48.98	117.99	41.83	114.22
Residents Donation	58.00	152.06	47.20	147.94
Residents Taxation	39.96	69.56	36.46	66.46
Visitors Overall	13.21	16.13	13.18	17.80
Visitors Donation	14.35	20.03	14.55	22.80
Visitors Landing Fee	12.07	11.07	11.81	10.78

Further subdividing the WTP statistics by type of payment mechanism gives us more information. WTP options for residents included a onetime donation and a onetime tax, while for visitors it was either a onetime donation or an airplane landing fee in which the increase would only go to species conservation. What we find is that there is a higher value for donations than there are for either a tax or an airplane landing fee with residents again, willing to contribute more than the visitors. Overall, residents contribute more under both payment schemes compared to visitors.

3.3. The effect of question sequence or order on WTP[2]

Finally, we wanted to see if there was an order effect, or in other words, see if the order of the WTP questions had an effect on whether people would be willing-to-pay or not. To do this, we would see if there was a difference if the monk seal question was asked before the loggerhead turtle question and vice versa. If there is an order effect, this would show that there is a faded glow, or, in other words, people would receive moral satisfaction from contributing to the preservation of a species, but if they are asked then to preserve another

[1] Results in Table 4 represent the entire dataset. For the resident's sample, there was one outlier of 1 000 Euros for both turtle and seal. If this was taken out, mean values would change but would still be significantly higher than visitor's results. For example: the overall average and standard deviation for the residents would be 39.37 Euros (68.86) for the monk seal and 32.15 Euros (60.98) for the turtle.

[2] Some authors make a distinction between the terms "sequence" and "order." We are simply using this test to see if changing the order of the animals in a sequence of WTP questions has a significant effect on the WTP for the conservation of each specific animal. Therefore, we use the terms interchangeably.

species, their moral satisfaction could have decreased since the first species in the sequence is likely to capture most of the utility associated with giving. As a result, we predict that when the species is second in the sequence, there will be a larger chance that the respondent will not be WTP for the conservation of the species rather than when it is presented first.

To test for an order effect, we looked at the proportion of the respondents that reported a zero WTP for each species if it was presented second (Table 5). In Table 5 we find that turtle conservation collected more true zeros under donation in both samples - residents and visitors - when it was second in sequence, rather than under taxation or landing fee. In particular, by conducting a two sample test on the proportions (Freund, 1992) the null hypothesis of no difference was rejected at a 10% level of significance. Using Pearson's chi-square statistic we found that this difference in the proportion reported was statistically significant. Hence, this indicated there is the presence of a faded glow, and therefore there is a sequence or order effect when the turtle conservation questions are presented after the seal conservation questions.

However, when the seal conservation questions are presented second, we do not find an order effect except for the residents' sample exposed to a taxation payment. In all the rest of the cases the differences were not statistically significant.

Table 5. Proportion of Sample Reporting a Zero WTP When Sequence Changes

	Turtle		**Seal**	
Residents-Donation	Number of zeros	Number of positive WTP	Number of zeros	Number of positive WTP
Turtle/Seal	1(5.2%)	18(94.7%)	2(10.5%)	17(89.4%)
Seal/Turtle	5(29.4%)	12(70.5%)	5(26.3%)	14(73.6%)

4. Discussion and Conclusions

The Mediterranean monk seal (*Monachus monachus*) and loggerhead turtle (*Caretta caretta*) populations in the Mediterranean are decreasing extensively. In order for their populations to increase, they will need the cooperation of people. While not all people could contribute their time to help these species, some that do not have time, might be willing to help by contributing money. This was one of the main goals of this project, to see if people were willing to contribute funds to support conservation projects for these animals.

To accomplish this, we surveyed visitors and residents of Zakynthos, Greece, in-person both in the city and in the National Marine Park. Since Zakynthos is an island in which both of these species are found, we felt that it was an appropriate area for the study. In this way, we could compare the values between visitors and residents as it is believed that they might hold very different interests for and against in-situ conservation. Residents were asked to contribute to either a tax or a donation for the animals, while visitors were asked to contribute to a tax or an increased amount in their plane landing fee. It was discovered that all people were willing to pay to protect the species; however, residents were willing to pay approximately 30 Euros more than tourists for the turtle, and a bit more for the seal. This shows that there is an important difference between people that live in an area and people that just come to visit. As seals and turtles are a major attraction for tourists, residents may have an incentive to preserve the animal populations as this is directly related to the economic income on the island. In accordance to what was found by other studies, the payment vehicle affected the stated WTP amount, with taxation showing the lowest a WTP amount, while donation the highest. Donation mechanisms are known to include a warm glow effect and are expected to be associated with higher stated WTP.

We then tested whether there was a sequence or ordering effect with the questions. To do this, some questionnaires asked seal WTP questions before the turtle WTP questions while some did the reverse. Here, we found that when turtle questions were presented first, there was an ordering effect, but this was not true when seal questions were presented first. Perhaps people have a greater fondness for turtles and are more likely to pay for their conservation, even though they still believe the monk seals are important.

Due to the extensive interest that was found for both seal and turtle protection, we believe that an increase in the airplane landing fee to Zakynthos could be used to contribute towards funds for the conservation and enhancement of loggerhead turtle and monk seal populations in Greece.

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