Full Length Research Paper

Social values of biodiversity conservation for Mediterranean monk seal (*Monachus monachus*)

Matsiori S.[1], Stamkopoulos Z.[1], Aggelopoulos S.[2], Soutsas K.[3], Neofitou Ch.[1] and Vafidis D.[1]

[1]Department of Ichthyology and Aquatic Environment, School of Agricultural Sciences, University of Thessaly, Nea Ionia, Magnesia, Greece.
[2]Department of Agricultural Development and Agribusiness Management, Alexander Technological Educational Institute of Thessaloniki, 57400, Sindos Thessaloniki, Greece.
[3]Department of Forestry and Management of the Environment and Natural Resources, Democritus University of Thrace, N. Orestiada PC 68200, Greece.

This paper presents goods and services approach to determine the economic value of *Monachus monachus* with the aim of clarifying the role of valuation in the management and conservation of marine biodiversity. More specifically, it uses Contingent valuation method to estimate the existence value of the Mediterranean seal population that is predicted to be lost in the future if we not take any measure today to protect them. Our empirical findings suggest that the major variables affecting respondents' willingness to pay were related to respondents' attitude against reasons (values) of monk seals conservations with non use value to play the most important role. Results show that monk seal is highly valued and people are willing to pay for the most endangered seal in Europe. The results would help the choice of management strategies; the economic valuation of monk seal is a key part of any successful management plane informs conservation biologists and policy makers about opportunity costs of protection activities.

Key words: Contingent valuation, economic value, endangered species, Mediterranean monk seal.

INTRODUCTION

The Mediterranean monk seal (*Monachus-monachus*) is the most endangered seal. Greece is an extremely important country for the monk seal as it holds the largest population in the Mediterranean (Johnson, et al., 2006), with best known populations in the National Marine Park of Alonnissos - Northern Sporades (HSSPMS, 1995) and the Ionian islands (Panou et al., 1993).

Understanding the economic value of monk seal and wildlife in general remains a key part of any wildlife management strategy. Environmental economics can inform conservation biologists and policy makers about why species are endangered, the opportunity costs of protection activities, and the economic incentives for conservation (Shogren et al., 1999) and a fundamental step in conservation (Pearce and Moran, 1994). The economic value of biodiversity can arise at of benefits that are derived from it: both tangible and intangible. The concept that will be used in these discussions is a measure known as the Total Economic Value (TEV) of a biological asset. It is defined as the sum of all service (use and non use) flows that the asset generates (Freeman, 1993) both now and in the future – appropriately discounted.

A number of valuation techniques were used to estimate the TEV of goods and services provided by environmental. One of the most widely used methods for

*Corresponding author. E-mail: steriani@uth.gr. Tel: +302421093251. Fax: +302421093065.

biodiversity valuation is the contingent valuation method (CVM) (Pearce and Moran, 1994) due in part to recent advances in the theory and especially the testing methodology (Hanneman and Kanninen, 1996) and its cost advantage over other methods. According to Loomis and White (1996) "the contingent valuation method can provide meaningful estimates of the anthropocentric benefits of preserving rare and endangered species". A number of valuation studies have attempted to value marine biodiversity (Van Kooten, 1993; Loomis and Larson, 1994; Stevens et al., 1997).

In Greece Langford et al. (1998) used CVM for estimating willingness to pay for protecting the Mediterranean monk seal (*M. monachus*) in the Aegean. Authors estimate a median willingness to pay (WTP) of 11.7€ and income, sex, age and education were found significant explanatory variables of the function. Langford et al. (2001) also used CV method to estimate the WTP of respondents to financially support a public fund for the protection of the Mediterranean monk seal. Kaval et al. (2009) in a CVM research at Zakynthos Island carried out a CV reaches that discovered residents were willing to pay approximately 30 € more than tourists for the turtle, and a bit more for the seal. Others CVM studies for endangered species in Greece were carried out from Kontogianni et al. (2003).

The focus of this paper is the estimation of Mediterranean monk seal conservation value based on public preferences. More over this paper tries to determine the factors influence willingness to pay for Mediterranean monk seal conservation. The specific objectives are as follows:

(1) To investigate the public's awareness, attitudes and behaviors regarding Mediterranean monk seal conservation;
(2) To estimate the public's willingness to pay (WTP) for the conservation of Mediterranean monk seal;
(3) To identify the factors those affect the WTP.

MATERIALS AND METHODS

In present research to investigate the values people have for monk seals in Volos, a survey instrument was developed and tested. Primary data on the WTP were randomly selected from residents of Volos city through personal interviews[1]. Volos' port is the third of

---

[1]The sample size was determined using the Cluster Sampling formula. All others sampling methods require sampling frames which demand a list of the enumeration units (Tryfos, 1996). This is not always feasible, possible or even available. As consequence entire population is divided into groups, or clusters and a random sample of these clusters is selected (Aaker et al., 2009; Shiver and Borders, 1996). The target population of present survey was recreational visitors of coastal zone and it was not feasible or even possible to have a frame list and cluster sampling was the only technique that we can use. So as clusters unit were assumed the coastal beaches and as elementary unit were the days during a summer holiday season. All visitors who were visiting the beaches in random selected unit – days ware included in the sample. The size of the sample is considered sufficient for the performed statistical analysis.

Greece's major commercial ports, the capital of its prefecture, Magnesia and near National Marine Park of Alonnisos Northern Sporades.

The research's questionnaire comprised 32 items and the CV section was constructed according to guidelines established by the NOAA panel (Arrow et al., 1993). Background information was provided and also information on a hypothetical conservation plan for Mediterranean monk seal tried to elicit values through WTP questions. The question format was a voter referendum to approve this effort. Respondents were asked, prior to the WTP question, whether they would be in favor of supporting such a program through a voter referendum question format[2], and the implementation of these program would cost them a specified amount of money (in €) in a one-time payment. In the second phase, the WTP was elicited only from people who had answered positively to the first question, this time by asking if they are willing to pay a specific amount of money to confirm their participation. Specified amounts were randomly assigned to respondents. Bit step amounts were used based on the results obtained in the pre-test and in the pilot study where an open-ended question ranged from 1 € to 65 € (bit step 2 €). Given this information, respondents were asked whether they would vote 'yes' or 'no' to approve these effort. In questionnaire of pilot study an open-ended question format was included with the aim to specify the bit step amounts of final questionnaire due to lack of previous valuation studies for the study area. The results of the pilot study shows that the WTP amounts were fluctuated between 1 and 65 € (Table 1).

Follow-up questions were asked to determine reasons for respondents' answers. As protest responses were considered those reject some feature of the hypothetical CV scenario rather than from an absence of value.

For this CVM study, the dichotomous choice method, which seeks simple 'yes' or 'no' answers to an offered bid, is used. In order to be able to calculate the correct willingness to pay (WTP), a function was formulated which described the relationship between a person's WTP (dependent variable) and a number of socio-economic characteristics (independent variables) that influence this choice (Giraud et al., 2002) and variables are associated with respondents' pro-environmental attitudes and knowledge about monk seal (Kotchen and Reiling, 2000). In cases that our dependent variable (WTP) had a dichotomous format (yes/no), a binary logistic regression model should be used (Hosmer and Lemeshow, 1989).

Yes: No f (BID, INCOME, SEX, AGE, VALUE, ECOLOGIST)

Where Yes:No was the dichotomous-choice response to the WTP question, BID was the specified amount (€) respondents are asked to pay, and INCOME was respondent income, VALUE was the result from the value question and ECOLOGIST was respondents' pro-environmental attitudes.

A wide variety of use and non-use values can be derived from an endangered species conservation program. For Loomis and White (1996) TEV of the conservation is a sum use values, option value, existence value and bequest value. TEV of biodiversity derived from future genetic information for potential uses (medicinal and genetic) of endangered species (Loomis, 1996) satisfaction of existence of a particular species (Freeman, 2003). According the above conservation economic values a set of 5 Lickert scale (value scale) items was used to measure respondents attitude against

---

[2]According NOAA Panel suggestion CVM surveys should use a referendum approach. Employing this question format respondent it faced with a particular program and the possibility to pay for the implementation of them through some means, such as higher taxes (Carson et al., 1998). Referendum format resembled the way people actually make choices regarding public programs (Portney, 1994).

Table 1. Respondents opinions for monk seal protection.

Respondents opinions	Strongly disagree	Somewhat disagree	Unsure	Somewhat agree	Strongly agree	r_{i-t}
Want monk seal protection for visiting its habitants	7.798	19.266	22.936	35,321	14.679	0.383
Want monk seal protection for next generations	1.376	5.963	20.642	37,156	34.862	0.686
Want monk seal protection because its ecological importance	1.835	5.046	19,725	33.486	39.908	0.568
Want monk seal protection because not human beings have rights to exist	1.835	2.752	16.972	24.771	53.670	0.496
Want monk seal protection because of its possible use in the future	6.422	13.303	37.156	22.935	20.183	0.408

total economic value of Mediterranean monk seal. These data for the Mediterranean monk seal enable analysis of the way people realize the benefits from monk seal conservation influence CV responses, elicited values, and non-use motivations. Thus, even numbered items were coded as: "strongly agree" = 5; "somewhat agree" = 4; "unsure"= 3; "somewhat disagree" = 2; and "strongly disagree" = 1. The order is reversed for odd-numbered items, with a possible minimum score of 5 and maximum of 25. All respondents were categorized as having weaker, moderate, or stronger "value attitudes" according to value scale results (Kotchen and Reiling, 2000). Weaker attitudes were those with value scores less than 15, moderate were those greater than 15 and less than 19, and stronger were those 20 or greater. The results from the value scale demonstrate a range of respondents' attitudes against monk seal total economic value.

Mean WTP was calculated by assuming no negative values for species protection and using the formula suggested by Hanemann (1989):

$$E(WTP) = \left(\frac{1}{\beta_1}\right) * \ln\left(1 + \exp^{\beta_o}\right)$$

RESULTS AND DISCUSSION

Knowledge of and attitudes toward Mediterranean monk seal conservation

All respondents knew the Mediterranean monk seal and they did not need any further information about them. Then respondents were asked on their stand on different statements concerning monk seal conservation. Most of them (83.9%) known that Mediterranean monk seal is protected and one of the most endangered seal. They also knew (55.5%) the monk seal conservation status and the existence of National Marine Park of Alonissos Northern Sporades. Finally, the majority of respondents rate are as important as the protection of monk seal.

According to the results from value scale significant majorities express the view that non humans being are having existence rights so Mediterranean monk seal must be protected. Strong "value" attitudes are revealed with non use values of monk seal. On the contrary respondents did not want monk seal conservation expecting direct use benefits (as recreation benefits). The

item–total correlations for each item and all correlations are reasonably strong, ranging from a high of 0.68 to a low of 0.38. Cronbach's coefficient a, which is the mean of all split-half correlations 0.736.

Willingness to pay for monk seal conservation

For present study protest answers ware those that reject some feature of the hypothetical CV scenario and were not included in analysis (Mitchell and Carson, 1989). Responses considered as protests are: "natural protection is a responsibility of the government", ''natural environment protection is already funded by national and regional governments", "natural protection are public good and do not pay for them" "I don't think the protection program would work'' and ''I am opposed to any new taxes".

According to the results of logit model, all coefficients have signs in the expected direction. Respondents were sensitive to the price they were asked to pay. Bid amount (BID) was negative and significant. On the contrary higher annual income encourages support of the CV scenario, as INCOME was positive and significant as in previous CVM studies for monk seal which is consistent with the economic theory.

Sex was found to significantly determine WTP, in that, females had higher probability of responding "yes" to the WTP question. Age had a negative and highly significant effect on the probability of respondents answering "yes" or 'no' to the valuation question. This indicates that as the age increases the tendencies to pay monk seal conservation will decrease. Younger people are more possible to participate and in CVM scenario.

On the other hand respondents with stronger pro-environmental attitudes had higher probabilities of responding "yes" to CVM scenario. Finally, the value scale was positive and significant, indicating that higher "value" scores result in higher probabilities of answering "yes".

The percentage of right predictions for the monk seal was 85.3 and R^2 value was 0.57. Mean WTP was approximately 15.67 €.

Environmental value attitude

Only 0.5% of the sample was NGO members. A significant percentage of respondents (10.5%) had actually paid for other species protection in the past. Comparisons among groups who had actually paid for wild life protection and pro-environmental it showed differences between groups are significant ($x^2 = 6.728$ and $p < 0.05$), indicating that environmental attitudes were related to the way respondents actually participate in action for wildlife protection.

According the considerable majority of the sample the Mediterranean monk seal conservation it was very important (40%) and we must intensify any effort for this direction. Environmental attitude was found to be significantly related to the way respondents rate the reasons of conservation (scale value). Significance tests for each conservation reason resulted in x^2 equal to 22.39 which is the 95% critical value for 4 degrees of freedom. The most noteworthy differences were in the way attitudes influence ratings of "very important". Stronger pro-environmental attitudes result in higher percentage ratings of "very important" for every conservation reason. The results showed that different reasons for monk seal conservation ware differentiated according to strength of pro-environmental attitudes, except the reason which was related with quasi option value. Respondents with strong pro-environmental attitude were more sensitive with reasons that were related with non use values. Respondents' attitude against the value scale was significant related to age ($x^2 = 17.229$ and $p < 0.05$), education level ($x^2 = 27.19$ and $p < 0.05$), prior knowledge of monk seal endangered status ($x^2 = 24.824$ and $p = 0.0$) and respondent's rate for importance of monk seal conversation ($x^2 = 80.063$ and $p=0.0$).

DISCUSSION

This study investigates relationships among environ-mental attitudes and socioeconomic characteristics of respondents to economic value of Mediterranean monk seal. Dichotomous-choice models of CV responses show how environmental attitude is one of the most significant determinants of yes/no responses. The most significant determinant is respondents' attitude against reasons (values) of monk seals conservation with non use value to play the most important role. The coefficients of the variables included in the model are all have the expected sign. First of all responses to willingness to pay questions are associated to some degree with socio-demographic factors as income, sex and respondents age. Jacobsen and Hanley (2008) investigate the effect of income in 46 CVM surveys for biodiversity conservation and only in 39% income effect on WTP for biodiversity conservation and such correlation were positive and significant. According Lopez et al. (2007) age influence peoples'

decision to support biodiversity conservation and often has been found to have a negative effect on WTP (Carson et al., 1998). For Spash et al. (2009) social psychology respondent's ethical beliefs help to understand WTP results and more over human attitudes toward these species under valuation influences respondents' willingness (Lopez et al., 2007; Serpell, 2004). Langford et al. (1998) valuing Mediterranean monk seal uses as explanatory variables bit amount, income (natural logarithm of annual income), age and education level. In this study education level had no significant effect to respondents' possibility to answer yes to WTP question.

Respondents rate of monk seal difference types of economic value determine their answer to CVM scenario. More over non use values of monk seal had positive influence to decision for monk seal conservation. These results ensure the opinion that the willingness to pay for species conservation is mainly based to non uses values (Jacobsen and Hanley 2008). Accordingly to previous studies pro-environmental attitudes result in significantly higher probabilities of responding "yes" (Kotchen and Reiling 2000). The results show that two main factors determine peoples' willingness to invest in the conservation of certain species: 1) respondent's degree of familiarity with the specific species and 2) the individual's understanding of the role that the specific species plays in the ecosystem. Moreover, the results shown that peoples' decision to support biodiversity conservation was influenced by the knowledge of its non-tourist value (that is, the ecological value), the origin of the respondents and their age.

The values obtained in this study are quantified indications of the value placed by the people on Mediterranean monk seal, one of the most endangered mammals on earth. As such, they are useful for cost benefit analysis and for debate and decision-making on conservation strategies. The study may contribute to drawing the attention of the policy makers in formulation of appropriate policy mechanisms for monk seal conservation polices. The results also point to the need for a better information programmed about the value an ecological importance of monk seal if we want people are more interesting for their conservation.

REFERENCES

Aaker D, Kumer V, Day G (1995). Marketing Research. Fifth Edition. New York: John Wiley & Sons.

Arrow K, Solow R, Portney PR, Leamer EE, Schuman RR (1993). Report of the NOAA Panel on Contingent Valuation. Report to the General Counsel of the US National Oceanic and Atmospheric Administration. Resources for the Future, Washington, D.C.

Carson RT, Hanemann WM, Kopp RJ, Krosnick JA, Mitchell RC, Presser S, Ruud PA, Smith VK, Conaway M, Martin K (1998). Referendum Design and Contingent Valuation: The NOAA Panel's No-Vote Recommendation. Rev. Econ. Stat. 80(2):335-338.

Freeman AM (1993). The Measurement of Environmental and Resource Values. Resources for the Future, Washington DC.

Freeman AM (2003). The Measurement of Environmental and Resource Values: Theory and Methods. Second Edition. Resources for the Future, Washington. DC.

Giraud K, Turcin B, Loomis J, Cooper J (2002). Economic benefit of the protection program for the Steller sea lion. Mar. Pol. 26:451-458.

Hanemann M (1989). Welfare evaluations in contingent valuation experiments with discrete response data: reply. Am. J. Agric. Econ. 71:1057-1061.

Hanneman M, Kanninen B (1996). The statistical analysis of discrete-response CV data. California Agricultural Experiment Station. Working Paper No. 798.

Hellenic Society for the Study and protection of the Monk Seal. (1995). Continuation of the Monitoring of the Monk Seals in the National Marine Park of Northern Sporades. Final Report for the European Commission Project. 4-3010(92):7829.

Hosmer DW, Lemeshow S (1989). Applied Logistic Regression. John Wiley & Sons. P. 307.

Jacobsen JB, Hanley N (2008). Are there income effects on global willingness to pay for biodiversity conservation? Environ. Resour. Econ. 43(2):137-160.

Johnson WM, Karamanlidis AA, Dendrinos P, De Larrinoa PF, Gazo M, Gonzalez I M, Guecluesoy H, Pires R, Schnellmann M (2006). Monk seal fact files: Biology, behaviour, status and conservation of the Mediterranean monk seal, Monachus monachus. The Monachus Guardian. Retrieved 1 December 2011 from www.monachus-guardian.org/factfiles/medit01.htm.

Kaval P, Stithou M, Scarpa R (2009). Social Values of Biodiversity Conservation for the Endangered Loggerhead Turtle and Monk Seal. Int. J. Ecol. Econ. Stat. 14:67-76.

Kontogianni A, Langford IH, Papandreou A, Skourtos MS (2003). Social preferences for improving water quality: an economic analysis of benefits from wastewater treatment. Water Resour. Manag. 17:317-336.

Kotchen JM, Reiling DS (2000). Environmental attitudes, motivations, and contingent valuation of nonuse values: A case study involving endangered species. Ecol. Econ. 32:93-107.

Langford IH, Skourtos MS, Kontogianni A, Day RJ, Georgiou S, Bateman IJ (2001). Use and nonuse values for conserving endangered species: the case of the Mediterranean Monk Seal. In: Turner RK, Bateman IJ, Adger N, editors. Economics of coastal and water resources: Valuing environmental functions. Dordrecht: Kluwer Academic Publishers.

Langford, IH, Kontogianni A, Skourtos MS, Georgiou S, Bateman, IJ (1998). Multivariate mixed models for open-ended contingent valuation data: willingness to pay for conservation of monk seals. Environ. Resour. Econ. 12(4):443-456.

Loomis J (1996). Measuring the Economic Benefits of Removing Dams and Restoring the Elwha River: Results of a Contingent Valuation Survey. Water Resour. Res. 32(2):441-447.

Loomis JB, Larson DM (1994). Total economic value of increasing Gray Whale populations: Results from a contingent valuation survey of visitors and households, Mar Resour. Econ. 9:275-286.

Loomis JB, White DS (1996). Economic benefits of rare and endangered species: Summary and meta-analysis. Ecol. Econ. (18):197-206.

Lopez BM, Montes C, Benayas J (2007). The non-economic motives behind the willingness to pay for biodiversity conservation. Biol. Conserv. 139:67-82.

Panou A, Jacobs J, Panos D (1993). The Endangered Mediterranean Monk Seal Monachus monachus in the Ionian Sea, Greece. Biol. Conserv. 64:129-140.

Pearce D, Moran D (1994). The Economic Value of Biodiversity. Earthscan Publications Limited, London.

Portney PR (1994). The Contingent Valuation Debate: Why Economists Should Care, J. Econ. Persp. 8:3-17.

Serpell JA (2004). Factors influencing human attitudes to animals and their welfare. Anim. Welfare 13:145-151.

Shiver DB, Borders BE (1996). Sampling Tecniques for Forest Resource Inventory. John Wiley & Sons. Inc. USA.

Shogren JF, Tschirhart J, Anderson T, Ando AW, Beissinger SR, Brookshire D, Brown GMJr, Coursey D, Innes R, Meyer SM (1999). Why economics matters for endangered species protection. Conserv. Biol. 13:1257-1261.

Spash CL, Urama K, Burton R, Kenyon W, Shannon P, Hill G (2009). Motives behind willingness to pay for improving biodiversity in a water ecosystem: Economics, ethics and social psychology. Ecol. Econ. 68(4):955-964.

Stevens TH, DeCoteau NE, Willis CE (1997). Sensitivity of contingent valuation to alternative payment schedules. Land Econ. 73:140-148.

Tryfos P (1996). Sampling Methods for Applied Research text an cases. John Wiley & Sons, Inc. Canada.

Van Kooten GC (1993). Bioeconomic Evaluation of Government Agricultural Programs on Wetland Land Econ. 69(1):27-38.