

Why conserve biodiversity? A multi-national exploration of stakeholders' views on the arguments for biodiversity conservation (2016) Biodiversity and Conservation

The final publication is available at Springer via <http://dx.doi.org/10.1007/s10531-016-1173-z>

Pam M. Berry¹, Veronika Fabók², Malgorzata Blicharska³, Yennie K. Bredin⁴, Marina García Llorente⁵, Eszter Kovács², Nicoleta Geamana⁶, Adina Stanciu⁶, Mette Termansen⁷, Tiina Jääskeläinen⁸, John R. Haslett⁹, Paula A. Harrison^{1, 10},

¹ Environmental Change Institute, University of Oxford, South Parks Road, Oxford, OX1 3QY, UK.

Pam.berry@eci.ox.ac.uk

Telephone: +44 (0)1865275882

Fax: +44 (0)1865275850

² Institute of Nature Conservation and Landscape Management, Szent István University, Páter Károly u. 1., Gödöllő, H-2100, Hungary and Environmental Social Science Research Group (ESSRG) Rómer Flóris u. 38., Budapest, H-1024, Hungary.

³ Department of Aquatic Sciences and Assessment Sciences, Swedish University of Agricultural Sciences, Box 7050, SE 750 07, Uppsala, Sweden and Swedish Biodiversity Centre, Box 7016, 750 07 Uppsala, Sweden.

⁴ Norwegian Institute for Nature Research, Fakkeltgården, NO-2624 Lillehammer, Norway.

⁵ Department of Applied Research and Agricultural Extension., Madrid Institute for Rural, Agricultural and Food Research and Development (IMIDRA), Ctra. Madrid-Barcelona (N-II), KM. 38.200, 28802 Alcalá De Henares, Madrid, Spain and Social-Ecological Systems Laboratory, Department of Ecology, Universidad Autónoma de Madrid, c. Darwin 2, Biology, 28049 Madrid, Spain.

⁶ Research Center in Systems Ecology and Sustainability, University of Bucharest; Splaiul Independentei 91-95, Sector 5; 050095; Bucharest.

⁷ Department of Environmental Science, Aarhus University, Denmark.

⁸ Finnish Environment Institute, P.O. Box 140, 00251 Helsinki, Finland.

⁹ Division of Animal Structure and Function, Department of Cell Biology, University of Salzburg, Hellbrunnerstrasse 34, A-5020 Salzburg, Austria

¹⁰ Centre for Ecology and Hydrology, Lancaster Environment Centre, Lancaster, Bailrigg LA1 4AP, United Kingdom

Abstract

Given the concern about biodiversity loss, there are a number of arguments used for biodiversity conservation ranging from those emphasising the intrinsic value of biodiversity to those on the direct use value of ecosystems. Yet arguing the case for biodiversity conservation effectively requires an understanding of why people value biodiversity. We used Q methodology to explore and understand how different conservation practitioners (social and natural science researchers, environmental non-Governmental organisations and decision-makers) in nine European countries argue for conservation. We found that there was a plurality of views about biodiversity and its conservation. A moral argument and some arguments around the intrinsic and ecological value of biodiversity were held by all stakeholder groups. They also shared the view that species valuation does not justify the destruction of nature. However, there were also some differences within and between the groups, which primarily reflected the espousal of either ecocentric or anthropocentric viewpoints. Our findings suggest that moral arguments and those around biodiversity's intrinsic and ecological value could potentially serve as a starting point for building consensus among conservation practitioners.

Key words: Intrinsic value, ecological value, utilitarian value, ecosystem services, Q-methodology, conservation practitioners

Introduction

While the loss of biodiversity continues to be of global concern (Secretariat of the Convention on Biological Diversity 2014; McCallum 2015), the debate over its importance remains a hot topic amongst conservation practitioners, researchers and policy makers. A wide variety of arguments for the conservation of biodiversity have been proposed, ranging from those based on its intrinsic value to more utilitarian perspectives (Ehrlich and Ehrlich 1992; Nunes and van der Bergh 2001; Montgomery 2002; Raffaelli et al. 2009). This spectrum of arguments is not new, as already in the late 19th century there were tensions between these two views as expressed by John Muir's "preservationism" and Gifford Pinochet's "conservationism" (Meyer 1997), with Muir emphasising the need to protect wilderness and Pinochet the sustainable use of natural resources. Armsworth et al. (2007) suggested that pluralism between the two schools of thought is the norm in conservation practice. However, the rise of the ecosystem services concept as a means of making human dependence on ecosystems explicit (Norgaard 2010) and attempts to mainstream the commodification of nature (Gómez-Baggethun and Ruiz-Pérez 2011), have led to renewed debate about the different arguments for biodiversity and the reasons for its conservation (e.g. McCauley 2006; Ridder 2008; Peterson et al. 2009).

In a study of the motivations behind conservation in urban areas, Dearborn and Kark (2010) suggested that there was a spectrum, ranging from motivations associated with benefits to nature, to those associated with benefits to humans. Moreover, they showed that often there were multiple motivations, arising from cultural and value differences, amongst the different groups of people involved in any given situation. Thus, those involved in biodiversity conservation can have different legitimate motivations and operate as different actors (Hermelingmeier 2014). It has been suggested that in order to increase the effectiveness of arguments supporting conservation, this diversity of

opinions in biodiversity conservation science and practice should be embraced (Sandbrook et al. 2010).

The ways in which we understand and interact with nature determine our human-nature relationship (Russell et al. 2013) and in practice, this personal perception of nature may affect the motivation of biodiversity conservation actors and how they seek to deliver conservation. Understanding the value systems of those working with biodiversity conservation is, therefore, important if we want to avoid unnecessary conflicts and design conservation solutions that take into account different, often diverging perspectives. Couix and Hazard (2013), for example, emphasise the importance of understanding the beliefs and values of different researchers and other stakeholders for effective cooperation.

The aim of this paper is to compare the personal views of individuals from different conservation practitioner stakeholder groups in different European countries concerning arguments for biodiversity conservation. Such an investigation is important because differences in argumentation may affect decisions concerning biodiversity conservation and thus the delivery of essential ecosystem services and their impact on human wellbeing. Also, understanding the interests and views of stakeholders is important for the successful implementation of natural resources and biodiversity policy (Grimble and Wellard 1997; Bagnoli et al. 2008). This explains why stakeholder analyses are often connected to stakeholder participation and conflict management (Grimble and Wellard 1997; Mushove and Vogel 2005; Reed 2008). Most papers applying stakeholder theory and stakeholder analysis in the conservation context, concentrate on a specific local or national conservation context with the purpose of revealing stakeholders' perceptions, interests or relationships, or making a complex analysis in a particular policy situation (e.g. De Lopez 2001; Mushove and Vogel 2005; Suškevičs et al. 2013). There are also a number of qualitative studies investigating certain stakeholder groups' perceptions about biodiversity or nature in general, sometimes also including their attitudes toward conservation measures (e.g. Fischer and Young,

2006; Buijs et al. 2008; Kelemen et al. 2013). However, there is a lack of analysis of the broad spectrum of values of biodiversity that might be held by the stakeholders working in biodiversity conservation. Particularly, there is a lack of studies that investigate the views of different stakeholders in a European context. Hence in this paper, we focus on three stakeholder groups particularly involved in informing, formulating, influencing and implementing conservation policy: researchers, non-governmental organisations (NGOs) and decision-makers, and we explore their views through a Q analysis.

Methodology

Q methodology combines quantitative and qualitative information to explore social perspectives on a particular issue. The Q methodology is particularly suitable for this study as it enables elicitation of the personal views of stakeholders involved in conservation on arguments associated with biodiversity conservation, and the identification of commonalities and differences in their perspectives in a quantitative manner. While, the qualitative information obtained during the Q-interviews allows for deeper investigation of the reasons underlying personal views.

It has been broadly applied to investigate a range of environmental issues, for example: potential for sustainable forestry (Swedeen 2006) and small scale forestry and market reform in the Ukraine (Nijnik et al. 2009); motivations for urban biodiversity conservation (Dearborn and Kark, 2010); or portrayal of climate change (O'Neill et al. 2013) and values and attitudes of locals living along the Tisza River, Hungary, to water issues and adaptation (Marjainé Szerényi et al. 2011). It is especially suitable for studying contested issues, such as those concerning the environment (Barry and Proops, 1999), as it seeks to capture a range of perspectives. It also provides the opportunity to understand how different stakeholders, characterised by a variety of points of view, perceive an issue (e.g. attitudes to conservation on private land in Poland; Kamal and Grodzínska-Jurczak 2014; landscape preferences of locals in southern Transylvania, Romania (Milcu et al. 2014); identifying which are the greater points of conflict; but also, uncovering the common ground of agreement and shared

understanding between different actors (e.g. Chamberlain et al. 2012). While Q-methodology has some potential drawbacks, such as a lack of possibility to generalise the findings to a larger population, it has proved useful in revealing a range of perspectives existing on a particular topic. It is an exploratory tool that gives qualitative data some quantitative support (Kamal et al. 2014).

The Q method involves six steps: (1) identification of a discourse area of interest; (2) collection of a full range of statements about the discourse; (3) selection of a representative set of statements from the full range (the concourse); (4) selection of participants and execution of Q sorts (i.e. sorting of the statements by the participants according to their level of agreement with the statements); (5) statistical analysis of the Q sorts; and (6) interpretation of the identified perspectives using both the results of the statistical analysis and qualitative information from the discussion of the statements during the sorting (based on Swedeen, 2006). In this study, the discourse of interest concerned views related to conservation, as reflected in arguments about the value of biodiversity and why it is worth investing effort in biodiversity conservation.

A literature review of biodiversity value arguments identified 549 relevant articles from which 180 statements representing the range of views on the importance of biodiversity were selected (Howard et al. 2013). These were sorted into the following broad categories: direct economic use (TEEB 2010); biophilia (Wilson 1984); non-use values (i.e., not associated with actual use of a good or service, such as the moral satisfaction obtained from biodiversity conservation known as its existence value (Kahneman and Knetsch 1992, TEEB 2010) or the satisfaction gained from preserving a natural environment for future generations known as bequest value (TEEB 2010); aesthetic value (e.g. Montgomery 2002); intrinsic value (i.e. biodiversity has a value in itself independent of its usefulness for humans; Brondizio et al. 2010); ecological value/importance of ecological functions (Cardinale et al. 2012); and ecosystem service reasoning (e.g. Daily et al. 2000; Ulyshen 2013). These broad categories were chosen to ensure that the final list of statements represented the diversity of arguments in the literature (Brown 1980). A number of statements between 40 and 80 has been

recommended in Q-literature (e.g. Watts and Stenner 2005), so from the initial 180 statements, 42 were selected (Appendix 1), covering the broad categories (the Q concourse). We selected statements that were salient (i.e. ones that people were likely to have opinion about and could be interpreted in slightly different ways by different people), and understandable (i.e. meaningful to people doing the sorts). In addition, as far as possible, both positively and negatively worded statements were selected from each category. Some editing of the statements (but without altering their meaning) was undertaken, so that they: (i) were understandable when taken out of context; (ii) understandable in different countries and (iii) were easily translated into other languages for application in non-English speaking countries. To avoid misunderstandings due to translation to national languages, we provided the participants with both national language and English versions of the statements. Overall piloting was not carried out as the Q methodology had already been used by a number of the researchers for other studies in their country (e.g. Denmark, Poland and Spain).

While Q methodology can be carried out with relatively small numbers of participants, between 40 and 60 individuals is thought to be good (Stainton Rogers 1995). The Q participants selected included 53 researchers (both natural and social scientists), 25 representatives from NGOs and 43 decision-makers from different governance levels from nine European countries: Denmark, Finland, Hungary, Poland, Norway, Romania, Spain, UK and Austria/Salzburg Province (Table 1). The Q interviews were conducted between April 2013 and April 2014.

The sorting of the Q statements can be according to a pre-defined (forced) quasi-normal distribution or can be freely placed relative to each other (Brown 1980), in both cases ranging from most like respondents think to most unlike they think. In this study, the participants were given the 42 statements, each on a separate card and asked to place them onto a sort chart with a quasi-normal distribution (Figure 1). Given that the centre (0) may not represent the inflexion point between an

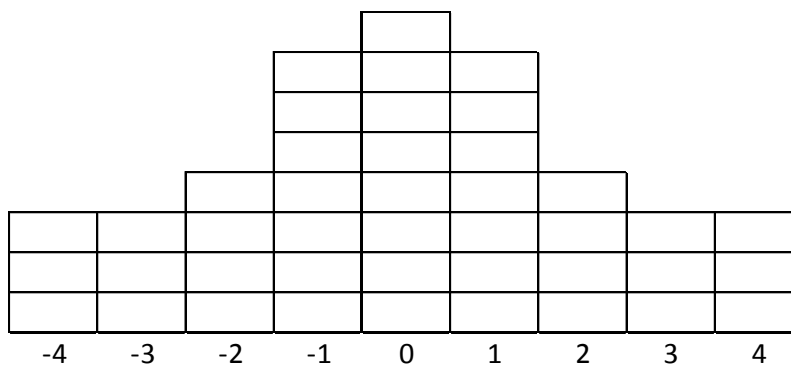
individual's agreement and disagreement with the statements, they were asked at the end of the sort to draw a line on the chart to represent this point, as suggested by Webler et al. (2009). The

Table 1: Number of respondents from each country and stakeholder group.

Country	Researchers	Decision-makers	NGOs	Total
Denmark	9	1	2	12
Finland	7	4	0	11
Hungary	6	4	3	13
Norway	6	3	4	13
Poland	6	4	5	15
Romania	4	11	2	17
Salzburg, Austria ¹	6	2	3	11
Spain	5	5	4	14
UK	4	9	2	15
Total	53	43	25	121

¹ Salzburg Province was considered as equal to the countries in our study, as biodiversity conservation decisions are the responsibility of Austrian Provincial Governments.

Figure 1: Distribution used for sorting the 42 statements.



Least like

Most like

I think

I think

interviews were, if possible, audio recorded to ensure a complete capture of their expressed thoughts. While placing the statements the participants were encouraged to reflect aloud on the reasons for their positioning of them. This information was used to help understand their thinking and to facilitate the interpretation of the results.

We used the free software PQmethod 2.35¹ to analyse the Q sorts. Firstly, we undertook principal component analysis on the statement response matrix and then rotated the resulting factors using the varimax rotation method, where a factor represents a cluster of respondents with similar views (Brown 1993). The rotation helps to reduce noise from sorts which load significantly on more than one factor (Wolf 2006). The decision making process of factor extraction is a complex process, and there is not one single mathematically best solution, as besides statistical considerations (eigenvalue of factors, total variance, number of significantly loading sorts, correlation between factors), it is important to take into account the meaning and significance of the factors (Watts and Stenner 2012). Extracting a set of factors with a relatively high eigenvalue, a reasonable proportion of the total variance (above 40 %) and two (or more) significantly loaded Q sorts is important in the decision making process (Watts and Stenner 2012). We considered variance above 40% acceptable and chose factor solutions with more than three significantly loading Q sorts per factor. We also tried to choose factors with the lowest factor correlation, (ideally below 0.4) as significant correlations could mean that the factors cannot be easily distinguished (Watts and Stenner 2012), but in some cases other considerations were more important. Before choosing the final factor solutions we checked other possible solutions (3 and 4 factor solutions for researchers and NGOs and 2 and 4 factor solutions for decision-makers). None of these had a correlation lower than 0.4

¹ (<http://schmolck.org/qmethod/pqmanual.htm>)

and although there were factor solutions that might have performed better on correlation than the chosen ones, they were more difficult to interpret or there were only a few significantly loading sorts on one of the factors.

We undertook the factor analysis and extracted the factors separately for the three stakeholder groups. We conducted a qualitative analysis of the different factors of the stakeholder groups using the data analysis software NVivo to compare the final perspectives of the different groups. Those individuals whose sorts correlate with a specific factor are called loaders and a sort loading of $\geq \pm 0.39$ for a given factor was considered significant at the $P < 0.01$ level, based on Brown (1980, p.283). The idealised sort pattern (i.e. -4 to +4) for the factor was constructed from the weighted averages of the loaders. The perspectives for each factor were primarily defined by the statements with the highest/lowest z-scores, as z-scores provide a measure of how far the statement is from the centre of the distribution of all statements typical for that factor. Thus, they are useful in identifying those statements most important for describing that particular factor (Webler et al. 2009). Qualitative data from the reflections made during the sort by the significantly loaded respondents was also included in the description in order to understand better the respondents' interpretations of the different statements. Thus, the perspectives were interpreted in a narrative style (Watts and Stenner 2012).

Kampen and Tamás (2014) identified several potential limitations of the Q methodology. One of them is the concern as to whether the concourse selected represents the full range of views on the particular topic. To address this, we conducted an extensive literature review, to cover as many issues as possible. Nevertheless, we acknowledge, that some extreme views may have been omitted from the concourse. Other potential drawbacks are the potential to affect participants' opinion by forcing them to sort the statements into the normal distribution, which may not fully represent their views and biased interpretation of the factors by the researcher. To avoid these problems, the sorting included interviews where the participants could fully express their views about particular

statements. Then the recorded interviews were used in the interpretation of sorting and thus contributed to un-biased understanding of the respondents' views.

Results

The factor analysis on the researchers' dataset (n=53) resulted in two factors representing two main perspectives (Table 2). All of the respondents loaded onto a factor, 34 respondents loaded onto the first and 19 onto the second factor. These factors explained 41% of the variance among all the researchers Q-sorts. When analysing the data we also considered an alternative with three factors. However, in the three factor solution the correlation between the first and third factors was relatively high (0.58). In addition, in this case the second factor, that explained 9% of the variance, did not identify any meaningful perspective. Thus, we decided in favour of the two factor solution.

Table 2: Results for two and three factor solutions for the groups of respondents.

NGOs (Two factor solution)	17	7	Not relevant	43	0.53	Not relevant	Not relevant
Decision-makers (Three factor solution)	16	14	8	47	0.46	0.56	0.41

Analysing the dataset of the NGO respondents (n=25), we distinguished two factors, demonstrating two main perspectives; 17 of the respondents loaded onto the first and seven onto the second factor. The correlation between the two factors was 0.53, while the explained variance was 43%. Although the highest correlation between the factors was lower in the three factor solution (0.48) and the explained variance was higher (52%), we decided against this solution as the number of significantly loaded Q sorts were higher in the two factor solution.

The decision-makers (n=43) loaded onto three main factors, which together explained 47% of the variance; sixteen respondents loaded onto the first, 14 onto the second, and eight onto the third

Stakeholder group	No. of respondents loaded on the factor			% of variance explained	Correlation between factors (F)		
	Factor 1	Factor 2	Factor 3		F1 and F2	F1 and F3	F2 and F3
Researchers (Two factor solution)	34	19	Not relevant	41	0.44	Not relevant	Not relevant

factor. The highest correlation was 0.56 between the first and the third factors. The highest correlation was slightly lower in the two factor solution (0.52), but the explained variance was lower in this case (42 %). Moreover, the perspectives represented by the factors were more meaningful for the three factor solution, so we opted for this.

In the following sections, based on the seven factors derived from the scoring of particular Q-statements, and combined with respondents' reflections on these statements, we present the perspectives that best describe the researchers, NGOs, and decision-makers views on the arguments for biodiversity conservation. Numbers in brackets refer to specific Q statements (see Table 3).

Researchers' perspectives on biodiversity conservation: intrinsic values and ecosystem services.

The first researchers' perspective (R1, Table 2) highlights some of the intrinsic and ecological values of biodiversity – that species are not superfluous and each species is important (17) and that species have a right to exist even if they do not benefit humans (20). This perspective also embraces a moral argument, as humans have no right “to decide about the lives of other creatures” (37) and do not have a “superior moral management role over nature”, although there are specific cases when humans can kill some species in order to protect themselves (e.g. from pathogens). On the contrary, humans have responsibility to protect the planet, “it is a moral duty”, as species extinction is considered to be bad, although there are natural extinctions (40). Species are seen as priceless (6). According to the respondents some species cannot be valued in monetary terms, and the lack of

- 1 Table 3: The 42 Q statements used for the interviews and the distinguishing statements for each of the perspectives. Negative scores indicate disagreement
- 2 (“most unlike I think”) and positive scores indicate agreement (“most like I think”).

Statements	Researchers		NGOs		Decision-makers		
	Statement positions						
	Perspecti ve R1 Intrinsic value	Perspecti ve R2 Utilitarian value (focus on ES)	Perspecti ve NGO1 Intrinsic value	Perspecti ve NGO2 Mixed (intrinsic & utilitarian value)	Perspecti ve D1 Intrinsic value	Perspectiv e D2 Utilitarian value (focus on ES)	Perspect ive D3 Mixed (intrinsic and spiritual value)
1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.	+3	+3		+4			
2. Protecting ecosystem service providers is important because they are a source of economic value.		+4				+4	
3. The ecosystem service approach has potential to improve species conservation in Europe.		+4		+2	+3		
4. Biodiversity conservation is not a moral matter.	-3	-4	-4			-4	-4
5. Some species are important symbols of human values, such as freedom.						-3	
6. Species are priceless.	+4		+4		+4		
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.							
8. The extinction of a species is like the destruction of a great work of art		-3		-3		-3	
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.	-3			-3	-4		
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.						+4	
11. Conserving genetic diversity is important to feed future human populations.		+3				+4	
12. Countries can benefit from their conservation efforts through tourism.				+2		+3	
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.		+3					

Statements	Researchers		NGOs		Decision-makers		
	Statement positions						
	Perspecti ve R1 Intrinsic value	Perspecti ve R2 Utilitarian value (focus on ES)	Perspecti ve NGO1 Intrinsic value	Perspecti ve NGO2 Mixed (intrinsic & utilitarian value)	Perspecti ve D1 Intrinsic value	Perspectiv e D2 Utilitarian value (focus on ES)	Perspect ive D3 Mixed (intrinsic and spiritual value)
14. Losing its biological richness and diversity, the world loses its magic.						-3	+3
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.		+4					
16. We want to experience areas where humans are merely visitors and not inhabitants							
17. Most species are superfluous.	-4	-4	-4	-4	-4	-4	-4
18. We value some species for their beauty, but this is only relevant for a very small number of species. Therefore, beauty is not a particularly important basis for conservation.							
19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.							
20. All species have a right to exist, regardless of their ability to benefit humans.	+4		+4	+4	+4		+3
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.				+3			
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.	+3		+3		+3		+4
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one’s way, to reflect on success and failure.							
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.		+2		-4		+4	
25. Pristine nature is valuable in itself.			+4		+4		+3
26. Ecosystems have co-evolved with humans creating landscapes of important				+3			

Statements	Researchers		NGOs		Decision-makers		
	Statement positions						
	Perspecti ve R1 Intrinsic value	Perspecti ve R2 Utilitarian value (focus on ES)	Perspecti ve NGO1 Intrinsic value	Perspecti ve NGO2 Mixed (intrinsic & utilitarian value)	Perspecti ve D1 Intrinsic value	Perspectiv e D2 Utilitarian value (focus on ES)	Perspect ive D3 Mixed (intrinsic and spiritual value)
cultural value.							
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.			-3				
28. Destroying nature is like burning unread books.		-3	-3				
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.	-3	-4	-3	-4	-3	-4	-3
30. Nature produces works of grace which please the eye.							
31. Species survival ultimately depends on large numbers of other species.				+2			
32. Nature provides the profoundest historical museum of all.				-3			+4
33. Species extinction reduces possibilities for future generations.	+4		+3	+3	+3		
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them in situ.			+3				
35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.			+3				
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.		-3					
37. Humans are morally permitted to extinguish any species harmful to human survival.	-4	-3	-4	-4	-4	-3	-4
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.	-3				-3		
39. As nature is always changing there is no point in conserving a fixed ecosystem state.							
40. Species extinctions are not necessarily bad.	-4		-3	-3	-3		-3
41. Nature and its diversity make our lives meaningful.							+4
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease		+4					

economic value of a particular species does not make it superfluous since "most species are necessary for one or another" (17). Humans are seen as part of nature "not detached from everything". Moreover, biodiversity is seen as important for future options (33). This reflects the precautionary principle, because of uncertainty and gaps in our knowledge about ecosystem functioning (1) and the need to try and conserve all aspects of biodiversity (38). In fact, respondents behind this perspective reflect on the moral relevance of biodiversity conservation "it is foremost a moral question" (4, 37) and express disagreement with the claim that valuing species in economic terms is harmful (29).

The second perspective represented by the researchers (R2) is more utilitarian, as, while it contains elements of the intrinsic value of nature, it also emphasizes the role of biodiversity in fulfilling human needs. Biodiversity is seen as fundamental in providing food security (11, 15), producing new drugs in the future (42) and offering recreational opportunities (13). However, respondents strongly disagree with the statement that biodiversity is good no matter what (36), as "in some cases the costs of conserving biodiversity may exceed the benefits". The precautionary principle is also mentioned in this perspective (1, 24) and biodiversity is seen as useful because of its economic value and the ecosystem services it delivers (2). Thus, applying the ecosystem services approach in conservation is seen as potentially useful as an effective argument about the benefits of nature "the anthropocentric framing can be very effective politically" and it is a "very important new tool if properly applied" (3). However, the respondents representing this perspective do not agree that economic valuation can be a justification for destroying nature (29).

Respondents representing this perspective also believe that biodiversity is a moral matter (4) and do not support the idea that humans have the right to kill any species that is dangerous (37) or that most species are superfluous (17). The respondents do not agree with the arguments that compare the destruction of nature to destroying works of art or books (8, 28). Some found the metaphors not

relevant or useful as arguments for biodiversity conservation, while one respondent saw the art metaphor as a “creationist viewpoint”, as art is created by humans and the species were created through evolution. According to another respondent, extinction can be a part of nature, while “a work of art is irreplaceable”. In the same manner, “destroying books is irreversible, with nature it is different, not all kind of nature is destroyed irreversibly, it can be restored”.

NGOs’ perspectives on biodiversity conservation: intrinsic and anthropocentric values

Similar to the researchers, the first perspective of the NGOs (NGO1) focuses on the intrinsic value of biodiversity. According to the respondents behind this perspective, species have a right to exist and they are valuable regardless of their economic value and their ability to serve human needs (6, 20). The knowledge of their mere existence is also of great value, no matter whether we will have the possibility to see them in our lifetime or not (34), yet biodiversity conservation should not be limited by considerations of other values such as freedom, equality, health, and justice (27). Although little untouched nature is left, pristine nature has a value in itself (25). Therefore, species are seen as invaluable and “standing above economic valuation” (6). Nevertheless, economic valuation would not necessarily lead to the destruction of nature (29). NGO1 also believe that humans are not “the lords of nature”, and thus cannot simply kill species that are harmful (with the exception of extreme cases, such as “smallpox virus”) (37). However, this is a complex issue that depends on the particular context, e.g. local people suffer more from large carnivores protected at the national level. Moreover, in this perspective, the extinction of species is seen as bad (40). Ecological values are reflected in it not being right to say that most species are superfluous, as “everything complements each other”, “species’ survival depend on a large number of other species” and “every species is a part of a whole” (17, 22). Therefore, one needs to be careful, particularly when considering the needs of future generations as the extinction of species will reduce their options (33).

The second NGOs' perspective (NGO2) includes very diverse statements. While there are intrinsic and ecological value arguments, concerning species' inherent right to exist (20) no matter if they benefit humans, and seeing every species as having some role (17), a more anthropocentric thinking about nature also is present. Respondents underline the role of humans in shaping (cultural) landscapes (26). Biodiversity conservation is not seen as a moral matter (4), but species extinction is bad and humans are not permitted to kill any species even if they are harmful to human survival (40, 37). Unlike any other group, NGO2 see nature as a laboratory for learning (21), but not like a museum (32). Within this perspective, economic valuation is seen as potentially useful in communicating the value of biodiversity, and the ecosystem services concept can serve as a justification for species protection (3, 29). Yet, according to one respondent the economic valuation can also be problematic, as some ecologically important species, such as soil fauna, do not have a direct economic value in conventional markets. Respondents acknowledge the importance of different species for future generations (33), and they see the need to apply the precautionary principle (1) due to the imperfections in our knowledge of how ecosystems might respond to future changes and thus the need to conserve species as back-ups (24).

Decision-makers: intrinsic values, spiritual values and ecosystem services.

As in the other two stakeholder groups, the main focus of the first perspective represented by decision-makers (D1) is the intrinsic and ecological value of biodiversity and pristine nature (25). Intrinsic value is fundamental; it is like a "religion or a belief". All species have a right to exist, "they cannot be valued as they are invaluable", they are all important, but usually not irreplaceable (20, 6, 17). This perspective also highlights that species depend on each other, even though there can be replacements, and that "nature is flexible", although sometimes the system can break down (22). D1 respondents claim that humans are not allowed to extinguish any species, but there can be exceptions (e.g. "mosquitos") (37). Extinctions that are caused by humans are seen as wrong, and

referring to extinctions as a natural process can be used as “an excuse from our responsibility to conserve” (40). The respondents also believe that we should aim to conserve biodiversity in all its aspects (38) because we have no right to diminish it, although some admitted that, in reality, sometimes we have other goals (as in the case of dealing with invasive species). Although the main focus of this perspective is on the intrinsic and ecological values of nature, it also mentions conserving possibilities for future generations (33). The ecosystem services approach and economic valuation are seen as good tools in communication, although both can be “dangerous as they can be abused” (3, 29). Nevertheless, economic valuation of nature itself is not seen as justifying the destruction of the biosphere (29).

The most prominent message of the second perspective of the decision-makers (D2) is the role of biodiversity in providing certain goods and services for humans. The usefulness of biodiversity in poverty alleviation and food provision are mentioned (10, 11). Maintaining genetic diversity for food security is very important for reducing vulnerability, especially to changes, like climate change and in developing countries. The insurance value of biodiversity is also seen as fundamental for maintaining functioning ecosystems under drivers of change, as particular species can replace each other (11, 24). This perspective also highlights the possible co-benefits of conservation and tourism (12). The economic value of biodiversity is considered important (2), although biodiversity should not be reduced to its economic benefits only. The ecosystem services concept and economic valuation, however, is described as a “promising approach” in convincing society of the importance of conservation. According to one respondent, ecosystem services provide a link between nature conservation and instrumental values. Economic valuation is not meant to destroy nature, and such thinking is seen as a “misconception” (29). Besides all these utilitarian arguments, the decision-makers behind the second perspective mostly see biodiversity as a moral matter (4). Thus, humans are not permitted to kill any harmful species, although in some cases there is a “room for discussion

(e.g. pathogens)” (37). As we do not know enough to say that most species are superfluous, “it cannot be a reason to not conserve species” (17).

The third perspective of the decision-makers (D3), besides intrinsic value, includes ecological, spiritual and aesthetic value elements. The respondents behind this perspective believe that nature makes our lives meaningful, and that without it “human existence has no sense” as we are “part of nature” (41). The world would lose its magic without biodiversity, and it would be a “poorer place” (14). D3 respondents also argue for the intrinsic value of biodiversity and pristine nature. According to them, the existence of species and their conservation should not depend on their capacity to provide services for humans (20, 25). Biodiversity conservation is seen as a moral matter and we have a moral responsibility towards nature (4). Species extinction is bad “no matter the motivation” (40). We do not have a right to kill any harmful species, except those with which it is impossible to co-exist (e.g. “smallpox virus”) (37). Those representing this perspective also believe that “all species are important” (17), and thus, it is essential to maintain the integrity of ecosystems. “If we want a healthy environment we need to stress the interconnectedness of it all (the system), we need to think about it as a whole, rather than (focusing on) individual species” (22). This perspective also underlines the possibilities that can be lost for future generations due to species extinctions. According to one respondent, we will never know what we will lose with species extinctions, from a medicine to the experience of seeing a tiger (33).

Discussion

There are various approaches to eliciting different views on aspects of biodiversity and conservation, with each serving different purposes. For example, questionnaires have been used to explore the thoughts of professional and public on nature and landscape (Buijs and Eland 2013); focus groups in

France, Hungary and Italy to compare organic and conventional farmer's perceptions of biodiversity (Kelemen et al. 2013) and semi-structured interviews followed by questionnaires to capture views on protected area expansion in Poland (Grodzinska-Jurczak and Cent 2011). While Q methodology has its limitations (see Methods), one obvious advantage is the relatively small sample size (number of respondents) needed for the exploration of different perspectives within a population, especially in comparison with traditional survey methods, such as questionnaires, although these serve different purposes. Furthermore, the Q methodology allows for fairly straightforward and easy analyses compared to other social science methods, e.g. discourse analyses, designed to exploring people's attitudes, and embraces the subjective nature of attitudes by asking for people's subjective views on specific topics. Another strength of the Q methodology is that it allows a combination of quantitative and qualitative information in the interpretation of results. Thus, the Q methodology allows for a relatively robust statistical analysis of people's subjectivities, while at the same time offering enough flexibility in the interpretation of results to allow for accurate representations of respondents' views.

a) Comparison of perspectives across the stakeholder groups

Our analysis has revealed seven different perspectives among the conservation practitioners interviewed. Given that they focus on different aspects of biodiversity conservation in their work, one could expect considerable variation in perspectives amongst the groups. However, our study identified a wide range of perspectives in all of these groups, from intrinsic to utilitarian, with certain statements (e.g. 17 and 37 around intrinsic ecological value and a moral argument) sorted similarly by the respondents from all the perspectives across all the stakeholder groups. These are the values which traditionally have been seen as central to motivations for conservation (McCauley 2006). Moreover, no respondents thought that economic valuation led to a justification for destruction of the biosphere (29), and most thought that human-induced species extinctions were bad (40). There were, however, within particular perspectives, certain views that were stressed and statements that were not shared by any other group. For example, for the potential of biodiversity for delivering

ecosystem services, R2 emphasised the importance of cultural experiences and genetic resources, especially for dealing with future change (13, 15, 42), while D2 focused on poverty alleviation and the benefits of (eco)tourism (10, 12). It is also interesting to note that the decision-makers have a mix of perspectives and that we identified more perspectives in this group than in the others.

The stakeholder groups we investigated are all directly involved in and influencing biodiversity policy making and working for biodiversity conservation, sharing a common goal. We acknowledge that our sample of respondents included more researchers, while two other groups were less represented (Table 1). This is partly because we sought to include both natural and social scientists, so this was more heterogeneous group, which needed to be represented. Also, it may both reflect the fact that biodiversity governance in Europe is dominated by researchers, and the availability of respondents that have agreed to take part in the study. However, we believe that the greater number of researchers in our investigation do not undermine the importance of our findings, as each group was analysed separately and our findings show that the main differences in perspectives on biodiversity conservation are not between the particular stakeholder groups, but rather between ecocentric and anthropocentric views. These two views could be clearly distinguished in the NGO group, while the researchers and decision-makers focused more on the ecosystem services (perspectives R2 and D2).

A number of statements did not reflect the thinking of any participants and thus they may represent arguments which are less likely to be relevant in discussions about biodiversity conservation in Europe, or that these arguments were considered less critical or not as strong as the others. These statements included some about the spiritual and aesthetic aspects of biodiversity (e.g. 7, 30), the desire to experience pristine or untouched areas (16) and beauty as a potential basis for conservation (18). For some of these there are related statements, for example statements 16 and 25 express similar sentiments, and, from observations of the sorting, in such cases respondents preferred one statement over another, and only placed one of them in the “more like I think” part of the sort. In fact, the well-known argumentation line followed by McCauley (2006) referred to “The

reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet ” (7) was not supported or opposed in any perspective.

Also, the respondents did not think in line with statement 19, “We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat”, although they reacted strongly to other, closely linked statements, such as all species having a right to exist (20) and humans (not) being morally permitted to extinguish species which are harmful to our survival (37). These less salient statements could offer a good starting point for discussions to reach an understanding or agreement among conflicting interest groups, as they could represent less controversial statements, which are not so critical to their standpoints. Then, once they are already talking, it could be easier to move on to discussing issues, which are actually important to the parties.

b) Perspectives on ecosystem services, economic valuation and biodiversity conservation

The ecosystem service approach was represented explicitly in four statements (2, 3, 10, 29), which refer to the concept itself and to the economic valuation process in particular. They were important for certain perspectives and this may be a result of the mainstreaming of the ecosystem service concept, which created a forum of debate where different stakeholders can express their various opinions (Primmer et al. 2015). In our study, decision-makers were often pragmatic and remarked on the key potential contributions of ecosystem services (e.g. to poverty alleviation).

The respondents also all agreed that economic value or the lack of it should not be used as a justification to destroy nature or species, but otherwise opinions about economic value and valuation seemed to be rather mixed. This is in line with the long ongoing debate about the opportunities, but also the limits, drawbacks, and problems of economic valuation of biodiversity

(e.g. Spash, 1997; Daily et al. 2000; Norgaard, 2010; TEEB, 2010). Many authors have previously pointed out the risk of economic valuation, which may lead to commodification of nature (Gómez-Baggethun and Ruiz-Pérez 2011; Salles 2011; Gómez-Baggethun et al. 2016). However, others point to the potential benefits of economic valuation that does not necessarily lead to such commodification (Costanza et al. 2014).

As presented by Kallis et al. (2013), to value or not to value could be a false dilemma, and the decision will depend on many other contextual factors that should be analysed. Following our findings, it seems that all respondents were aware of the potential downsides of economic valuation. The range of perspectives about biodiversity identified in our study supports the suggestion that a more integrated and pluralistic approach to biodiversity and its valuation is needed (IPBES 2014; Gomez-Baggethun et al. 2016). This should consider different values (anthropocentric and non-anthropocentric) and valuation techniques including ecological, economic and socio-cultural approaches.

c) Why conserve biodiversity?

Little published research is available comparing the views of conservation stakeholders across Europe, as opposed to studies in individual countries (e.g. Sandbrook et al 2010; Buijs and Eland 2013; Couix and Hazard 2013). This study is the first to identify these differing conservation perspectives between stakeholder groups and revealing them can help communication and cooperation. Our study has shown that, while the stakeholders do have a variety of reasons for why nature should be conserved, ranging from moral to more anthropocentric and utilitarian arguments, there is an overall appreciation of certain aspects of the intrinsic value of nature. This, and the existence of elements of utilitarian or anthropocentric perspectives in all groups provides, some common ground with opportunities for building an inclusive discourse around biodiversity conservation. Also, realising and acknowledging the differences in stakeholders' arguments for

biodiversity when engaging in discussions about conservation is likely to lead to better communication and thus more effective delivery of conservation solutions (Gustafsson 2013).

The ecosystem services concept seems to lie between the intrinsic value and the utilitarian perspectives and may form an important conceptual and communication bridge. In our analysis, it appeared in the utilitarian perspective of researchers (R2), in the mixed perspective of NGOs (NGO2) and in the intrinsic value and utilitarian perspectives of decision-makers (D1 and D2). It might be explained by the main feature of ecosystem services, which is their linking of social and ecological systems (e.g. the cascade model of Haines-Young and Potschin, 2010). Despite being inherently anthropocentric, concentrating on the benefits people obtain from ecosystems (Millennium Ecosystem Assessment 2005), the ecosystem services approach has potential for raising awareness about the importance of nature and nature conservation across various stakeholder groups.

In conclusion, this study has provided insights into the reasons underlying European conservation practitioners' value of biodiversity. However, while we found an overall appreciation of certain aspects of the intrinsic value of nature, we also revealed a broad spectrum of perspectives on biodiversity conservation from intrinsic to utilitarian ones. The main differences appeared to result from the espousal of ecocentric or anthropocentric viewpoints, rather than from differences between the various stakeholder groups. Understanding of these different and sometimes diverse perspectives represented by the conservation practitioners can provide the basis for better cooperation and more effective argumentation for maintaining biodiversity. Thus, understanding how arguments for conservation are considered by different stakeholders is of crucial importance for the planning of effective biodiversity conservation and the use of a variety of arguments based on the plurality of views may enhance the acceptability and success of conservation action.

Acknowledgements

We would like to thank all the stakeholders who took part in this study and gave freely of their time and thoughts. This work was also supported by the European Union, under FP7 project BESAFE (FP7-ENV.2011.282743). MGL was also funded by a postdoctoral grant from the Spanish National Institute for Agriculture and Food Research and Technology (INIA), which is co-funded by the European Social Fund. Authors from the Szent István University were also supported by the Research Centre of Excellence (9878/2015/FEKUT, 9878-3/2016/FEKUT). We would also like to thank two anonymous reviewers for their comments, which helped to strengthen this paper.

References

- Armsworth PR, Chan KMA, Daily GC, Ehrlich PR, Kremen C, Ricketts TH, Sanjayan MA (2007) Ecosystem-service science and the way forward for conservation. *Conserv Biol* 21: 1383-1384
- Bagnoli P, Goeschl T, Kovács E (2008) People and biodiversity policies, impacts, issues and strategies for Policy Action. OECD, Paris
- Barry J, Proops J (1999) Seeking sustainability discourses with Q methodology. *Ecol Econ* 28:337-345.
- Brondízio E, Gatzweiler FW, Zografos C, Kumar M (2010) The socio-cultural context of ecosystem and biodiversity valuation. In: Kumar P (ed) *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*, Earthscan, London, pp 149–181
- Brown SR (1993) A primer on Q methodology. *Operant Subj* 16: 91–138
- Brown SR (1980) *Political subjectivity: applications of Q methodology in political science*. CT: Yale University Press, New Haven
- Buijs AE, Elands BHM (2013) Does expertise matter? An in-depth understanding of people's structure of thoughts on nature and its management implications. *Biol Conserv* 168:184–191

- Buijs AE, Fischer A, Rink D, Young JC (2008) Looking beyond superficial knowledge gaps: understanding public representations of biodiversity. *Int J of Biodiver Sc and Manage* 4: 65-80
- Cardinale, B.J, Duffy JE, Gonzalez A. et al. (2012) Biodiversity loss and its impact on humanity. *Nature* 486(7401): 59-67
- Chamberlain EC, Rutherford MB, Gibeau ML (2012) Human Perspectives and Conservation of Grizzly Bears in Banff National Park, Canada. *Conserv Biol* 26: 420–431
- Costanza R, de Groot R, Sutton P, van der Ploeg S, Anderson SL, Kubiszewski I, Farber S, Turner RK (2014) Changes in the global value of ecosystem services. *Global Environ Change* 26:152–158
- Couix N, Hazard L (2013) When the future of biodiversity depends on researchers' and stakeholders' thought-styles. *Futures* 53: 13-21
- Daily GC, Soderquist T, Aniyar S, Arrow K, Dasgupta P, Ehrlich PR, Folke C, Jansson AM, Jansson BO, Kautsky N, Levin S, et al (2000) The value of nature and the nature of value. *Science* 289:395–396.
- De Lopez TT (2001) Stakeholder management for conservation projects: A case study of Ream National Park, Cambodia. *Environ Manage* 28:47-60
- Dearborn DC, Kark S (2010) Motivations for conserving urban biodiversity. *Conserv Biol* 4: 432-440.
- Ehrlich PR, Ehrlich AH (1992) The value of biodiversity. *Ambio* 21:219–226
- Fischer A, Young JC (2006) Understanding mental constructs of biodiversity: Implications for biodiversity management and conservation. *Biol Conserv* 136:271-282
- Gómez-Baggethun, E. Barton DN, Berry P, Dunford R, Harrison PA (2016) Concepts and methods in Ecosystem Service Valuation. In: Potschin M, Haines-Young R, Fish R, Turner RK (eds), *Handbook of Ecosystem Services*, Routledge

Gómez-Baggethun E, Ruiz-Pérez M, (2011) Economic valuation and the commodification of ecosystem services. *Prog in Phys Geog* 35: 613–628

Grimble R, Wellard K, (1997) Stakeholder methodologies in natural resource management: a review of principles, context, experiences and opportunities. *Agr Sys* 55: 173-193

Grodzinska-Jurczak M, Cent J (2011) Expansion of nature conservation areas: problems with Natura 2000 implementation in Poland? *Environ Manage* 47: 11-27

Gustafsson KM. (2013) Environmental discourses and biodiversity: the construction of a storyline in understanding and managing an environmental issue. *J Integr Environ Sci* 10: 39–54

Haines-Young R, Potschin M (2010) The links between biodiversity, ecosystem services and human well-being. In: Raffaelli, D.G. and Frid, C.L.J., (eds) *Ecosystem ecology: a new synthesis*, Cambridge University Press, pp. 110-139

Hermelingmeier V (2014) Harmonizing OPERAs voices. An investigation of different perspectives on the ecosystem services concept and their implications for research and practice. Masters Thesis, University of Lund

Howard BM, Braat L, Bugter R, Hails RH (2013) Deliverable 1.1: Report on the classification of arguments and the provisional framework <http://www.besafe-project.net/files/DOWNLOAD2/D1%201%20Report%20on%20classification%20of%20arguments%20-%20FINAL%20.pdf>

IPBES (Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services) (2014) Preliminary guide regarding diverse conceptualization of multiple values of nature and its benefits, including biodiversity and ecosystem functions and services, IPBES/3/INF/7)

Kahneman D, Knetsch JL (1992) Valuing public goods: the purchase of moral satisfaction. *J of Environ Econ and Manage* 22:, 57 -70

Kallis G, Gómez-Baggethun E, Zografos C (2013) To value or not to value? That is not the question. *Ecol Econ* 94: 97-105

Kamal S, Kocór M, Grodzińska-Jurczak M (2014) Quantifying human subjectivity using Q method: when quality meets quantity. *Qual Sociol Rev.* X: 60–79

Kamal S, Grodzińska-Jurczak M (2014) Should conservation of biodiversity involve private land? A Q methodological study in Poland to assess stakeholders' attitude. *Biodiver and Conserv* 23: 2689-2704

Kampen JK, Tamás P (2014) Overly ambitious: contributions and current status of Q methodology. *Qual and Quant* 48: 3109-3126

Kelemen, E, Nguyen G, Gomiero T, Kovács E, Choisis J-P, Choisis, N, Paoletti MG, Podmaniczky L, Ryschawy J, Sarthou J-P, Herzog F, Dennis P, Balázs K (2013) Farmers' perceptions of biodiversity: Lessons from a discourse-based deliberative valuation study. *Land Use Policy* 35: 318–328

Marjainé Szerényi Z, Zsóka Á, Ásványi K, Flachner Z (2011) The Role of Adaptation to Climate Change in Rural Development. *Reg and Bus Stud* 3 Suppl 1: 189-198

McCallum M (2015) Vertebrate biodiversity losses point to a sixth mass extinction. *Biodivers Conserv* 24: 2497-2519

McCauley DJ (2006) Selling out on nature. *Nature* 443: 27-28

Meyer JM (1997) Gifford Pinchot, John Muir, and the Boundaries of Politics in American Thought. *Polity* 30: 267–284

Milcu AI, Sherren K, Hanspach J, Absom D, Fischer J (2014) Navigating conflicting landscape aspirations: Application of a photo-based Q-method in Transylvania (Central Romania). *Land Use Policy* 41: 408-422

Millennium Ecosystem Assessment (2005) *Ecosystems and Human Well-being: Synthesis*. World Resource Institute, Washington DC

Montgomery C (2002). Ranking the benefits of biodiversity: an exploration of relative values. *J of Environ Manage* 65:313–326

Mushove P, Vogel C (2005) Heads or tails? Stakeholder analysis as a tool for conservation area management. *Glob Environ Change* 15: 184–198

Ninjik M, Ninjik A, Bizikova L (2009) Analysing the Development of Small-Scale Forestry in Central and Eastern Europe. *Small-scale For* 8: 159-174

Norgaard R (2010) Ecosystem services: From eye-opening metaphor to complexity blinder. *Ecol Econ* 69: 1219-1227

Nunes PALD, van der Bergh JCJM (2001) Economic valuation of biodiversity: sense or nonsense? *Ecol Econ* 39: 203–222

O'Neill SJ, Boykoff M, Niemeyer S, Day SA, (2013) On the use of imagery for climate change engagement. *Glob Environ Change* 23(2): 413-421

Peterson MJ, Hall DM, Feldpausch-Parker AM, Peterson TR (2009) Obscuring ecosystem function with application of the ecosystem services concept. *Conserv Biol* 24: 113–11

Primmer E, Jokinen P, Blicharska M, Barton DN, Bugter R, Potschin M (2015) Governance of ecosystem services: a framework for empirical analysis. *Ecosystem Services* 16: 159-166

Raffaelli D, Smart J, Austen M, Mangi S, Hattam C, Termansen M, Fraser E, Abson D (2009) Valuation of Biodiversity? A NERC scoping study. Natural Environment Research Council, Swindon

Reed MS (2008) Stakeholder participation for environmental management: a literature review. *Biol Conserv* 141: 2417–2431

Ridder B (2008) Questioning the ecosystem services argument for biodiversity conservation. *Biodivers Conserv* 17: 781–790

Stainton Rogers R (1995) Q methodology. In Smith JA, Harre R, Van Langenhove L (eds.) *Rethinking methods in psychology*, Sage, Thousand Oaks, CA, pp. 178-192

Russell R, Guerry AD, Balvanera P, Gould RK, Basurto X, Chan KMA, Klain S, Levine J, Tam J (2013) Humans and nature: how knowing and experiencing nature affect well-being. *Annu Rev Environ Resour* 38: 473–502

Salles JM (2011) Valuing biodiversity and ecosystem services: why put economic values on nature? *Comptes Rendus Biologies* Doi:10.1016/j.crvi.2011.03.008

Sandbrook C, Scales I, Vira B, Adams WM (2010) Value plurality among conservation professionals. *Conserv Biol* 25: 285-294

Secretariat of the Convention on Biological Diversity (2014) *Global Biodiversity Outlook 4*. Montréal

Spash CL (1997) Ethics and environmental attitudes with implications for economic valuation. *J of Environ Manage* 50: 403-416

Suškevičs M, Tillemann K, Kūlvik M (2013) Assessing the relevance of stakeholder analysis for national ecological network governance: the case of the Green Network in Estonia. *J for Nat Conserv* 21: 206–213

Swedeen P (2006) Post-normal science in practice: a Q study of the potential for sustainable forestry in Washington State, USA. *Ecol Econ* 57: 190-208

TEEB (2010) *The Economics of Ecosystems and Biodiversity: Ecological and Economic Foundations*. Kumar P (ed), Earthscan, London and Washington

Ulyshen MD (2013) Strengthening the case for saproxylic arthropod conservation: a call for ecosystem services research. *Insect Conserv Diversity* 6: 393–395

Watts S, Stenner P (2012) *Doing Q methodological research theory, method and interpretation*. Sage, London

Watts S and Stenner P (2005) The subjective experience of partnership love: a Q methodological study. *Brit J Soc Psychol* 44: 85-107

Webler T, Danielson S, Tuler S (2009) Using Q method to reveal social perspectives in environmental research . Greenfield (MA): Social and Environmental Research Institute. Available from <http://www.seri-us.org/content/primer-q-methodology-available-free-download>

Wilson EO (1984) *Biophilia*. Harvard University Press, Cambridge

Wolf J (2006) *Climate change and citizenship: a case study of responses in Canadian coastal communities*. Department of Development Studies. University of East Anglia, Norwich, UK

Appendix 1: the 42 Q statements

1. We do not know how ecosystems will be affected by the loss of species, therefore we better preserve them.
2. Protecting ecosystem service providers is important because they are a source of economic value.
3. The ecosystem service approach has potential to improve species conservation in Europe.
4. Biodiversity conservation is not a moral matter.
5. Some species are important symbols of human values, such as freedom.
6. Species are priceless.
7. The reason biodiversity matters is because it confers on us an imprecise, immeasurable well-being that is located in the spirit rather than in the wallet.
8. The extinction of a species is like the destruction of a great work of art.
9. It is not clear why all species that environmentalists campaign to conserve ought to be saved.
10. Protecting biodiversity and ecosystem services is particularly important for poverty alleviation in developing countries.
11. Conserving genetic diversity is important to feed future human populations.
12. Countries can benefit from their conservation efforts through tourism.
13. Nature provides us with many valuable experiences. We hunt, fish, hike, mountain climb, and engage in numerous activities in which we interact with nature.
14. Losing its biological richness and diversity, the world loses its magic.
15. It is important to conserve the genetic reservoir in a region, in case we need to breed disease-resistant plants or produce food adapted to local conditions.
16. We want to experience areas where humans are merely visitors and not inhabitants.
17. Most species are superfluous.
18. We value some species for their beauty, but this is only relevant for a very small number of species.
Therefore, beauty is not a particularly important basis for conservation.

19. We do not need to recognize other beings as our moral equals to realize that we should not kill that which is not a threat.
20. All species have a right to exist, regardless of their ability to benefit humans.
21. Nature is a laboratory for the pursuit of science through which society gains knowledge, and understanding of the world.
22. The diversity of life is something like the rivets on an airplane, with each species playing a small but significant role in the working of the whole. The loss of each rivet weakens the plane by a small but noticeable amount – until it loses airworthiness and crashes.
23. Nature provides a place to take calculated risks, to learn the luck of the weather, to lose and find one's way, to reflect on success and failure.
24. Even if only a few species are needed for our world to be productive we have to conserve more species as a back-up. Otherwise a pest or climate change could wipe out the few species we have saved, and we would have nothing in reserve.
25. Pristine nature is valuable in itself.
26. Ecosystems have co-evolved with humans creating landscapes of important cultural value.
27. Any effort to conserve biodiversity must be limited by considerations of other values such as freedom, equality, health, and justice.
28. Destroying nature is like burning unread books.
29. Valuing species in economic terms implies a justification for the destruction of the biosphere.
30. Nature produces works of grace which please the eye.
31. Species survival ultimately depends on large numbers of other species.
32. Nature provides the profoundest historical museum of all.
33. Species extinction reduces possibilities for future generations.
34. The knowledge of the mere existence of species is valuable, even if it is certain that I will never experience them *in situ*.

35. Genetic diversity is good because each particular species represents the success of generations of evolutionary trial and error.
36. Biodiversity is an unqualified good, i.e. biodiversity is good no matter what.
37. Humans are morally permitted to extinguish any species harmful to human survival.
38. We can't aim to conserve biodiversity in all its aspects. Instead, we have to make choices about increasing, maintaining, or even diminishing biodiversity in particular circumstances.
39. As nature is always changing there is no point in conserving a fixed ecosystem state.
40. Species extinctions are not necessarily bad.
41. Nature and its diversity make our lives meaningful.
42. The earth's biodiversity should be conserved because genetic diversity may be valuable in the development of new drugs against disease.